SNOW REMOVAL STRATEGIES BY THE CITY OF SAPPORO TO SECURE WINTER ROAD SPACE

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1. Abstract

Snow removal is of great importance to citizens in Sapporo. Recently, citizens have increased their requests for greater mobility in winter through the securing of road space including residential streets, which relate closely to daily life. We introduce examples of various strategies implemented by the City of Sapporo to address these requests.

1) Snow removal on residential streets

The City of Sapporo classifies roads into two types, by width: residential streets (less than 10 m wide) and trunk roads (10 m or wider). The trunk roads are subdivided as main trunk roads, trunk roads, and sub-trunk roads. Different service levels are set for each road type.

Snow removal on residential streets is conducted through the Snow-Removal Partnership, a snow-removal system in which the City and the residents contribute cooperatively to snow removal. Cooperation is required because residential streets are used mainly by neighboring residents, whereas trunk roads which used by the general public driving vehicles.

i) Scheduled snow removal

Weekly snow removal is conducted on scheduled days (e.g.: District A on Monday, District B on Wednesday), with the aim of maintaining the road in a continuous state of trafficability. This kind of snow removal affords efficiency through proper allocation of snow removal machinery and staff to support snow removal by citizens themselves on roads in front of their residences and in parking areas.

ii) Snow-Removal Partnership

The Snow-Removal Partnership is a unique snow removal system mainly for snow hauling on residential streets, whose costs are evenly shared by citizens and the City.

iii) Welfare-Oriented Snow Removal

Toward ensuring the welfare of the elderly and people with physical disabilities, the City provides the service of removing snow between the road and the entrance to a residence.

2) Regional snow treatment

Decrease in snow dumping sites and difficulties in securing new dumping sites require the establishment of a regional snow treatment system. The system could realize environmentally friendly snow treatment and cost reduction.

i) Onsite snow treatment facility

As part of the regional snow-treatment system, snow disposal at regional open spaces, parks and other areas, and snow treatment in sewer mains is being planned.

ii) Loan system for home snow-melting facility

The City and financial institutions cooperate to lend money interest-free to citizens who establish snow-melting tanks and road heating facilities on their residential properties.

2. Introduction

Sapporo is a metropolis of more than 1.8 million people. It is rare for a city of this size to be located in a region as snowy as that where Sapporo is found. Annual snowfall in this city measures about 5 m, and to maintain its development, snow-removal service is indispensable and a vital political issue.

The City of Sapporo started full-scale snow removal service in 1950, about a half century ago, after purchasing snow removal machinery. At the time, people commonly walked on snowy roads with long rubber boots because no snow removal was conducted.

At the beginning of the 21st century, winter living in Sapporo has dramatically changed from these days. When residents wake up in the morning, snow on most trunk roads, residential streets, and even sidewalks is cleared away so that daily living, including social activities, commuting, and shopping, is smooth.

However, year by year, citizens' requests for municipal services have tended to become increasingly great and varied. Despite continuous snow-removal service development, the fact that improvement of snow-removal services has ranked as the top request by citizens in the 23 consecutive years from 1978 to date indicates that further progress in snow removal should be sought.

In August 2000, the City of Sapporo launched its Master Plan for Snow and Ice Control (target period: FY 2000 to FY 2009). It provides various strategies toward realizing a more fulfilling and comfortable life in winter. Through specific examples, this paper introduces measures to secure road space including residential streets, which relate closely to daily life and whose snow-removal improvement is highly demanded by citizens.

3. Citizens' requests for snow-removal policies for residential streets

Recently, improvements in living standards have led citizens to place importance on not just material fulfillment, but also on their satisfaction with their living environment. They desire that the city environment should be more pleasant so that they may enjoy more relaxing lives. Their demands have increased concerning snow removal on residential roads which relate more closely to daily life than do trunk roads.

