

Promotion Methods of Mutual Assistance for Snow Removal Activity on the Community Roads through the Communication among the Residents of the Local Settlements

NOZOMU MORI, SHUICHI TAKEYA, ASAKO YUHARA, SATORU OTANI
& SACHIKO OHASHI

Ministry of Land, Infrastructure, Transport and Tourism, Japan
mori-n2zq@nilim.go.jp

ABSTRACT

In heavy snowfall regions, the snow removal on the roads is indispensable in winter to protect socioeconomic activities and daily lives. However, because of tight government budget, they cannot make sufficient support for snow removal. Therefore, we considered that it might be effective that the residents of a local settlement themselves found their own ways in snow removal on community roads, and held workshops and experiments to find their solutions. So we held some workshops in five settlements. At the workshops, the participants found issues and solutions for snow removals on the community roads, and the demonstration experiments were implemented. In the next winter the evaluation of these workshops was implemented. As a result, the following conditions are required to the improvement of local disaster prevention capability in the winter; (1)Participation consists of diverse organizations; (2)The workshop program is configured to adapt to local conditions; (3)Proposed countermeasures are implemented; (4)The program is linked to continued activities. We also made a handbook to activate communications among local residents on the snow removal to roll out this methods to the other communities.

1. INTRODUCTION

1.1. Background

In Japan, about half of the total area of the national land, approximately 30% of its cities, towns, and villages, and 15% of its total population are in heavy snowfall areas(Figure 1). Therefore, snow must be removed from roads during the winter to sustain social and economic activities and daily life in these heavy snowfall areas.

On the other hand, in Japan, the birth rate is falling, society is aging, and the population is declining, but in hilly and mountainous parts of heavy snowfall areas, the birthrate is falling, society is aging, and the population is declining at rates far faster than the average rates nationwide. Figure 2 shows changing working age percentage and elderly percentage of the population in heavy snowfall areas of Japan broken down between hilly and mountainous areas and urban areas. The working age percentage of the population is falling and the elderly population percentage is rising in both hilly and mountainous areas and in urban areas. But, the working age percentage of the population is falling faster in the hilly and mountainous areas than in the urban areas, and the elderly percentage of the

population in the hilly and mountainous areas is higher than in the urban areas. So it is feared that in hilly and mountainous parts of heavy snowfall areas, local society's ability to deal with severe snow storms and other disasters will continue to weaken in the future.

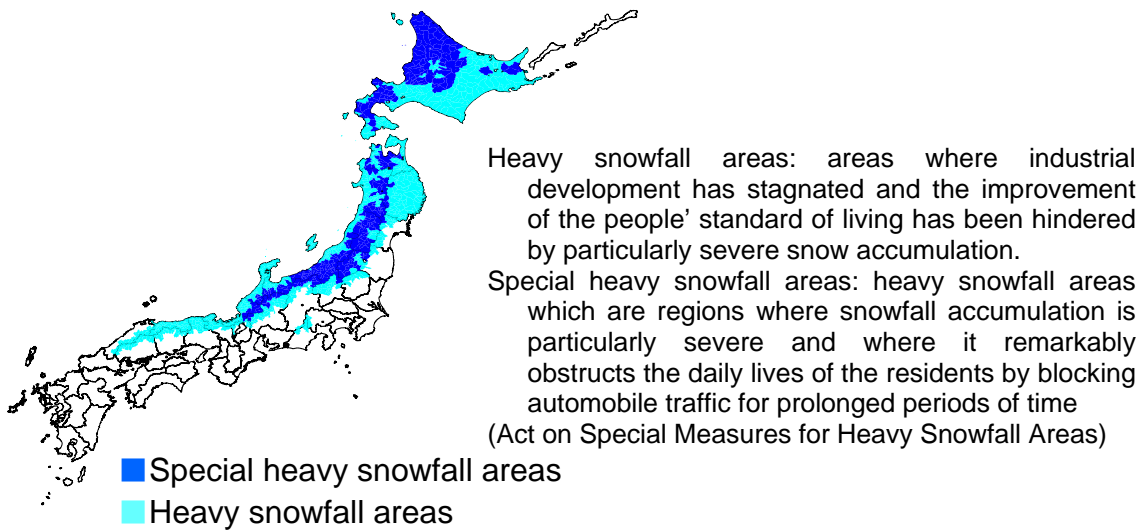


Figure 1. Distribution of Heavy Snowfall Areas and Special Heavy Snowfall Areas of Japan

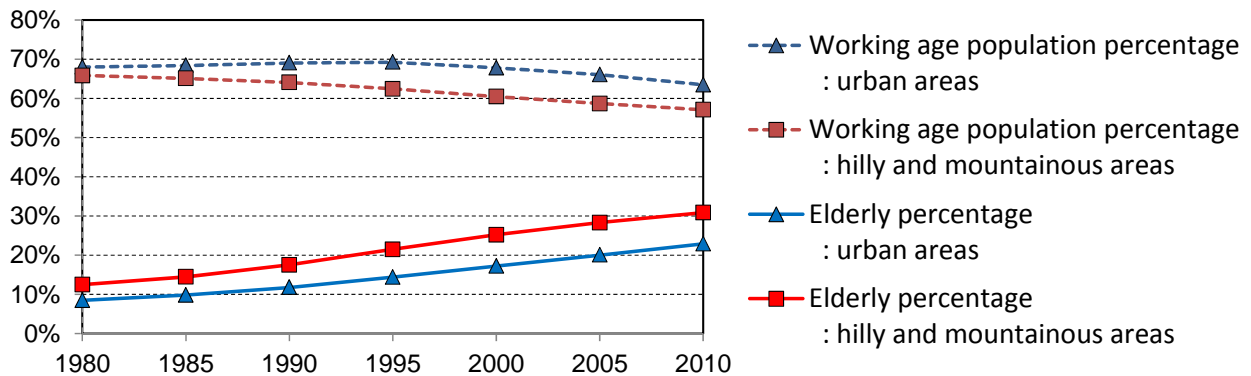


Figure 2. Changing Working Age Population Percentage and Elderly Percentage in Heavy Snow Areas (By Urban Areas and Hilly and Mountainous Areas)

But with Japan's central government and regional governments facing harsh financial circumstances restricting expenditures on public works, snow removal is an extremely burdensome expense and it is becoming increasingly difficult for them to adequately support snow removal.

