Road Weather and Traffic Data in Traffic Management

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INTRODUCTION

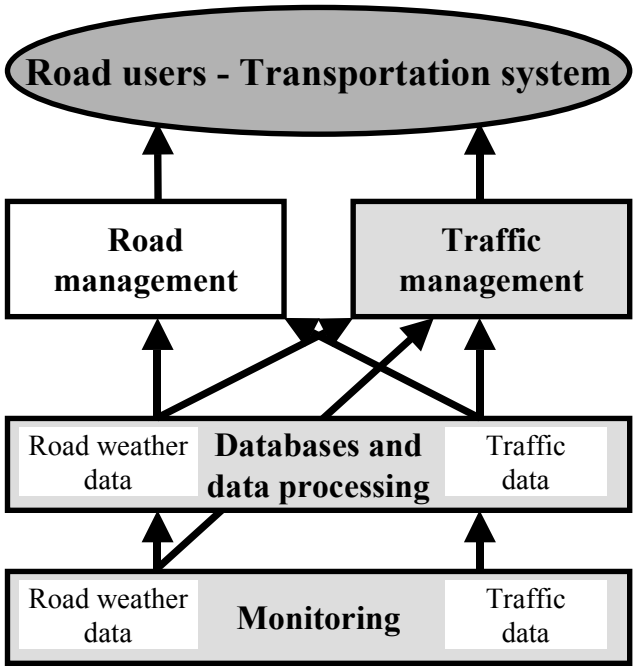
During the last decade the importance of information technology has become more important than ever. The use of modern technology in everyday life is increasingly common as moving from one place to another. So it is the fact also in road management and traffic management when discussing trafficable road network. The detectors and the sensors are covering wider network than ever. These road weather and traffic monitoring devices are used to measure road conditions, weather conditions and traffic conditions to get information for both road management and traffic management.

FROM ROAD WEATHER AND TRAFFIC DATA TO ITS UTILISATION

The road weather and traffic monitoring is necessity to get useable data for road management and traffic management. However the monitoring is not enough by itself. The monitoring needs also databases or data warehouses for data storing and data processing to handle the data. In many cases this automatic data processing is improved by human expertise in road management centres and traffic management centres. This improved information is used widely for road management and traffic management e.g. traffic information or traffic control purposes.

Nowadays road weather information is used not only for road management but also for traffic management. Also measured traffic information is used for road management prioritisation in the main road network. At the present moment both road weather information and traffic information is monitored mainly by fixed stations in Finland. During the last few years there has been done in Finland research and development work for utilisation of mobile monitoring like probe vehicles and mobile phone positioning to improve road weather data and traffic data collected by fixed monitoring stations.

When describing the use of road weather information and traffic information in traffic management centres, there is two main areas to work with: traffic information and traffic control. Both traffic information and traffic control are used also for incident management which is becoming more important area in traffic management in the near future.



Information flows from road weather and traffic monitoring systems for road users and transportation system

THE UTILISATION OF ROAD WEATHER AND TRAFFIC INFORMATION FOR TRAFFIC MANAGEMENT IN SOUTHEAST FINLAND

The utilisation of road weather and traffic information for traffic management is handled here with two examples in Southeast Finland. In these cases there are some interesting points that are very important from the point of research and development view but also for the future development of the transportation system. The main differences between these cases focus on road weather conditions (closeness of coast – inland), road management (intersection – road section), traffic environment (intersection – road section), traffic composition (heavy traffic – car traffic), variation of traffic (seasonal variation – day-to-day variation – hourly variation) and traffic behaviour (local traffic - long distance traffic).

The case of intersection is a three-way junction of two main roads inland (main road 6 and main road 13). Traffic accident risk is higher in the area at issue than usually at the same kind of intersections. Traffic problems at the intersection occur typically during morning peak-hours and during summer weekends. The traffic control system in the intersection area includes fixed traffic monitoring system with loop detectors and turnable video camera and variable speed limit signs on the primary main road. The system has also been planned to update with road weather information system if needed.

