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SUSTAINABLE WINTER SERVICE FOR ROAD USERS

Advanced Snow and Ice Control Measures for Hokkaido's Expressways

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Introduction

Contents

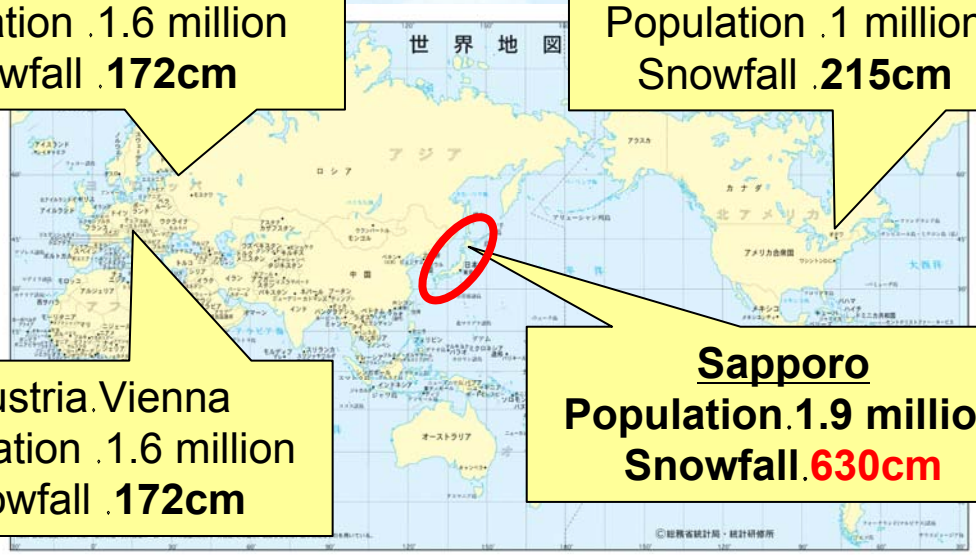
- Background to the development
- Purpose of the development
- The Road Image Distribution System
- The Snowfall Amount Web System
- Effectiveness of the systems
- Summing-up
- Future initiatives

1□Background to the Development □Ring Expressway around Sapporo□

- Population □ 1.9 million
- average total yearly snowfall □ 630cm.
  average temperature in February □ -3.5ºC
- Daily traffic volume □ 40,000 □congestion in the morning and evening□
- continuous elevated highway □approx.20km□
- Snow cannot be cleared from the expressway and piled below the

.Russia.St. Petersburg
Population .1.6 million
Snowfall .**172cm**

.Canada.Montreal
Population .1 million
Snowfall .**215cm**



.Austria.Vienna
Population .1.6 million
Snowfall .**172cm**

Sapporo
Population.1.9 million
Snowfall.630cm

2□Purpose of the Development

- An attempt to improve snow and ice control

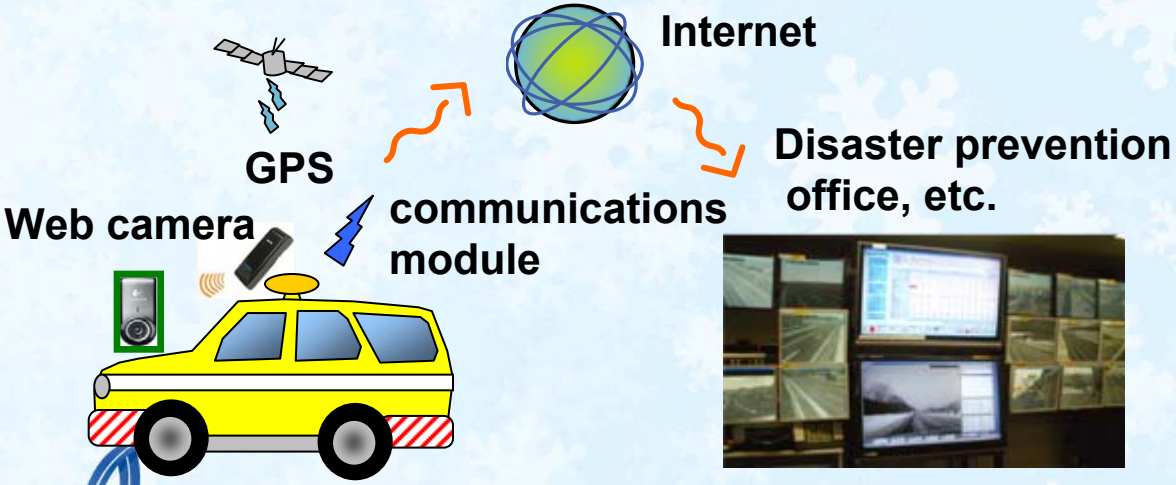
□ **Provision of information to support decisions-making in snow and ice operations**

