SUSTAINABLE SALT PRACTICES FOR MUNICIPALITIES

Sustainable Practice Type	*Sustainable Practice Description*	*Anticipated Benefits and Impacts*			
		Environmental	*Financial*	*Liability*	*Service*
Planning	Use precise weather forecasts (7, 10, 11) and road weather information stations (RWIS) to inform salting.	Decreased negative impacts by more effectively using salt, and thereby using less salt.	Increased costs for initial investment (4). Minimal costs to maintain (4). Decreased costs over time by improved knowledge of conditions leading to reduced salt use. Can lead to reduced staff time required (4) and 10-20% decrease in winter management expenses (8).	Decreased liability due to more targeted service for conditions.	Improved service due to more effective and targeted service.
	Reduce amount of rock salt distributed per lane mile (to 50 to 300 lbs/mile) (3,8).	Possibly decreased negative impacts by limiting use of salt.	Decreased costs of materials due to less salt used.	Little or no change.	Little or no change for end users.
	Improve road surfaces, cut back roadside trees and brush to reduce shading (25).	Possible environmental impact due to tree removal.	Sustained costs to keep pavement surface free of potholes and other imperfections and to keep trees pruned.	Decreased liability due to improved visibility and road surface conditions.	Improved service due to improved ability to plow effectively and improved ability of the sun to heat pavement.

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		Environmental	*Financial*	*Liability*	*Service*
Physical actions	Remove snow before salt application and frequently during storms (2).	Possibly decreased negative impacts to surface waters by limiting use of salt.	Sustained increased costs to support additional staff time. Decreased costs of materials, as less salt required.	Little or no change.	Little or no change for end user.
	Physically remove snow more efficiently with properly maintained equipment (2), or with segmented plows (23) or secondary plows.	Decreased negative impacts by limiting use of salt.	Increased costs for initial investment. Decreased costs for maintenance on segmented plows by being able to replace/repair sections not entire plow. Decreased costs by using less salt and staff time as a result of improved surface clearing.	Little or no change.	Improved ability to clear surfaces efficiently and quickly (2).
	Cover stored salt (2, 3, 6, 7).	Decreased negative impacts as salt runoff is minimized, and extra salt in truck can be stored rather than spread (8).	Increased costs for initial investment to cover stored salt. Decreased costs over time as less salt lost in runoff.	Little or no change.	Little or no change for end-users.
Altered techniques	Use equipment with adjustable application rates and adjust salting based on conditions (3, 4, 9).	Possibly decreased negative impacts with more efficient salt use.	Increased costs for initial investment. Decreased costs by reducing salt use over time.	Decreased liability through improved surface safety.	Similar or improved service with less effort.

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	Treat surfaces before snow and ice accumulation (anti-icing).	Decreased negative impacts by using less salt and increased efficiency (up to 25% less salt) (12).	Increased costs for initial equipment investment (4,13). Decreased costs by reducing salt use and required snow/ice removal efforts by preventing bond between snow/ice and surface (3). As much as a 137% return on investment (14).	Decreased liability through improved surface safety.	Improved due to ability to prevent snow and ice buildup (7).
Altered techniques	Measure surface temperatures (2, 3, 7) to inform salting.	Decreased negative impacts by more effectively using salt, and thereby using less salt.	Increased costs for initial investment (4). Minimal costs to maintain (4). Decreased costs over time by improved knowledge of conditions leading to reduced salt use. Can lead to reduced staff time required (4) and 10-20% decrease in winter management expenses (8).	Decreased liability due to more targeted service for conditions.	Improved service due to more effective and targeted service.
Alternatives to dry rock salt (NaCl)	Use only liquid brine (i.e., 23.3% salt-water solution).	Decreased negative impacts by using less salt (30 – 45% reduction) (15,16).	Increased costs for initial investment of equipment or ongoing costs to purchase pre-made brine. Decreased costs by using less salt over time as compared to dry application of salt to surfaces (16).	Decreased liability due to less snow and ice buildup on surfaces.	Improved ability to prevent snow and ice buildup.

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Alternatives to dry rock salt (NaCl)	Pre-wet salt with brine as it exits the vehicle (3,17).	Decreased negative impacts by using 20% to 40% less salt (2,3,24). Scatters less than dry salt (7,15). Infiltrates groundwater 5% less than dry salt (7).	Increased costs for initial investment to buy equipment to pre-wet salt (17). Potentially decreased costs as less salt required to provide same level of service (17,24).	Decreased liability due to less snow and ice buildup on surfaces as evidenced by decreased crash frequency (18).	Improved ability to prevent snow and ice buildup. Improved service due to minimized scatter of salt (7,15).
	Use treated salt (i.e., rock salt treated with magnesium chloride, calcium chloride or another additive) (3,12,17,19).	Decreased negative impacts by using less salt (12), 25-40% reduction (20). Scatters less (3,7,19). Less corrosive than pure sodium chloride (20).	Increased costs for initial investment to buy equipment to treat salt, to cover treated salt (17), to train staff in new methods, and/or to purchase more expensive pre-treated salt. 25% to 12 times more expensive than NaCl (12). Decreased costs overall as less salt required to provide same level of service (17,19,20).	Decreased liability as a result of less snow and ice buildup on surfaces and decreased time to clear pavement (7).	Reduced snow and ice buildup by reducing scatter (19). Improved service by reducing time to bare pavement (7). Lower usable temperatures than NaCl (20,21).
	Use alternative materials such as acetate, beet juice, or molasses.	May decrease negative impacts by using less material and/or be less toxic to plants or animals (2,4). May cause impacts such as eutrophication, cyanobacteria blooms (4,15), oxygen depletion in water bodies (13,22).	Up to 10 times more expensive than NaCl (4). Potential for decreased overall costs as less material is needed for similar results (4). Alternative materials may be less corrosive to infrastructure compared to NaCl (2,4,13).	Decreased liability through and improved surface safety.	Improved service by more effective bond prevention between surface and snow/ice or by improved snow/ice melting.

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Maintenance and tracking	Calibrate and maintain equipment.	Decreased negative impacts by using salt more efficiently and therefore using less salt (2).	Increased costs for investment in calibration staff time and equipment (3). Potential decreased materials costs by ensuring more uniform applications (3).	Little or no change.	Similar or improved service with less effort.
	Track salt use, conditions and driver actions and truck location by route, vehicle and driver (3,15,23).	More consistent and predictable salt usage through tracking (3) and efficiency (23) may decrease salt usage and environmental impacts.	Increased costs for initial investment to train staff and to set up tracking systems (3). Possible decreased costs by reducing salt use over time.	Decreased liability by having record of treatment provided.	Improved ability to prevent snow and ice buildup.
Education and staff training	Provide training, resources, and education to staff on BMPs.	Decreased negative impacts by increased/improved sustainable practice usage (2,3,4).	Possibly sustained increased costs due to training time (3). Possible decreased costs by reducing salt use over time.	Decreased through more effective service (3).	Improved by more efficient, consistent service (3).

*Table modified from Sparacino, H., Stepenuck, K. F., Gould, R. K., & Hurley, S. E. (2022). Review of reduced salt, snow, and ice management practices for commercial businesses. Transportation Research Record, 2676(3), 507-520.

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