The case of road section is one-carriageway stretch of European road (E18) in the south coast of Finland. There is a lot of cross-border goods traffic between Finnish harbours and Russia. The problem on the road relates partially to speed limit difference for heavy vehicles and cars. The maximum speed limit for freight vehicles in Finnish road network is 80 km/h. The traffic management system in road section case includes road weather information system for traffic information via various media (road side equipment, internet and points of information) and traffic control by variable speed limit signs and variable warning signs. Existing traffic monitoring system will be connected to weather-related traffic management system during spring 2002.

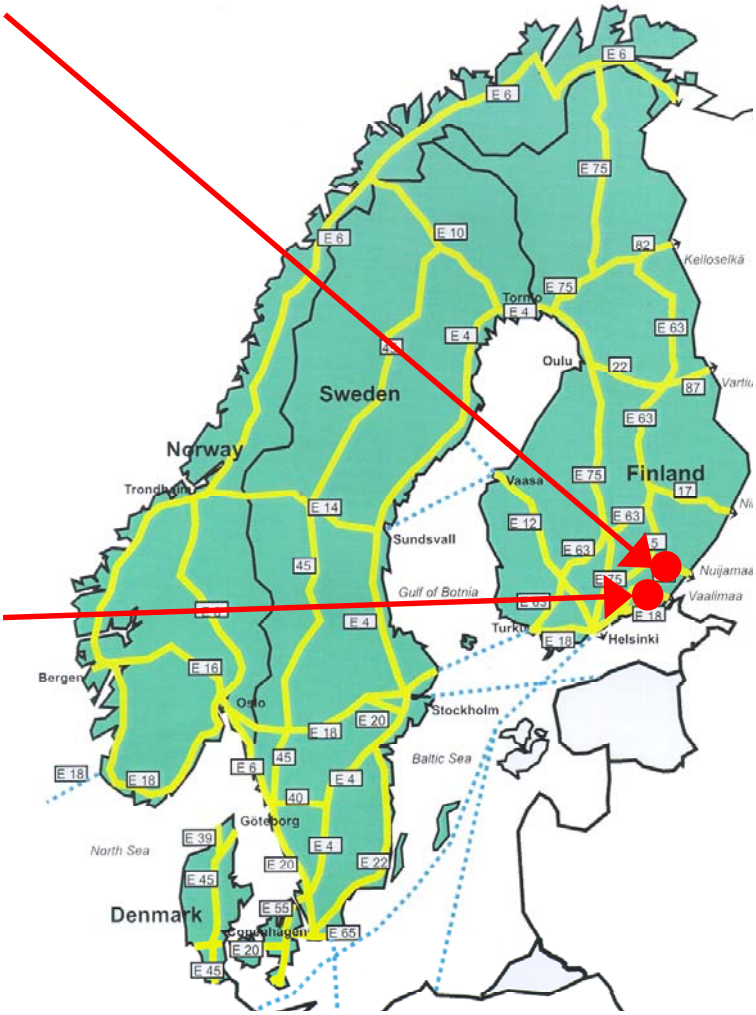
CASE DESCRIPTIONS

Intersection of two main roads

- Located in the city of Lappeenranta (58 000 inhabitants).
- It is located in valley.
- The traffic accident risk is higher than usually.
- Average annual daily traffic: 4900…11700 veh./day, heavy traffic 9…18 %.
- Maximum hourly traffic about 1200 veh./h
- Maximum queue length over 30 vehicles on secondary main road.

Road section of European road

- Located in the city of Kotka and in the municipality of Pyhtää (56 000 inhabitants).
- Section length 8 km.
- Average annual daily traffic: 8700…15700 veh./day, heavy traffic 10…13 %.
- Includes weather-related traffic management system with RWIS and VMSs.

