NORDIC
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Smart Safety
New Technologies Improve Air and Reduce Risks on the Road

Still in the driver's seat
Tomorrow's Pensioners Prefer Car Travel

No trespassing!
Reducing Fatalities on Finnish Railways

Contents

New Programme Focuses on Norway´s Bridges and Tunnels 3

Road Safety on Four Continents – Conference in Beijing 2013 3

Improving Safety on Finnish Railways by Prevention of Trespassing . . . 4

Electric Lorries Best in Congestion 5

ICT Technologies Reduce Emissions and Congestion on Roads 6

Up to Date Knowledge About Traffic Safety Attitudes of European Road Users 6

Short Distance Between Lorries Can Save Energy and Increase Safety 7

Modelling Residual Salt – Mors. 8

Tomorrow's Pensioners Continue to Prefer Car Travel 10

Sustainable Urban Mobility Indicators. 11

Electromobility – at a Crossroad 12

Thin Layer Pavements. 13

Protective Measures Against Avalanches and Floods 14

Successful Introduction of Counter-Flow Cycling 15

Editorial Notes

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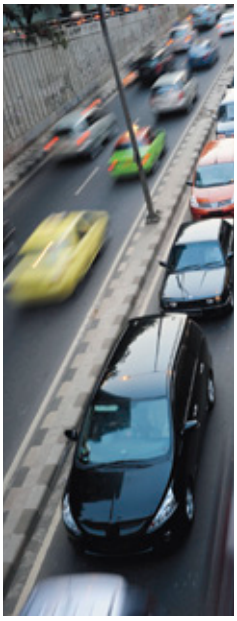

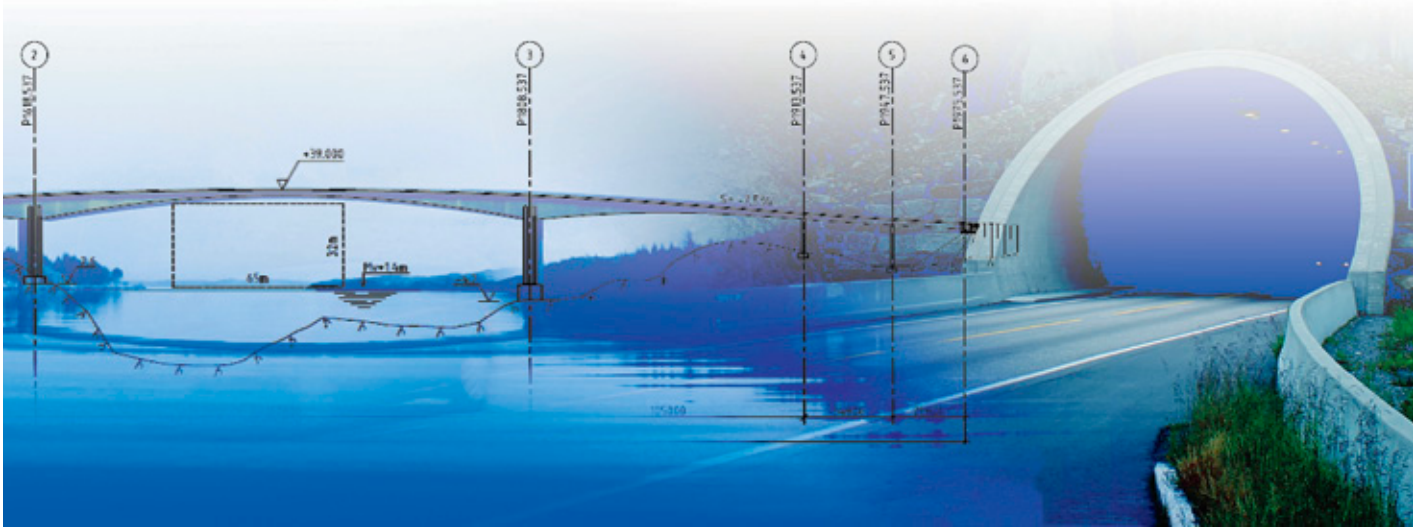

Illustration: Norwegian Public Roads Administration

New Programme Focuses on Norway's Bridges and Tunnels

"Durable structures" is a four-year research and development programme of the Norwegian Public Roads Administration (NPRA). This programme, focusing on bridges and tunnels as critical structures in the road network, aims to ensure that the right materials and products are used correctly in NPRA structures. The programme period is 2012-2015.

Norway's deteriorating road network gives rise to a need for optimising how structures are built. In addition, the complexity of bridges and tunnels keeps increasing with changing requirements for technical equipment and traffic safety, as well as accessibility and environmental concerns, while the numbers of such structures are growing. The programme is designed to yield specific suggestions regarding choice of materials and solutions, to increase existing knowledge of environmental impact and deterioration mechanisms, and to participate in updating rules and regulations. In the long term, this will mean more predictable operation and maintenance of bridges and tunnels, and hence, lower costs.

