

# **Influence of Roadside Environment and Road Structures on Blowing-Snow-Induced Visibility Hindrance on Winter Roads: Analysis using the results of weather observations by a visibility observation vehicle during blowing snow.**

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## **SUMMARY**

In planning blowing-snow control facilities for roads, it is important to accurately determine which locations are at risk of blowing snow. In Japan, such assessment relies on the degree of snowstorm danger described in The Highway Snowstorm Countermeasure Manual of the Civil Engineering Research Institute for Cold Region. However, for the manual, the items and scores used to assess the degree of snowstorm danger were determined empirically. The establishment of an evaluation method based on quantitative surveys has been called for.

In this study, to clarify the influence of the road environment and structures on blowing-snow-induced visibility hindrance, weather observation was done during blowing snow and the following analysis was done.

Weather observations were made by using a visibility observation vehicle customized for such observation. The observation was done on days with blowing snow along 5 sections on 4 routes of national highways in Hokkaido where blowing snow tends to occur. The observations were done during three winters from 2012 to 2015. A thermometer, a wind direction and velocity meter, a visibility meter, a GPS sensor and a video camera were installed in the visibility observation vehicle. The data obtained using these devices were recorded every 0.1 seconds during the observation.

By using the data obtained by the visibility observation vehicle during blowing snow, multivariate analysis using mathematical quantification theory class I was done. The analysis addressed how the following affected the visibility hindrance occurrence rate (%) (i.e., incidents of visibility hindrance divided by the number of observations and multiplied by 100): length of windward flat land, the width of the tree belts, the width of rows of houses, the height of fill and cut sections on the road, and the presence/absence of guardrails.

The analysis clarified the following.

- The visibility hindrance occurrence rate tended to be high for roads with long windward flat land. With flat land of 300 m or longer, the rate tended to be high.
- On roads with a windward tree belt of 100 m or wider or with rows of houses of 300 m or wider, the rate tended to be remarkably low. The visibility tended to be good at such locations.
- The rate during blowing snow differed depending on the road structure. The rate tended to be high at fills of about 3 m or higher and at cuts of lower than 5 m.
- At sections with guardrails, the rate during blowing snow tended to be higher than at road sections without guardrails.