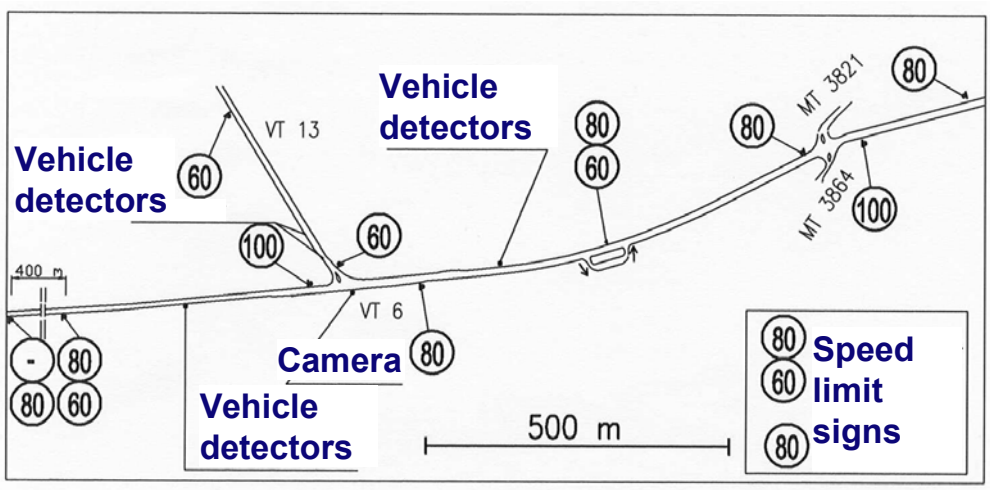


The locations of described two traffic management systems in Southeast Finland

TRAFFIC MANAGEMENT AT THREE-WAY JUNCTION

The traffic management system at three-way junction is based on automatic traffic monitoring system and traffic control system. The system is under implementation in September 2001 and the introduction of the system is planned to be during spring 2002. The system will be controlled primarily automatically. If needed, manual control is possible by officers in Finnish Road Administration's Traffic Management Centres.

The basic parameters that are planned to use for traffic control are delays of traffic and queue length on secondary road and traffic volume of main road on both sides of the junction. The monitoring will be done with the loop detectors on every approach and main road exits of the intersection. The monitoring system includes also turnable video camera for real-time traffic monitoring and video tape recorder for further development of the system. Measured real-time information is used for traffic control by variable speed limit signs on main road approaches. At the junction there will be used speed limits 80 km/h and 60 km/h. The lower speed limit is used mainly when having problems to turn from secondary road to main road during morning peak-hours and summer weekends.



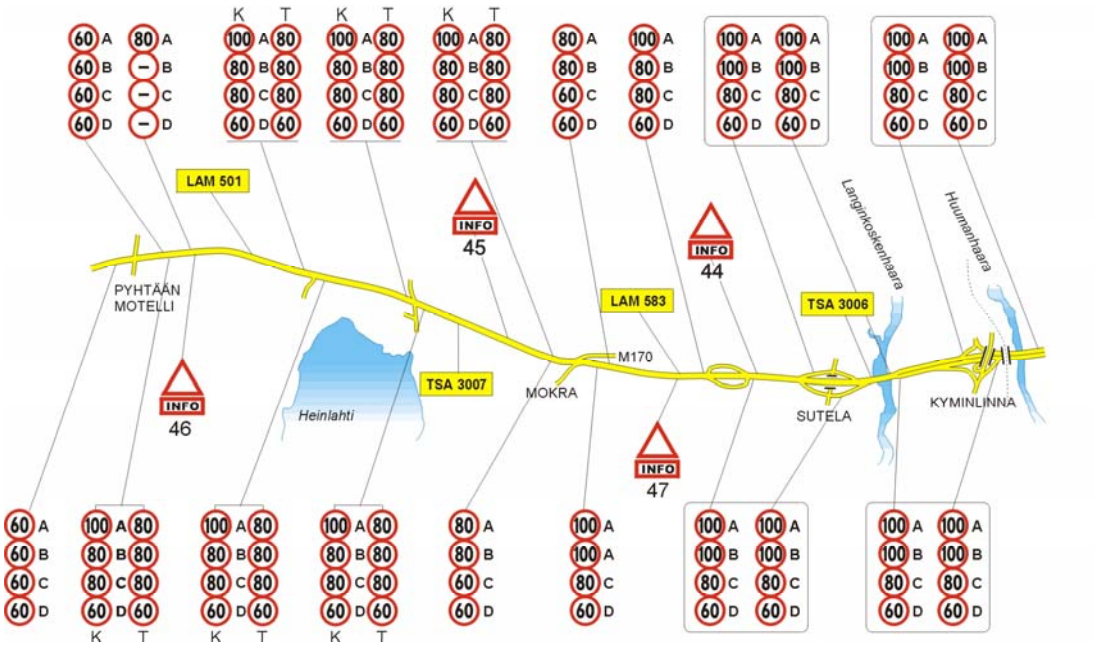
Traffic management system at three-way junction of main road 6 and main road 13.

