

# MANAGING MOUNTAIN PASSES EXPOSED TO AVALANCHES

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- **Ivar Hol**
- Senior Principal Engineer
- Norwegian Public Roads Administration
- [ivar.hol@vegvesen.no](mailto:ivar.hol@vegvesen.no)

Torgeir Vaa  
Senior Principal Engineer  
Norwegian Public Roads Administration



**Statens vegvesen**  
Norwegian Public Roads  
Administration

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## 1. INTRODUCTION

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- Managing mountain passes exposed to avalanches is a great concern both for the Norwegian Public Roads Administration (NPRA) and the contractors in mountainous areas
- One of the main transport corridors in Norway, which passes through the area along the E136 trunk road in Romsdalen, is an example of a road exposed to road closures every winter
- Can be due to avalanches that are already triggered or due to the risk of avalanches being considered too high to let the traffic pass through
- A weather incident on 15-19 March 2010 in the western part of mid-Norway illustrates different aspects of managing mountain passes exposed to avalanches

# 1. Introduction



## 2. Case: Avalanche week

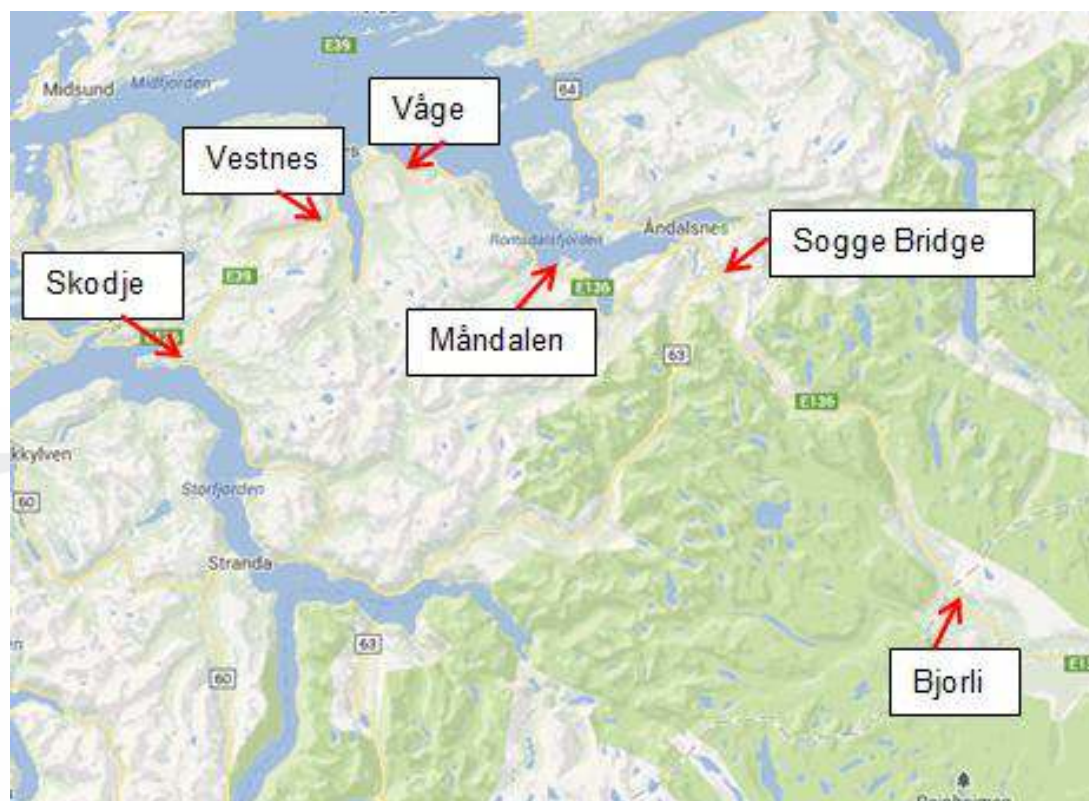
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- 14–19 March 2010 was a period of severe weather in Møre og Romsdal, and the weather incidents that hit most of the county caused this period to be named the "avalanche week"
- There were many avalanches during this particular week of March, and in addition the substantial avalanche risk in a wide area resulted in extensive closures on the road network in the county
- Both trunk roads and minor roads were affected

## 2. Case: Avalanche week

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Based on the weather situation on Monday 15 March the road owner, in consultation with geological experts and the contractor, decided that it was necessary to initiate closure of several road sections of trunk roads in the county



## 2. Case: Avalanche week

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- The closures at Bjorli and Sogge bridge were manually operated
- The other closures were implemented using only signs



## 2. Case: Avalanche week

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The sign in the picture below show that the road is closed and a trailer can be seen waiting.

One of the challenges of using only signs is to maintain respect for the signs during a long period of closure, and some road users ignored the signs.





