Alternative Delivery Methods for Winter Maintenance Operations

DETAILS

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ALTERNATIVE DELIVERY METHODS FOR WINTER MAINTENANCE OPERATIONS

This digest summarizes the findings from NCHRP Project 20-07/Task 329, "Alternative Delivery Methods for Winter Operations." It was prepared by Amir N. Hanna, NCHRP Senior Program Officer, from the contractor's final report authored by Michael J. Markow of Teaticket, Massachusetts.

INTRODUCTION

Different approaches for delivery of maintenance operations have been employed by highway agencies in recent years—many of which aimed at outsourcing government services. Examples of these approaches include (a) individual service contractors directed by government employees, (b) bundling by service type or by geography, (c) annual and multi-year (up to a decade) agreements, and (d) variety of contract and quality management approaches. Some of these approaches provide alternatives that recognize agency constraints of labor staffing or skills and available funds. Although some of these approaches have been adopted for winter maintenance operations, a systematic decision-making framework is not readily available for identifying the delivery method for winter maintenance operations that is best suited for a specific situation. Thus, there was a need to develop a decision-making framework to guide public road agencies in identifying the effective methods of providing this essential service and selecting the preferred method while considering prevailing legislative, societal, and resource constraints. NCHRP Project 20-07(329) was conducted to address this need; this digest summarizes the findings of this research.

RESEARCH APPROACH

The research obtained information through a review of international literature, responses to a questionnaire provided by public- and private-sector transportation agencies, and telephone interviews with transportation specialists. This information was used to identify the different delivery methods applicable to winter maintenance that are employed in the United States and other countries. The information also identified relevant issues surrounding decisions on highway-service delivery, such as financial risks, quality of service, impact on workforce, performance standards and measures, industry qualification/capabilities, and actions to maintain competition in procurement and continuing availability of service providers. The research then organized and used these findings to develop the decision-making framework. It also documented sources of additional supporting information, and discussed different scenarios by which the decision framework could be applied and refined.

ALTERNATIVES IN DELIVERING HIGHWAY SERVICES

Historically, highway agencies began delivering their maintenance and operations programs using their own employees (also

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referred to as state forces, in-house forces, departmental forces, and force-account labor). Alternatives to this delivery method would therefore comprise essentially different forms of outsourcing. Outsourcing employs either contracting with public- or private-sector entities, or collaborating through intergovernmental agreements or other arrangements, to perform needed work. There is an apparent increase in the use of recent innovations in outsourcing mechanisms for highway maintenance and operations as shown by the increased consideration of performance-based contracting and use of comprehensive long-term contracts. Therefore, although this study focused on alternative methods of delivering winter services for snow and ice control, the potential methods to deliver a highway maintenance and operations program needed to be considered, for the following reasons:

- Decisions on ways to provide snow and ice control are not independent of wider agency considerations. An agency's snow and ice control unit is one part of its maintenance and operations organization. Delivering winter services would be expected to be compatible with an agency's overall approach to providing comprehensive highway maintenance and operations functions. Thus, understanding an agency's approaches for its delivery of highway maintenance and operations will help frame the options, motivations, incentives, and constraints associated with the different approaches available for delivery of winter services.
- To build a decision framework, it is necessary to understand the rationale of the process and its elements (i.e., analysis or decision factors and criteria). Much of the literature explaining highway maintenance and operations delivery options and decisions deals with the broader maintenance and operations program as seen from the maintenance-unit and agency levels, rather than for snow and ice control alone. Therefore, understanding the factors and criteria influencing decisions on delivering highway maintenance and operations overall is a necessary step in dealing with the methods of delivering winter services specifically.

Also, the factors affecting decisions on winter services delivery may derive from policy and political determinations, as well as from technical, contractual, and managerial considerations.

