OM-12

Road Weather Management Program

Goal

Plan, implement, and monitor a road weather management program (RWMP), including snow and ice control, to reduce environmental impacts with continued or better levels of service.

Sustainability Linkage

Implementing an effective and efficient road weather management program supports all of the triple bottom line principles by improving safety, increasing mobility, reducing delay and traffic interruptions, increasing productivity of the labor force, and reducing impacts of materials (e.g., salt) used for management on infrastructure and the environment.

With the effective use of technology, RWMP's can inform managers on the deployment of response resources on highway weather events more efficiently. These efficiencies save treatment costs while improving mobility, avoiding environmental impacts (e.g., salt impact), and reducing crashes.

Potential TBL Cost Savings*

$$ - DOTs can save 10 to 25 percent of their winter maintenance costs.

$$$ - Highway users can save millions of dollars in travel delay.

$ - Salt impacts can be reduced by 10 to 20 percent.

$$$ - Safety/access benefits can also go well into the millions.

*Order of magnitude dollar equivalent potential savings: $~1M, $$~10M, $$$~100M

Basis for Savings

Typically RWMP's can address impacts to transportation systems across the country from all types of weather events. However, principal among these is the use of RWMP's for snow and ice control on highway systems. Enhanced use of technology in snow and ice control to both monitor and predict deterioration of travel conditions (RWIS – Road Weather Information Systems), as well as recommend event and site specific treatment plans (MDSS - Maintenance Decision Support Systems) can:

Save agencies several percent of the tens of millions of dollars spent on snow and ice control by reducing unnecessary deployment of labor (e.g., drivers), equipment (e.g., trucks), and materials (e.g., salt) to treat highways during marginal snow and ice conditions.

Improve mobility by at least a few percent of the hundreds of millions of dollars related to vehicle miles of travel during storms by providing smoother and safer travel conditions, thus avoiding crashes and delays, while improving system reliability.

Reduce environmental impacts caused by salt and other deicing chemicals (environmental damage and vehicle/infrastructure corrosion), and reduce emissions from traffic backups (attendant to poor travel conditions) and unneeded treatment miles logged by trucks, which translate to at least a few percent of the millions of dollars of savings.

Improve safety and access by at least a few percent of the tens of millions of dollars associated with the avoidable cost of crashes by providing safer travel conditions on a more reliable system for personal vehicles and buses as well as commercial and emergency users.

Agency Experience

An INVEST Case Study Report by the Utah Department of Transportation (DOT) concluded, "[u]sing the proper amount of material (salt, red salt, etc.) is vital to keeping the roads safe during storms. Excess use wastes resources (material and money) as well as introducing more salt to the environment (…) Although each storm is unique, guidelines regarding best practices (including type and amount of material; use of brine; time between plow passes; etc.) are available and should be implemented."[1]

RWIS-based Programs

A study performed on the Wisconsin DOT's Wisconsin's Winter Weather System documented that this RWIS-based program achieved "savings of up to four hours per person for each significant storm (a value of around $144,000/storm)."[2]

A separate report from the Utah DOT states that its RWIS-based program provided a benefit-cost ratio of approximately 11.0 and estimated the potential value of savings to range from 11 to 25 percent of its winter maintenance costs.[3]

Reports of RWIS savings from other DOTs are listed below:

Agency	Cost Savings (%)	Benefit-Cost Ratio
Iowa DOT[4]	5.6	1.8
Michigan DOT[5]	19.5 to 50	2.8 to 7.0
Nevada DOT[6]	6.5	3.2
Utah DOT[7]	11.0 to 25.0	11.0

These numbers are consistent with those reported in the NCHRP 20-7 (117) report, which suggests that an RWIS-based program can reduce approximately 10 to 20 percent of an agency's snow and ice control budget.[8]

MDSS-based Programs

The Indiana Department of Transportation (DOT) implemented MDSS-based RWMP throughout the state between 2008 and 2009 and reports a 38.6 percent savings to agency winter maintenance costs on an annual basis. This translates to a benefit-cost ratio of over 25.0.[9]

Reports of this and other MDSS savings are listed below:

Agency	Cost Savings (%)	Benefit-Cost Ratio
City/County of Denver[10]	2.0	1.3
Colorado DOT[11]	10.9	0.9
Indiana DOT[12]	38.6	25.0
Minnesota DOT[13]	6.6	1.6
New Hampshire DOT[14]	4.7	1.1

Notes on Valuation

The range in the benefit-cost ratios and agency cost savings potential can be expected to vary across states due to:

- ✓ Climate variation
- ✓ Highway congestion
- ✓ Labor and material costs
- ✓ Degree of system maturity

Individual Assessments

States are encouraged to access the following references and to consult the Federal Highway Administration (FHWA) INVEST Subject Matter Expert, Paul.Pisano@dot.gov, for additional working materials in assessing their own unique situations and/or if they have information that could assist others on this topic.

References

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5 Krechmer, D., et al. Benefit-Cost Evaluation Techniques for Rural ITS Deployments. 2008. Accessed February 1, 2014, http://www.itsbenefits.its.dot.gov/its/benecost.nsf/SummID/B2011-00685.
6 Shi et al. 2009
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12 McClellan, 2009.
13 Ye, 2009.
14 Ibid.