## 2. Avalanche week

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The closure resulted in an accumulation of trailers and by 10 a.m. on 16 March it had reached a number of about 120 trailer trucks on each side of the road blocks.



### 3. Traffic impact

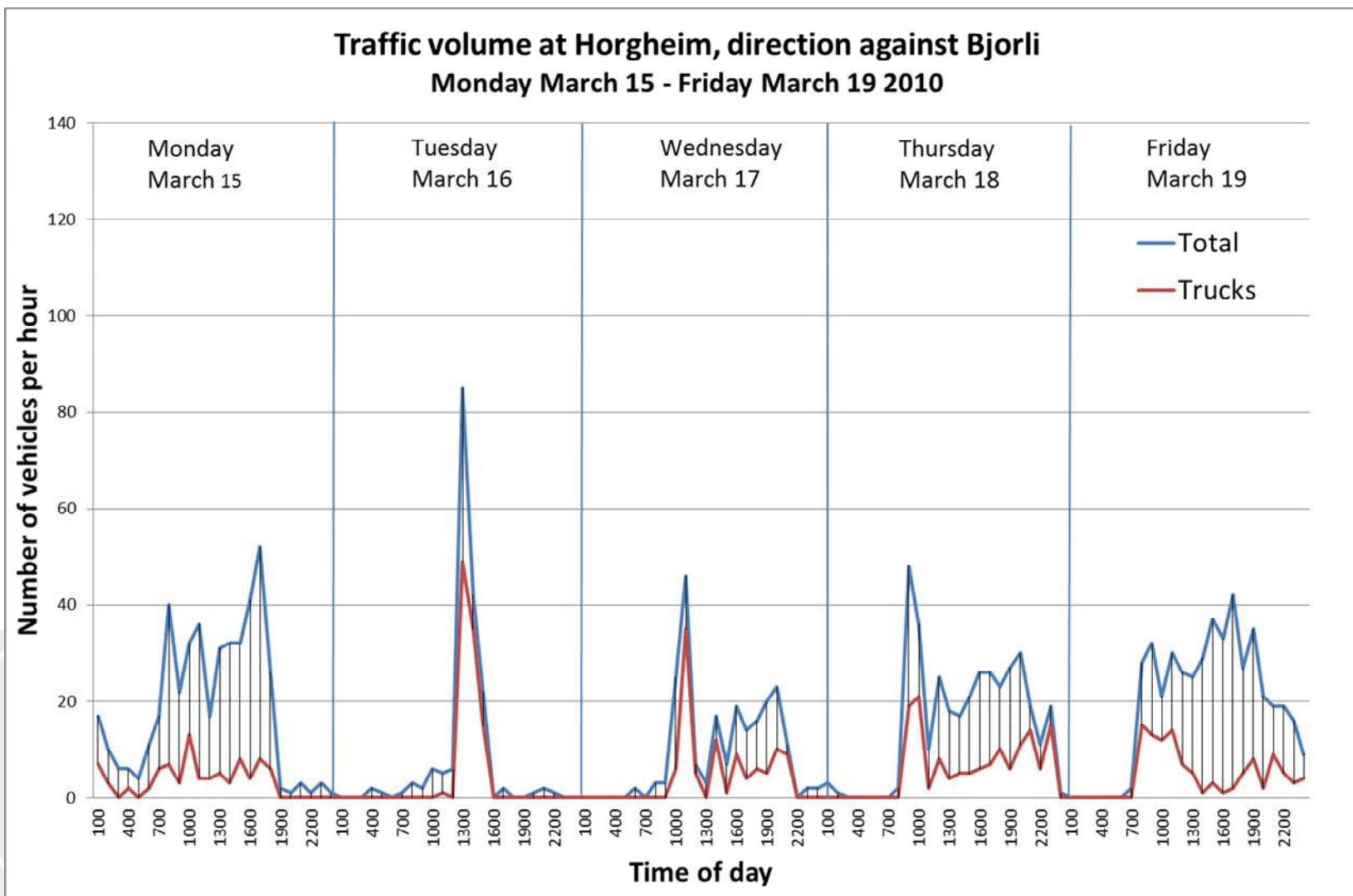
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The traffic impact consisted of several components:

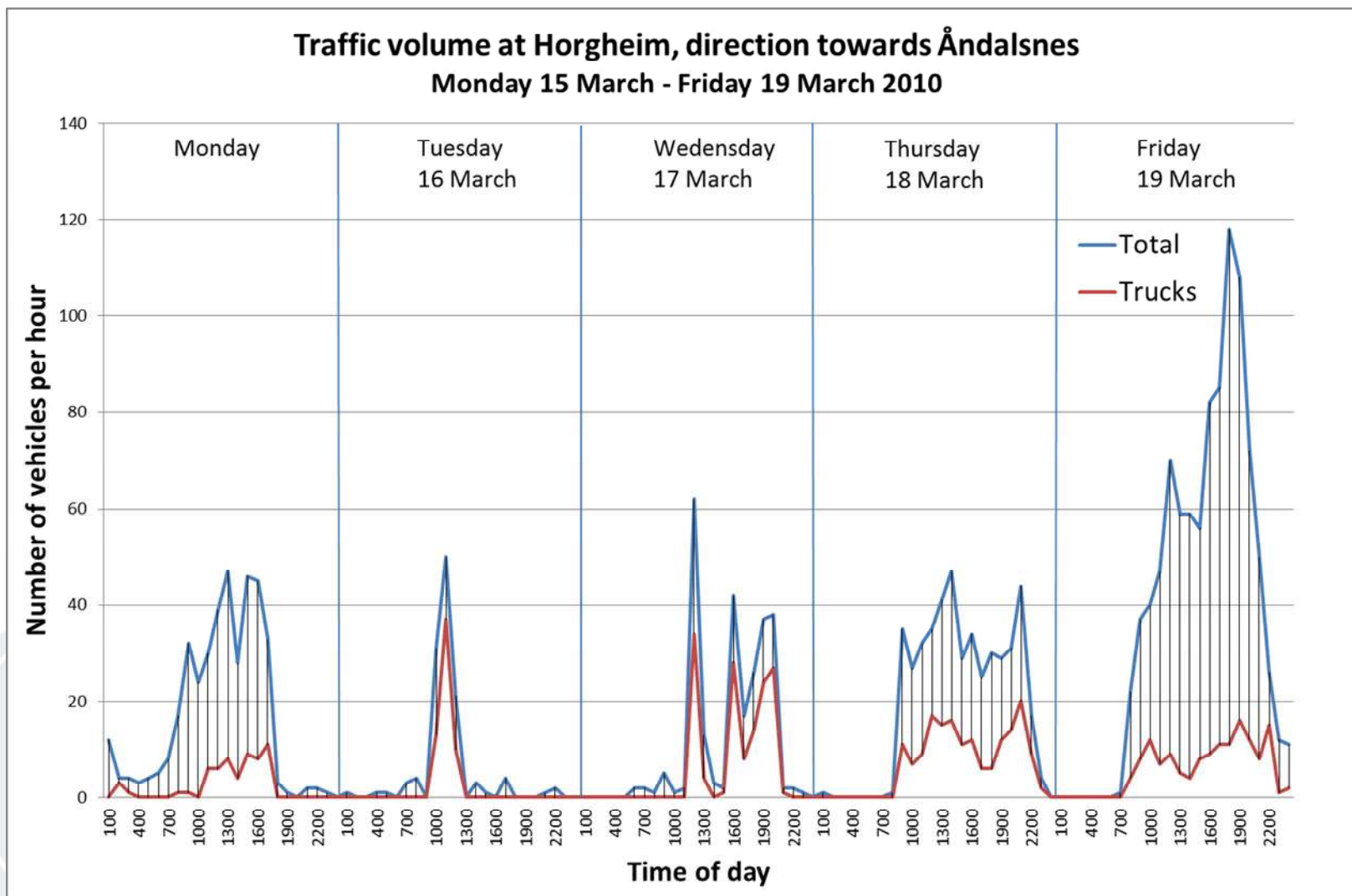
- Loss of traffic
- Delays
- Detour via longer routes