CURRENT PRACTICES IN DELIVERING WINTER MAINTENANCE AND OPERATIONS SERVICES

The research categorized the current practices for delivering winter maintenance and operations services in the United States in four groups:

- One group relies almost completely on agency employees, using other methods (such as rental agreements or short-term contracts) only in extraordinary circumstances (e.g., severe storms, or to haul away excess snow that has been plowed to the side of the road).
- Another group relies primarily on agency personnel (say, 90% of the total effort) and outsourcing a small amount on a recurring basis (e.g., contacts with selected local governments to provide snow and ice control on state routes within their jurisdiction).
- A third group employs state forces and contractors for winter services, with contractors handling the majority of the effort.
- A fourth group employs a comprehensive contract mechanism for winter maintenance operations such as an asset management contract or public-private partnership.

Numerous factors were found to influence the agency's selection of delivery methods for winter services; examples are listed in Table 1. While there is general agreement among highway agencies on the relevance of these factors, agencies view their collective impact differently. This study found that even neighboring jurisdictions in the United States can have significantly different approaches to providing winter services. Moreover, the current findings are consistent with those of earlier research studies indicating that the major drivers of change in highway-service delivery in the United States have been related to policy/political factors and agency resource constraints.

DECISION-MAKING FRAMEWORK

This study dealt with the organizational or contractual approach to providing winter services, and not with the technology and techniques of snow and ice control materials or applications. Thus issues

Table 1 Example factors influencing selection/decision.

A.	Availability of enabling legislation (i.e., allowing certain delivery mechanisms, but not necessarily requiring their use)
B.	Feeling that agency forces are already able to meet winter levels of service technologically and cost-effectively
C.	Ready availability of options among qualified public or private winter service providers
D.	Capability of agency to manage new methods of delivering winter maintenance and operations
E.	Cost of transitioning agency to a new method of winter maintenance and operations delivery
F.	Competitiveness of local construction industry (i.e., availability of sufficient number of qualified bidders)
G.	Agency resource constraints: dollars, work force, equipment
H.	Aging employee workforce
I.	Desire to balance the agency workforce seasonally (winter–summer)
J.	Desire to reduce financial burden of wages and overhead
K.	Employee union-related considerations (if applicable)
L.	Risks inherent in fulfilling winter maintenance and operations services satisfactorily (financial? performance? other risks?)

relevant to the "method of delivering winter maintenance operations" include:

- Who provides winter services?
- Who directs and manages this effort?
- Who oversees and enforces the quality of this effort?
- What are the respective organizational responsibilities of the parties involved and the relationships among them?

As noted earlier, there is a wide range of contracting mechanisms, extending from simple, short-term agreements for renting equipment with a driver, to large, complex, long-term public-private partnerships. Moreover, the decision-making framework for winter services needs to recognize that winter maintenance operations are but one part of an agency's overall approach to delivering a comprehensive highway maintenance and operations program to the public. Other organizational units within the agency, as well as external stakeholders, may need to participate in the decision process, particularly where comprehensive, longer-term contracting mechanisms are involved, or where activities critical to public safety and mobility are involved. The proposed decision framework has therefore been designed with a recommended structure and coverage of topics, but it is not prescriptive in its content. It allows flexibility and adaptability to accommodate the varying practices now existing among U.S. state highway agencies, and the factors that mandate or constrain options in delivering highway maintenance and operations.

Outline of Decision Framework

The proposed decision framework is illustrated in Figure 1. It comprises three stages needed to evaluate alternative methods of delivering winter services and to provide the rationale for the selection of a specific delivery method. These stages are:

- Stage I: Identify preconditions affecting method selection;
- Stage II: Analyze and select candidate methods to deliver winter maintenance; and
- Stage III: Anticipate steps to effective implementation an operational readiness.

Identify Preconditions Affecting Method Selection—The objective of this stage is to identify the factors that constrain the consideration of alternative delivery methods toward particular options. These factors include two broad groups: (1) requirements (mandates) or commitments to consider particular approaches (referred to in Figure 1 as "Game Changers") and (2) other considerations and constraints that influence the selection of methods. This stage will yield an understanding of the motivation for updating methods of winter services delivery, and the key factors that will influence that decision. Table 1 lists some of the factors that influence decisions on