Results of a questionnaire in 1998 on citizens' satisfaction with snow-removal service shows that supportive responses including those of "satisfied", "largely satisfied", and "not unsatisfied" account for 91%. (Figure 3-1) In the question on their desire for snow removal, requests that snow not be left in front of a residence or a parking area after snow removal marked high following those for icy road surface treatment improvement. These exceeded the requests for snow removal to maintain effective road width and treatment for fewer bumps and ruts. (Figure 3-2)

Figure 3-1 Citizens' opinions on snow removal status of trunk roads

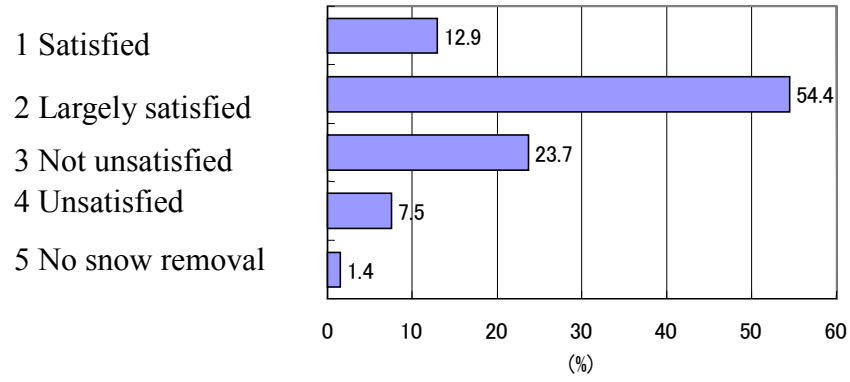
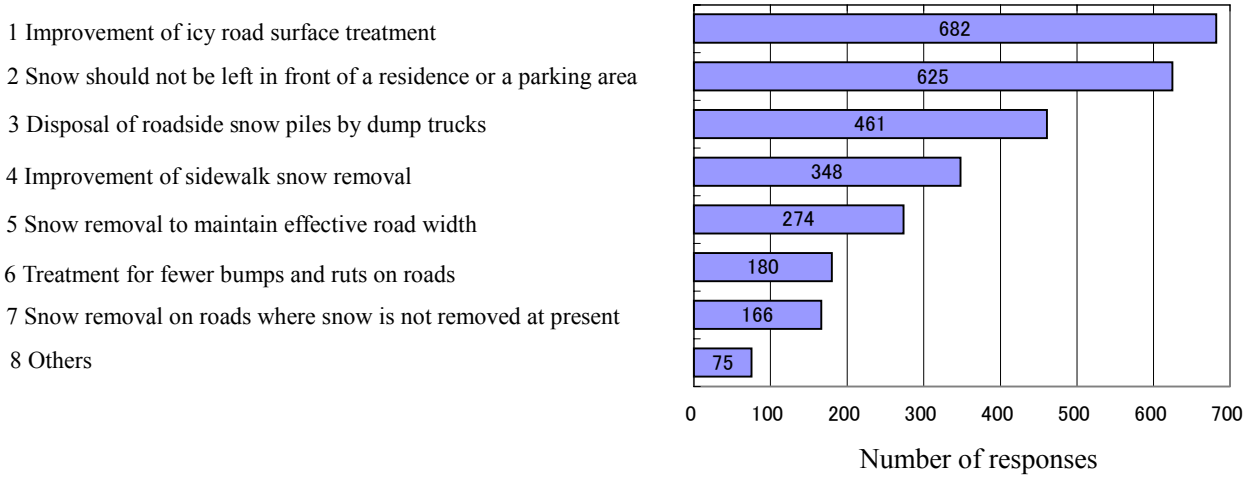


Figure 3-2　Requests for snow removal (two items were chosen)



Outline of the questionnaire
Date: October 1998
Subjects: 2, 912 citizens aged 20 or older
Method: dispatch and collection of questionnaire sheets by post
Valid responses: 1, 450 (49.8%)

4. Basic policies of the City of Sapporo for snow removal on residential streets

At present, the City of Sapporo manages 5, 211 km of roads. Of this, 57%, or 2, 972 km, is classified as residential street.

