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## ***ISSUE DEFINITION AND STUDY METHODOLOGY***

This chapter reports on public opinion about the use of road salt in Michigan and describes the scope and methodology of this study.

### ***PUBLIC ATTITUDES ABOUT CURRENT ROAD SALTING PRACTICES***

In 1992 the MDOT conducted a survey to measure public opinion about the use of road salt as a deicing material. Respondents were asked their opinions about environmental costs, corrosion costs, and their willingness to pay for an alternative deicer. Survey results were analyzed by the Public Opinion Research Institute of Public Sector Consultants, Inc. Survey questions and a tabulation of responses can be found in appendix A.

The survey sample consisted of 1,116 respondents—43 percent men and 57 percent women. Michigan telephone area codes were used to classify respondents by location. The sample was divided evenly among southeast Michigan (area code 313), the remainder of the lower peninsula (area codes 517 and 616), and the Upper Peninsula (area code 906). Approximately 12 percent of the sample are aged 18–25, 34 percent are aged 26–40, 24 percent are aged 41–55, and nearly 30 percent are 55 and older. The average respondent from southeast Michigan is younger than those from the other two geographic areas; that area had more respondents in the 26–40 age group and fewer in the 55 and older group. Licensed drivers comprise 99.8 percent of the sample, and 97 percent own a car. During the winter, 28 percent drive fewer than 50 miles a week, 33 percent drive 51–100 miles a week, and 29 percent drive 101–300 miles per week.

### *Survey Results*

The MDOT survey reveals that while Michigan residents clearly recognize the benefits of deicing winter roads, they are concerned about the effects of road salt. They believe that road salt contributes to a variety of environmental problems, and they strongly support finding an alternative. However, respondents also expressed strong reservations about the costs of alternatives.

Not surprisingly, Michiganders clearly recognize the hazards posed by winter weather. Nearly two-thirds of the survey respondents said they leave for work earlier when the roads are icy or snow covered, and approximately two-thirds indicated that they reduce the amount of driving they do when the roads are bad. Although overall a majority of respondents said that they wait for roads to be plowed and salted before driving on them, in the more populous southeast area of Michigan the split

between those who wait before driving and those who do not is nearly even. One-third reported having had an accident that they attribute to snow or ice on the road, with the highest percentage being reported by those living in the 5 17 and 6 16 area codes.

A majority of respondents (51 percent) believe that road salt causes environmental and structural problems; one-quarter do not; 22 percent are unsure. There are some regional differences in the response to the question: Substantially more respondents in southeast Michigan (59 percent) than in the rest of the state (47 percent) think road salt is an environmental and structural problem. Of those believing that road salt causes such problems, one-third think that automobile rusting is the worst effect, one-quarter regard water pollution as the worst problem, 8 percent believe plant damage is the most troublesome, and 2 percent consider hazards to animals to be the worst result. Residents of the Upper Peninsula express concern about a wider range of environmental problems than do respondents from the rest of the state. Although automobile body rust is ranked as the most common problem associated with the use of road salt, only one-third of the respondents indicated that it causes them to trade in a car sooner than they would otherwise.

When asked if the use of road salt should be increased or decreased, the sample is equally divided between decreasing its use (37 percent) and keeping its use the same (37 percent); only a few (7 percent) favor an increase. In every region there is very strong support (72 percent overall) for replacing road salt with some other material. When interviewers raised questions of potential costs of an alternative, however, support weakens. Only 48 percent of those who support finding an alternative to road salt are willing to pay an additional 10 cents per gallon of gasoline to pay for it; 39 percent are opposed outright. Support erodes even further when the alternative of having to put up with icy or snow-covered roads is proposed: A total of 53 percent oppose stopping or reducing the use of road salt, and in the Upper Peninsula 59 percent are opposed. It is worth noting, however, that overall nearly 40 percent are concerned enough about the effect of road salt to say they would accept roads being more icy or snow covered.

### *Survey Analysis*

Although the use of road salt for deicing winter roads is a matter of concern to Michigan residents, it is not a simple question of favoring or opposing its use. While most survey respondents express concern about the drawbacks of using road salt, they also recognize the utility of deicing winter roads. They strongly oppose any increase in the use of road salt, and while they would prefer to find an alternative material for deicing, support for alternatives is qualified by cost and safety considerations.

There is a perception, although not strong, that road salt causes water pollution. Automobile rusting is viewed as a far worse effect, and from this it is reasonable to conclude that Michigan residents also would view other economic costs, such as infrastructure deterioration, as important effects.