1.2 Purpose

Under such circumstances, and particularly in hilly and mountainous parts of heavy snowfall areas, the residents of local settlements, who are taxpayers counting on administrative bodies to provide snow removal services are, at the same time, aware that both the organizations these bodies form to remove snow and of the level of the snow removal these organizations carry out will inevitably decline. Therefore, among these residents of the local settlements, there is now a movement to conduct snow removal

activities themselves in order to make up for the decline of this administrative service. In other words, in order to maintain daily life and ensure safety during the winter, which requires strengthening of each region's capacity to deal with snow, the residents of local settlements are improving their mutual assistance capability to make up for the declining capacity of administrative bodies.

One method of strengthening their mutual assistance capability is assumed to be building appropriate snow removal procedures centered on mutual assistance within entire settlements. A specific procedure considered to be an effective way to do this is for all people residing in a settlement to clarify the state of snow removal on their community roads in the winter, discover challenges, then prepare countermeasures to resolve these challenges based on existing communication methods.

So the purpose of this research is to hold workshops (below referred to as "WS") in five districts in hilly and mountainous parts of heavy snowfall areas with different snowfall quantities and varying mutual assistance capabilities and then corroborate the effectiveness of the workshops to clarify whether such a method is or is not effective.

2. REVIEW

A number of research projects have already been undertaken in the disaster prevention field to study communication and WS etc. which contribute to strengthening self-help and mutual assistance capabilities.

To evaluate the effects of experts giving lectures at WS, Kumagai et al.[1] measured how residents' awareness of tsunami countermeasure was changed by lectures given by experts as a tsunami risk communication method.

To provide people with a simulated experience of a disaster in order to improve their understanding of disasters, some researches using simulators has been done. For example, Katada et al.[2] developed safety-behavior indicative flood hazard maps, and the map could reduce dangerous resident's actions. And Futagami et al.[3] have reported that for residents of urban areas, which are areas at high risk of urban fires during earthquakes, risk communication between experts and residents is an effective form of user-friendly fire simulation. And Hatayama et al.[4] have developed a system which simulates the way that residents evacuate based on the results of river inundation analysis, and residents of local settlements can study alternate proposals for evacuation action plans by using this system. And as an example of repeatedly holding WS, Kakimoto et al.[5] have reported that increasing residents' consciousness of disaster prevention by holding multiple WS dealing with sediment disasters and simultaneously building a disaster prevention activity support system improves local disaster prevention capabilities in settlements.

And in the area of risk communication concerning snow, the Ministry of Land, Infrastructure,

Transport and Tourism(below, “MLIT”)[6] has prepared a guide book showing the importance of local snow removal activities, and the importance of discussions at the local level, but it does not mention any specific program of discussions. The authors [7] has proposed and implemented a WS program as a form of risk communication intended to deal with heavy snowfall, but has not adequately described the effectiveness of the WS or the implementation of the program in other areas.

So it is assumed that studying the content of the construction of the WS program and corroborating its effectiveness in districts with differing snowfall quantity and mutual assistance capability, etc., will obtain knowledge that is extremely useful later when building a snow removal system centered on hilly and mountainous areas.

3. RESEARCH METHOD AND STRUCTURE OF THE WS PROGRAM

This research was a study done by implementing WS in specific areas, assuming based on past research that it would be possible to build an appropriate snow removal method centered on mutual assistance within entire settlements through risk communication in WS. WS were held in three areas of Akita Prefecture in 2010. Based on the results, WS were held in two areas of Niigata Prefecture in 2011.

The basic flow of the WS was the same in all 5 areas, and the structure of the flow is shown in Figure 3. During the three WS, participants study local challenges and propose countermeasures to overcome these challenges. Those proposed countermeasures studied during the three WS which can be implemented immediately are given trial implementation as corroborative experiments. This is reviewed the following year.

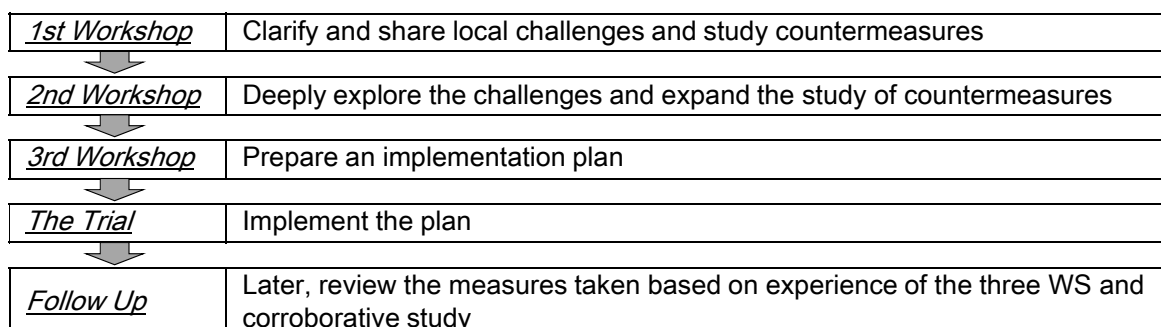


Figure 3. Flow Chart of Basic Program

The following are details of the WS conducted for this research.