□ Road Image Distribution System

□ **Information on road surface conditions, weather conditions, traffic conditions**

□ Snowfall Amount Web System

□ **Prediction of coming snowfall condition to current snowfall condition**

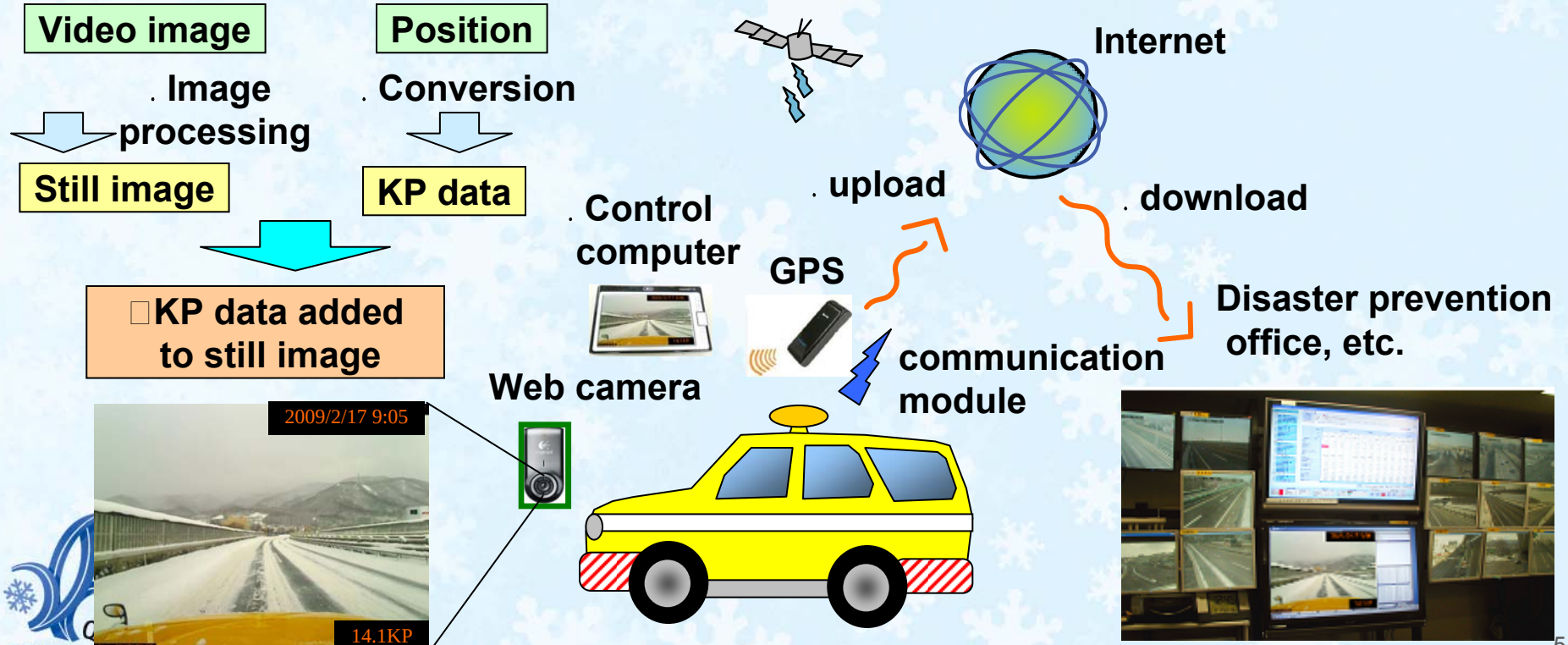


Road Image Distribution System

Snowfall Amount Web System

3-1 Road Image Distribution System
How the system works

- Mounted on snow and ice patrol vehicles dispatched every 3~4 hours
- Conditions in the field are transmitted in real time via the Internet, in the form of still images
- Viewed by the road administrator making decisions regarding snow and ice operations

