



# Road Weather Management Performance Measures

## *A Way to Measure and Monitor Achievement*

### Background

The 2005 Safe, Accountable, Flexible and Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) established a Road Weather Research and Development Program under the Intelligent Transportation System (ITS) program with three primary goals: maximize the use of available road weather information and technologies; expand road weather research and development efforts to enhance roadway safety, capacity, and efficiency while minimizing environmental impacts; and promote technology transfer of effective road weather scientific and technological advancements.

To gauge performance, the Road Weather Management Program (RWMP) conducted a study to identify meaningful, understandable, and practical measures to evaluate products and activities, including *Clarus*, the Maintenance Decision Support System (MDSS), Weather Responsive Traffic Management (WRTM), and others. The study generated input from over 250 public and private stakeholders who reviewed an initial list of candidate output and outcome measures and identified 11 measures to assess RWMP performance.

Program impacts can result as a direct consequence of RWMP actions or indirectly through other agencies and activities associated with or influenced by the RWMP. The RWMP catalyzes and encourages the efforts of other Federal agencies, state departments of transportation (DOTs), and private sector providers, which contributes to achieving the SAFETEA-LU goals as well as supporting independent initiatives and efforts.

### Performance Findings

RWMP performance is assessed using data collected from RWMP records, ITS deployment surveys of state DOTs, Federal agency records, and state agency interviews:

#### Goal 1: Maximize use of available road weather information and technologies.

*1.1 Number or percentage of transportation agencies that use road weather information and decision support systems for advisory, control, and treatment decisions.*

- States that provide travelers with weather information increased 46 percent and 22 states provided route-specific weather forecasts in 2007, up 69 percent over 2004.
- In 2007, 46 states used atmospheric data, 45 states used pavement data for operations, and 30 states implemented weather-related traffic control strategies.
- By 2008, 30 agencies reported some use of MDSS, and 5 reported operational use.
- Between 2004 and 2007, the number of state DOTs using weather information increased an average of 31 percent.

*1.2 Number or percentage of travelers who use road weather information for making travel decisions (both pre-trip and en-route).*

- In 2008, 33 states had 41 operating 511 systems and 25 offered road weather information.

*1.3 Number of environmental sensor stations (ESS) deployed and used by transportation agencies to support decision-making (normalized by total area or length of road network).*

- From 2006 to 2008 agencies contributing ESS data to *Clarus* increased from 3 to 33. In 2008, these 33 agencies provided data from 1,700 ESS to the *Clarus* system, which is about 68 percent of the ESS in the country. ESS data for agency use increased from 26 to 30 (15 percent), and for public use from 38 to 45 (18 percent).

#### Goal 2: Expand road weather research and development efforts to enhance roadway safety, capacity, and efficiency while minimizing environmental impacts.

*2.1 Number of agencies participating in and benefiting from road weather R&D projects.*

- Eighty-eight percent of agencies experienced moderate or substantial benefits, and 20 said they were involved in more than one RWMP initiative.

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2.2 *Percentage of time roadway meets safety and capacity level of service (LOS) standards (i.e. V/C ratio, etc.) during and after weather events (normalized by the frequency/intensity of winter events).*

- Thirty-two percent of agencies measure “time to wet/bare pavement;” 11 percent measure “time to prevent travel speeds after a weather event;” and 18 percent measure “customer satisfaction with maintenance and recovery time.”

2.3 *Reduction in agency costs (i.e., labor, equipment, and materials) due to adoption of maintenance and operations decision-support systems for road weather management.*

- Based on the latest evaluation, MDSS usage by three states resulted in savings of \$1.2 to \$1.7 million per winter; a city maintenance unit estimated saving 10 percent of their overtime costs per year; and another state reported saving \$12.1 million in salt usage and \$1.4 million in overtime compensation.

2.4 *Reduction in user costs (i.e., delay, crashes, vehicle operating costs, emissions, salt damage) due to improved road weather advisory, control, and treatment strategies.*

- Fog warning systems have reduced crashes by 70 to 100 percent; the use of RWIS has reduced crashes by up to 17 percent; anti-icing strategies have reduced crashes by up to 83 percent; and wet pavement detection by 39 percent.
- Low visibility warning systems reduced speed variability by 22 percent and increased speeds by 11 percent; variable speed limits reduced average speed by 13 percent.

**Goal 3: Promote technology transfer of effective road weather scientific and technological advances.**

3.1 *Number of agencies/individuals visited or contacted through technology transfer, training, and outreach efforts.*

- State DOT participation in *Clarus* stakeholder meetings increased 68 percent between 2004 and 2008.
- Twenty-two of 30 state agencies interviewed (73 percent) are involved in the *Clarus* Initiative, and 41 state DOTs have participated in one or more annual MDSS stakeholder meetings.
- Seventeen of 30 agencies (57 percent) are involved with MDSS and 13 (43 percent) with both *Clarus* and MDSS.

- One hundred and fifty-one persons attended six road weather management training courses and 925 participated in 28 RWMP sponsored MDSS Road Shows.

3.2 *Rate of adoption of RWMP technologies (e.g., decision-support systems) by agencies that participated in workshop or training activities.*

- Between 2006 and 2008, state and local agencies contributing ESS data to the *Clarus* system increased from 3 to 33. At the end of 2008, *Clarus* system included 68 percent of the ESS network in the country. MDSS use grew to 30 agencies reporting some use in a decision-support system for maintenance.

3.3 *Number of RWMP technology development, testing, and deployment activities initiated through public or private sector based on identified operational needs.*

- Between 2001 and 2008 approximately 90 projects have been initiated through Federal, state, and university sponsorship with RWMP input and support.

3.4 *Number of road weather technologies developed through public-private and/or public-public partnerships reaching operational deployment.*

- Eight public-private and public-public partnerships supported by the RWMP are in various stages of operations across the country.

### Next Steps

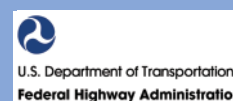
Multiple measures and indicators supported by a variety of data sources are required to assess the RWMP's performance. Refining these measures and applying them consistently over time will give a more complete picture of performance, particularly as the data improve.



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