First WS: It was held so participants would consider, clarify, and share local problems, and study the proposal of countermeasures to resolve the problems. The risk communication method used at this WS was a version of the Local Disaster Prevention Improvement Workshop Kit developed by Kawauchi and Sawada[8] (below, “CDM Kit”) which was converted into a heavy snowfall response version. Simulation sheets were used to discuss “anxiety, worry, and problems” a region feels concerning heavy

snowfall, “desirable responses” and “difficulties and obstructions concerning response”, and “precautions or preparations” which are the proposed countermeasures. And as necessary, local maps were also used to share information about the locations of each challenge. As a result, basic local problems were shared.

Second WS: It was held to more deeply study the local problems or proposed countermeasures studied at the first WS to make sure they are not insufficient. As during the first WS, the heavy snow version of the CDM Kit was used to more deeply explore the problems or proposed countermeasures. And on the premise that the proposed countermeasures studied would be implemented later, they were organized and categorized according to effectiveness or degree of difficulty.

Third WS: It was held to select proposed countermeasures which will actually be implemented from among those organized and categorized by the Second WS and to prepare a plan for their implementation. Participants considered advance preparation and the time schedule for the day prepare the implementation plan.

Corroborative Experiment: The implementation plan prepared at the third WS was implemented.

Review: The WS and corroborative experiment done the previous season were reviewed.

And based on past research, during each WS, outside experts on the need for mutual assistance and examples of preceding initiatives in other regions gave lectures, and the WS participants completed the proposed countermeasures to be studied.

4. STATUS OF TARGET AREAS

Figure 4 shows areas where WS were held in 2010 and 2011 and Table 1 shows conditions in the areas.

Of the five areas, four are designated as special heavy snowfall areas while the Hirokunai area in Akita Prefecture is designated as a heavy snowfall area. The population of the areas range from about 50 to 650 people, and although the elderly population percentage

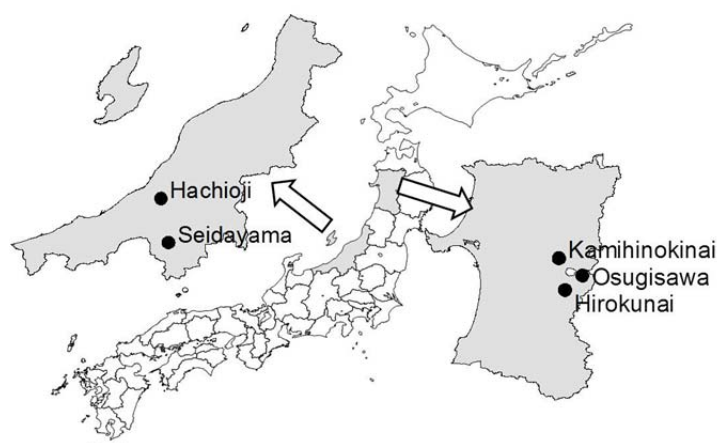


Figure 4. Distribution of Locations of WS

Table 1. Conditions in Five Districts

	Akita Prefecture			Niigata Prefecture	
	Osugisawa	Kamihinokinai	Hirokunai	Seidayama	Hachioji
Category of heavy snowfall area	Special heavy snowfall area	Special heavy snowfall area	Heavy snowfall area	Special heavy snowfall area	Special heavy snowfall area
Maximum snow accumulation (average) snow depth	1.0~1.5m ^{*1}	1.5~2.0m ^{*1}	0.5~1.0m ^{*1}	Over 3m	1.5m
Regional population	310 people	647 people	609 people	57 people	85 people
Regional area	0.2km ² ^{*2}	87.6km ²	3.9km ²	0.4km ²	10.1km ²
Elderly percentage	9.0%	41.1%	33.2%	44%	54%

*1. Based on the results of interviews with residents

*2. Results of measurement using maps

of the Osugisawa area in Akita Prefecture is low, the elderly population percentages of the other four areas are about 30 to 50%, which are levels higher than the national average of Japan. All five areas are heavy snowfall regions, but snowfall is particularly heavy in the two areas in Niigata Prefecture.

5. HOLDING THE WORKSHOPS

As stated above, in 2010, WS were held to study winter snow countermeasures in three areas in Akita Prefecture, mainly by residents of local settlements. In 2011, in two areas of Niigata Prefecture, a WS program prepared by revising the program used for this WS implementation to adapt it to local circumstances was implemented. And in all five areas, after completion of the WS, the participants completed a questionnaire prepared to confirm the effectiveness of the WS. The following year, a follow-up survey was carried out to confirm if and how the state of local of activities and consciousness changed.

5.1 Workshops held in Akita Prefecture

Yuhara et al.[8] have already reported the details of these WS in three areas in Akita Prefecture., so only an outline is given here.

The first WS was held using the CDM Kit in order that residents would share details of conditions in the area and so that they would set the targets of the heavy snow countermeasures. The second WS was held using local maps so participants would share locations in the district which are important for the study of heavy snow countermeasures. The third WS was held to set the roles of the participants on the calendar of the CDM Kit to create the plan for the heavy snow countermeasures which the residents of local settlements would implement. After these three WS, the trial implementation of the heavy snow countermeasures proposed by the residents of local settlements was implemented. A characteristic of this program is that unlike those for other disaster phenomena, snow countermeasures are implemented in addition to the sharing of information.

