

# NORDIC

ROAD AND TRANSPORT RESEARCH | NO.1 | 2011

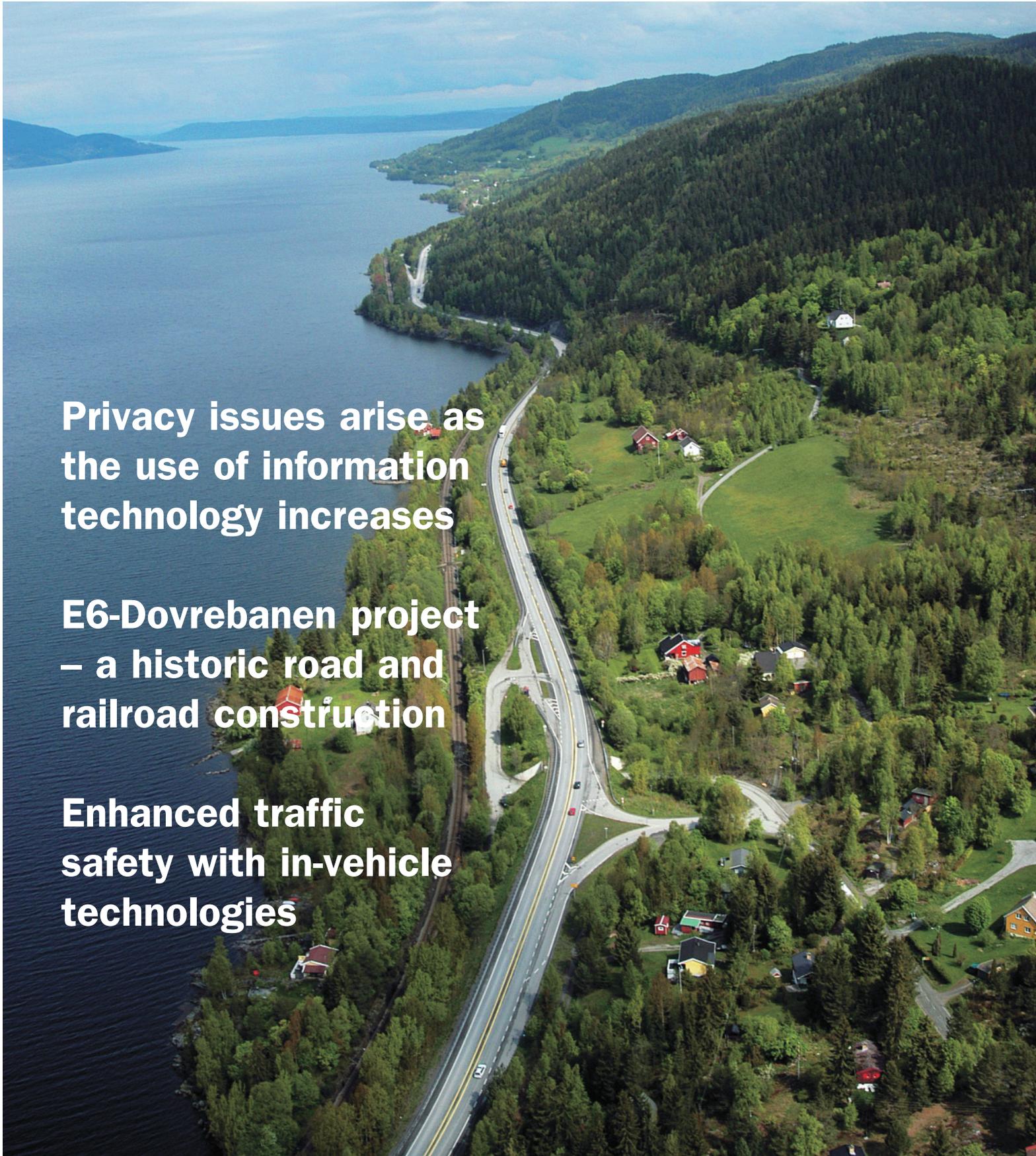


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**Privacy issues arise as the use of information technology increases**

**E6-Dovrebanen project – a historic road and railroad construction**

**Enhanced traffic safety with in-vehicle technologies**



# News from

## Change in publication frequency

Nordic Road & Transport Research is now published two times a year. The lengths of the articles are shorter, but more information is to be found at our website [www.nordicroads.com](http://www.nordicroads.com). The publication is still free of charge.

### **Swedish National Road and Transport Research Institute (VTI)**

VTI is an independent, internationally established research institute which is engaged in the transport sector. Our work covers all modes, and our core competence is in the fields of safety, economy, environment, traffic and transport analysis, public transport, behaviour and the man-vehicle-transport system interaction, and in road design, operation and maintenance. VTI is a world leader in several areas, for instance in simulator technology.

### **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.

### **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.



### **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 340. 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.



### **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. The 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), Norway**

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. The Institute is an independent research foundation employing about one hundred persons.