Major issues regarding residential street snow removal are roadside snow piles which grow higher with continued snowfall and finally disturb the living environment, and snow left by snow removal contractors in front of a residence or a parking area, which citizens must struggle to remove.

The simplest solution to these issues is to recover road space by hauling snow. However, hauling snow on all roads and streets by the City alone is not realistic because of financial burden would be too great.

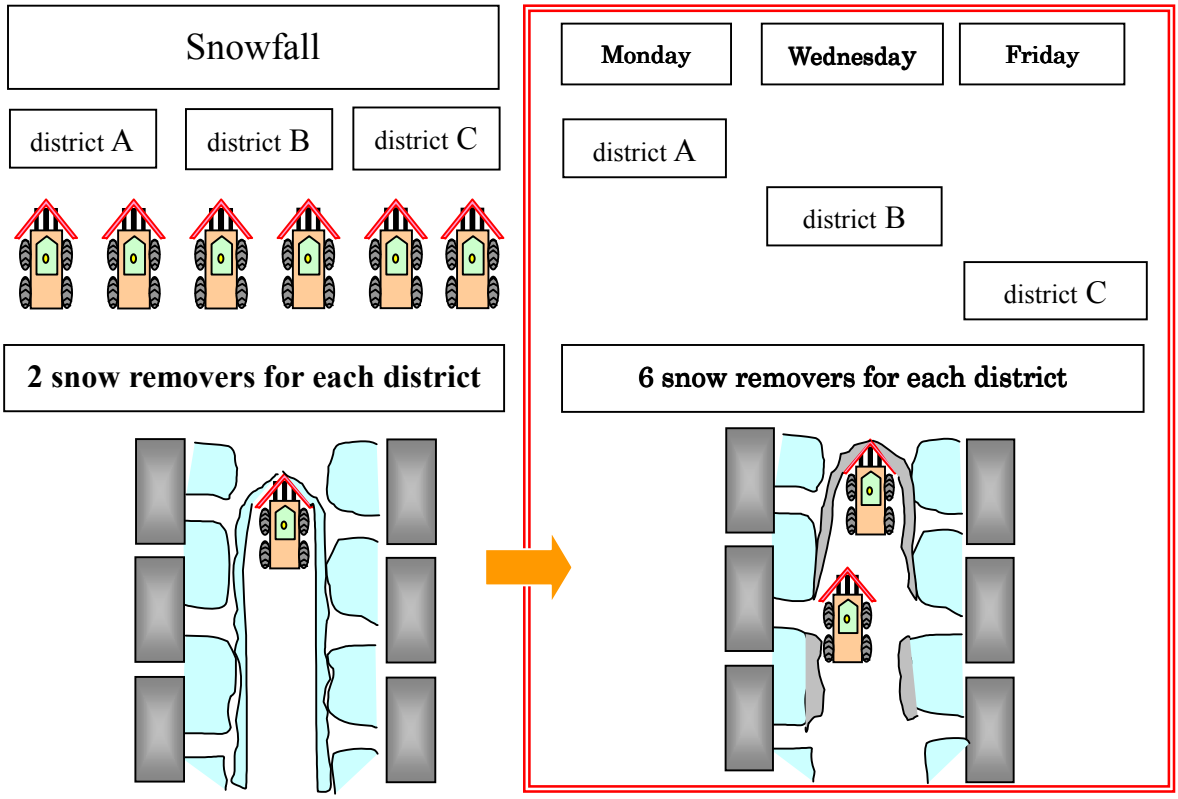
Therefore, the City of Sapporo cannot help but set as its political goal efforts to secure basic snow-removal service level and to let citizens choose a higher level of snow removal. The City, however, in consideration of citizens' high demand for more adequate snow removal, recognizes that it should cooperate with and support citizens' efforts to realize comfortable winter life. Projects that are being developed in partnership between the City Hall and citizens are described below.