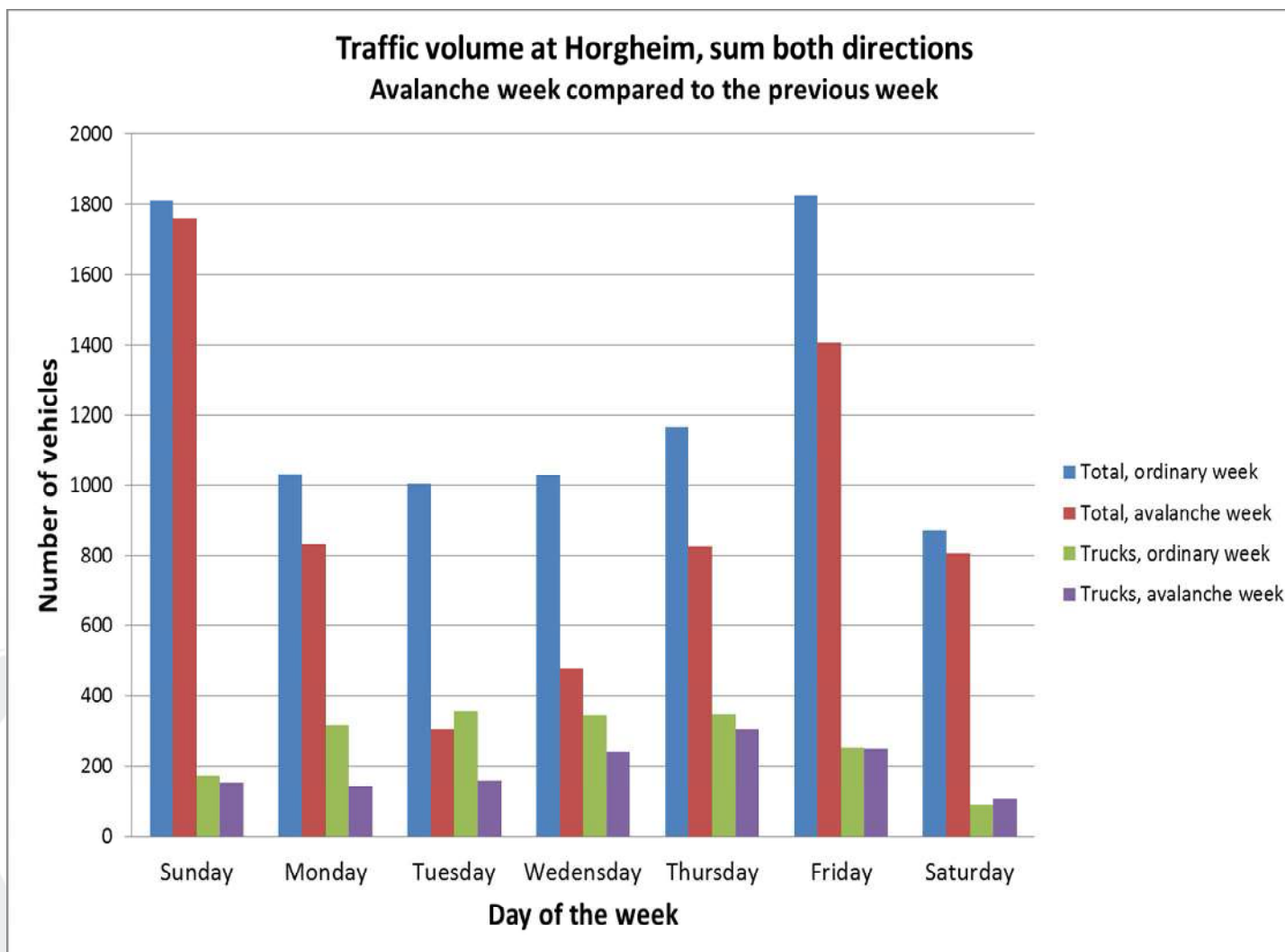
### 3. Traffic impact



### 3. Traffic impact



### 3. Traffic impact



### 3. Traffic impact

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Daily change in traffic volume in the avalanche week compared to the previous week

	Difference between avalanche week and the previous week	
Day of week	Total traffic	Trucks
Sunday	-3%	-10%
Monday	-19%	-55%
Tuesday	-70%	-55%
Wednesday	-53%	-30%
Thursday	-29%	-12%
Friday	-23%	-1%
Saturday	-8%	21%
Total for the week	-27%	-27%

## 4. Experience from the avalanche week

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### Operational issues

- The avalanche situation that occurred during the snowstorm, and the fact of dealing with this situation overshadowed the effort to keep the road open in technical terms
- Due to safety concerns for the operating personnel it might be necessary to stop snow-clearing on the most exposed avalanche areas



## 4. Experience from the avalanche week

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### Economic impact

- Extra cost for the transport provider
- Extra cost for the goods owner
- Extra labour costs if there is a halt in production
- Extra cost for the customer if production is affected





## 4. Experience from the avalanche week

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### Action points

- Simplify and use more correct names for closure locations
- Greater involvement of the ferry crew in all matters concerning ferry connections
- The emergency preparedness crew should be organized with a fixed meeting point to improve the information flow
- The emergency preparedness crew should also be more involved in the decision processes
- More use of the Traffic Management Centres
- It may also be possible to expand the use of the “convoy” in traffic management
- Meetings after the weather incident with the most affected municipalities

## 5. Recommendations for avalanche control

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- Mapping of avalanche-prone areas
- Passive protection by use of snow sheds, catchment basins etc.
- Organizational clarifications of roles and responsibilities
- Instrumentation and recording of snow conditions
- Warning systems and information strategy
- Development of traffic management routines varying between preventive measures and more urgent actions

## 5. Recommendations for avalanche control

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- Road weather information system and system for forecasting avalanche risk
- Team (emergency preparedness crew) with operational tasks
- New technology for surveillance of avalanche areas
- Techniques for active avalanche control
- Calculation tools for socioeconomic calculations and evaluation of avalanche incidents

## 5. Recommendations for avalanche control

Daisy Bell



UAV





Thank you for your attention

Foto: Knut I. Orset