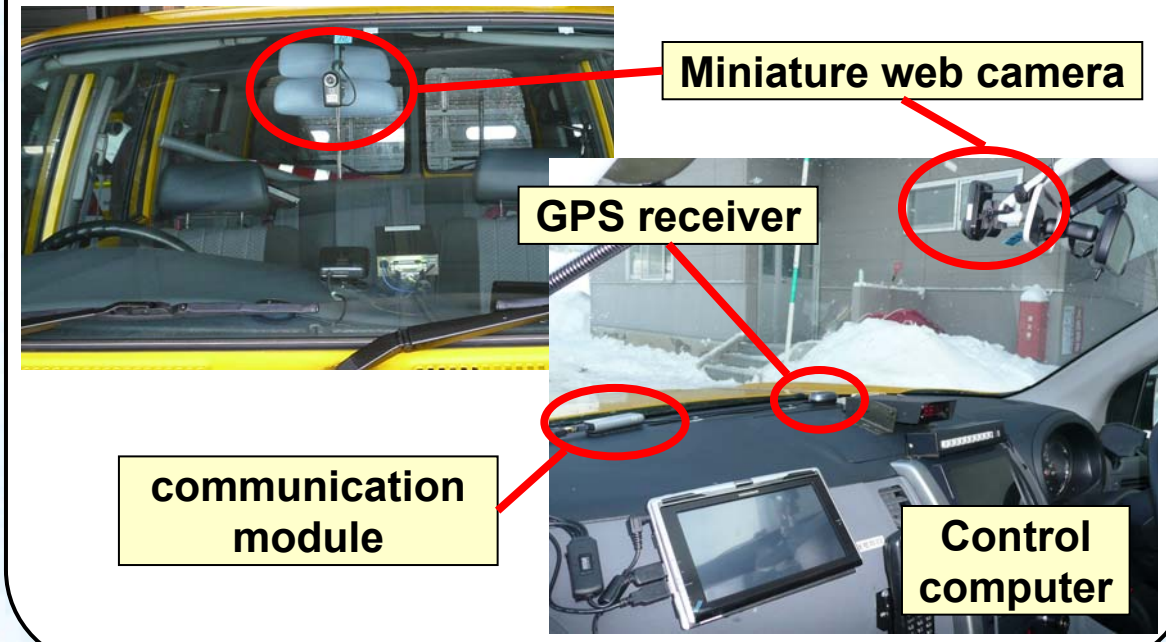


3-2 Road Image Distribution System Equipment

- Miniature Web camera, GPS receiver, control computer, mobile phone communication module
- Video image→Still image: image processing to produce a clear still image

