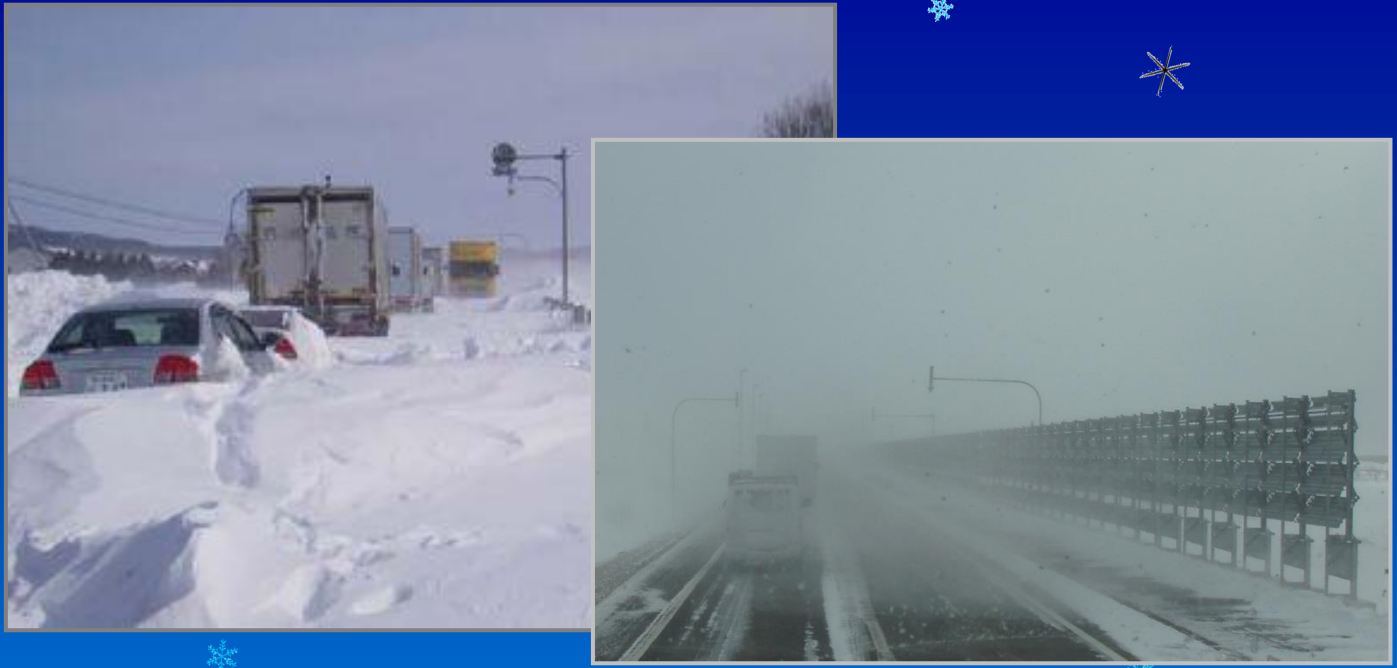

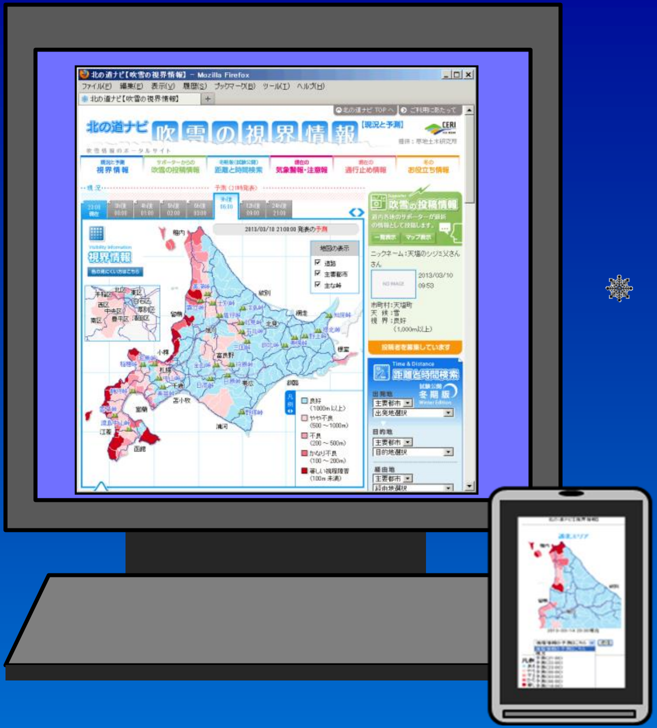

# Development of the Snowstorm Visibility Information System for Road Users

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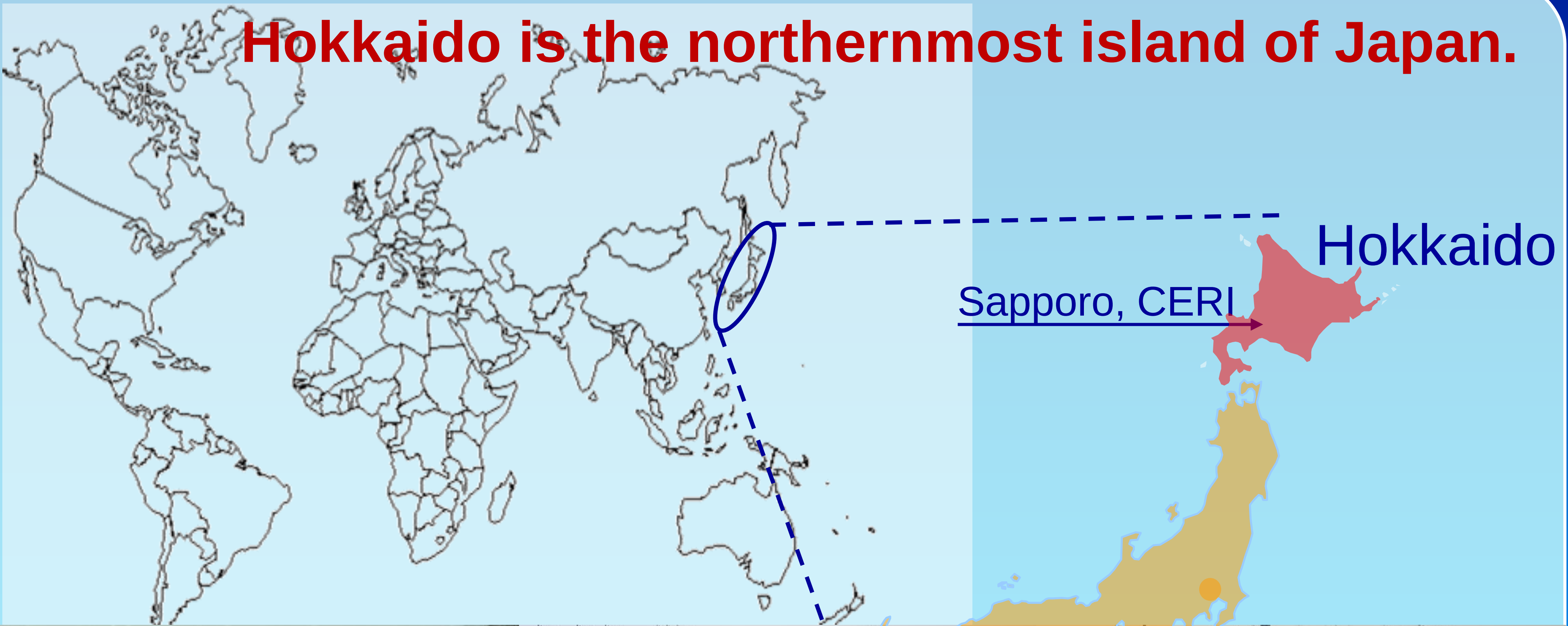
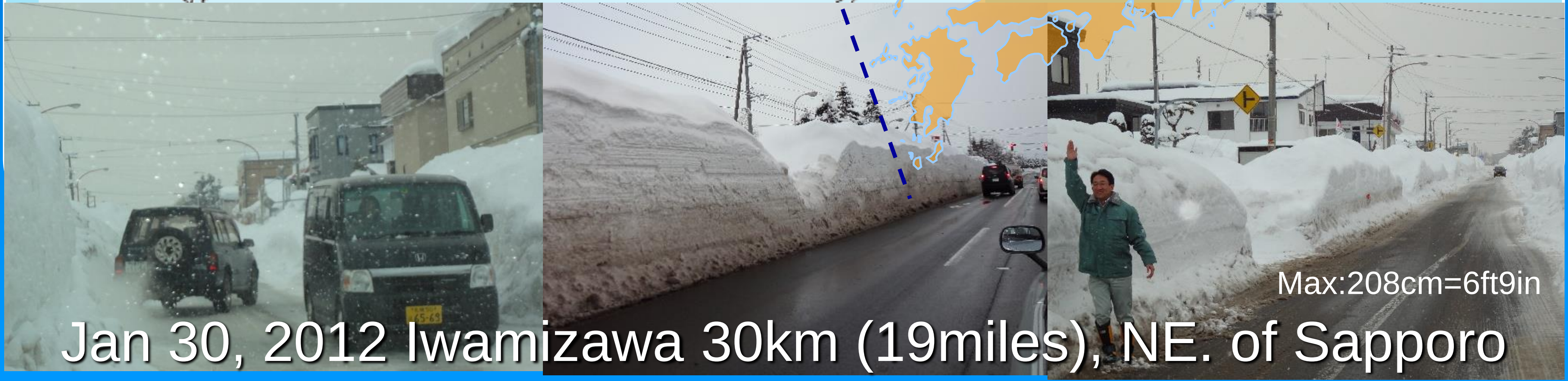
*Cold-Region Road Engineering Research Group*
*http://www2.ceri.go.jp*

