



ADVANCES IN ROAD WEATHER RESEARCH

Nearly a billion hours and seven thousand lives are lost each year due to the effects of adverse weather on the nation's highways.^{1,2} To address this national challenge, the transportation and weather communities have joined forces to define needs and coordinate programs on road weather research.

WEATHER AND HIGHWAY OPERATIONS

Weather affects the nation's roads everyday. Adverse weather is the second largest cause of non-recurring highway congestion. Snow, ice, and fog alone account for 15 percent of that congestion. Additionally, more than 1.5 million crashes, resulting in 800,000 injuries and 7,000 fatalities, occur annually under adverse weather.

While we cannot change the weather, we can reduce its impact on highway safety and operations. Today we can predict weather changes, identify threats to the highway system, and respond proactively.

To do so, accurate and timely road weather information is essential, allowing transportation managers to warn people of changing weather, manage the infrastructure, and respond to conditions in real time. Making this information available requires the active involvement of a range of participants in the transportation and weather industries. Since this information is not readily available today, a strong research program is required to address the various technical, policy, and institutional issues associated with the providers and users of weather-related information.

Three recent publications capture the status of road weather research and describe its needs.

GAPS IN ROAD WEATHER RESEARCH

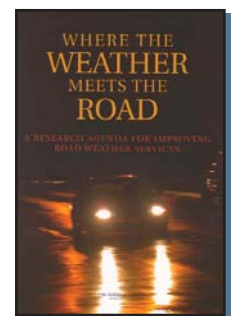
In 2002, the Office of Federal Coordinator for Meteorological Services and Supporting Research (OFCM) completed a study of existing and potential needs for weather information for surface transportation including highways. The study stressed that in order to meet the nation's surface transportation needs, public

and private partners should work together to provide the basic weather and information forecasts, support the fundamental research and technology innovation needed to advance the state-of-the-art, and encourage the transfer of research results into operations.³



This report has been instrumental in shaping efforts to date. In response to the OFCM study, the FHWA requested the National Research Council (NRC) to examine what needs to be done from the research, development, and technology perspectives to improve the production and delivery of weather-related information on the nation's highways. The NRC formed the Committee on Weather Research for Surface Transportation under the Board on Atmospheric Sciences and Climate to investigate the current state of knowledge regarding road weather conditions and to recommend key areas of research to enhance operational production of weather-related information for roads.

In the report titled "*Where the Weather Meets the Road*";⁴ the committee states that there are substantial research questions and opportunities in road weather that warrant a long-term national commitment, and therefore recommends the establishment of a focused, coordinated national road weather research program. The report also recommends that the FHWA have the lead role in the national road weather research program, with the National Oceanic and Atmospheric Administration (NOAA) as a key partner. Based on an assessment of unmet needs and costs for comparable research activities, the report estimates the research program will require on the order of \$25 million per year for 15 years.



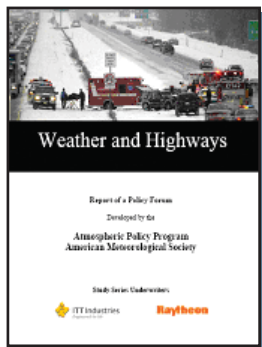
¹ *Traffic Congestion and Reliability - Linking Solutions to Problems*. Cambridge Systematics and Texas Transportation Institute. July 2004.

² NHTSA Fatality Analysis Reporting System (FARS) and General Estimates System (GES).

³ *Weather Information for Surface Transportation*. National Needs Assessment Report. Office of the Federal Coordinator for Meteorological Services and Supporting Research. Washington D.C. 2002.

⁴ *Where the Weather Meets the Road: A Research Agenda for Improving Road Weather Services*. National Research Council. Committee on Weather Research for Surface Transportation. National Academy of Sciences. Washington D.C. 2004.

The FHWA also partnered with the American Meteorological Society (AMS) Atmospheric Policy Program to conduct a forum in November 2003 that would discuss: the need to provide weather information to improve the highway system; the strategies to effectively respond to weather information; and the policy issues surrounding the effective application of weather services to highway system management. Like the NRC study, one of the major recommendations from the AMS forum, summarized in the document “*Report of a Policy Forum on Weather and Highways*”,⁵ is the need to develop a national road weather program that will coordinate the research, development, and applications activities of all public, private, and academic sector weather stakeholders.



Within a national research program, the NRC and the AMS studies recommended the following major focus areas:

1. A robust and integrated road weather observational network and data management system;
2. Improved modeling, forecasting, and decision-support capabilities and tools to provide relevant, useful information and deliver road weather services to those who build, maintain, operate, and use the highways;
3. Increased understanding of road weather phenomena and decision processes through user training and education courses; and
4. Advanced sensing technologies and multiple mechanisms for communicating road weather information to the range of users in ways that support informed decision-making.

To address these focus areas, the NRC study recommends establishing regional centers and national demonstration corridors for road weather research.

FHWA RESEARCH AGENDA

The needs identified in the above reports have been embraced by FHWA, who has dedicated resources to achieve them, some of which are described here.

⁵ *Weather and Highways*. Report of a Policy Forum. Atmospheric Policy Program. American Meteorological Society. Washington D.C. 2004.

National Surface Transportation Weather Observing System

In coordination with the Intelligent Transportation Systems (ITS) program, FHWA established a 5-year initiative to design and deploy a nationwide, integrated road weather observational network and data management system. The resulting system will integrate fixed, mobile, and remote road weather sensors, allowing unprecedented access to tailored road weather information.

Modeling, Forecasting, and Decision-Support Tools

FHWA developed and continues to improve the prototype Maintenance Decision Support System (MDSS) for winter road maintenance. The system is the most advanced road weather information system to date, providing weather forecasts, road condition information, and treatment recommendations (snow removal and ice control) for various sections on the highway network. MDSS has been successfully piloted in Iowa. Throughout this effort, FHWA has also identified gaps in knowledge about the interaction of weather, roads, and traffic.

Training and Education

FHWA develops and delivers a variety of outreach products such as training courses, brochures, and a web site, in coordination with NOAA and other partners. Current efforts include a one-day course on the Fundamentals of Road Weather Management, a CD about making the most of National Weather Service products and services, and a resource finder that points users to the most appropriate road weather solutions given their needs.

Advanced Sensor and Communications Technologies

FHWA’s Vehicle-Infrastructure Integration (VII) initiative looks at vehicle-based sensors and communications technologies for gathering weather and road condition information and transmitting this information to the road users. This effort promotes the use of road weather sensors and facilitates the integration and sharing of data between vehicles and the road infrastructure.

FHWA Publication #: FHWA-HOP-04-030
ITS Electronic Document Library #: 14006

For more details about these efforts, contact:

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