5. Snow removal on residential streets

5-1 Scheduled snow removal

Snow removal is conducted weekly on scheduled days by district (e.g.: District A on Monday, District B on Wednesday). In regular snow removal operation, when snow depth by snowfall from the evening to the next morning exceeds 10 cm, snow removal contractors all over Sapporo start working almost at the same time to clear snow on roads before commuting time. However, in this type of snow removal, removing snow completely including that left in front of a residence entrance or a parking area is difficult because of the available time and the road length requiring clearing by limited number of snow removal contractors. In scheduled snow removal, more time and snow removal contractors are available for a given area, so that snow in front of residences that would be left by regular snow removal is minimized. This, in turn, minimizes the citizens' snow removal burden. (Figure 5-1-1)

Figure 5-1-1　Chart of scheduled snow removal



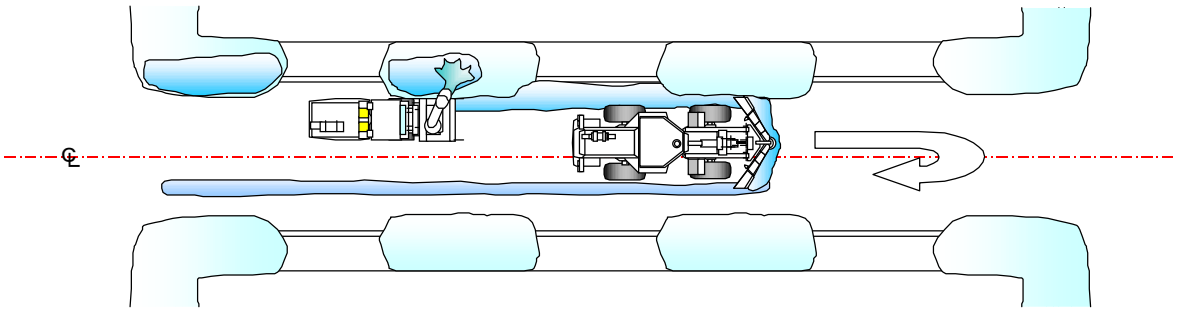
Since 1994, the City of Sapporo has tested forms of snow removal that differ by removal area, machinery type, operation time, as well as rotation of stuff and machinery.　This trial aims to establish a city-wide standardized snow removal measure, although snowfall amount differs by district and it results in slightly different operation. (Figure 5-1-2)

-1　Snow removal is conducted in the daytime on a scheduled day once a week depending on snowfall and road surface condition.　Efforts are made to avoid leaving snow in front of residences and parking areas, so as to minimize the amount of snow requiring independent removal by citizens themselves.

-2　When snow depth during nighttime has reached 15 cm, regular snow removal operates.

-3　For the scheduled snow removal, graders and small rotary snow removers are used in combination.

Figure 5-1-2　　Scheduled snow-removal operation



Road widening and removal of snow in front of a residence entrance by a small rotary snow remover, road surfacing by grader

Further research will be necessary toward finding solutions to the following issues and thereby to promote scheduled snow removal.

Issues:

1) Possibility of obtaining agreement of residents to relax the service standard so that snow removal may start from snow depth of 10 to 15 cm.
2) Although road surface condition is improved, in comparison with conventional snow removal, roadside snow piles tend to become larger, and effective road width cannot be maintained without snow disposal.
3) Depending on snowfall condition, it will be more costly than the usual snow removal method.

5-2 Snow-Removal Partnership

The Snow-Removal Partnership was established for cooperation of residents, snow-removal contractors, and the City to improve the winter living environment by work sharing of snow removal.

To use the system, residents will apply to the City and the City plans the snow removal operation. The residents and the City share the expenses equally, and the City arranges the contract between the residents and snow-removal contractors.