*Northern Road Research*

# Introduction

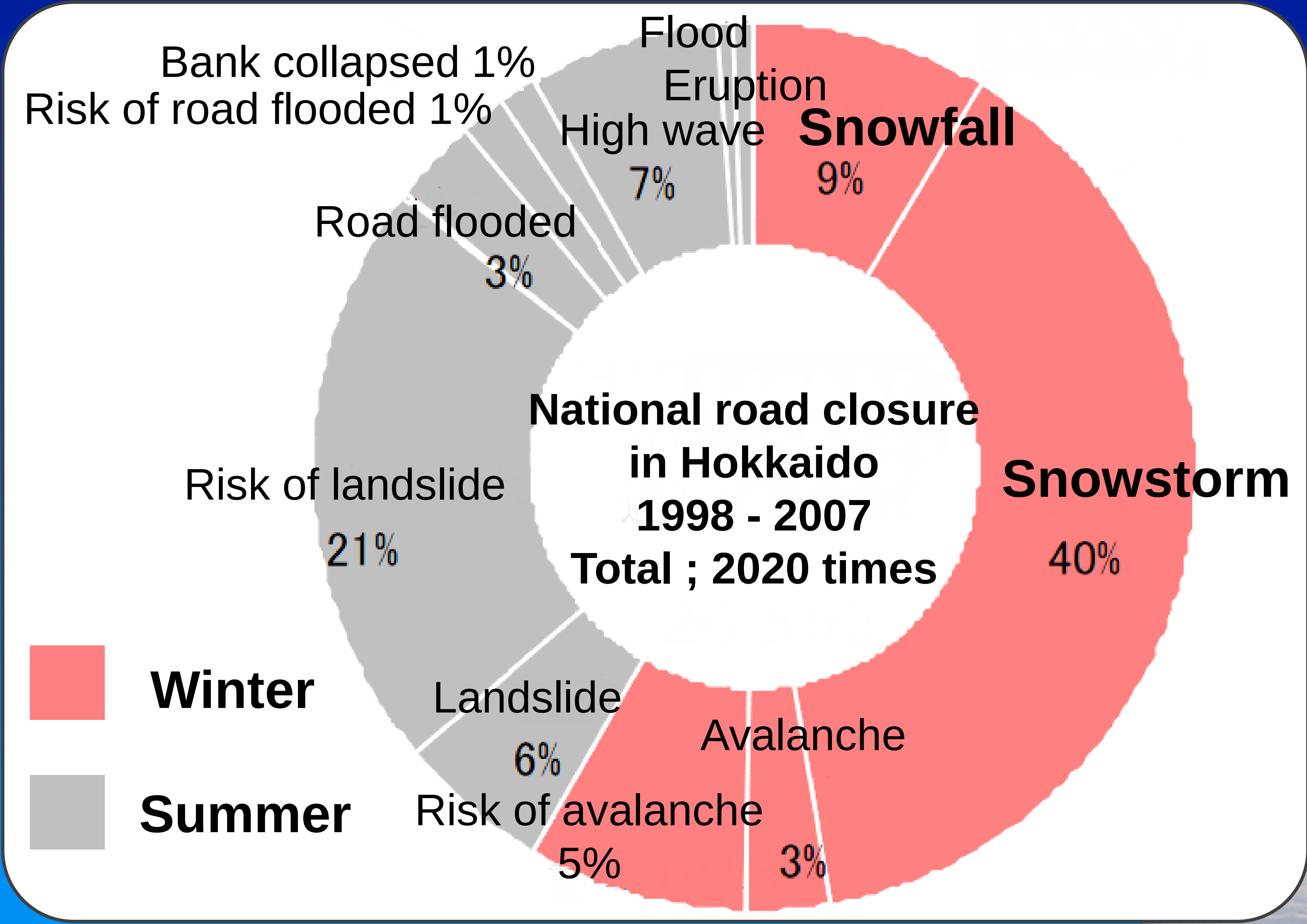
**Hokkaido is the northernmost island of Japan.**