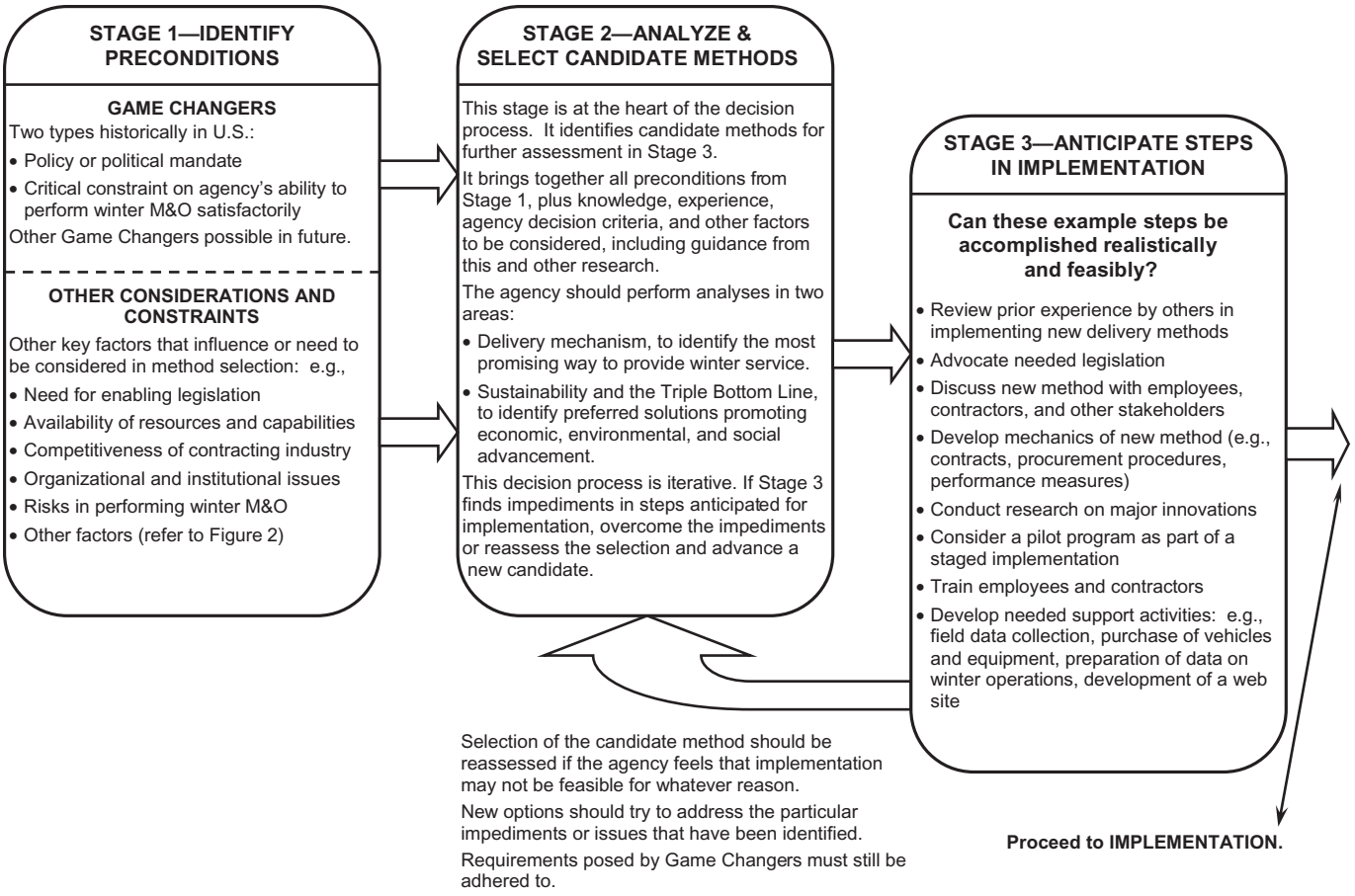

Figure 1 Overview of decision-making framework.

methods to deliver winter maintenance, and Figure 2 shows an example of how the information is processed to identify potential options for winter-service delivery that merit further consideration.

