

Research Trends and Results

Effects of Snow and Cold Weather on the Operation of Evacuation Facilities

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1. Foreword

When a disaster strikes, many disaster victims are forced to live in evacuation facilities. If a disaster occurs during winter in snowy cold regions, it is easily assumed that things will be very much different because of the snow and cold weather than when it occurs during the summertime.

NILIM has been engaged in studying ways to further strengthen disaster prevention measures in preparation for disasters that occur during winter months. Here in this paper, I would like to present the status of our study regarding the effects of snow and cold weather on the operation of evacuation facilities.

2. Characteristics of Snowy Cold Regions

In heavy snowfall regions such as Niigata Prefecture, as winter snowfall is extremely heavy, roads tend to become impassable or the pace of traffic on roads tends to become extremely slow after a heavy snowfall due to delayed snow removal, and open space areas tend to become unusable as they are fully covered by snow. Also, in cold weather regions such as Hokkaido, it is not uncommon for the outside temperature to fall below zero degrees Celsius, and the people's lives may be in danger without heating equipment, and roads and walking areas may become icy, which results in constraining people's movement and road transport (see Photos 1 and 2).



Photo 1. Winter Conditions in Heavy Snowfall Region (Niigata Prefecture)



Photo 2. Winter Conditions in Cold Weather Regions (Hokkaido Prefecture)

3. Constraints on the Operation of Evacuation Facilities during Winter

Using as case studies schools in Hokkaido and Niigata Prefecture that will be used as evacuation facilities in the event of a disaster, we studied the effects of snow and cold weather on the operations of evacuation facilities from the standpoint of constraints on space, movement, and habitability. During the course of our study, we held workshops with the participation of experts in the relevant fields.

As a result of our study, it has been found, as shown in Table 1, that different problems may arise during winter from those that may be encountered during summer. For example, (i) the amount of usable open space will be reduced because of snowfall, thus resulting in constraining outdoor activities, (ii) icy roads may make it difficult for people to evacuate or may cause a delay in the delivery of relief supplies, and (iii) the intrusion of snow into indoor spaces may make the indoors dirty or may make it difficult to use heating equipment.

4. Conclusion

We will publish, through NILIM's website and other means, key points that need to be taken into account concerning the operation of evacuation facilities during winter, which have been identified during the course of studying ways to further strengthen disaster prevention measures during winter months.

Table 1. Examples of Challenges in Operating Evacuation Facilities during Snowfall/Cold Weather Season

Constraints	Challenges
Constraint on Space	<ul style="list-style-type: none">- Lack of parking space due to snowfall or ice in open space areas, such as schoolyards- Difficult to set up a tent or prepare meals outdoors- Difficult to secure space for temporary bathrooms or baths
Constraint on Movement	<ul style="list-style-type: none">- Icy roads may make it difficult for people to move to and from an evacuation center, may cause a delay in the opening of an evacuation center, or may cause accidents when moving to and from an evacuation center, among other things.- Snowfall on roads or icy roads may cause a delay in the delivery of relief supplies.
Constraint on Habitability	<ul style="list-style-type: none">- The slush and snow on evacuees' shoes and/or clothes may make the living space dirty.- Unable to use heating equipment because of a stoppage of essential utilities- Dry or frigid weather may cause damage to the health of evacuees.



Photo 3. Study Items during Expert Workshop