Hokkaido
Sapporo, CERI


Max:208cm=6ft9in

Jan 30, 2012 Iwamizawa 30km (19miles), NE. of Sapporo

# Background



**Causes of national road closure in Hokkaido**

**Snowstorms cause ...**

Poor visibility

Snowdrifts

* 40% of road closures - snowstorms

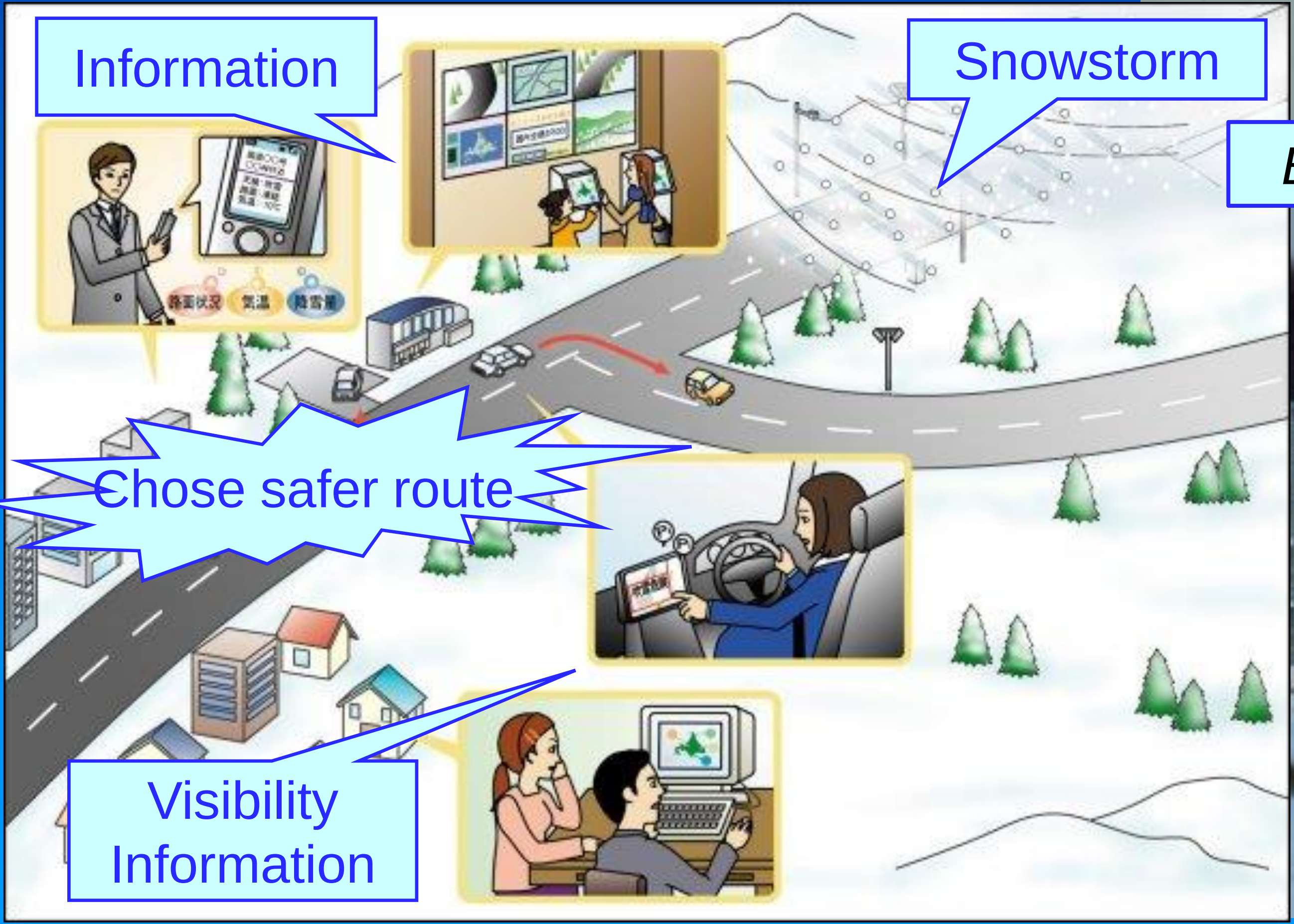
# *Background*

Reduce damage caused by snowstorms ...

Road: Installation of blowing-snow control measures

Driver: Help drivers to make safer decisions

Snowstorm visibility information

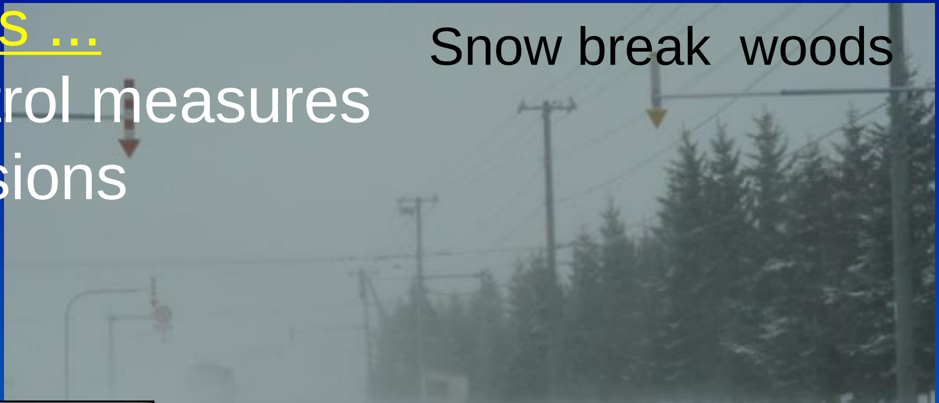


Information

Snowstorm

Chose safer route

Visibility Information



Snow break woods

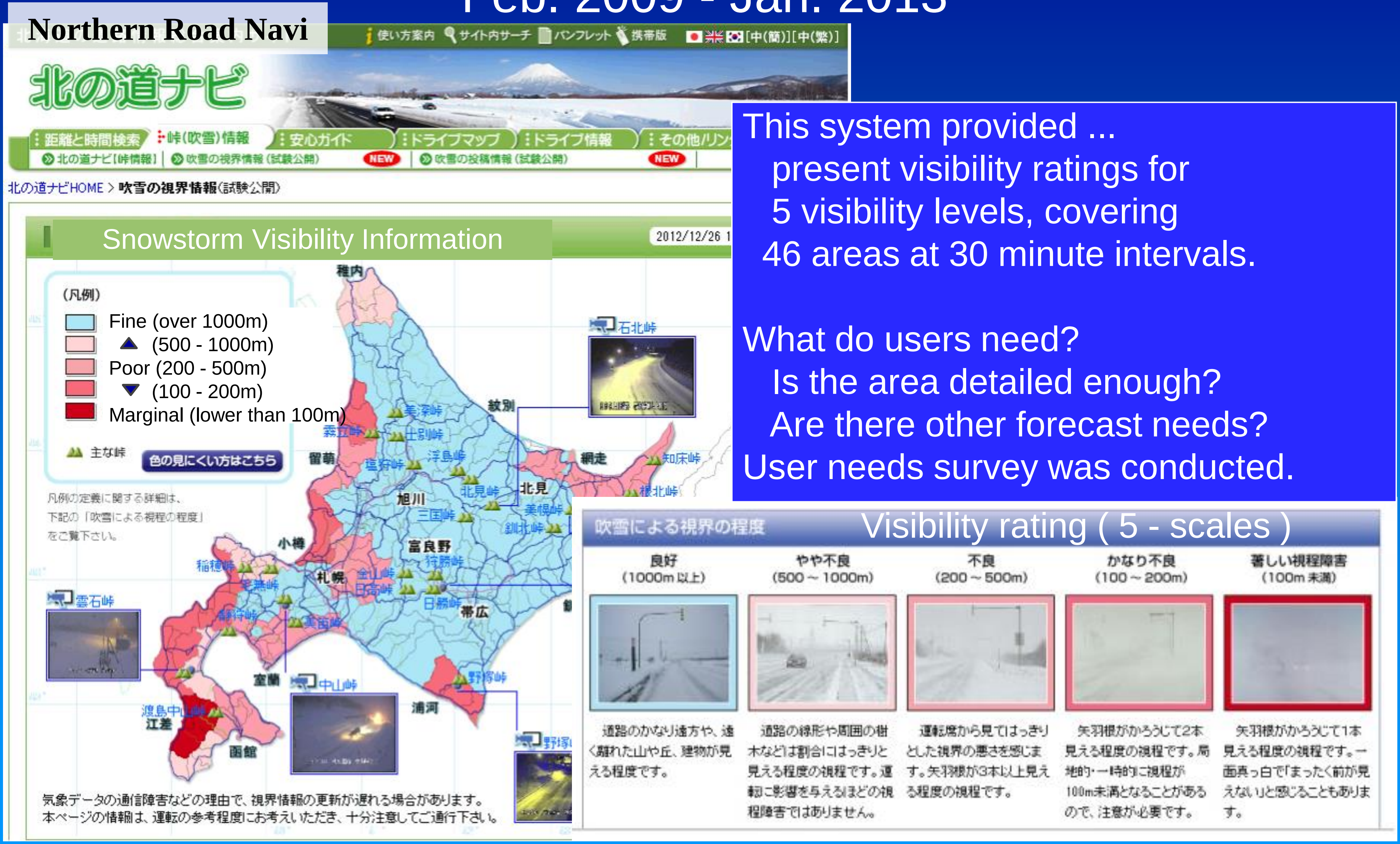
Blowing-snow control facilities

Snow fences

* Control measures are installed in areas storms frequently occur.
* Recently, bomb cyclones cause blowing-snow.
* Snow-control facilities require much time and cost to construct, so cannot address sudden storms.

