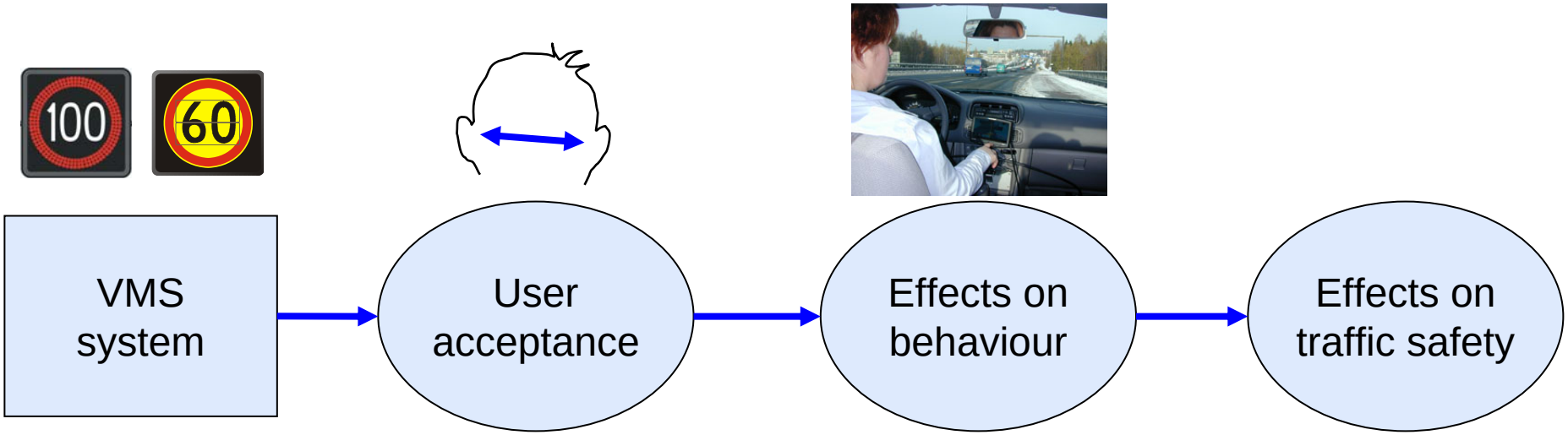
EFFECTS OF WEATHER-CONTROLLED VARIABLE SPEED LIMITS ON INJURY ACCIDENTS

Pirkko Rämä and Anna Schirokoff

VTT Building and Transport

Acknowledgements

The study was funded by the Finnish National Road Administration, and it has been granted European Community financial aid.



?

- Effect evaluation since 1994

Aim: To study the effects of variable speed limit systems on injury accidents?

Two purposes of the dynamic speed limit systems:

1) to improve traffic safety by decreasing speeds during adverse road conditions

2) to improve fluency by allowing higher speeds under good conditions

Before:	80 km/h	approx. from November to April
After:	100 km/h	during good conditions
	80 km/h	during normal conditions
	70/60 km/h	during adverse conditions