In the implementation plan of the described traffic management system there has been taken into account the further development of the system with road weather information system. During wintertime when road surface can be icy or snowy it is usually more troubled to draw from secondary main road to primary main road than during summer when road surface is dry or wet. Road weather information has been planned to use with traffic information so that the speed limit values of implemented variable speed limit signs are appropriate not only at prevailing traffic conditions but also at dominant road weather conditions. The timetable for the connection of road weather information system to traffic-related traffic management system has not been decided yet.

TRAFFIC MANAGEMENT ON ROAD SECTION

The planned traffic management system on the stretch of European road E18 will improve existing weather-related traffic management system. The first part of weather-related traffic management system has been in use since November 1994 and the enlargement of the system since December 1997. The whole weather-related traffic management system covers 25 kilometres road section with road weather information system, variable speed limit signs and variable warning signs with additional panel. At the same time with the implementation plan of enlargement of the weather-related traffic management system in 1997, it was prepared to implement traffic monitoring devices for traffic-related control system. The traffic monitoring devices were implemented in 1997. The preparing for traffic-related control system was started in 2000 with the study dealing with traffic and its features. Definition for the connection between real-time traffic monitoring system and traffic control system was started in 2001. The connection has been planned to implement during spring 2002. The introduction of the system has been planned to be during autumn 2002. The system will be controlled primarily automatically. If needed, manual control is possible by officers in Finnish Road Administration's Traffic Management Centres.

The basic parameters that are in use for weather-related traffic control are wind speed and direction, temperatures of air, road surface and road structure, humidity, intensity and state of precipitation, visibility, state of the road surface and state of the deck of the bridge over the river. This weather-related traffic management system has been planned to improve with real-time traffic information like traffic volume, queue length and headway information and the speed of traffic. Traffic information will be collected from the road section covered with traffic control system but also before arrival in the controlled road section.



Part of the existing traffic management system on road section of European road E18.

CONCLUSIONS

The implementation and introduction of intelligent transport systems (ITS) for road management and traffic management seems to become more common in the near future. These innovative systems including road transport telematics need active research and development work but also co-operation and information exchange between experts in the area.

Comprehensive monitoring systems will be bases also in the future for improved road management, traffic information and traffic control systems. When looking widely the field of ITS, it seems to be technically effective and also cost-effective to use collected data and technical devices for many purpose of use. As an example the road weather information system can be used not only for road management but also for traffic information and control. And equally traffic measuring devices can be used in addition to statistical data collection also for real-time traffic control and information and road management. Also in the case when having roadside equipment like variable speed limit signs and variable warning signs with additional panel, it is beneficial and cost-effective to control the signs with the information improving each other like road weather data and traffic data do.

ACKNOWLEDGMENTS

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