# Original Snowstorm Visibility Information System

## Feb. 2009 - Jan. 2013



**Northern Road Navi**

使い方案内
サイト内サーチ
パンフレット
携帯版
[中(簡)][中(繁)]
北の道ナビ
距離と時間検索
峠(吹雪)情報
安心ガイド
ドライブマップ
ドライブ情報
その他リン
北の道ナビ【峠情報】
吹雪の視界情報（試験公開）
NEW
吹雪の投稿情報（試験公開）
NEW
北の道ナビHOME > 吹雪の視界情報(試験公開)
Snowstorm Visibility Information
2012/12/26 1
(凡例)
主な峠
色の見にくい方はこちら
稚内
石北峠
紋別
美深峠
霧立峠
士別峠
留萌
塩狩峠
浮島峠
網走
知床峠
根北峠
北見峠
北見
旭川
美幌峠
三国峠
釧北峠
小樽
富良野
狩勝峠
稲穂峠
札幌
金山峠
日高峠
毛無峠
日勝峠
帯広
雲石峠
美笛峠
中山峠
野塚峠
室蘭
浦河
渡島中山峠
江差
函館
野塚

- 🟦 Fine (over 1000m)
- 🟥 ▲ (500 - 1000m)
- 🟥 Poor (200 - 500m)
- 🟥 ▼ (100 - 200m)
- 🟥 Marginal (lower than 100m)

凡例の定義に関する詳細は、下記の「吹雪による視程の程度」をご覧下さい。

気象データの通信障害などの理由で、視界情報の更新が遅れる場合があります。
本ページの情報は、運転の参考程度にお考えいただき、十分注意してご通行下さい。

This system provided ...
present visibility ratings for
5 visibility levels, covering
46 areas at 30 minute intervals.

What do users need?
Is the area detailed enough?
Are there other forecast needs?
User needs survey was conducted.

吹雪による視界の程度 Visibility rating ( 5 - scales )

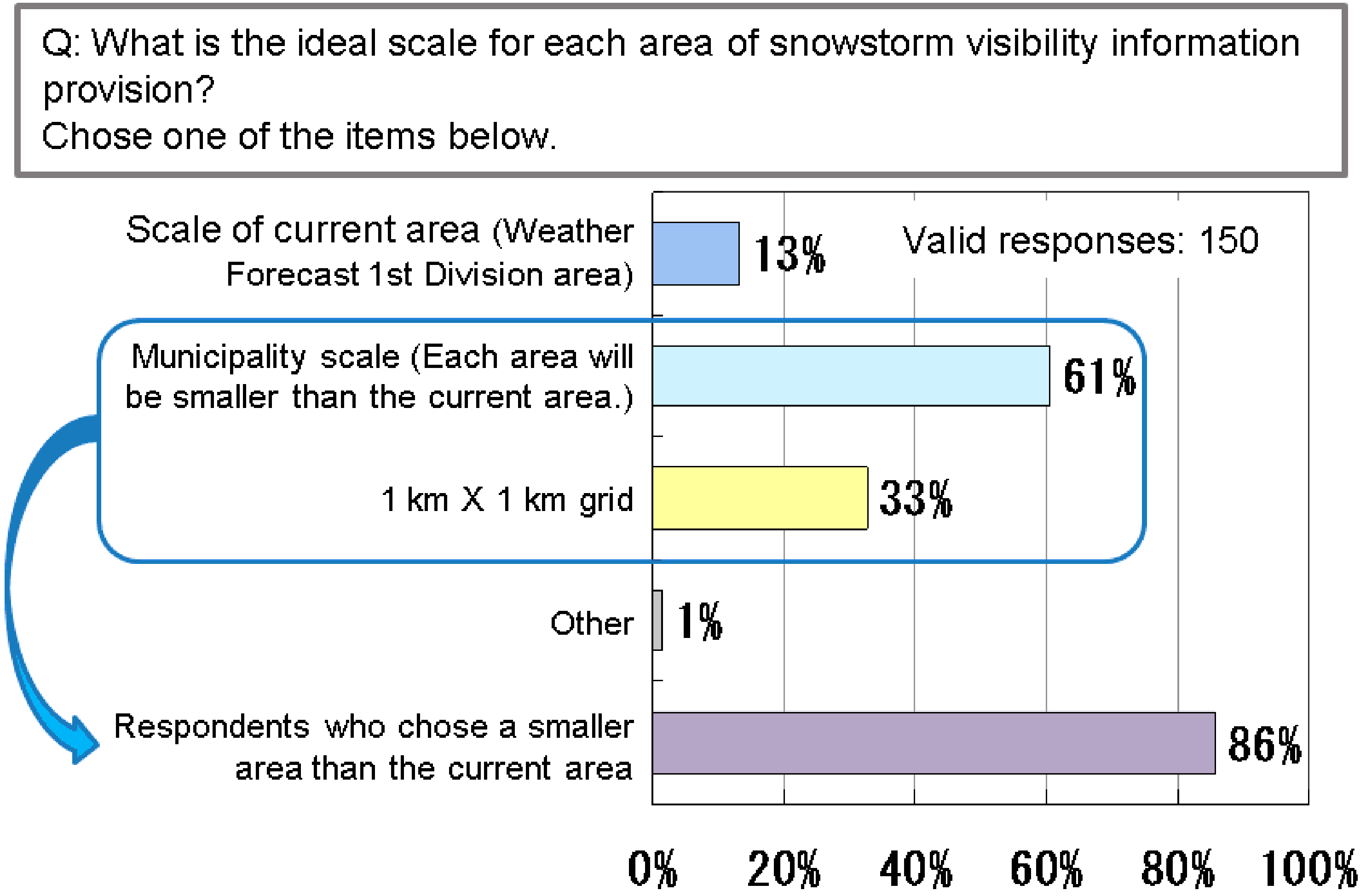
| 良好<br>（1000m以上） | やや不良<br>（500～1000m） | 不良<br>（200～500m） | かなり不良<br>（100～200m） | 著しい視程障害<br>（100m未満） |
|---|---|---|---|---|
| 道路のかなり遠方や、遠く離れた山や丘、建物が見える程度です。 | 道路の線形や周囲の樹木などは割合にはっきりと見える程度の視程です。運転に影響を与えるほどの視程障害ではありません。 | 運転席から見てはっきりとした視界の悪さを感じます。矢羽根が3本以上見える程度の視程です。 | 矢羽根がかろうじて2本見える程度の視程です。局地的・一時的に視程が100m未満となることがあるので、注意が必要です。 | 矢羽根がかろうじて1本見える程度の視程です。一面真っ白で「まったく前が見えない」と感じることもあります。 |

- * In order to reduce damages through the use of IT.
- * Since 2009, this system provided visibility information of JMA data.
- * Visibility levels indicated by using 5-color scale.
- * Hokkaido was divided into 46 areas.

# *Questionnaire Survey for System Modification*

## Question on the ideal size of each area for which information is provided.

86% of respondents desired information for "smaller areas"
Division was changed to one based on municipality.
Number of divisions rose from 46 to 203.



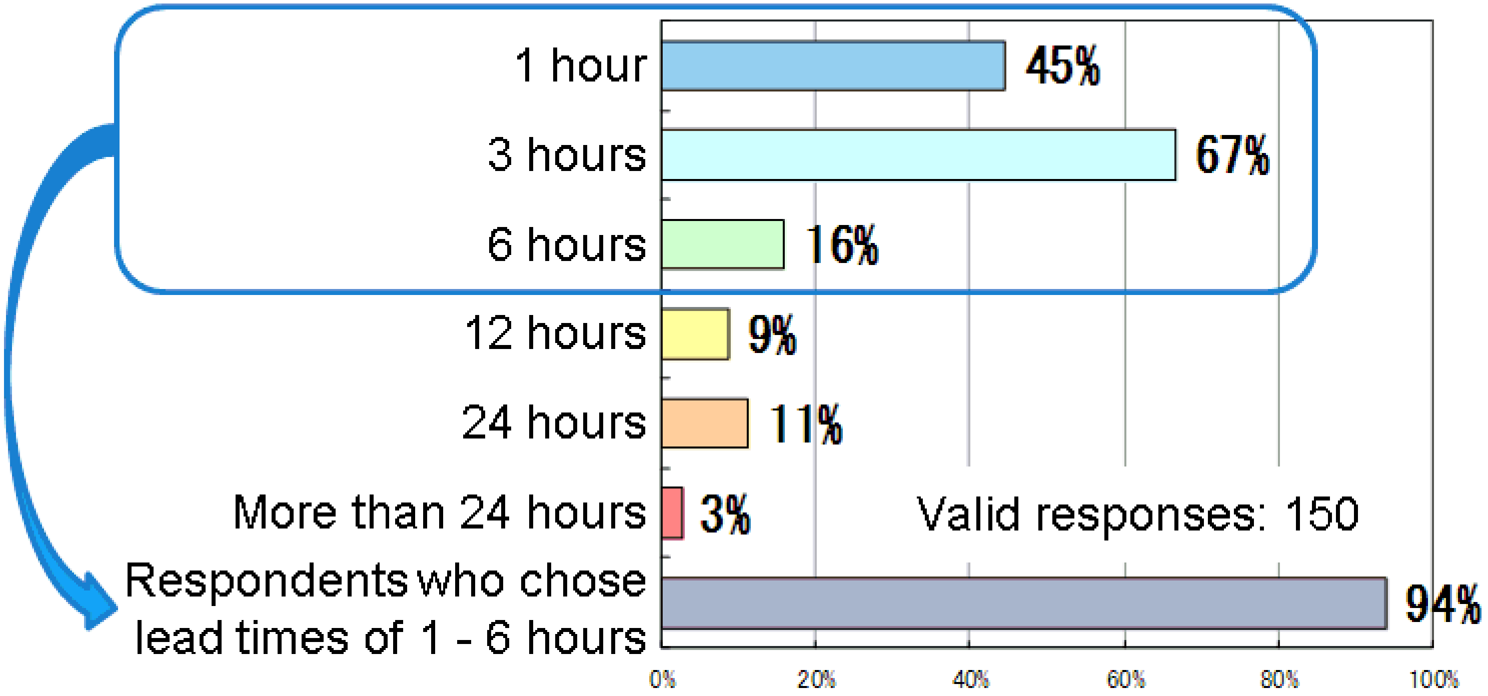
Q: What is the ideal scale for each area of snowstorm visibility information provision?
Chose one of the items below.