Analyze and Select Candidate Methods to Deliver Winter Services—This stage is unique to a particular agency, the nature of the preconditions, and the delivery options that are considered. It will comprise several analyses and individual decision steps, including:

- Determining how the preconditions translate into potentially new options for winter-service delivery;
- Evaluating these new options in several ways, including the capability of the agency to undertake them and what additional capabilities may need to be developed;
- Analyzing the options in terms of their sustainability impacts; and
- Making a preliminary recommendation of the most viable candidates for further consideration.

Anticipate Steps to Effective Implementation and Operational Readiness—This stage will screen the identified options for additional preparations that will ensure effective implementation and operational readiness for the targeted winter season. Some options may entail little or no change in fundamental agency practice (e.g., an extension or enhancement of current delivery methods, with which agency personnel are well familiar). Other options, however, may require significant effort to address issues such as (1) new delivery methods that have not been used previously by the agency; (2) contract terms that will modify critical elements such as the type of specifications, method of cost reimbursement, and allocation of risk; and (3) particular methods of contracting, such as total asset maintenance contracts or privatization. Preparations may include several potential initiatives, each of which can be substantial: new training programs, outreach to the construction industry, redrafting of contract specifications and procurement procedures, proposal of enabling legislation, review of information technology and field

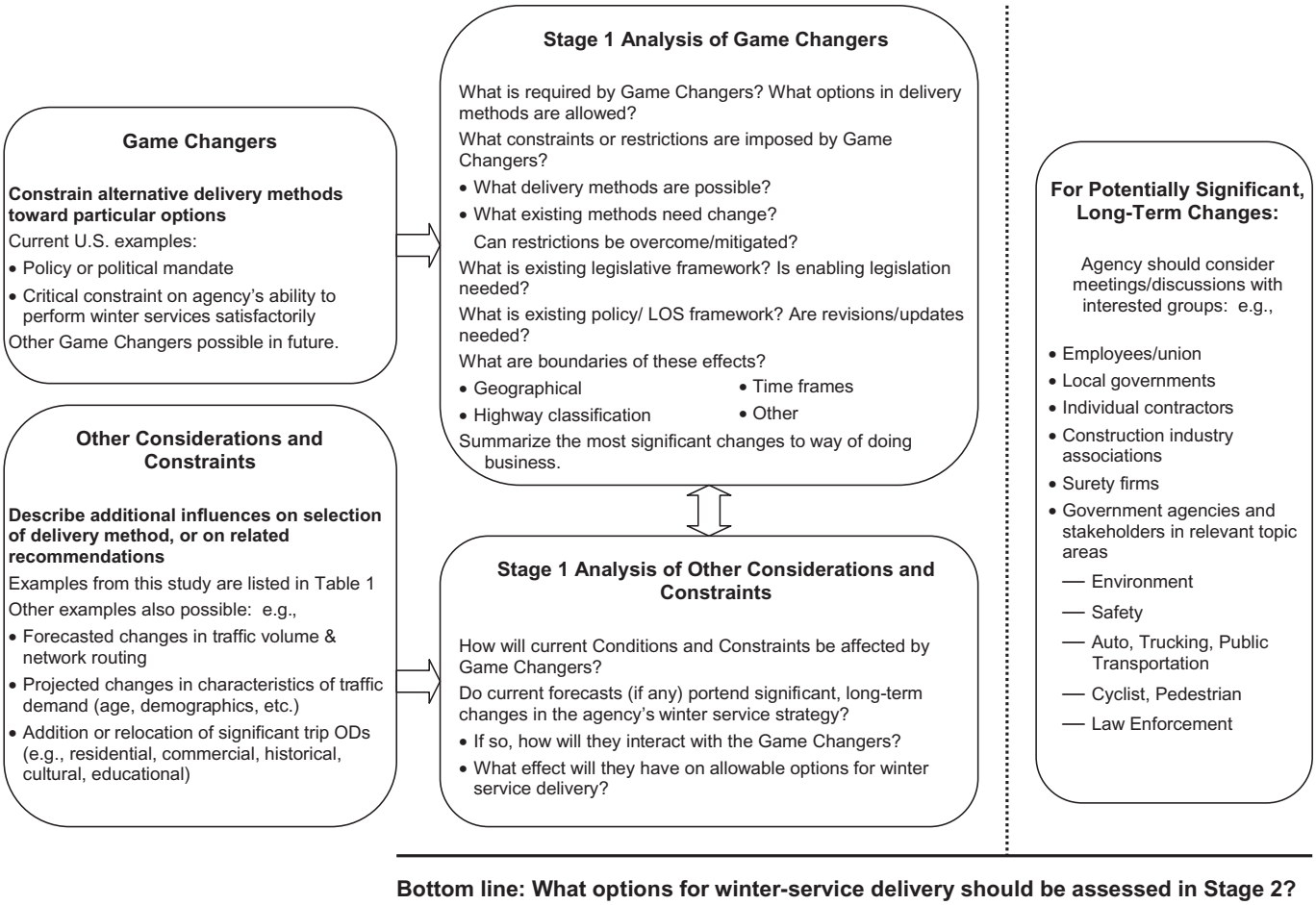

Figure 2 Example processing of information in Stage 1.

sensor technology, and formulation of pilot projects. An agency should consider such implications, and proceed with the necessary tasks if they can be accomplished realistically and cost-effectively. Otherwise, other options for delivery methods should be considered.

Table 2 lists examples of the items that may be considered in the evaluation process, including those pertaining to the environmental, economic, and social impacts of candidate delivery methods.

Implementation Issues

Implementation of this decision-making framework would require a good understanding of relevant elements such as the following:

- The factors that influence an agency's decisions on winter-service delivery methods (i.e., the "preconditions" addressed in Stage 1 of the framework), including perceived interactions among key factors.
- The importance of ongoing communications with the contracting industry and other key stakeholders regarding planned new methods of delivery and their implications for key parties.