Background

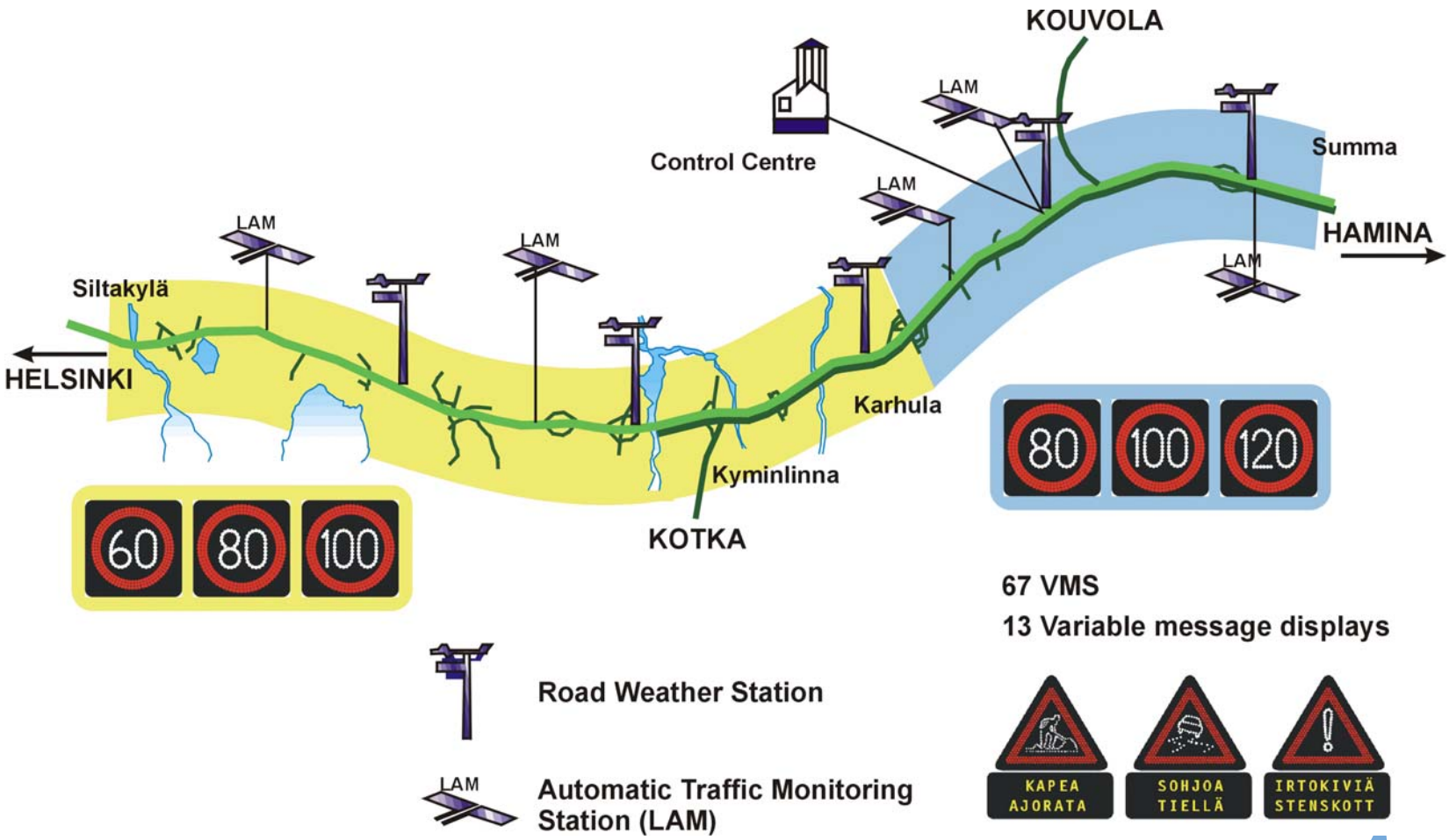
- User acceptance
  - well recalled: 88 ... 90%
  - well accepted: 95%
- Driver behaviour
  - mean speed effects: –6 ... +5 km/h
  - st.dev. of speed: –3 km/h
  - short headways: –10 ... –25%
- Reliability
  - error-free data collection and control system are required!

15 variable speed limit sections on public roads, in all 350 km

- 7 weather-controlled systems
- 4 traffic+weather-controlled systems
- 1 traffic-controlled system

- others:
  - 1 section with decreased salting
  - 1 wind warnings on a long bridge
  - Individual speed limits

VMS system on the E18 road



Two types of weather-controlled systems

Coastal road E18:

- fibre optic or LED
- automatic classification
- variable warnings
- use of 100 km/h in winter moderate

Roads in Central Finland:

- electromechanical
- not automatic classification in all systems
- no variable warnings
- 100 km/h over half of the time