In the actual operation, residents are in charge of making arrangements to facilitate the snow-removal operation, such as moving cars parked on roads or disposing of garbage left at garbage stations. The snow-removal contractors honestly and responsibly remove snow, and the City, confirms that the snow removal is conducted appropriately.

As an existing support system for snow-removal of residential streets, the City has rented out trucks with a driver to citizens, for snow dumping free of charge (Truck Rental System to Support Residents). This system is still used by some neighborhood associations; however, there are issues of insufficient safety control during snow removal and crowding at snow dumping sites on holidays because snow removal by this system tends to concentrate on holidays. Thus, the Snow-Removal Partnership is increasingly used instead of the truck rental system. The road length whose snow was removed by the partnership system was 1,272 km in 2000, or 43% of the total residential road length.

5-3 Welfare-Oriented Snow Removal

Toward ensuring the welfare of the elderly and people with physical disabilities, the City provides the service of removing snow left in front of a residence as a result of regular snow removal. Conventionally, neighbors and volunteers have supported those who have difficulty in removing snow independently, but a new system needs to be sought because of scarcity of volunteers and expected increase in the elderly population.

In 2000, a trial was implemented in part of the city. A committee of citizens and experts examined the trial implementation plan introduced below.

-1 Expected beneficiaries

1) Households consisting of members over age 70 (those born before April 1, 1931)
(Two households sharing a residence will be regarded as one household.)
2) Households consisting of only people with serious physical disabilities (disability-1 and disability-2, which are categories for degree of physical handicap.)
3) Households consisting of only members over age 70 and people with serious physical disabilities.
4) Households that are approved by the Mayor to be qualified for the service.

-2 Details of the welfare-oriented snow-removal service trial

Snow in front of residence entrances was removed to a width of 1.5 m (excluding snow in front of parking areas and that between the curb and the front door.) Snow disposal was not conducted. After regular snow removal had finished, the work was conducted from the morning to around noon.

-3 Citizens' share of the expense during a winter

A beneficiary household pays part of the expense. There are three kinds of expense-sharing depending on the household's income.

Residence tax exempted household: 5, 000 yen
Residence tax payer's household: 10, 000 yen
Welfare household: free

The City conducted a questionnaire survey of households that tried the snow removal system. Respondents who evaluated the snow removal as "very good" or "good" accounted for 87. 0%. As 82. 7% of households responded that they would like to utilize the system again, expansion of the target area of this sort of snow removal is being discussed.

Details of the questionnaire survey	Target households: 650
	The questionnaire was sent by post.
	Respondent households: 538
	Response rate: 82. 8%

6. Policies for regional snow treatment

Snow dumping sites are increasingly located in the suburbs due to progress of urbanization. This has resulted in deterioration of snow transport efficiency because of longer hauling distance. In addition, adverse effects on the urban environment of long- distance snow hauling including those of trucks exhaust have become a concern. In considering snow removal issues, not only raising the service level, but also minimizing environmentally adverse effects of snow treatment requires attention.