The miniature Web camera is mounted permanently behind the rearview mirror

System equipment



Originally a digital video camera was used

4-1□Snowfall Amount Web System□Effectiveness□

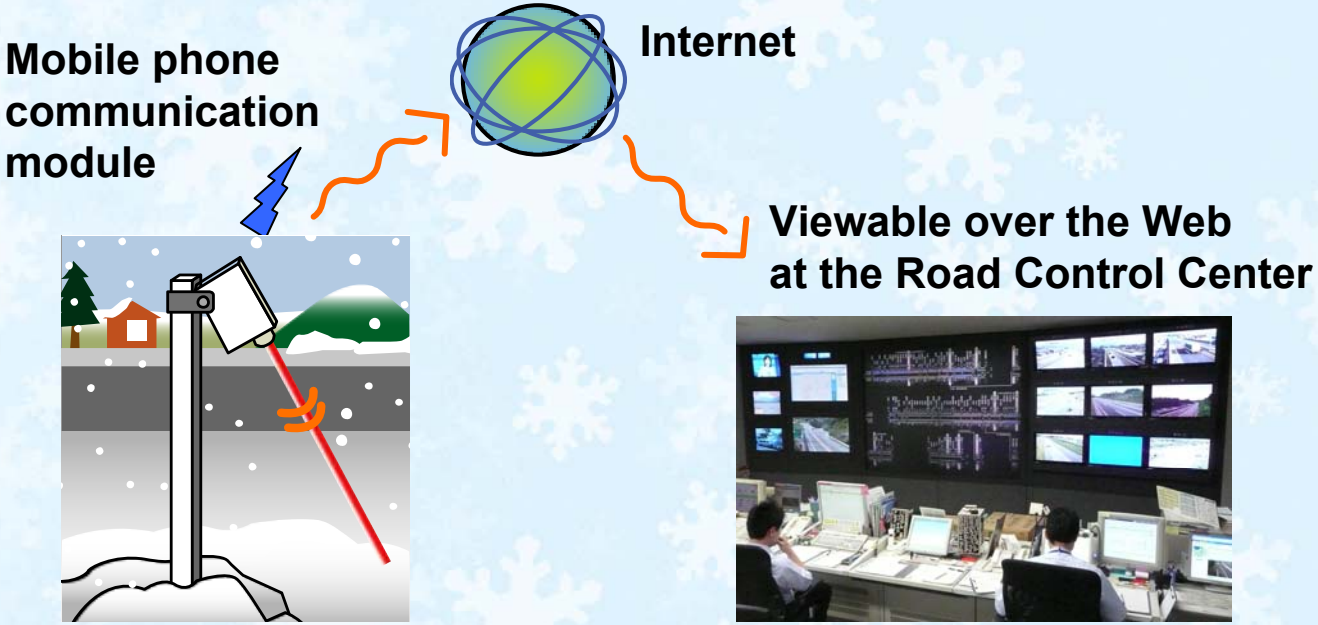
- Snowfall measured

□Previously□: Watching measured every 3 to 4 hours

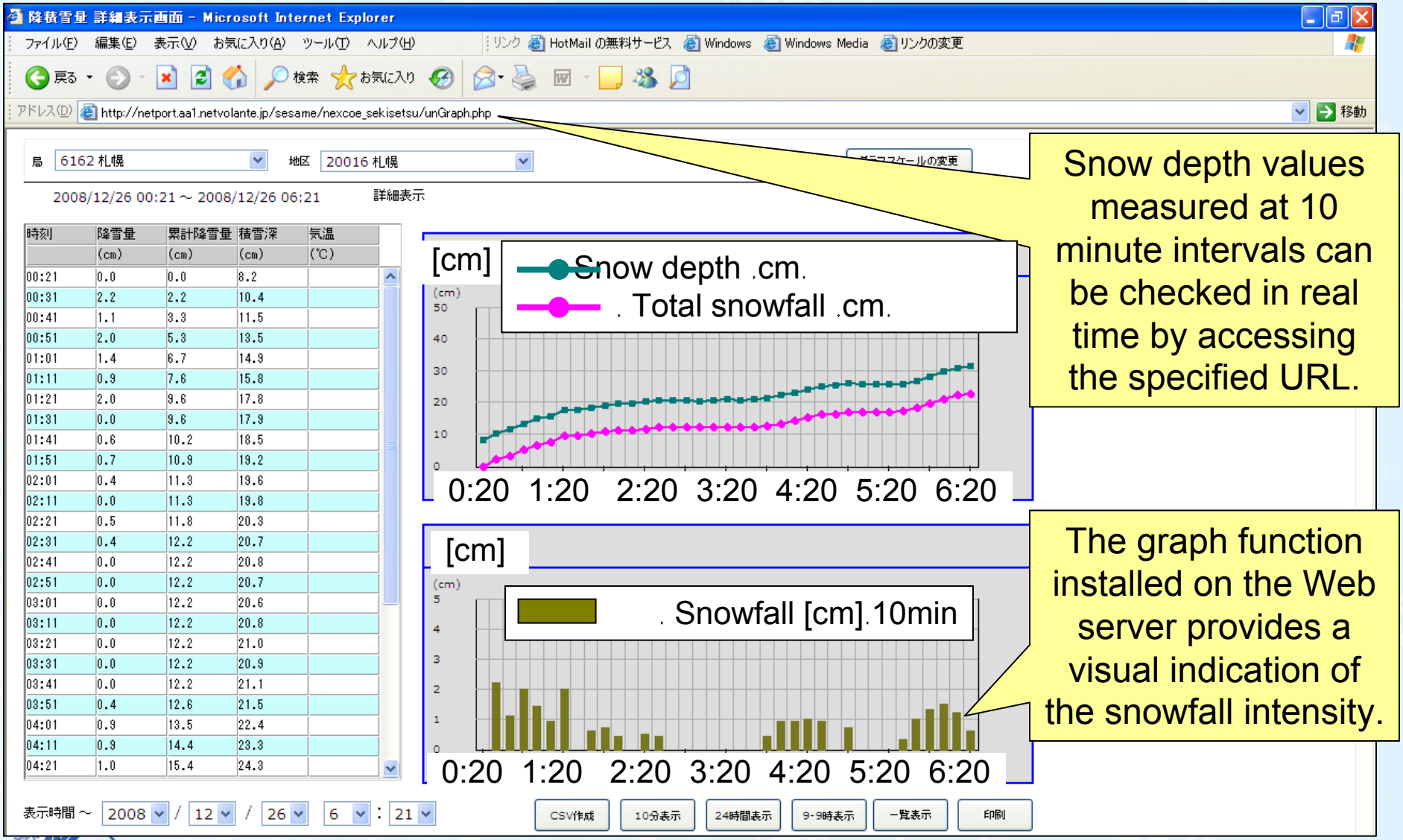
□ **Data cannot be put to effective use in snow and ice control decision-making.**

□Snowfall Amount Web System□:Measured automatically at 10 min intervals and transmitted over the Web.