The split is nearly even between respondents who support using the same amount of road salt and those who would reduce the current rate of application. This result, combined with the nearly 72 percent who to protect the environment would favor a deicing alternative, indicates that Michigan

residents would urge consideration of alternative deicing strategies. It is not clear how expensive the alternatives could be and still be acceptable. The survey also shows that an additional gas tax could be an acceptable means of paying for more expensive deicing practices.

Although Michigan residents may be open to the use of alternative deicers, it is clear that a majority expect the current *level* of deicing to continue. Respondents indicate that they generally change their driving practices to accommodate road conditions, but more than half (53 percent) say they would not accept icy roads. They are **willing**, however, to accept at least some increased deicing costs in exchange for less vehicle rust, better water quality, and reductions in other perceived detrimental effects of road salt.

## ***SCOPE OF STUDY***

The purpose of this study is to examine the environmental and economic effects of selected deicing materials. A comprehensive review was conducted, including the way in which each material works, the rate at which it causes deicing to occur, the temperatures at which it is effective, and its performance and effectiveness in tests and field trials. The chemical and toxicological characteristics of each are noted, including its chemical composition, how its components react with the environment, and the potential threats each poses to the flora and fauna, surface water, and groundwater adjacent to roadways. The effects of the materials' components on human health/use are identified, and their corrosive effects on vehicles and the highway infrastructure are examined. Finally, where possible, the direct and indirect costs of these materials are examined and quantified. This information will enable the MDOT to make informed decisions, based on careful consideration of all the relevant factors, regarding the use of deicing materials.

Also thoroughly analyzed is the effect of current and increasing salinity levels in the Great Lakes—widely believed to be caused at least in part by the use of road salt—on aquatic plants and animals. Historical data on chloride levels are reviewed and future levels at current loading (input) rates estimated, and a model was constructed to calculate the change in chloride levels of the Great Lakes if loadings are increased. Projected chloride levels are compared to those toxic to aquatic biota to determine if the health of the Great Lakes ecosystem is threatened.

The factors involved in the economic evaluation of road salt and alternatives include where possible the costs of materials, personnel, storage, equipment, and corrosion. The costs of corrosion to automobiles and bridge decks are derived using depreciation rates tailored to Michigan. While the quantification of costs includes all available information, the results of the analysis are estimates only and are based on many assumptions.

Climate and environmental conditions within Michigan are diverse due to latitudinal spread and also to proximity to the Great Lakes. This diversity is addressed by creating maps and profiles that identify land use, forest types, water bodies, wetlands, vulnerable aquifers, endangered species, and population densities in each of MDOT's nine districts. Used in conjunction with an overlay of state trunk lines, they will identify areas of sensitivity in each district. Also developed was a grid

identifying sectors of the environment potentially vulnerable to harm from deicing materials. In addition, a performance and cost grid presents information necessary to determine the materials most appropriate for use in sensitive zones.

## STUDY METHODOLOGY

A team of prominent scientists, engineers, economists, and policy analysts were assembled to address the issues associated with using deicing materials on Michigan roads. The team's extensive experience in various disciplines assured a broad and knowledgeable review of existing information and its specific applicability to Michigan.

The team examined the performance, environmental, human health/use, economic, and public health factors of the study using the following sources of information, data, and analytical tools:

- Literature review
  - a Interviews with MDOT personnel and local contractors
- Discussions with national experts
- Database analysis
- Cost-benefit analysis
- Modelling
- Geographic information systems

This methodology enabled the study team to

- assess performance of deicers;
- document chemical and toxic properties of deicers;
- assess human health/use and safety factors;
- determine economic costs and benefits;
- quantify risks to the Great Lakes; and
- identify environmentally and structurally sensitive areas.

A product of this extensive analysis is a set of maps, overlays, and matrices that simplify the complex issues and will allow the MDOT to formulate deicing strategies for Michigan's particular climate and roadway system.

Because of the variety of economic and environmental interests involved in considering deicing alternatives, an advisory committee was convened to provide guidance on issues and analysis. Representatives from the state departments of Agriculture and Natural Resources, the MDOT Bureau of Highways, and the Legislative Service Bureau participated, as did representatives of the Michigan Environmental Council, Michigan United Conservation Clubs, Inc., County Road Association of Michigan, Community Safety Services, and the Michigan Municipal League.