- Comprehensive and objective considerations of agency and industry capacity and capability to undertake the desired options (some which may include innovative approaches to winter maintenance operations).

Therefore, it is important that agency personnel involved in implementing the proposed decision-making framework would have adequate familiarity with these elements. In this manner, implementation of the framework will yield a method for delivering winter maintenance and operations that is feasible and meets the agency expectations in terms of service quality and environmental, economic, and social sustainability.

Table 2 Example considerations in evaluating delivery methods for winter services.

Basic Issue	Relevant Considerations
WINTER SERVICE DELIVERY METHOD	Decision of in-house performance versus outsourcing; factors influencing the decision. Categories of criteria to be considered in assessing contracting options.
	Type and structure of contract(s) to consider: e.g., specifications, payment provisions, procurement method.
	Consideration of winter services within a broader performance-based maintenance and operations contract.
	Operational aspects of winter service: equipment selection and operation, level of service (LOS), performance measurement, storm-specific actions, and annual activities.
ENVIRONMENTAL SUSTAINABILITY	Impacts on natural environment. Training of agency personnel needed to maintain knowledge of environmental impacts and mitigation measures related to winter maintenance and operations, as well as satisfaction of regulatory requirements.
	Impacts on infrastructure.
ECONOMIC SUSTAINABILITY	Cost comparisons for different methods of delivery, assessments of cost efficiency, indirect costs, comparison of benefits and costs.
	Road-user benefits (in terms of both performance and cost savings) in safety, mobility, and fuel consumption. Fuel efficiency of agency vehicle fleet.
SOCIAL SUSTAINABILITY	Improvements in wintertime safety and mobility due to winter service. Effective and timely communication of winter road conditions to public.
	Impacts of winter service on cultural assets; public accessibility to, and utility of, transportation services; access to safety and security facilities; drivability of roads for individuals and public transport; and equitable treatment and social integration among all population groups.

FINAL REPORT

The contract agency's final report, "Alternative Delivery Methods for Winter Operations," gives a detailed account of the project, findings, and conclusions and includes further information on the proposed decision-making framework. The report is available online at the AASHTO Highway Subcommittee on Maintenance website at http://maintenance.transportation.org/Documents/NCHRP%2020-7_Task%20329%20Final%20Report-Final%20Revision.pdf. The report is not an official publication of the National Cooperative Highway Research Program, Transportation Research Board, National Research Council, or The National Academies.

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