# *Questionnaire Survey for System Modification*

## Question on the forecast lead times preferred by road users.

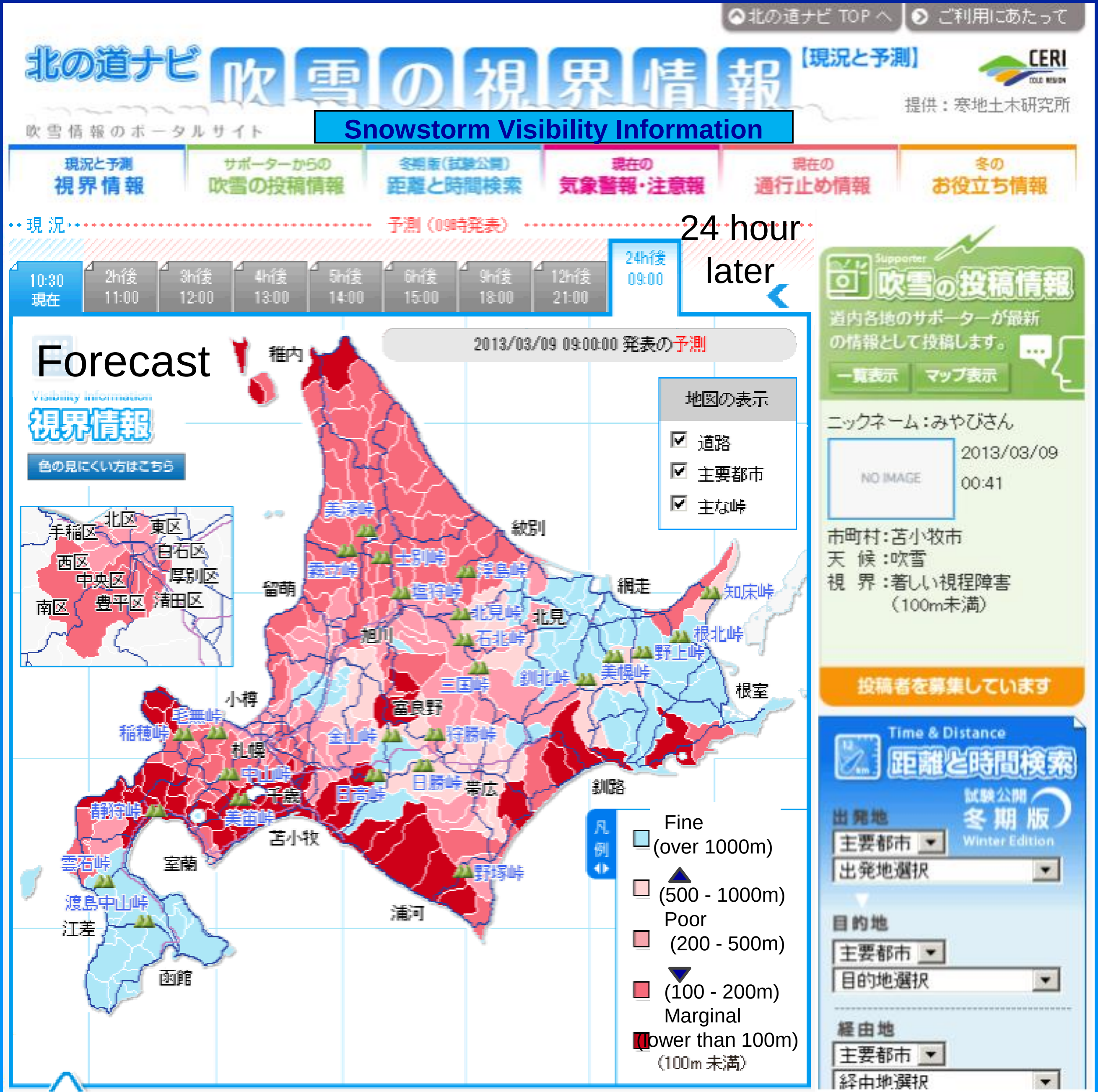
94% of respondents desired 1 - 6 hours lead time.
Up to 6 hourly forecasts to be provided.
Also provide 9, 12 and 24-hour forecasts.

Q: Forecasts of visibility distance on roads will be become possible in the near future. What is your preferred lead-time for such forecast information? (Choose as many as you like.)



# *Modified Snowstorm Visibility Information System*

## since Feb. 2013



北の道ナビ TOP へ
ご利用にあたって
北の道ナビ
吹雪の視界情報
【現況と予測】
吹雪情報のポータルサイト
CERI
提供：寒地土木研究所
Snowstorm Visibility Information
現況と予測 視界情報
サポーターからの 吹雪の投稿情報
冬期版（試験公開） 距離と時間検索
現在の 気象警報・注意報
現在の 通行止め情報
冬の お役立ち情報
現況
予測（09時発表）
24 hour later
10:30 現在
2h後 11:00
3h後 12:00
4h後 13:00
5h後 14:00
6h後 15:00
9h後 18:00
12h後 21:00
24h後 09:00
Forecast
Visibility Information
視界情報
色の見にくい方はこちら
地図の表示
☑ 道路
☑ 主要都市
☑ 主な峠
稚内
美深峠
紋別
士別峠
霧立峠
浮島峠
留萌
網走
塩狩峠
北見峠
北見
知床峠
石北峠
旭川
根北峠
野上峠
三国峠
釧北峠
美幌峠
根室
小樽
富良野
毛無峠
稲穂峠
金山峠
狩勝峠
札幌
中山峠
日勝峠
帯広
日高峠
釧路
千歳
静狩峠
美笛峠
苫小牧
室蘭
雪石峠
野塚峠
渡島中山峠
浦河
江差
函館
北区
東区
手稲区
白石区
西区
中央区
厚別区
南区
豊平区
清田区
凡例
Fine (over 1000m)
(500 - 1000m)
Poor (200 - 500m)
(100 - 200m)
Marginal (lower than 100m)
（100m 未満）
Supporter
吹雪の投稿情報
一覧表示
マップ表示
NO IMAGE
投稿者を募集しています
Time & Distance
距離と時間検索
試験公開 冬期版 Winter Edition
出発地
主要都市
出発地選択
目的地
主要都市
目的地選択
経由地
主要都市
経由地選択