Each of the four subprojects in this programme has designated objectives:

- Existing bridges – increase existing knowledge of the current condition of our bridges and their deterioration trends. This will provide a basis for improved inspection procedures, design life assessment and repair methods.
- Existing tunnels – gain knowledge about the technical condition of both the structure of and the equipment in tunnels, and also learn more about deterioration trends.
- Future bridges – ensure that future bridges are built using materials and solutions that are better adapted to the surrounding environment, so that future bridges achieve intended service life.
- Future tunnels – ensure that future tunnels achieve their intended service life by using materials, execution and inspection adapted to the surrounding environment.

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Learn more about "Durable structures" at www.vegvesen.no/varigekonstruksjoner (in Norwegian).

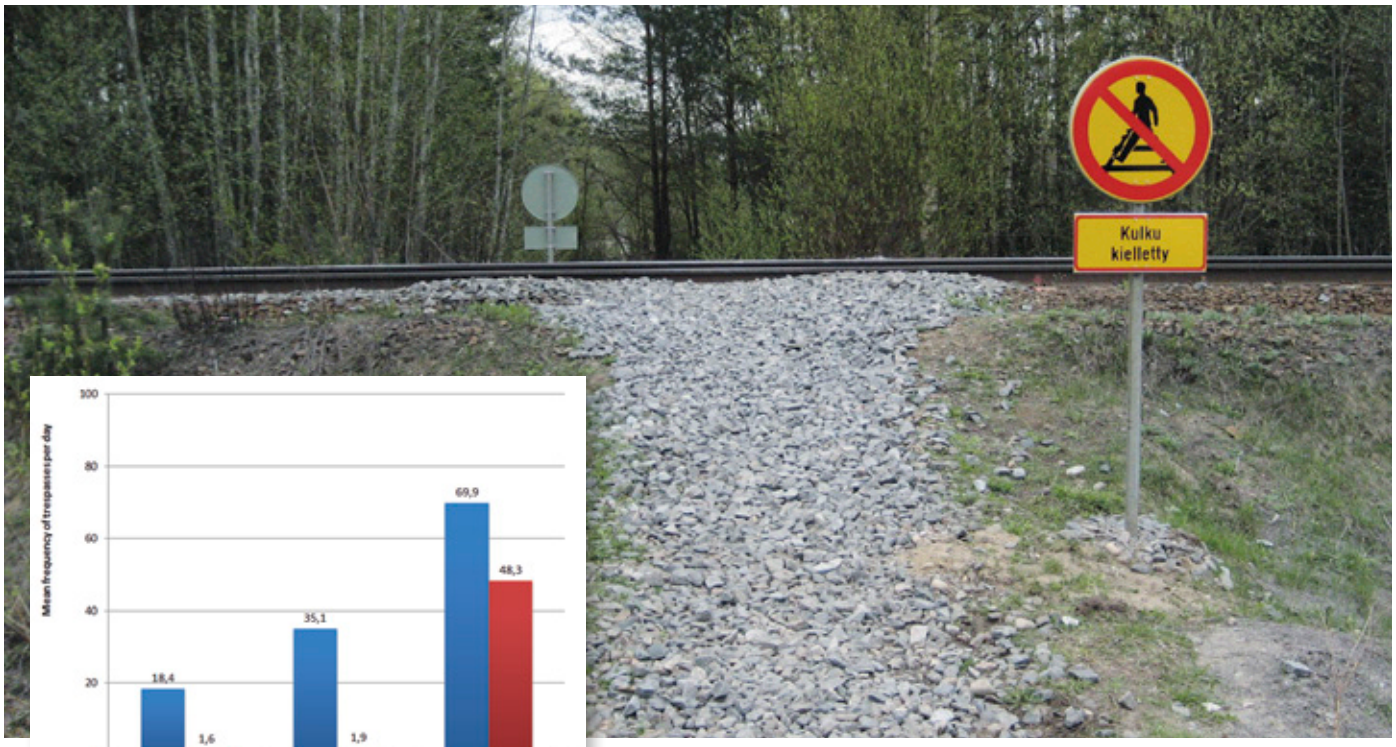
Road Safety on Four Continents – Conference in Beijing 2013

The 16th conference Road Safety on Four Continents will take place in Beijing, China, 15–17 May 2013 in a co-arrangement between VTI, the Research Institute of Highway and the Beijing University of Technology. For more information, please visit the VTI website.

Date: 15–17 May 2013 in Beijing, China
More information: www.vti.se/RS4C

Further Reading

In conjunction with this issue of Nordic Road & Transport Research you find extra material and longer versions of articles on www.nordicroads.com



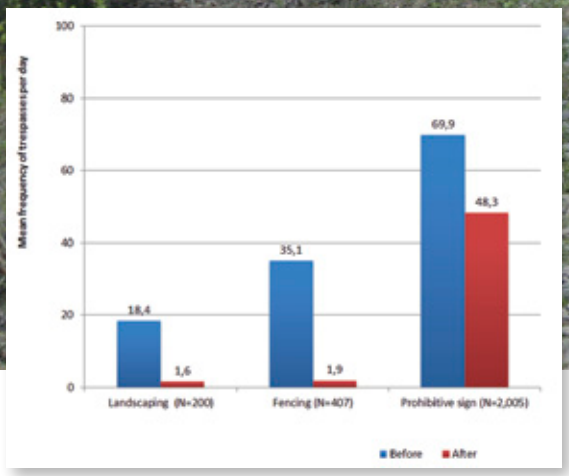


Photo: Mikko Poutanen

During the field observations the effect of prohibitive signs on number of trespassings were investigated in a place known for frequent trespassing.