And after implementation activities, participants were given questionnaires to fill out in order to survey their impressions and evaluations of these series of activities. As a result, more

than 90% of the participants answered that they were satisfied with their participation in the activities (Figure 5). Concerning future efforts, more than 80% answered, “It is necessary to continue such programs in the future,” and nearly 70% answered that they wanted to independently conduct such activities in the area. This suggests that methods used to conduct these workshops are also effective in heavy snow countermeasures, but a future challenge will be to find out if it can be applied or whether its continuity can be maintained in an area where conditions different.

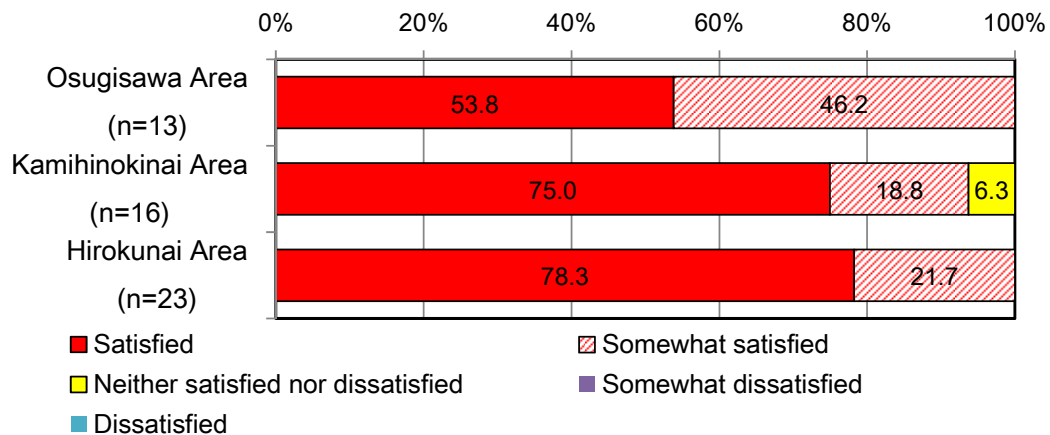


Figure 5. Degree of Satisfaction of Participants in Corroborative Experiment (Akita Pref.)

5.2 Holding the Workshops in Niigata Prefecture

Below, the results of WS in the Seidayama area, which is one of the two areas, are introduced.

About 12 residents participated, plus members of intermediate support organizations which have regular exchanges with the area. Including members of intermediate support organizations, which are strongly trusted by the residents of the local settlements, prevents the activity from being limited to residents of local settlements and city hall officials, which would result in the residents appearing to be petitioning the officials, and stimulates discussions between the residents. The city hall officials participated as observers and during the WS, were asked to provide information about administrative services which the city hall provides. It was hypothesized that having the city hall officials participate in the position as third parties would permit them to hear the real opinions of the residents of local settlements. And during the WS, the experts continually strove to improve the consciousness of the participants by giving lectures and making comments.

5.2.1 The first workshop

At the first WS, the CDM Kit was used to clarify local problems. The result obtained about 20 “anxieties, worries, and problems” (Figure 6(a)). In addition to the problems, the well-being of elderly and the the timing of snow removal from roads, which were found in WS performed in Akita Prefecture, roads from the city center to the local area and roads inside the area are both sloping roads with continuous walls of snow on both sides in this area, so “I am worried that an ambulance might not be able to come up the road at night”

and “the sloping road is scary and slippery” were conspicuous opinions. Maps were used according to circumstances to confirm locations where the road easily becomes slippery or locations where snow banks form easily (Figure 6(b)). Others were, “Falling off my roof while removing snow from it” or “I am afraid to remove snow from my roof alone.” And as “precautions or preparations”, proposals included “Make a petition to have snow removed more often”, “Have everybody keep watch” and “have people voluntarily cooperate”.



(a) Study using a CDM Kit



(b) Mapping dangerous places in the area

Figure 6. View of Studies by Participants in the First WS

5.2.2 The second workshop

At the second WS, the study was focused on the problems which “precautions or preparations” had not been proposed at the first WS. The two axes are set so the vertical axis represents “predicted effects” and the horizontal axis represents, “degree of difficulty or ease of implementing the countermeasure”, and the countermeasures were prioritized on the two axes (Figure 7(a)). When it was done in three areas of Akita Prefecture last year, this was categorized considering priority for each countermeasure, but because the priority among countermeasures were not always adequately clear, the method was improved so it was a method permitting study while including comparative evaluations of individual countermeasures. As a result, it was, as hypothesized, possible to perform the prioritization while understanding the relative relationships of countermeasures (Figure 7(b)).



(a) View of Study During a WS



(b) Results of Prioritization

Figure 7. View of Prioritization

City hall official introduced spraying sodium chloride, which is a snow-melting agent, as a sloped road countermeasure. Participants also proposed spreading sand as a slipping prevention countermeasure. Other proposals were preparing an “Emergency contact list” to be used to notify snow removal companies in an emergency, or “drawing up a water channel map”, a fire-fighting activity particularly necessary during the winter.

5.2.3 The third workshop

At the third workshop, an implementation plan was created. After the participants were divided into small groups, during the first half, they decided theme name, and chose countermeasures which would be very effective and can be implemented easily. During the latter half, they decided the implementation schedule and person to be in charge of preparations (Figure 8). Specific countermeasures proposed were training in the use of the Automated External Defibrillator (AED) to improve emergency response capabilities and to prevent accidents during snow removal, a “Life-saving Team” to provide training in use of safety ropes, and a “Snow Support Team”, to help volunteers remove snow. So a decision was made to prepare and carry out a plan integrating these measures.