□ **Quantitative data can be put to effective use as an aid to decision-making for the implementation of efficient snow and ice control.**



4-2 Snowfall Amount Web System
Method of Display



Snow depth values measured at 10 minute intervals can be checked in real time by accessing the specified URL.

The graph function installed on the Web server provides a visual indication of the snowfall intensity.

5-1□a□□Effectiveness of the Systems
□Mobilization in response to weather conditions□

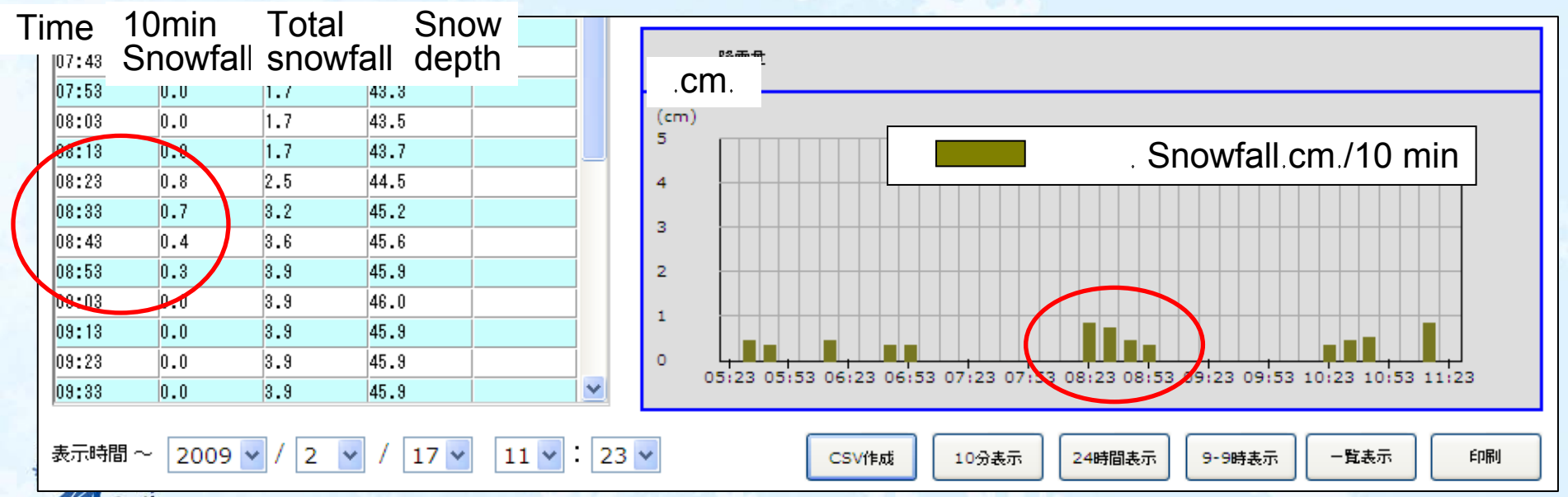
- February 17th : Decision-making using the Snowfall amount Web System