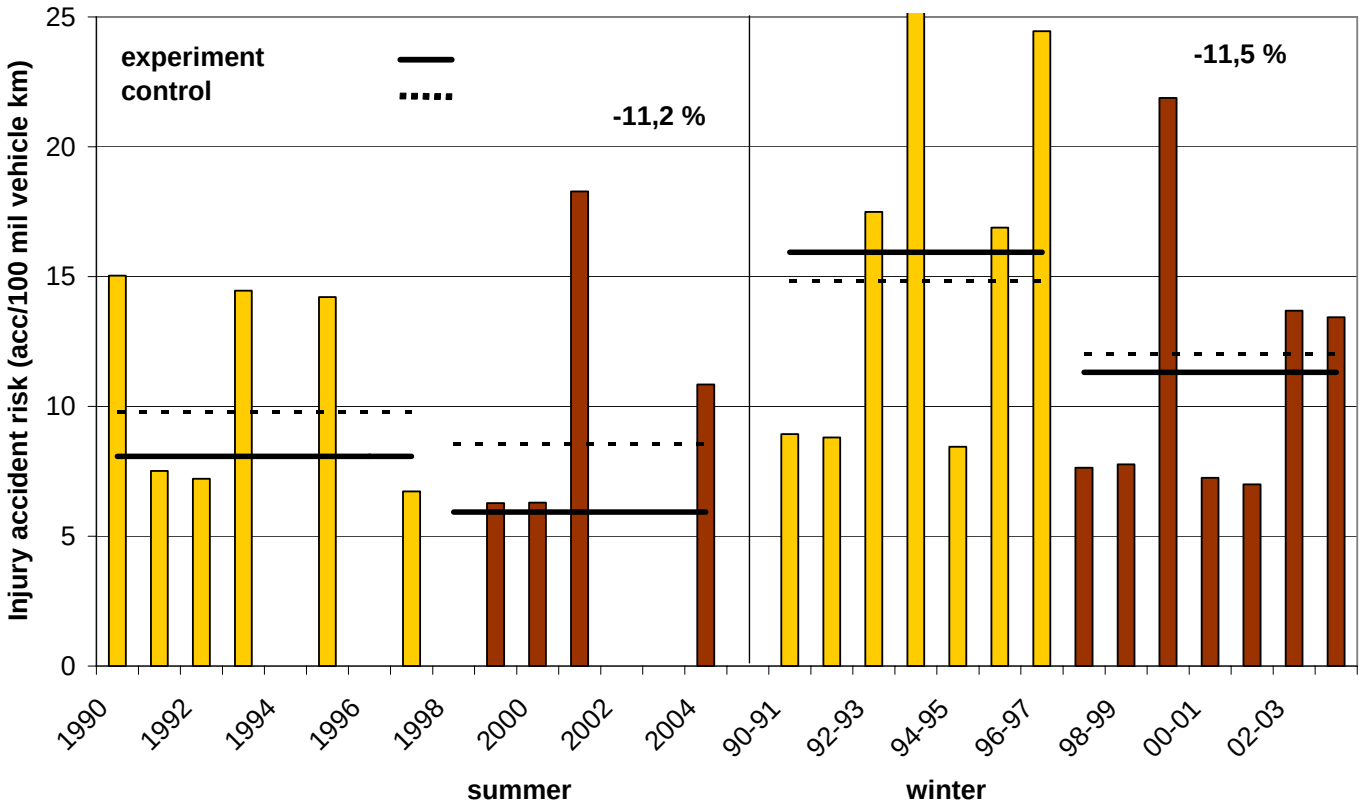
Design

- Six weather controlled speed limit systems on two-lane roads, follow up periods up to 14 years
- Before-after analysis (AccRisk = AccRiskAfter - AccRiskBefore)
- Control data from same types of roads with fixed speed limits -> general trend in the injury accident risk (AccRiskCont)