Removing snow in cooperation with volunteers contributes to the improvement of mutual assistance capability. Because, it is required that establishing a system able to accept volunteers to borrow force from outside the local area.



Figure 8. Preparing Implementation Plan

5.3 Implementing the Corroborative Experiment

On the day of implementation, personnel from the city’s fire department gave AED training during the morning. First aid and live-saving activities during snow removal were concretely hypothesized and a lively question and answer session was held.

In the afternoon, the participants were divided into a group to remove snow in cooperation with student volunteers from the Tokyo region and another group to give safety rope training. The volunteers had never before shovelled snow, so the residents of the local settlements gained experience of measures which have to be taken to accept volunteers; the need to prepare tools, the need to give guidance concerning how to use the tools, and the need to ensure the safety of the volunteers.

A post-activity meeting held for participants to exchange views was the scene of lively discussions as, in addition to the corroborative experiment, they discussed an experiment performed to assess the slip-proofing effects of residents spreading sodium chloride or sand on frozen road surface, introduced maps of channels used for fire-fighting and so on.

5.4 Change of the Contents of Initiatives Adapted to Local Conditions

In order to achieve the major goals which are to independently resolve local problems and strengthen local winter disaster prevention capability, at this WS, instead of having third parties dictate the contents to be actually implemented, participants themselves made decisions according to local conditions. Although the WS program is extremely flexible, it is necessary to revise the configuration and initiatives taken to adapt to local conditions.

In Niigata Prefecture, WS were also held in the Hachioji area, where a snow removal support organization, the “Snow Removal Team”, had already been formed by residents of local settlements, and snow removal volunteers accepted. On the other hand, as a result of the aging of the society, many people have difficulty participating in snow removal and other activities. And in this area, it is considered important to learn new knowledge. So with priority on lectures presented by experts on the occasion of the corroborative experiment to introduce this knowledge, lessons were given concerning safety measures to boost the capability of the Snow Removal Team, and on AED. And as one method of achieving the local goal of making it an area which will attract people, participants discussed and revised methods of cooperating with snow removal volunteers.

6. EVALUATION BY WS PARTICIPANTS

After the corroborative experiment, the effectiveness of the WS procedure was clarified by conducting a questionnaire survey of WS participants in three parts of Akita Prefecture to obtain their views concerning the three WS and the corroborative experiment.

In both areas, more than 80% of participants answered that they were satisfied or somewhat satisfied (Figure 9). Specific opinions included, “My first experience, I learned a lot”, “We all enjoyed the activity,” and “It was a good change to teach (volunteers)”, and “I was able to obtain knowledge from others”.

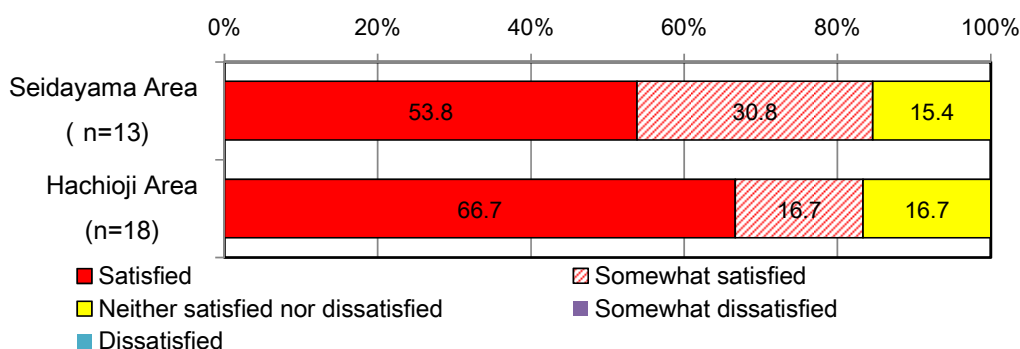


Figure 9. Degree of Satisfaction of Participants in Corroborative Experiment(Niigata Pref.)

And five student volunteers who participated in the Seidayama area described their impressions as satisfaction with the activities, surprise at the quantity of snow, difficulty of disposing of it, friendliness of the local residents, and the enjoyment of the activity itself.

Next, Figure 10 shows the results of a questionnaire survey concerning a “activities which should be undertaken to prepare for snow in the area in the future”. Multiple answers to the questions are permitted, and the figure shows the percentage of those who completed the questionnaires in each area who selected each item. Most answered that lecture meetings, which were held as part of this implementation program, should also be continued in the future. The results showed that creating an emergency liaison network that was proposed but not implemented in the Seidayama Area was done the same number of times, and followed this time by spreading sand by part of the residents. In the results for the Hachioji Area, strengthening of existing snow removal support organizations was often done.