□Previously□: Decision-making reliant on the ITV cameras:
no grasp of actual snowfall intensity

□ **Early mobilization as soon as snow starts to fall**

□Snowfall Amount Web System□:Snowfall of 1cm/10 min.
confirmed at 8:20am

□ **Information can be used to mobilize extra patrol vehicles.**



5-1□b□□Effectiveness of the Systems
□Multi-vehicle snow removal□

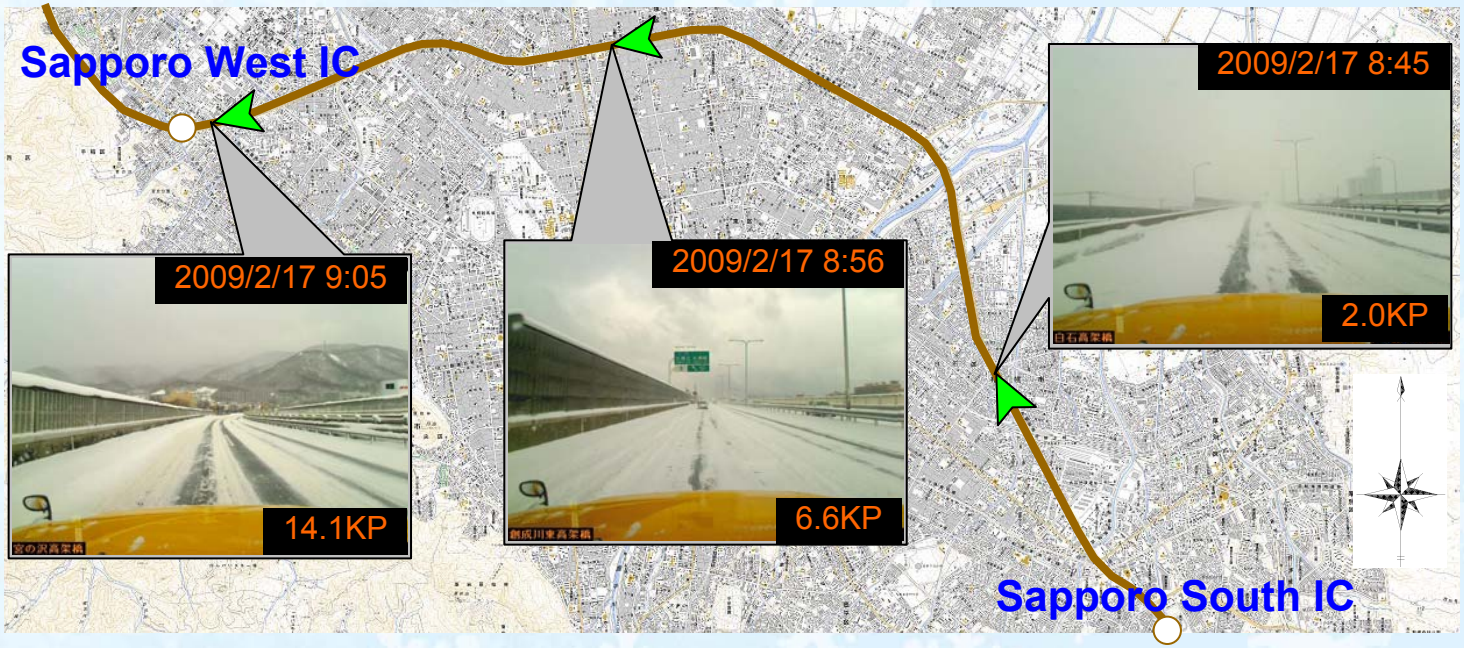
- February 17th : Decision-making using the Road Image Distribution System