Frequency of trespasses per day before and after countermeasure installation.

Improving Safety on Finnish Railways by Prevention of Trespassing

Railway trespassing is frequent in Finland and the number of trespassers fatalities on railways has not diminished over the past decade, as opposed to other types of railway fatalities.

This study investigated trespassing accidents, trespassing and related countermeasures to provide information for prevention of trespassing accidents on Finnish railways. Although the trespassing problem has long been recognised in Finland, information on its extent and detail has been either lacking of insufficient because no detailed studies on railway trespassing have been conducted before. This study was therefore designed to investigate various aspects of railway trespassing as a platform for prevention work.

The study includes five complementary substudies, of which two included accident analyses and three collected information on railway trespassing by means of surveys, interviews and field observations. The main results showed, for example, that (1) trespassing is frequent in Finland and, contrary to the overall improvement of railway safety in Finland, the number of trespasser fatalities has not fallen over the past decade; (2) there are specific sites of frequent trespassing on Finnish railways; (3) both the victims in trespassing accidents and the observed trespassers were typically adult males and the victims were frequently intoxicated; (4) the risk related to railway trespassing was associated with trespassing behaviour, and (5) at selected sites fencing and landscaping can stop trespassing almost entirely, but the effects of a prohibitive sign are much more limited.

Overall, a systems approach is recommended for prevention work along with a shared responsibility between stakeholders such as government, railway organisations, various authorities and communities, because the problem is broad and multifaceted and the elements of the rail safety system are interrelated. The recommended countermeasures for preventing railway trespassing vary from under- and overpasses, physical barriers and prohibitive signs to enforcement and education. Selection of the most effective or suitable countermeasure depends on the effectiveness of different measures, location and the characteristics of trespassing.

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Full report: VTT Science 27
http://bit.ly/14p5Qz1

Electric Lorries Best in Congestion

A new simulation model shows that electric lorries are better than diesel-driven vehicles in urban environments

By combining vehicle simulation and traffic simulation, VTI has produced a simulation model that provides detailed information about how different types of freight transport vehicles are affected by the conditions in their environment. The new model shows, among other things, that electric lorries are less sensitive to congestion in cities than diesel-driven lorries.

Photo: Hejdlösa Bilder

Well-functioning freight transport is of crucial importance for Europe's cities. However, increased transport also means congestion, increased risk of road accidents and increased energy consumption. The situation is made worse by the ever increasing frequency of just in time-deliveries. This trend leads to increased emissions, in particular in the case of smaller deliveries which are often transported in lorries with low capacity utilisation.

Prototypes of the lorries of the future

VTI has participated in the EU project Citymove for three years. The aim of the project is to make future urban freight transport systems more efficient, both from the point of view of the environment and safety.

Researchers have, among other things, studied how emissions from lorry refrigerators can be reduced and how the likelihood of lorries overturning can be reduced. Two prototypes of new, modern lorries have been developed: a hybrid vehicle and an electric vehicle.

Detailed simulation models

Within Citymove, VTI has developed vehicle and traffic simulation models that describe how the traffic system affects the individual vehicle and vice versa.

– To achieve efficient transport solutions, an integrated approach is required taking into account both freight transport and other traffic, says VTI researcher Andreas Tapani, project manager for Citymove at VTI.

He is positive to the project's preliminary findings.

– By combining two different simulation models, Citymove has contributed to our now being able to obtain more detailed information about how different freight transport vehicles affect and are affected by the environment than before.

VTI's models indicate, among other things, that electric lorries are less sensitive to congestion in cities than diesel-driven lorries. Frequent braking leads diesel lorries to use more fuel, while electric vehicles can instead regenerate energy to charge the battery.

For the benefit of the vehicle industry

During the autumn, field tests have been in process within Citymove. One of the aims of these tests was to find out how well VTI's simulation models coincides with reality. In Uppsala, an electric lorry has been tested and in Bucharest a hybrid lorry. The result of the tests will be analysed and presented in early 2013.

– The findings of the project will mainly be used within the vehicle industry for development of new vehicles, but in the course of time there will be more areas of application, says Andreas Tapani.

Further research could be undertaken, for instance, to evaluate the advantages and disadvantages for logistics companies of including electrically powered vehicles in their vehicle fleets.

– It would also be possible, starting from the perspective of the city, to investigate the aspects that a municipality needs to take into consideration if it is decided that only electric vehicles may deliver freight in city centres, something which may well be possible in the future.