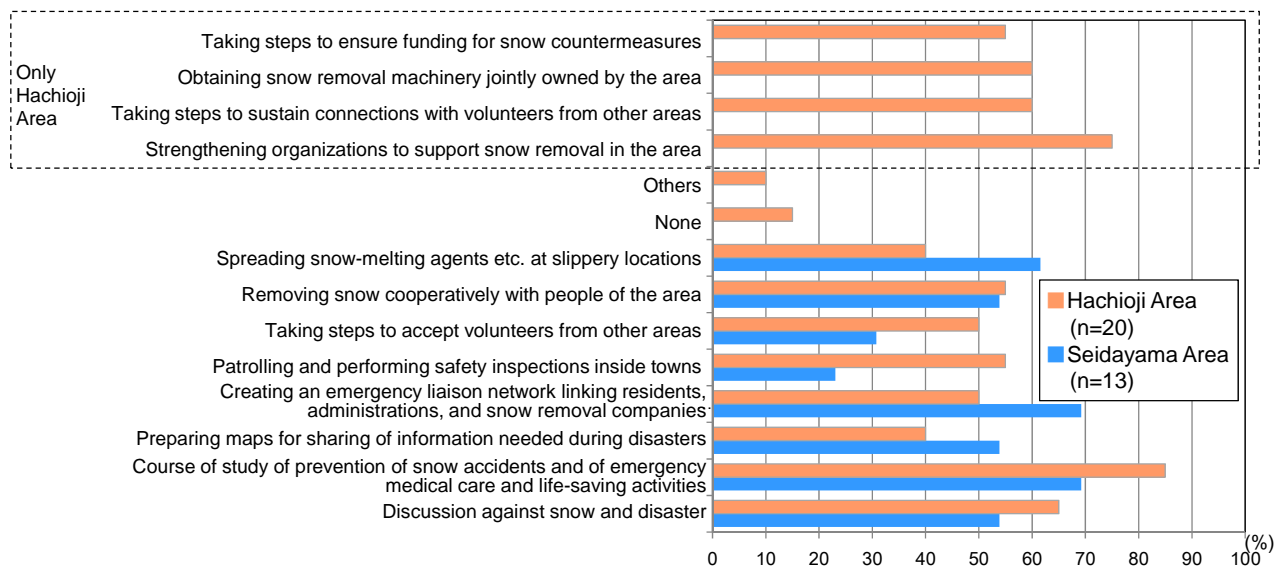


Figure 10. Proposed Future Menu

7. FOLLOW-UP SURVEY THE NEXT YEAR

After the corroborative experiments, the following years, follow-up surveys were done. The follow-up surveys were performed as reporting meetings where the contents of activities the previous season were reported and opinions exchanged. And in the three areas in Akita Prefecture, a heavy snow version of Crossroad was also performed. Table 2 shows the contents of the report meeting and its implementation method.

7.1 Implementation of the Heavy Snowfall Crossroad

A report meeting based on the configuration in Table 2 was held as a follow-up survey to the WS and corroborative experiment performed the preceding year. In December 2011, a heavy snow version of Crossroad was performed during the report meetings in the three areas of Semboku City in Akita Prefecture. The results are presented here.

Table 2. Report Meeting: Contents and Implementation Method

Item	Description	Organizing body
Report on implementation during the previous season	Classroom lectures using PPT <ul style="list-style-type: none"> • Activities which were conducted (corroborative experiment) • Contents of exchange of opinions • Questionnaire survey results and impressions 	Explanations given to residents by sponsor
Exchange of opinions	Joint hearing using vellum and post-its <ul style="list-style-type: none"> • Retrospective impressions • Change of the area by activities (case studies) • Initiatives planned for the present winter 	Residents exchange opinions under guidance of facilitator
Conducting a Snow Accumulation Version of Crossroad (Only in 3 regions of Akita Prefecture)	Problem preparation group work <ul style="list-style-type: none"> • Forming small groups to prepare problems with response to heavy snowfall and exchange opinions concerning the reports on responses taken 	Residents of local settlements are quizzed about local challenges guided by a facilitator

Crossroad was developed by Professor Yamori of Kyoto Univ. and Associate Professor Kikkawa of Keio Univ.[9]. Normally, a problem is presented, people express their opinions about it, and then they discuss it. At this WS, the participants were given the task of preparing the problems in order that participants consider local problems more deeply. The theme of the problems presented by Crossroad was Heavy Snow Countermeasures. The participants were divided into two groups, and winter problems in the said local region from someone's viewpoint were prepared as problems. After preparation of the problems, they were announced and the participants discussed their individual ideas.

As a result of preparing the problems for Crossroad, residents of the local settlements prepared a total of five problems in the three areas. Figure 11 presents an example of a problem which was prepared and results of implementation. And Figure 12 shows the results of a questionnaire survey conducted after performing Crossroad.

Question prepared by resident	
<p style="margin: 0;">You are a district leader (manager) or assembly member. A snow removal vehicle has been provided to a local operating group. But there is nobody in the area to operate the vehicle. A resident notifies you that he cannot leave his home so would you please remove the snow. You do not know what to do. And a major event which you have been eagerly looking forward to is scheduled for that day. Would you remove the snow with the snow removal vehicle?</p>	
Result of implementation	
Results of answers	YES : 4 persons NO: 7 persons Unanswered: 4 persons
Resident's view	<p style="margin: 0;">Because you have been selected by the local people you bear responsibility ("Yes" participant).</p> <p style="margin: 0;">Normally I am adequately careful about such matters and while taking care that such a situation does not occur, I want to guarantee there are enough operators while ?attending to something? ("Unanswered" Participant)</p>

Figure 11. Example of Crossroad Question which a Resident Prepared and Implementation Result

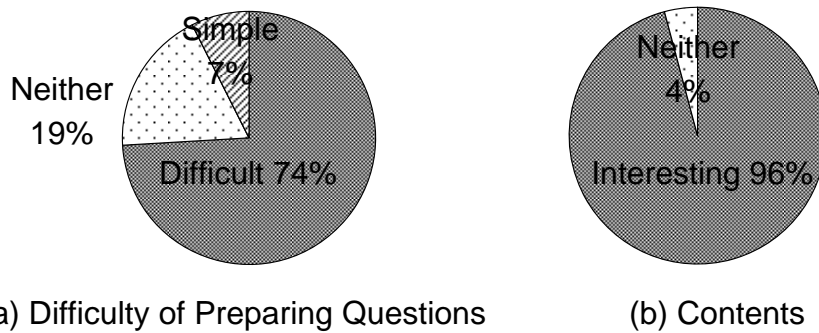


Figure 12. Impressions of Preparing Crossroad Problems (Total of 3 Areas of Akita Pref.)