2013/03/09 09:00:00 発表の予測

道内各地のサポーターが最新の情報として投稿します。

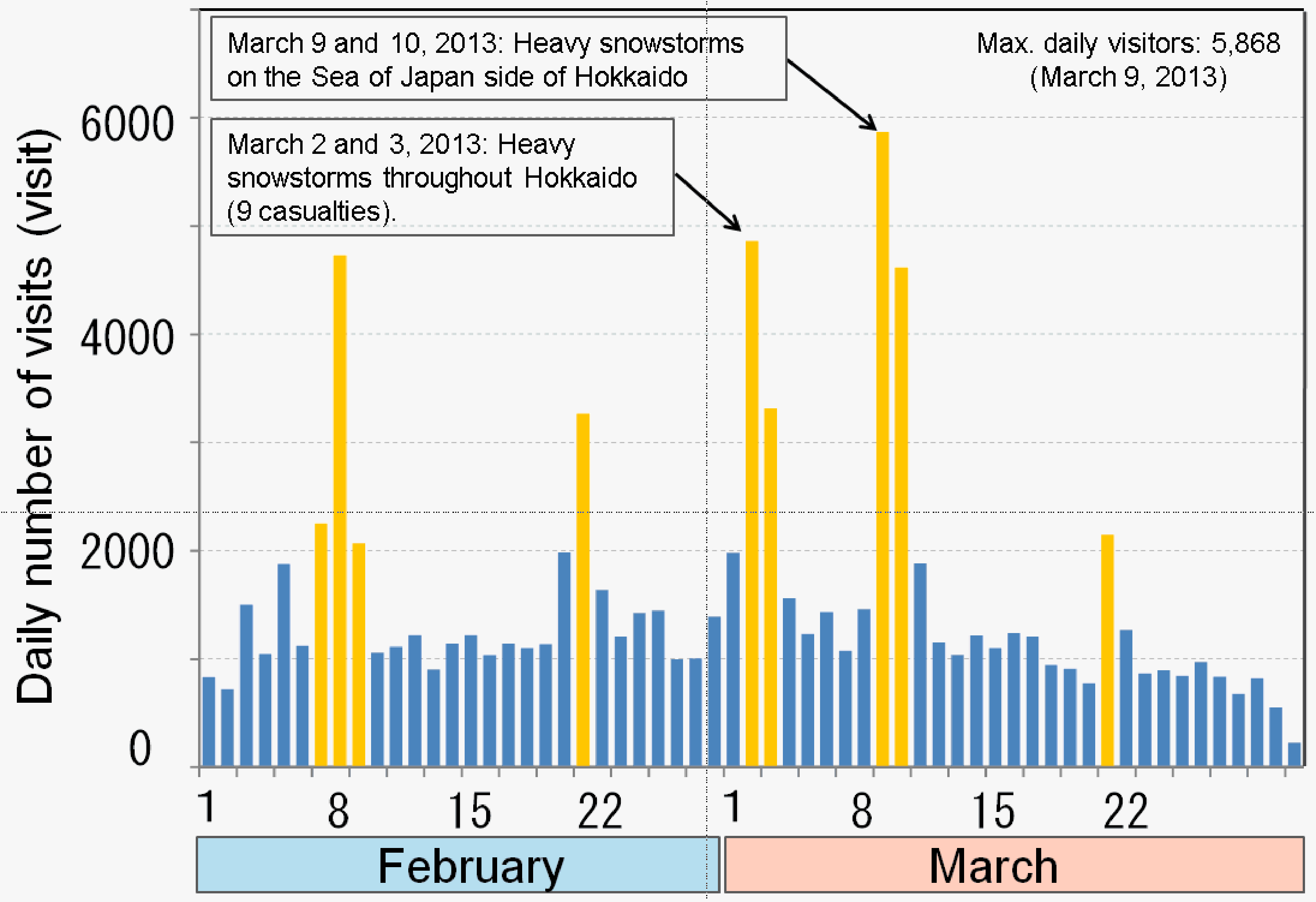
ニックネーム：みやびさん
2013/03/09
00:41
市町村：苫小牧市
天　候：吹雪
視　界：著しい視程障害
（100m未満）

*Cold-Region Road Engineering Research Group*
*http://www2.ceri.go.jp*

*Northern Road Research*

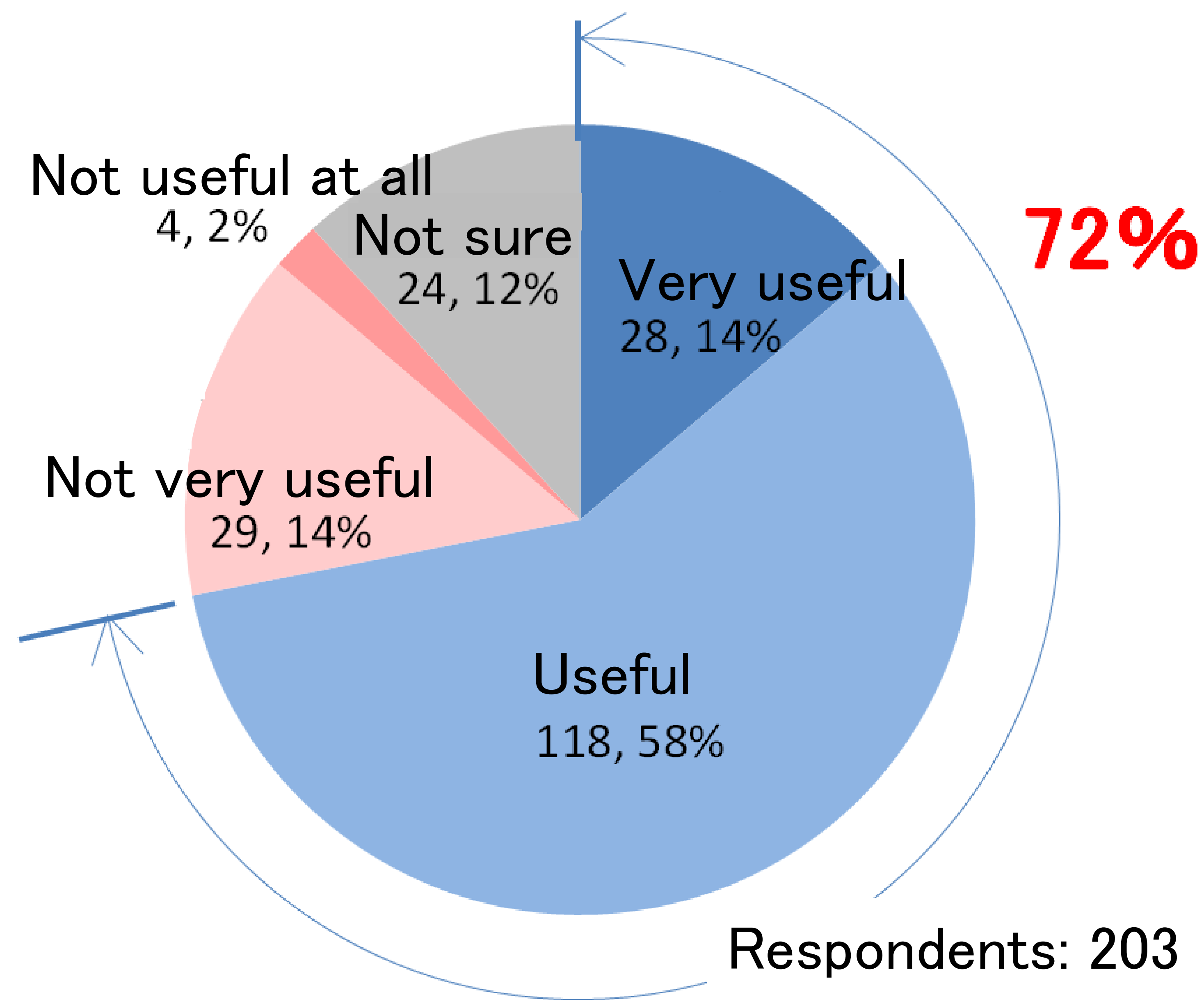
# The number of visitors to the Snowstorm Visibility Information Website

( after visibility forecast information was implemented )



- * Visits have been increasing.
- * After modification, typically 1500 visits/day.
- * March 2-3, 5000, March 9-10, 6000 visits.
- * Road users actively use info for decision-making.