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ICT Technologies Reduce Emissions and Congestion on Roads

Results of a recent study indicate that intelligent transport systems (ITS) applications such as eco-driving support and eco-driving coaching have potential to reduce energy consumption and CO_2 emissions by about 3–11% on European roads. The results also indicate that several applications such as lane keeping support, speed alert and automatic emergency braking have potential to reduce travel times and mitigate congestion, in addition to their considerable safety benefits. Lane keeping support was estimated to reduce travel times on European roads by 0.37–1.25 % on average, if fully deployed in EU27 countries. Smaller reductions were estimated for speed alert (1.1–1.7 % for urban roads and 0.5-1.0 % for rural roads) and emergency braking (0.3–0.7 % reduction of congestion costs in Europe).

Dynamic traffic management systems have also been found to be effective tools in reducing emissions and congestion. Hard shoulder running has been estimated to reduce travel times up to 26 % in certain conditions and locations and energy consumption and CO_2 emissions by 4 %. Ramp metering was also found to reduce average travel times by 4–35 % in the sites evaluated.

The results are based on a literature study and expert assessments carried out in 2012. The analyses were carried out for iMobility priority applications which are expected to offer most potential to improve safety, reduce congestion, and reduce energy consumption and CO_2 emissions. The priority applications and their most likely impacts in Europe have been documented in the iMobility Implementation Road Map published by the Implementation Road Maps Working Group of the iMobility Forum.

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Photo: Photos.com

Up to Date Knowledge About Traffic Safety Attitudes of European Road Users

Over 21,000 people from 19 countries have been interviewed in the fourth report of the so called Sartre project that records knowledge about the mobility and traffic safety attitudes of European road users.

Three VTI researchers have worked within the latest Sartre report. The word Sartre stands for "Social attitudes to road traffic risk in Europe" and the project started as early as 1991. VTI has been part of the project since then.

The reports provide information on mobility, risk perception, attitudes and behaviour on European roads.

– Previously the Sartre reports have focused on car drivers, but this latest survey, Sartre 4, has been expanded to include car drivers, powered two wheelers and other road users such as pedestrians, cyclists and public transport users, says Sonja Forward at VTI.

Photo: Katja Kitcher

The results give a valuable insight into public perception of road safety and an opportunity to compare behaviour and experiences in different countries. Some national characteristics and challenges are discussed in the full Sartre 4 report, too.

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Short version of the report: http://bit.ly/11JHZbU
Website of the Sartre project:
www.attitudes-roadsafety.eu

Short Distance Between Lorries Can Save Energy and Increase Safety

Field tests to investigate the impact on other traffic

By driving closely together, lorries can reduce energy consumption by over ten per cent. Together with Scania, VTI is participating in the iQFleet project to evaluate the platooning concept.

Just as competitive cyclists who often ride behind one another to benefit from reduced air resistance, so can lorries reduce their energy consumption by driving in platoons.

– The technical prerequisites for driving in platoons already exist, but we still need to investigate all the practical aspects involved, not least for the drivers, says researcher Magnus Hjälmdahl, who is in charge of VTI's participation in the project.

During the project, security has always been the top priority. With new support functions, vehicle platoons can even improve safety and reduce accordion effects in traffic.

– By connecting the vehicles with the aid of Wi-Fi, it is possible to get them to follow one another automatically. This means that if the first vehicle in a platoon brakes sharply all vehicles following it will automatically do the same.

This reduces the risk of drivers colliding with the vehicle in front. However, Magnus Hjälmdahl emphasises that these support functions are only for things like braking and accelerating.

– The driver is still responsible for controlling the vehicle.

Photo: Katja Kircher

Differing opinions among drivers

During the project, VTI has investigated drivers' expectations on vehicle platoons through interviews and questionnaires.

– Before the test, drivers wondered a lot about the adjustment that would be needed for driving in a platoon, says Magnus Hjälmdahl.

Some of the drivers expressed concern about the reliability of the systems and how the new method of driving would affect alertness and the level of distraction. Some thought that they would experience driving in a platoon as more stressful, while others considered that the system could contribute to reducing stress.

Reduced energy consumption

To find out whether it is true that vehicle platoons can reduce energy consumption by over ten per cent even in actual traffic conditions, the researchers will carry out a number of field tests in the course of the project. The field tests will also clarify the impact of vehicle platoons on other traffic.

The tests will take place in several stages. To start with, the researchers studied vehicles that drove in accordance with existing routines. The vehicles have then waited for one another and then driven as a platoon with 70 metres and three seconds braking distance between each lorry. In a final stage, the researchers will investigate vehicle platoons with as short a distance as ten metres between the vehicles.

– After the tests, we will also carry out new interviews and questionnaires to see whether the drivers' attitude to driving in platoons has changed.

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Photo: Google Maps

The Bygholm test facility.

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Göran Blomqvist
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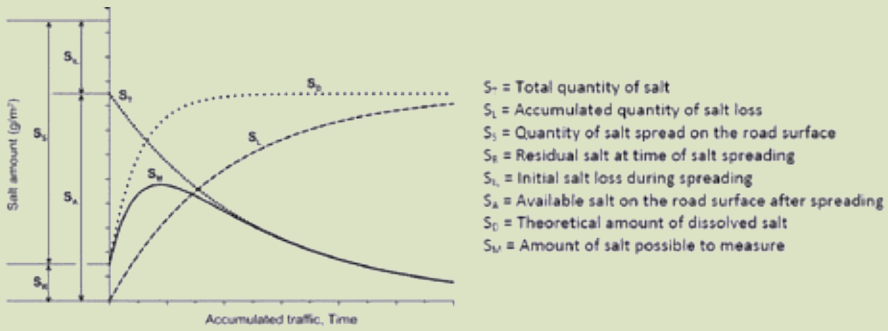
Mats Gustafsson
Swedish National Road and Transport Research Institute

Skuli Thordarson
Icelandic Road Administration



(Illustration: MORS project group)

The MORS model approach.