Concerning the difficulty of preparing the problems for Crossroad, about 3/4 of participants answered that it is, “Difficult”. Free comments included the view that it was good to be able to discuss actual problems, that they wanted to question many people, but the comment that it was difficult to resolve the problems was also given. More than 90% of participants answered that they thought the contents of the Crossroad were interesting. Free comments included the view that the shortage of time prevented a thorough study of the problems.

The above results suggest that having participants prepare their own Crossroad questions can, if sufficient time to do so is allowed, permit deeper study of actual local problems.

7.2 Participants Opinions Obtained during the Exchange of Opinions

Report meetings were held as follow-up surveys to WS and corroborative experiments held the preceding season in three areas of Akita Prefecture in December 2011 and in two areas of Niigata Prefecture in December 2012.

In the three areas of Akita Prefecture, impressions of the act of reviewing past activities included “it was a good opportunity for the residents of local settlements to get together,” and, “residents of local settlements gathering to conduct activities has increased local disaster prevention capability”. And comments given concerning changes in the local area caused by the activities include, “I discovered the need to help elderly people living alone,” “I can now more readily call out to elderly people,” “it started exchanges within settlements,” and “it gave residents of local settlements confidence that they can cooperatively discuss and deal with heavy snowfall.”

Comments indicating people’s impressions of their review of past activities in the two areas of Niigata Prefecture include, “I learned a lot from last year’s program,” “While removing snow to prepare for this winter, I recalled last-year’s initiatives and the need for life lines, but I could not remember how to attach life lines,” and “It was meaningful to be able to meet and interact with volunteers when receiving outside volunteers.” Comments regarding changes to the region resulting from the activities included, “a variety of tools were needed to accept volunteers, but thanks to a subsidy from the Social Welfare Council, we were able to obtain them,” “activities by local volunteer organizations are continuing but ensuring funds for their activities is a problem,” “funds for activities in settlements must be

guaranteed, but the use of subsidies must be studied and steps taken to have outside volunteers return as sightseers,” and “there are not enough facilities to accept visitors”.

According to these results, it is now clear that this WS program contributes fully to improving mutual assistance capability, which means residents of local settlements ability to undertake various activities, and helps improve acceptance capability by building a volunteer acceptance system. And some problems were discovered, but because of awareness of ensuring funds to continue local activities as Medium-and-long term problem, the process has been adequately effective in ensuring continuity of the activities.

8. EFFECTIVENESS OF THE WS PROGRAM

As stated above, participants are highly satisfied with the implementation of this series of WS. The following points are considered to be reasons for their high level of satisfaction.

- During WS, the participation not only of the residents of local settlements, but of intermediate support organizations, experts, and administrative officials, deepened understanding of snow problems.
- While they felt that snow problems are difficult to deal with, they personally considered local problems and thought about measures to resolve the problems as they obtained specialized knowledge.
- They implemented and experienced the countermeasures that they had studied.

And it is clear that by flexibly revising the program to adapt to local conditions instead of following a fixed WS program, they felt a high degree of satisfaction, even in areas where local initiatives were already matured.

9. PREPARING THE HANDBOOK ON APPLICATION IN OTHER AREAS

The WS, corroborative experiment, and follow-up survey implementation procedures described above were summarized to prepare the Heavy Snow Countermeasure Workshop Handbook (Draft Edition) (Figure 13). This handbook is configured as follows; (1) About the Handbook; (2) About Heavy Snow Countermeasure Workshops; (3) WS Program by Step.

(1) states the purpose of the handbook, which is to improve local areas' ability to deal with disasters by, with the cooperation of administrators, NPO, and other concerned organizations under the leadership of residents of each area's local settlements, holding WS with snow heavy snow countermeasures as its theme, and presents goals such as improvement of residents consciousness of disaster prevention or the stimulation of activities, plus examples of achievement goals, which are the discovery of snow countermeasures approved by both residents and administrators. It also states that it is premised on its users being officials of cities, towns, and villages and staff of NPO or private companies, and on it being used in regions in hilly and mountainous areas and in heavy snowfall areas where specific activities to deal with snow are not performed.