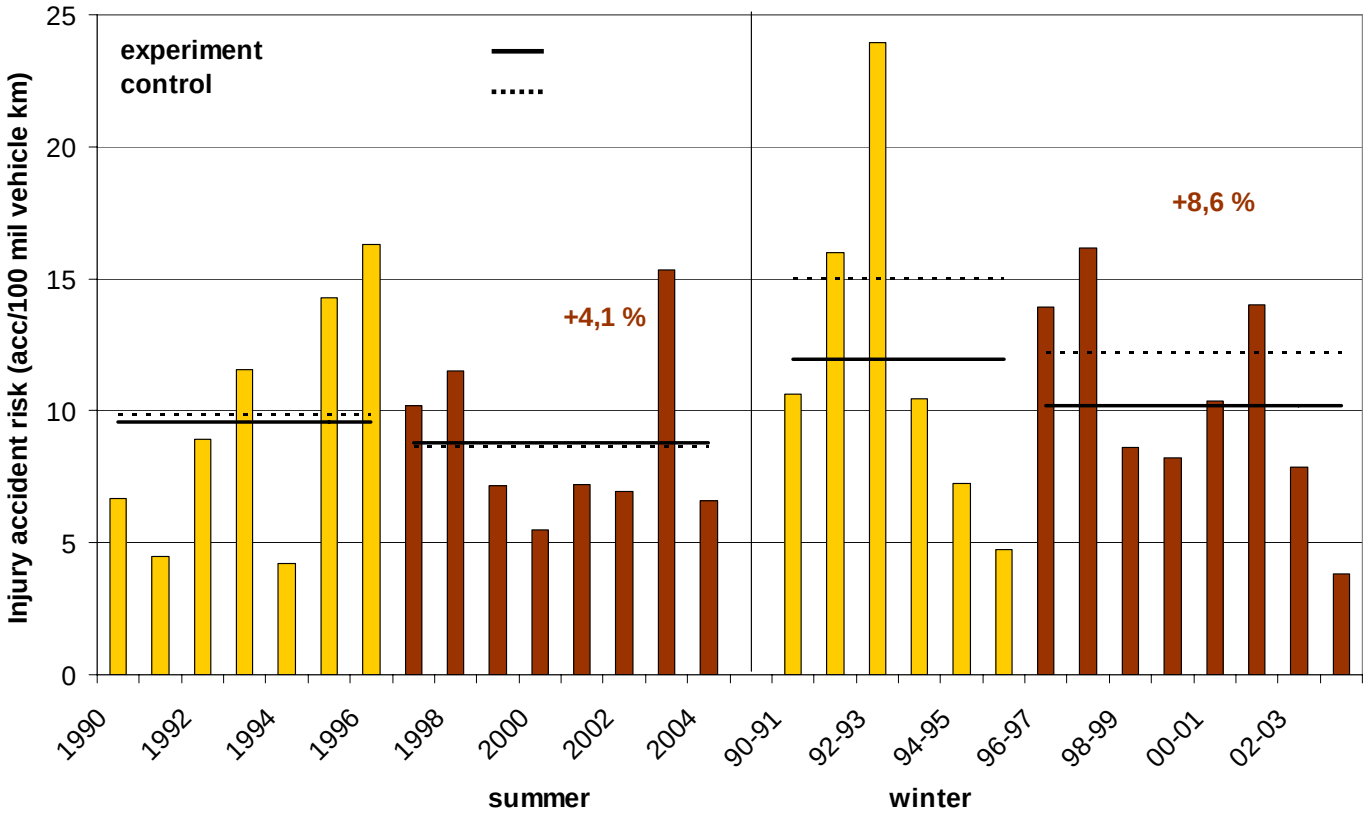
Effect :

$$\frac{100 \times (\text{AccRiskExp} - \text{AccRiskCont})}{\text{AccRiskExp}}$$

Example from the costal road E18: Pyhtää - Kotka, 8 km



Example from Central Finland: Jyväskylä - Äänekoski 29 km



Results

Coastal road E18:

- the risk for injury accident decreased approx. 10%
- the risk for injury accident high before implementation in winter

Roads in Central Finland:

- the risk for injury accident was slightly increased, approx. 2%

Results are not statistically significant

Conclusions and discussion

- The high quality systems with elaborate control system seemed to decrease the injury accident risk, the positive effects base on:
  - efficient recognition of hazardous weather and road conditions
  - use of the variable slippery road signs
  - the moderate use of the highest speed limit (100 km/h)
  - the choice of sign technology
- The control principles and degree of automation has been developed in systems with negative effects
- The results highlight the importance of evaluation of impacts
- Control policy principles and error-free control are important

Conclusion

The high quality variable speed limit system seems to be a successful ITS application:

Improved safety and mobility!

Thank you for the attention!