Modelling Residual Salt – MORS

Nordic Road Authorities join efforts for better decision making in road winter service. A new model for predicting residual salt on the road enables a more precise and economic salt spreading without compromising traffic safety and road network accessibility.

In an effort towards a more economic and effective use of salt in winter maintenance, a joint research and development project, MORS (Modelling Residual Salt), was initiated under the NordFoU framework during 2011-2013, the common platform of the Nordic road administrations for research collaboration. The funding partners are the road administrations of Denmark, Sweden, Norway and Iceland. The aim of the project is to develop a model to be implemented within present and future decision support systems for daily winter service management.

Model background

The model will be predicting the residual salt development on the road, taking traffic, road and weather parameters into consideration. The model development is supported by intensive field measurements on the Bygholm test facilities in Horsens, Denmark, where the model parameters can be extensively studied and to a large degree controlled. The test facilities enables detailed measurements of residual salt on the pavement surface under controlled conditions, both with manual measurements and by automatic road sensors. In 2012, several intensive measurement campaigns were conducted in order to monitor the different processes contributing to salt and water leaving the road surface. Processes included in the model are run-off, blow-off (solid salt), spray-off (liquid splash and spray), evaporation, condensation, precipitation, and salt spreading.

Bygholm test facility

The test site consists of an approximately 650 m long two-lane road with a turnaround at each end, enabling circular traffic to simu-

Photo: Göran Blomqvist & Mats Gustafsson)

Example of manual measurements at the Bygholm test site.

late traffic passing through the measurement section halfway down the track . Permanently mounted equipment includes a traffic counter, road surface sensors for salt amount, salt concentration, temperature and water amount, an automated weather station and an optic sensor for road conditions. Manual measurement methods applied include salt amount by SOBO20 device and the Wet Dust Sampler, salt concentration by optical refractometer, water amount with the Wettex-method, trays on the road edge to collect run-off, and petridishes to collect redistributed droplets within and in the vicinity of the road.

Liquid water on the road surface during experiments is either achieved by natural precipitation or through spreading. The measurements resulted in knowledge giving a better understanding of the residual salt development, and enables validation of automated sensors for real traffic situations.

Model validation

In order to validate the model and calibrate it to different road and traffic classes, it will be implemented and monitored in a number of road sections with different pavement characteristics, local conditions and speed limits during the winter of 2012/13.

Application and future development

Implementation of the model will be made possible in a range of different complexity levels from including comprehensive algorithms into existing advanced decision support systems, in the one end, to the use of simple printed graphical nomograms, describing the same processes, at the other end. With aid from the model, decision makers have a better possibility of assessing the current and required salt amount on the road surface and planning future operations. It is expected that the model may contribute to a more precise and sound use of salt application rate, without compromising traffic safety and road network accessibility. Future development opportunities of the model include refined physical interpretation of the individual processes, input from automatic sensors, both in-vehicle mobile sensors and mounted on-site and direct input from weather forecast and observation systems.

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Photo: Photos.com

– There is still a lack of research on transportation in relation to city planning when it comes to the elderly in traffic. This is a key issue for being able to promote social and ecological sustainability, says VTI researcher Satu Heikkinen.

Tomorrow's Pensioners Continue to Prefer Car Travel

Lack of elderly research focusing on sustainability

Research on the elderly in traffic has for a long time focused on safety and mobility while a sustainability perspective is still often lacking. This is shown by a literature study conducted by VTI.

Many people who retire in the next few years will continue to drive even at an advanced age. How to guarantee mobility and welfare for elderly people is an important problem for society, especially when it comes to achieving environmental goals.

– Research on elderly road users very seldom takes up matters relating to sustainability but focuses mainly on road safety and mobility. This is largely for historical reasons. When road safety issues became more politically important at the end of the 1960s, elderly drivers were identified as a risk group in road traffic. At the same time, there already existed popular cultural conceptions that elderly drivers drove badly and dangerously, says Satu Heikkinen, VTI researcher and project leader for the literature study.

This led to the mobility of elderly people being neglected.

– Later, probably under the influence of more general tendencies in research where attention was drawn to age discrimination and when there was greater knowledge about elderly drivers, there was a re-evaluation and views about the risk of elderly drivers on the roads became more nuanced. This happened at the end of the 1990s.

Satu Heikkinen explains that it became clear during this period that mobility for elderly persons is a key question for society.

Sustainable Urban Mobility Indicators

Indicators performing and alerting essential trends and correlations between driving forces, transport factors, environmental changes and policy performance are increasingly important for planning and policymaking.