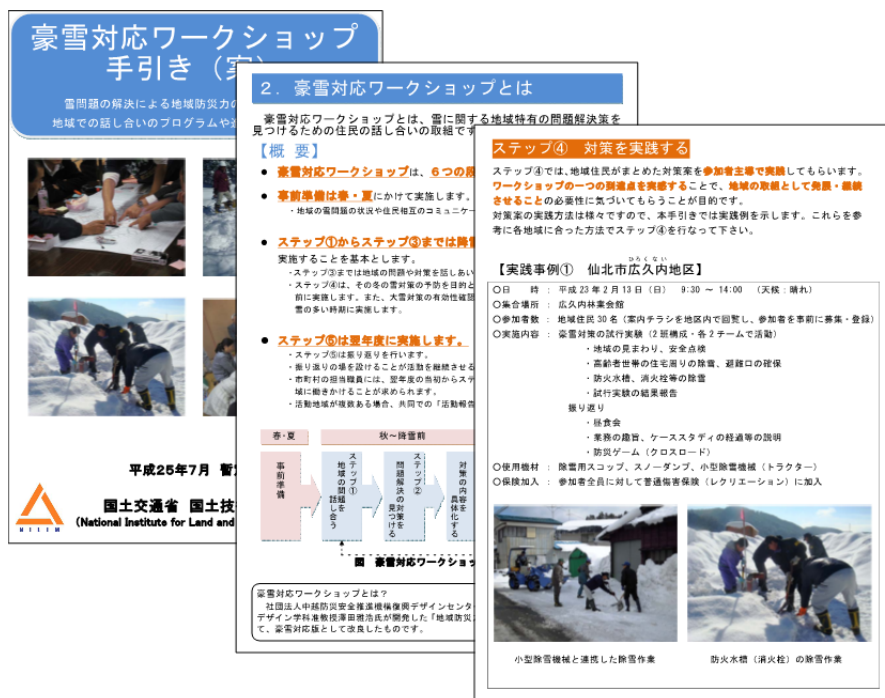


Figure 13. Heavy Snowfall Area Workshop Handbook which was Prepared

(2) presents, as an outline of the heavy snow area workshops, outlines of each step, the fact that the participants are, in addition to residents of local settlements, staff of NPO and intermediate support organizations etc. as concerned persons, the fact that the desirable number of participants is 2 or 3 groups consisting of 5 to 8 individual people, and as an outline of the operating system, the need for several operating staff and facilitators, documents necessary for WS, and an outline of the program configuration.

In Part (3), for each step explained in (2), the details of the program and the day's schedule are presented in detail including the tools used. For Step 1, explanations are given concerning a heavy snow simulation using the CDM Kit in order to discuss local problems, the creation of disaster prevention maps, and examples of specific sheets and maps are presented. For Step 2, it explains that in order to discover countermeasures to resolve problems, as in Step 1, proposed countermeasures to resolve problems are studied while the heavy snow simulation is repeated by showing examples of simulation results, and an example of the prioritization of the proposed countermeasures is presented. For Step 3, it states what kinds of sheets should be used to study advance preparations and the day schedule to prepare the implementation plan in order to specify the contents of the countermeasures. To propose countermeasures, the authors were careful to make it easier for readers to imagine what kinds of things should be done by giving examples of WS which the authors had conducted.

Finally, preparations are now being made to release the Handbook to the public, including regional development bureaus of MLIT, and regional public bodies. By releasing the Handbook to the public, we are counting on it being used in areas where the decline of disaster prevention capabilities in the winter is feared.

10. SUMMARIZATION

The above report clearly shows that WS participants studying local problems and proposed countermeasures and implementing the proposed countermeasures to deal with the local problems during WS will, if the following conditions are satisfied, contribute to the improvement of local disaster prevention capability in the winter.

Participation by diverse organizations: It is implemented by groups consisting of people with experience and knowledge of snow removal on community roads, communication experts, and administrative officials.

The program is configured to adapt to local conditions: Challenges faced by each area are very diverse and measures to resolve them also vary widely, so instead of uniform WS contents, the contents of the WS are varied flexibly to adapt to local conditions.

Proposed countermeasures are implemented: By not only conducting a theoretical study, but actually implementing the proposed countermeasures which have been studied, the good and bad points of each proposed countermeasure are verified and participants are given a feeling of accomplishment.

The program is linked to continued activities: Instead of stopping after a trial implementation of the proposed countermeasures, reviewing the implementation next year and taking steps so that the activity can be conducted continually.

The authors wish to conclude by expressing their gratitude to everyone who participated in and supported the workshops.

REFERENCES

1. K.Kumagai et al(2008). Measurement Method for the Effect of Tsunami Risk Communication and a Result of Measurement, Proceeding of Infrastructure Planning and Management(JSCE), Vol.38, No.121 (in Japanese)
2. T.Katada et al(2011). The Safety-Behavior-Indicative Flood Hazard Map, Journal of JSCE, Division D3, Vol.67, No.4, pp.528-541 (in Japanese)
3. T.Futagami et al(2011). Research on the Earthquake Fire Risk Communication in a Wooden High Density City Area, Journal of JSCE, Division D3, Vol.67, No.5, pp.1_35-1_43 (in Japanese)
4. M.Hatayama et al(2007). Development and Feasibility Study on Interactive Flood Risk Communication Support System, IPSJ SIG Technical Report, 2007-IS-102(6), pp.37-44
5. R.Kakimoto et al(2009). Supporting Systems of Risk Mitigation Suitable for Mountainous Area through Risk Communication, Proceeding of Infrastructure Planning and Management(JSCE), Vol.40, No.327 (in Japanese)
6. Ministry of Land, Infrastructure, Transport and Tourism (2013). Guidebook for Regional Snow Removal (CHIKI JOSETSU KATSUDOU JISSEN GAIDO BUKKU), Available from https://www.mlit.go.jp/report/press/kokudoseisaku04_hh_000051.html (in Japanese) [Accessed 9th July 2013]
7. A.Yuhara et al(2012). Case study of risk communication in snow disaster management. SNOW ENGINEERING VII. Proceedings of the 7th international conference on snow engineering, Refereed paper, pp.81-95
8. T.Kawauchi and M.Sawada(2010). The trial of development on a workshop kit to strengthen local community ability related to disaster-prevention, Proceeding of JSDRR Annual Conference (in Japanese)
9. K.Yamori, T.Kikkawa and T.Ajiro(2005). Risk Communication learning from Disaster Mitigation Game, Nakanishi Shuppan (in Japanese)