□Previously□:Need for repeated radio communication

□Road Image Distribution System□:Decision-making at a glance

□ **Decision made to implement snow removal operations after the rush hour.**

□**avoid the congestion that accompanies snow removal operations**

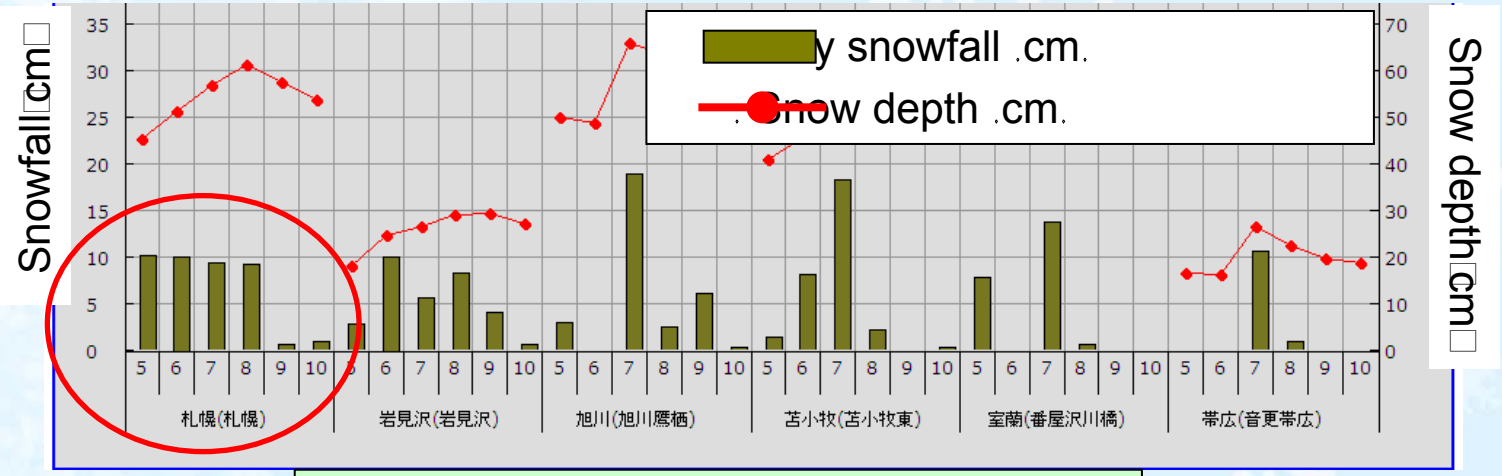


5-2□a□□Effectiveness of the Systems
□Criteria for snow transportation and disposal□

□Snow transportation and disposal□
: Huge cost : should be kept to a minimum
□ **Causes road closure if operations are delayed**

- Criterion: snowfall totaling 30 cm after disposal of snowbank

- February 5th : Use of total snowfall data
□ **Total recorded snowfall of roughly 40 □ over 4 days exceeds the criterion**