The Institute of Transport Economics (TØI) has developed an indicator set for urban transport and environment illustrating the driving forces behind the development in transport volumes and modal split, the environmental and climate impact, and the transport and environment policy performance.

Our indicator relationships show: that the growth in transport emissions in Norwegian cities is inversely proportional to population and income growth, to the service sector share and to the level of education. Thus, urbanisation both in terms of physical, economic and sociocultural factors is essential for more sustainable mobility patterns. A wide scope of knowledge on the driving forces for urban mobility and transport emissions provides a broader picture of development trends and policy options.

The indicator set is based on available and regularly updated data for Norwegian cities – from Statistics Norway's website and TØI's regular national travel surveys.

An active use of indicators of the drivers behind the cities' mobility patterns and transport emissions provides a broader picture of the political action space. Indicators alert and reveal the key areas where policies and measures are to be put in place.

Transport data for calculated greenhouse gas emissions at city level and for local emissions still need improvement to be more easily available. In the quantification of environmental goals in transport policy, increasing emphasis is put on the indicator relationships and distance-to-target indicators.

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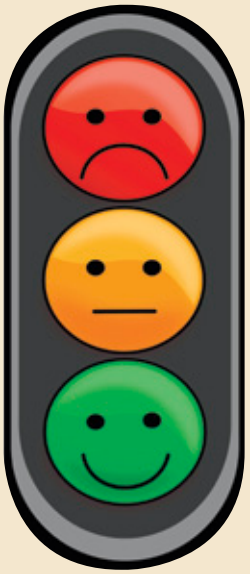

Photo: Shutterstock

Red, yellow or green? An active use of indicators of the drivers behind the cities' mobility patterns and transport emissions provides a broader picture of the political action space.

Full report (written in Norwegian with English summary): Sustainable urban mobility indicators - relationships and comparisons. TØI report 1210/2012.
Authors: Vibeke Nenseth, Petter Christiansen, May Hald.
Available at http://bit.ly/WeONfk

– It was emphasised that elderly people should drive for as long as possible as use of a car helps even those with physical aches and pains to get about relatively easily. Environmental issues were absent in the discussion – it was perhaps far too sensitive to take them up. There may have been a fear that the elderly would again be singled out and their mobility restricted. After all, the elderly drive much less than other age groups.

Sustainable means of transport for the elderly as well

Satu Heikkinen has also looked at what plans have been made to enable the elderly to use sustainable means of transport.

– Time is passing and we can't avoid viewing travel by the elderly in a sustainability perspective. All groups need to participate in the transition to a sustainable society. Given that the elderly make up a large proportion of the population, they are also an important group.

She explains that there is sometimes a goal conflict between social and environmental sustainability when it comes to the elderly. This may make it difficult to create simple general measures.

– The elderly are a heterogenous group. At the same time as there are groups of elderly people who may need encouraging to continue driving, there are others that drive a lot who may need to reduce the amount of driving they do.

Inexperienced users of public transport

Many elderly people lack experience of using public transport. Previous research shows that many of those retiring in the 2000s do not have any experience of bus or train travel. Over 40 per cent say that they have never used public transport for their daily travel.

Matters relating to transport in relation to city planning are still unresearched when it comes to the elderly in traffic. Satu Heikkinen considers that this is a key issue for, for example, promoting social and ecological sustainability.

– A more overarching perspective on sustainability, including both ecological and social sustainability, is largely lacking in elderly research. This is an important issue bearing in mind the fact that an increasing number of elderly people will probably choose to travel by car in preference to other means of transport in the next few years.

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Electromobility – at a Crossroad

The next few years we will see new products on the market from many different car manufacturers, and various business models will be tested. Yet the market has not developed quite as hoped for some car manufacturers. The Electromobility+ project Compett (Competetive Electric Town Transport) investigates the conditions for successful implementation of electromobility in European regions and cities.

Photo: Better Place, Denmark

E-car Charging.

Model-regions for electromobility in Austria

Austria, with its model-regions for electromobility, represents a structured approach where national support programs are channeled to local model-regions. The model-regions establish their own goals and approaches to systematically develop the electric vehicle market. The Austrian Energy Agency is the Austrian partner in the project. They have a central role in the work of the model-regions and are well positioned to bring the Austrian approach into the project. The model-region of Eisenstadt with substantial commuting in and out, will be studied in-depth. This region is situated about 60 km from Vienna.

Denmark tests two interesting business models

In Denmark two interesting business models for electric vehicles deployment are tested out by commercial actors. Both business models take advantage of the fact that Denmark is a small country. In one of the business models the operator will cover all of Denmark with a limited number of battery switch-stations where the discharged battery can be replaced with a fully charged battery in a few minutes.

The other model sets up a number of fast charging stations thereby making longer distance driving possible. Both operators also establish a network of normale charging stations. Both business models are based on a subscription service. The Danish Road Directorate is the Danish partner in the Compett project and will focus on the noise advantage of electric vehicles and contribute with new insights from national travel surveys to identify the electromobility potential.