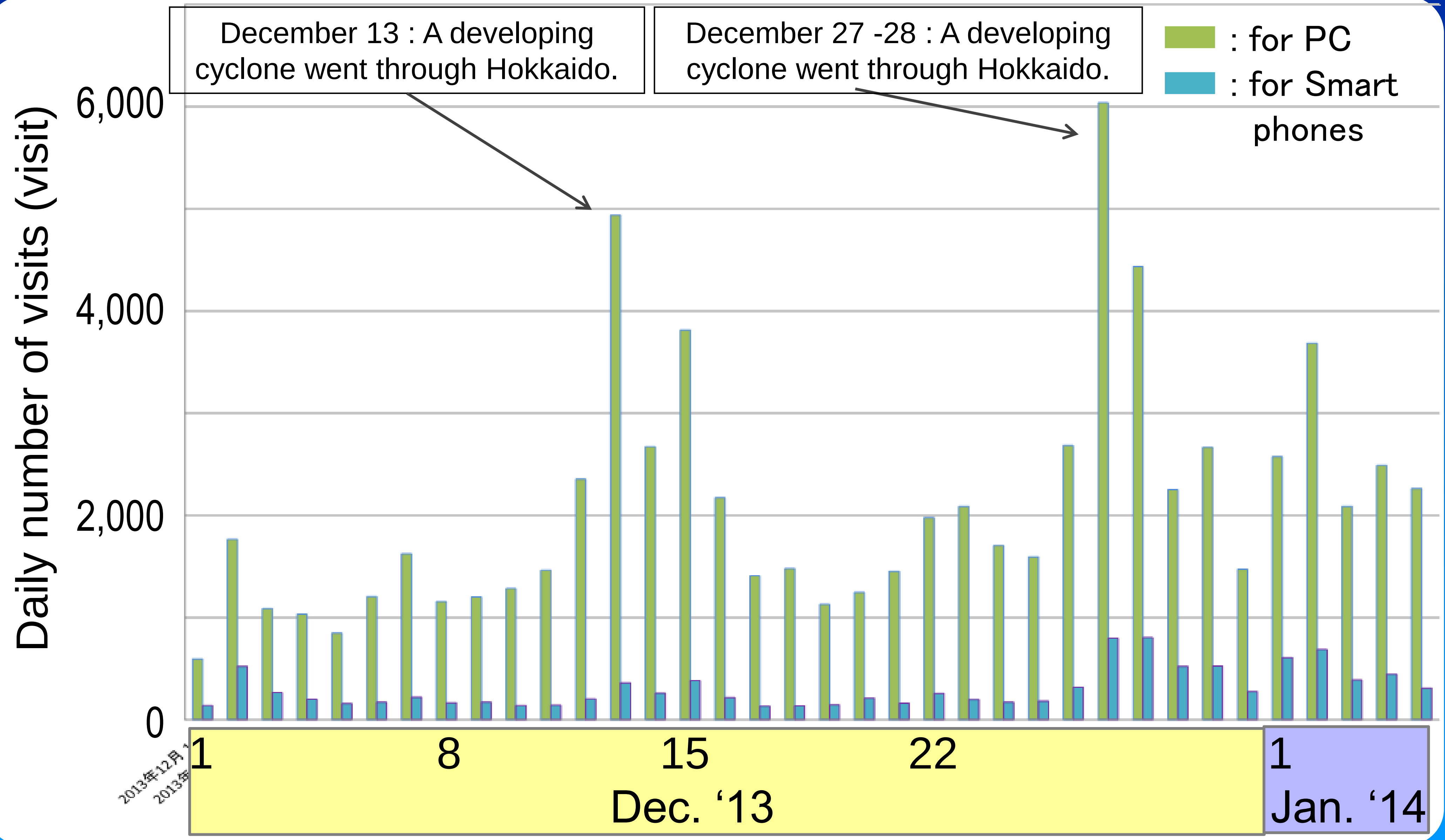
# Questionnaire survey results on the usefulness of visibility forecast information provided



* 72% of drivers surveyed felt the information provided was useful.

# The number of visitors to the Snowstorm Visibility Information Website

( this winter )



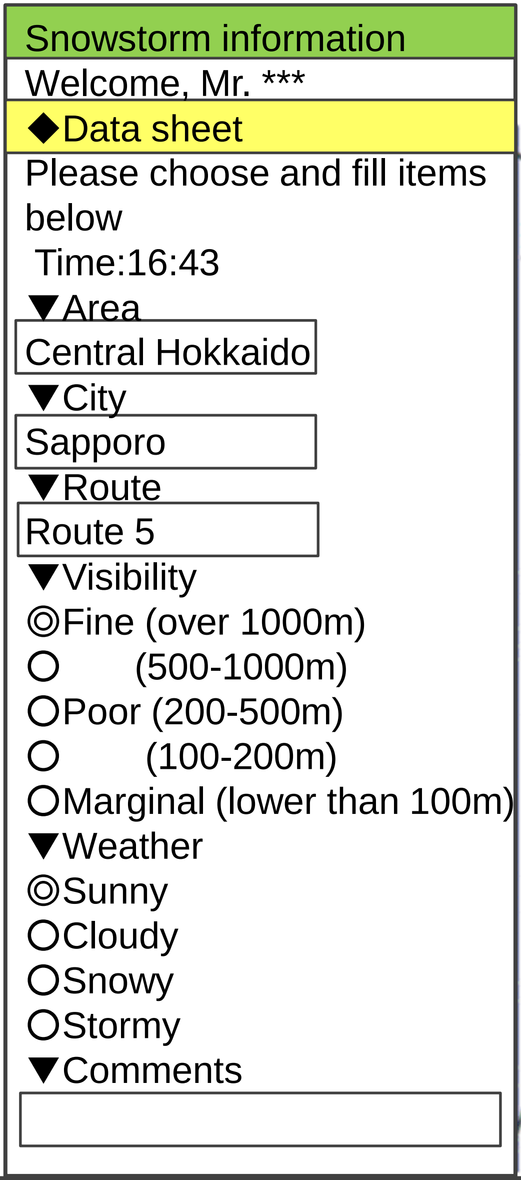
December 13 : A developing cyclone went through Hokkaido.

December 27 -28 : A developing cyclone went through Hokkaido.

- * In this winter,
- * The number of daily visits reached to 6038 ( 27 Dec. ) - PC site
- * 805 ( 28 Dec. ) – Smartphone site

# Outline of the System for User-Uploaded Snowstorm Information Sharing

## Uploading by cellular phone



Snowstorm information

Welcome, Mr. ***

◆Data sheet

Please choose and fill items below

Time:16:43

▼Area

Central Hokkaido

▼City

Sapporo

▼Route

Route 5

▼Visibility

◎Fine (over 1000m)

○ (500-1000m)

○Poor (200-500m)

○ (100-200m)

○Marginal (lower than 100m)