Daily snowfall according to area

5-2□b□□Effectiveness of the Systems

□Decision-making using the Road Image Distribution System□

- Snow transportation and disposal required on 10th February

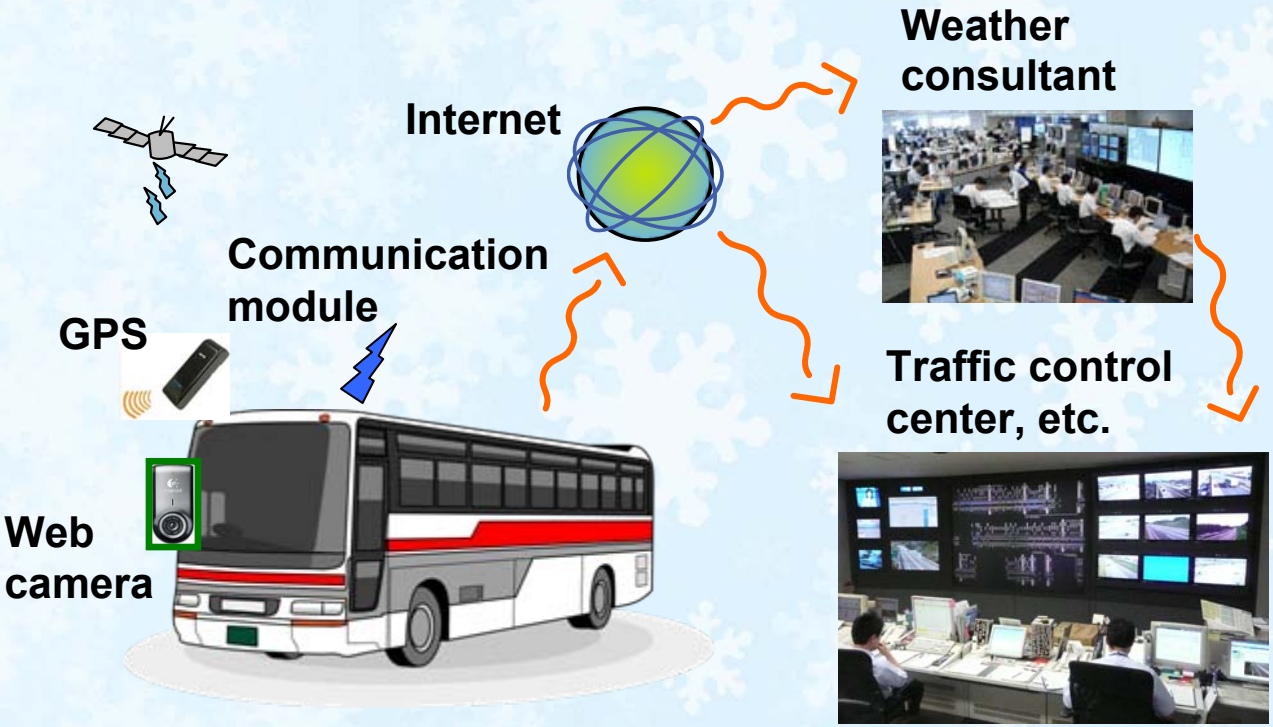
□ **Daily viewing of a sequence of images enables decision-making**

□ **Used to establish order of priority for snow transportation and disposal and to implement more confident, planned decision-making**

Date	February 5th, 2009	February 7th, 2009	February 10th, 2009
Bank	Small scale	Medium scale	Large scale
Deci-sion	No need	required in 4-6 days' time	required urgently
Road image			

6□Next Initiatives□Expressway bus□

- Sapporo□Asahikawa expressway bus service every 30 minutes
  - □ **Mount the Road Image Distribution System on the buses**
- Weather consultants improve accuracy in weather forecasting
- Road administrator gets up to date information for lower cost



7□Summary: Future Directions

Present

(1) Until now, decisions in snow and ice control have been made on the basis of verbal messages from patrol staff, qualitative data from fixed ITV cameras, etc.

(2) From now on, decision-making will also include quantitative data: continuous, real-time road images taken along the road, snowfall measured at 10 minute intervals, etc.

(3) Decisions in snow and ice control can be made with greater confidence and planning.

Future

(1) Sharing of the information used to make decisions in snow and ice control by the patrol staff and road administrator makes possible more efficient, more effective use of snow removal operations and other hard measures.

(2) In the future there will be an accumulation of data on local road conditions and snowfall and on operations; and it will be possible to analyze the data and use them to make more efficient projections for snow and ice control.

Thank you for your kind attention.