Economic incentives, user privileges and infrastructure support makes electric vehicles competitive in Norway

In Norway electric vehicles are exempted from registration taxes as well as VAT. The annual tax rate is lower as is the taxable benefit rate of company cars. Electric vehicles are allowed in the bus lanes, exempted from road charges and are offered free parking in many places.

The government and local authorities supports the establishment of public charging stations. These incentives placed the Nissan Leaf electric car on the national top 15 list of sold models in 2012 and the electric vehicles market share reached 3 percent.

The Kongsberg region (80 km south of Oslo) has been selected as a study area for regional electromobility. The region is centre to many high-tech businesses with commuting into and out of the region and travel between business locations.

The Norwegian partner, The Institute of Transport Economics, is well positioned to analyze the potential for electromobility in Norway using travel surveys, interviews with stakeholders and economic assessment methods.

Understanding the mechanisms of expanding the electric vehicle market

The diversity of the three countries´ approach to electromobility, enables the Compett project partners to investigate, analyze, understand and communicate the mechanisms of expanding the electric vehicle market in Europe, and analyze the impact it will have on society. The project also looks at Plug-in hybrid vehicles and electrified two-wheelers.

The project will run until June 2015.

The final deliverables of Compett are:

- A report on the success factors for implementing electromobility in Europe
- A practical guideline handbook on electromobility

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Photo: Hans Bendtsen, Lykke Møller

Thin Layer Pavements

Long time effect of noise reduction

In 2003 the Danish Road Directorate (DRD) started a co-operation with local administrations and asphalt contractors to develop noise reducing thin layer pavements and to construct such pavements on test sections. This article contains a status of the noise measurements carried out in the period from 2003 to 2010.

In 2003 the Danish Road Directorate started developing noise reducing thin layer pavements with open surface texture and small maximum aggregate size. Six test sites on urban roads and highways have been constructed, with a total of 44 pavements, including a dense asphalt concrete as reference pavement at each test site.

The test sections are now between two and seven years old. Road side SPB noise measurements have been performed yearly supplemented by CPX-noise-trailer measurements and friction surveys. Comparisons are made between noise levels of the thin layers and the reference pavement which have been exposed to the same traffic and weather conditions.

It can be concluded that these thin layer pavements maintain a noise reducing effect, even when they become older, although the noise levels increase with the pavements age. This applies for all the pavement types examined. However, the level of noise increase depends on the type of pavements and is generally higher for the thin layers.

The annual increase in noise from heavy vehicles on motorways is around half of the increase for passenger cars for the reference pavements - about 1/3 for the thin layers.

In 2010 the DRD has a total of 44 test sections with thin noise reducing pavement distributed on six test sites. It is the intention to continue these measurement series throughout the total lifetime of the test sections to the extent that it is economically possible. In that way it will be possible to create unique knowledge about the development of noise on the many different pavements from "cradle to grave".

This knowledge can be used to:

- Examine and analyse why noise levels rise on various types of pavement
- Optimise and improve noise reducing thin layer pavements
- Calculate the noise reducing effect during the lifetime of the pavements
- Choose noise reducing pavements
- Develop the so called Danish "SRS" system for noise classification of noise reducing road pavements
- Develop acoustic ageing models for road pavements in Pavement Management Systems
- Improve noise emission data for the Nordic noise calculation model NORD2000.

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Protective Measures Against Avalanches and Floods

How can we develop more efficient protective measures against avalanches, landslides and floods? How can we improve the construction and localisation of these measures? These are some of the questions that a Norwegian programme on natural hazards will try to elucidate.

In the period 2012-2015 the Norwegian Public Roads Administration (NPRA) will collaborate with the Norwegian National Rail Administration (Jernbaneverket) and the Norwegian Water Resources and Energy Directorate (NVE) in a research programme on Natural hazards. One of the subprojects focuses on protective measures against avalanches, landslides and floods. The main goal for this subproject is "How can we protect ourselves against floods and avalanches in the most efficient way?". The aim is to use the correct mitigation measures in the correct places, in a way that benefits society.

Here is a short description of the project's main activities:

1 Protective measures
The goal is to study and evaluate the protective measures in selected areas, in order to identify the factors that determine whether a protective measure works efficiently or not. Case studies of selected measures will be conducted; a review of several measures in Norway has already been launched. Slush avalanches will be given extra focus, since there is a lack of knowledge about how to build effective protective measures against this type. Climate change scenarios also predict an increase in water-related avalanches, so more knowledge is needed.

2. Handbooks and guidelines
The aim is to have handbooks, guidelines and check-lists that cover all processes in avalanche and flood protection – from planning to maintenance. The three different agencies cooperating in the project have different sets of guidelines, and one aspect of the work will be to gain experience from each other and to suggest improvements. This will be based on the outcome of activity 1.

Photo: Heidi Bjordal

Snow avalanche gallery at Ura in Lyngen, Norway.

3 Acceptance criteria
Norway has many landslide prone areas, and a common question is "What risk level can be accepted in this area?". Another consideration is "Where should we prioritise expensive structural measures, and where should we seek to monitor and give early warnings?". These questions will be discussed throughout the project period.

4. Database of protective measures for infrastructure in Norway
There is a need for an overview of all existing measures, together with their associated data such as hazard frequency, year of construction, purpose and condition. The long-term goal is to have better control of the operation and maintenance of these constructions.