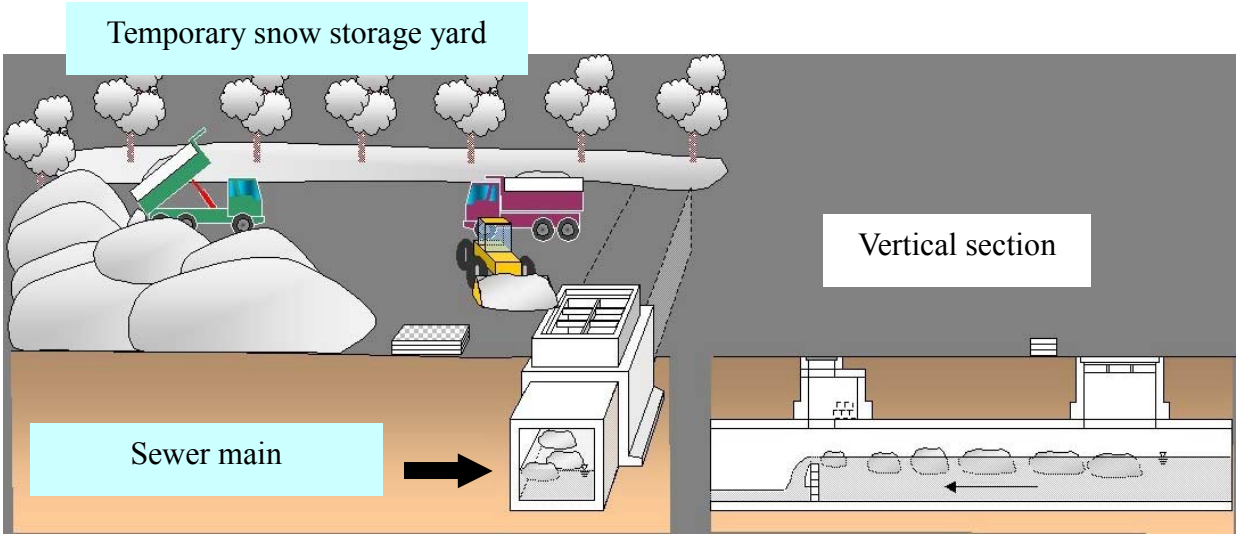
A solution will be establishing a regional snow treatment system which treats as much snow as possible within a region. Specific projects are described below.

i) On-site snow treatment facility

As part of the regional snow-treatment system, joint utilization of snow disposal in regional open spaces including parks and school yards and snow treatment in sewer mains work effectively as medium-sized snow-treatment facilities. (Figure 6-1-1) In this system, snow temporally stored in an open space is regularly dumped into sewer mains for treatment. Such snow treatment enables regional treatment of as much snow as possible.

At present, snow tentatively stored in a park is experimentally disposed of in an adjacent sewer main. This has been largely successful, so this system will be further examined toward full-scale implementation.

Figure 6-1-1　Concept of regional snow treatment



6-2　Loan system for home snow-melting facility

The City and financial institutions cooperate to lend money to citizens who establish snow-melting tanks and road heating facilities on their residential properties to treat snow piled in front of a residence.　The loan system started in 1994 was of low-interest loans, but system improvement made later greatly increased the number of loan borrowers.　In 1998 interest free loans were decided.　The qualification for borrower was expanded from individuals to corporations, and the application came to be possible not only at municipal offices but at financial institutions.　The increasing utilization of the loan system attests to citizens' high demands for snow treatment in residential areas. (Table 6-2-1)

Table 6-2-1

Year	No. of loans	Total loan amount (unit: 1, 000 yen)	Loan conditions			
			Interest rate (%)	Maximum loan limit (unit: 1,000 yen)	Loan object	Notes
1994	78	61, 620	3.2	1, 000	Compact snow-melting tank	Borrowers: only individuals Application: only at municipal offices
1995	51	41, 900				
1996	105	84, 650	3.0		Snow-melting tank and/or road heating	
1997	49	41, 100				
1998	1, 701	1, 195, 340	0	3, 000		Borrowers: individuals and corporations Application: available at municipal offices and financial institutions
1999	1, 732	1, 858, 970				
2000	1, 737	1, 874, 580				

7. Conclusion

To improve city planning to meet new demands in this dawning era, the City of Sapporo launched the Fourth Long-Term Comprehensive Plan in February, FY 2000, with a target year of FY 2020.　The primary goal of the Plan is to increase the charm and vitality of Sapporo by development of the city's living environment in mutual

partnership between citizens, businesses, and the city government. The partnership is indispensable to realizing a unique and attractive city that will flexibly addresses raising the service level and the diversification in citizens' requests.

Sapporo citizens are believed to understand the significance of partnership in a snowy town, based on their many years of overcoming winters in the days when snow-removal machinery itself was unavailable. In the 21st century, we will make further efforts to steadily realize snow treatment measures introduced here in cooperation with citizens, toward satisfactory Northern life.