▼Weather

◎Sunny

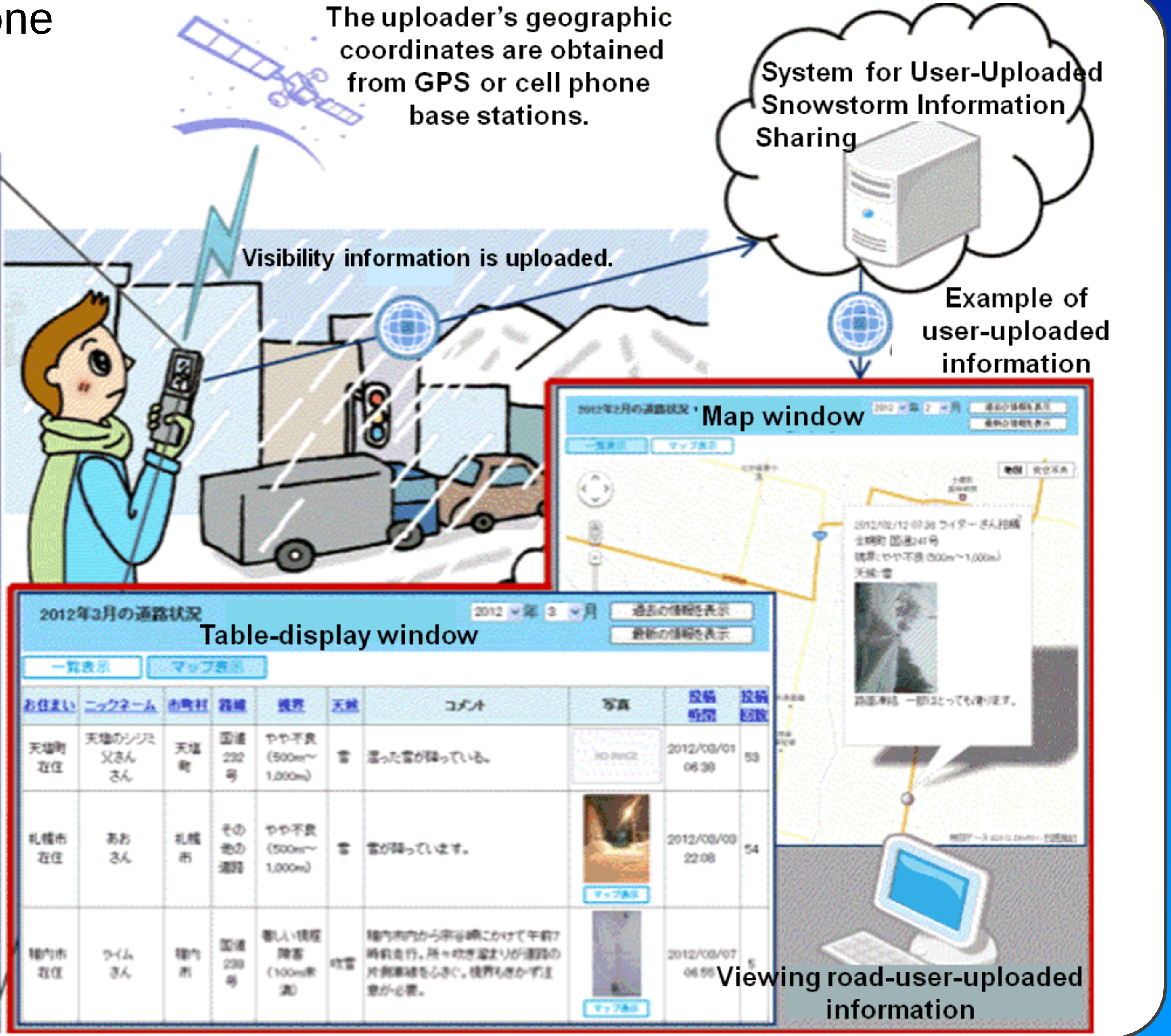
○Cloudy

○Snowy

○Stormy

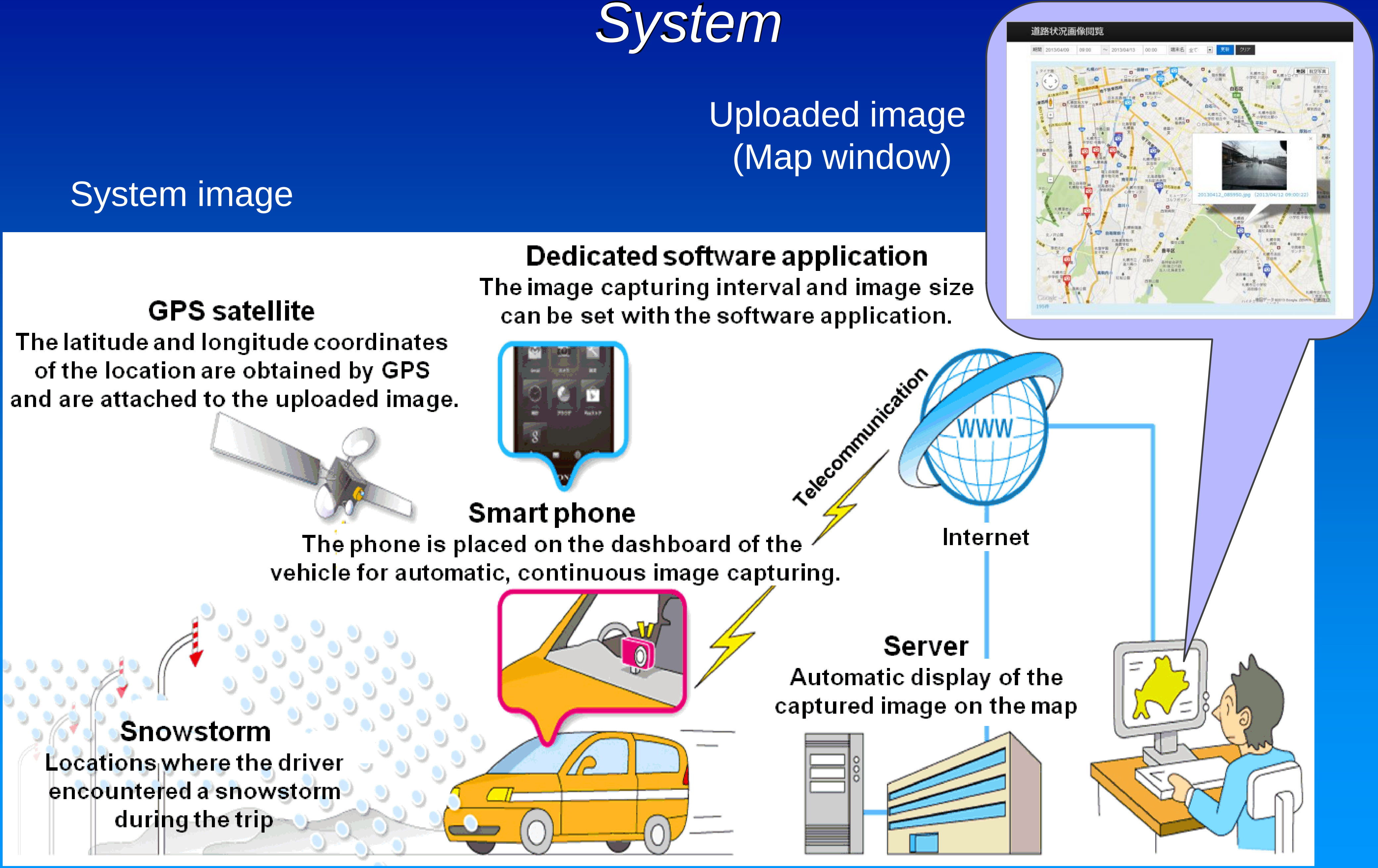
▼Comments

☐


The uploader's geographic coordinates are obtained from GPS or cell phone base stations.
System for User-Uploaded Snowstorm Information Sharing
Visibility information is uploaded.
Example of user-uploaded information
Map window
Table-display window
Viewing road-user-uploaded information

- * Road surveillance cameras are expensive.
- * Our forecast system is based on overall weather data.
- * It is difficult to determine poor visibility in local areas.
- * This system was developed to collect local visibility data by users.

# Automatic Road Image Capturing and Uploading System



Uploaded image
(Map window)

System image

**Dedicated software application**
The image capturing interval and image size can be set with the software application.

**GPS satellite**
The latitude and longitude coordinates of the location are obtained by GPS and are attached to the uploaded image.

**Smart phone**
The phone is placed on the dashboard of the vehicle for automatic, continuous image capturing.

**Snowstorm**
Locations where the driver encountered a snowstorm during the trip

**Server**
Automatic display of the captured image on the map

- * User-uploaded system is feasible, but quantity was insufficient.
- * It is very difficult to take photo and upload under poor visibility.
- * This system was developed to be installed in buses, taxis, trucks.
- * Smart phones already have cameras, GPS, data transmssion.

# Conclusions

To reduce damage caused by snowstorms, CERI developed the three information systems shown below.

1) The Snowstorm Visibility Information System which provides distribution of forecast visibility for up to 24 hours for local areas.

2) The User-Uploaded Snowstorm Information Sharing System which collects local visibility information with road users uploading data.

3) The Automatic Road Image Capturing and Uploading System which collects visibility images from equipment in commercial vehicles.

For disaster mitigation, it’s important to assist drivers’ decision-making.

We are planning a study on information content and descriptions which can effectively help drivers to make safer decisions.