5. Simulation models
2D dynamic simulation models for snow avalanches, such as Elba+ and RAMMS, have been little used in Norway, in part because they were developed in alpine countries with different altitudes and snow conditions. This project aims to acquire more knowledge about how these models can be calibrated, in order to improve the dimensioning and localisation of structural protective measures.

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More information about the Natural hazards programme can be found on the website www.naturfare.no (in Norwegian).

Photo: Michael W. J. Sørensen

Cyclists stated clearly that it is sensible to permit counter-flow cycling and to implement marked cycle lanes in both directions in one-way streets in the city-centre.

Successful Introduction of Counter-Flow Cycling

Introduction of counter–flow cycling in two streets in Oslo increased the number of cyclists by 50 percent.

As part of a policy to improve cycling conditions in Oslo, counter-flow cycling was permitted and cycle lanes were installed in both directions of two one-way streets. The cycle lanes were marked with red asphalt and combined with advanced stop lines and "cycle boxes".

Surveys were conducted before and after the implementation, comparing road users in the two trial streets with those in two control streets. Cycle counts reveal that cycling volumes increased by approximately 50 percent in both streets, while cycling volumes decreased in the control streets.

Cycling against the normal traffic flow increased in the experimental streets in particular, indicating that the cyclists to a large degree were using the new counter-flow cycling lanes. Some of the increased cycle traffic may be the result of transfer of cycle traffic from neighbouring streets.

In the interviews cyclists stated that they cycled less on the pavements in the experimental streets after counter-flow cycling was permitted and they considered the cycle conditions to be very good and felt more secure than before.

In contrast, in 2011 the cyclists were very dissatisfied with the cycle conditions in these streets. In general the cyclists stated very clearly that it is sensible to permit counter-flow cycling and to implement marked cycle lanes in both directions in one-way streets in the city-centre.

Opinions among pedestrians and car drivers were mixed. Pedestrians felt slightly less secure after the implementation, but despite this were generally in favour of counter-flow cycle lanes in one-way streets.

Car drivers were negative about the new cycle lanes in the one trial street where parking facilities had been removed, but opinions were mixed in the other trial street.

Video observations reveal that counter-flow cycling led to few traffic conflicts. Thus such a measure would not seem to be detrimental to road safety.

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Full report (written in Norwegian with English summary: Counter-flow cycling. Evaluation of counter-flow cycling in one-way streets in Oslo city centre. TØI Report 1237/2012.
Authors: Torkel Bjørnskau, Aslak Fyhri, Michael W. J. Sørensen.
Available at: http://bit.ly/UhaKot

NORDIC

ROAD AND TRANSPORT RESEARCH

A joint publication with the latest research findings of six public research organisations in Denmark, Finland, Iceland, Norway and Sweden.

FINLAND

TECHNICAL RESEARCH CENTRE
OF FINLAND (VTT)

VTT Technical Research Centre of Finland is a contract research organisation with a staff of 2,800. In this joint publication, the VTT expertise areas cover research and development of transportation, logistics and road structures. The work is carried out in five research groups employing a staff of 60.

DENMARK

DANISH ROAD DIRECTORATE (DRD)
DANISH ROAD INSTITUTE (DRI)

The Road Directorate, which is a part of The Ministry of Transport, Denmark, is responsible for development and management of the national highways and for servicing and facilitating traffic on the network. As part of this responsibility, the Directorate conducts R&D, the aim of which is to contribute to efficient road management and to the safe use of the network. The materials research component is carried out by the Danish Road Institute.

SWEDEN

SWEDISH NATIONAL ROAD AND
TRANSPORT RESEARCH INSTITUTE (VTI)

VTI is an independent and internationally prominent research institute in the transport sector. Its principal task is to conduct research and development relating to infrastructure, traffic and transport and its operations include all modes of transport. VTI has a total of some 200 employees. VTI's head office is in Linköping, with branch offices in Stockholm, Gothenburg and Borlänge.

ICELAND

ICELANDIC ROAD ADMINISTRATION (ICERA)

The ICERA's mission is to provide the Icelandic society with a road system in accordance with its needs and to provide a service with the aim of smooth and safe traffic. The number of employees is about 290. Applied research and development and to some extent also basic research concerning road construction, maintenance, traffic and safety is performed or directed by the ICERA. Development division is responsible for road research in Iceland.

NORWAY

NORWEGIAN PUBLIC ROADS
ADMINISTRATION (NPRA)

The Norwegian Public Roads Administration is one of the administrative agencies under the Ministry of Transport and Communications in Norway. NPRA is responsible for the development and management of public roads and road traffic, as well as the Vehicle Department. This responsibility includes research and development of all areas related to road transport and the implementation of R&D results.

INSTITUTE OF
TRANSPORT ECONOMICS (TØI)

The Institute of Transport Economics is the national institution for transport research and development in Norway. The main objectives of the Institute are to carry out applied research and promote the application and use of results through consultative assistance to public authorities, the transport industry and others. TØI is an independent research foundation employing about one hundred persons.

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