## Editorial notes

Nordic Road & Transport Research is a joint publication of six public road and transport research organisations in the Nordic countries, Denmark, Finland, Iceland, Norway, and Sweden. The main objective of the publication is to disseminate research results and news from the institutions, especially to researchers and decision makers. Each institution is responsible for the selection and presentation of the material from its own scope of activities.

Nordic Road & Transport Research is published two times a year. It is regularly sent out, free of charge, to recipients selected by the six joint publishers. Free sample copies are also sent out on special request.

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Addresses: see back cover.

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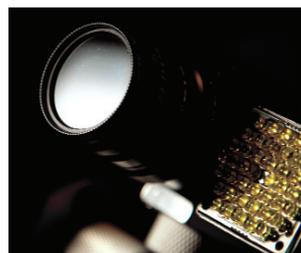
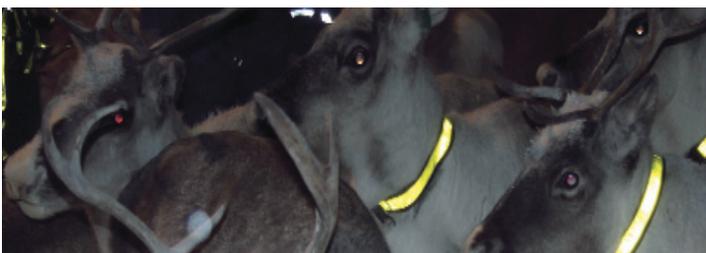
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## The VTI Library and Information Centre participates in a new transport research database

At the annual TRB conference in January 2011 in Washington, D.C., US, a new international transport research database, TRID, was introduced. In TRID, the two databases TRIS (of TRB) and ITRD (of ITF/OECD) are united.

– This means that research and research results will get a wider spreading. As research cooperation between Europe, US and the rest of the world increases there is also a need for larger cooperation within the field of information. The TRID database will not only unite but also make work more effective, says Birgitta Sandstedt, director of the VTI Library and Information Centre.

The TRID database in short:

- the database includes transport research from the whole world
- so far about 20 countries have actively contributed to the ITRD part of the database, and several countries will join after the union
- the database includes more than 900 000 entries of published or ongoing research
- the database is open for everybody.

ITF/OECD (the International Transport Forum) and TRB (the Transport Research Board) are the owners of the database.

**More information:** <http://trid.trb.org/>

## The 4<sup>th</sup> EPAM Conference 2012 Deadline for submission of abstracts is 1 June 2011

The effects of increasing traffic, and climate change, and the need of safety as well as the need of well-being have to be met by even more effective road management. A holistic approach covering a lifetime view of road keeping (e.g. LCA) and preserving the assets is essential. The challenge Europe is facing is to use envi-

ronmentally friendly materials and technologies providing a sustainable and safe road infrastructure system.

The 4th EPAM conference will cover all aspects of the road infrastructure including the sub-assets pavements, engineering structures, and road furniture and equipment.

### Preliminary paper submission and time schedule:

2011

1 June                      Deadline submission of abstracts  
31 August                Notification to authors

2012

1 February              Deadline submission of papers  
1 May                      Preliminary program, registration  
1 July                      Deadline final papers  
5-7 September        Conference

The 4th European Pavement and Asset Management Conference is to be held in Malmö, Sweden, on 5-7 September 2012. The conference is the follow up of the previous EPAM conferences in Budapest,

Hungary in 2000; Berlin, Germany in 2004 and Coimbra, Portugal 2008.

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## Fourth advanced VTI simulator inaugurated



PHOTO: KATARINA LJUNGDÄHL

VTI's new driving simulator, officially inaugurated in 18 May by Sweden's Minister for Infrastructure Catharina Elmsäter-Svärd, is located at VTI's office in Gothenburg.

The simulator, Sim IV, is equipped with an advanced motion system. It is the first one of VTI's simulators to offer large stroke linear motion in both the longitudinal and lateral directions. The simulator has a visual system consisting of nine projectors and three

LCD displays for the rear view mirrors. The projectors provide a 210-degree forward field of view. The imaging system is equipped with a camera-based calibration system that allows the driver position to be changed quickly. Sim IV also has interchangeable car and truck cabins, which means that studies can be made with both passenger vehicles and heavy vehicles.

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# Anna Anund co-author of a new book on sleepiness

The book, *Sleepiness – Causes, Consequences and Treatment*, is the first of its kind to focus on the causes, consequences and treatment of abnormal sleepiness.

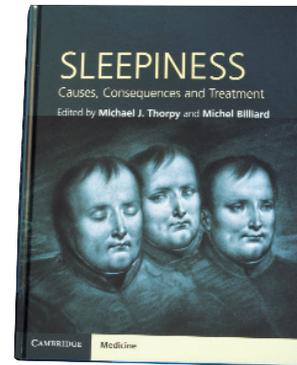
Assisted by Göran Kecklund, Anna Anund writes about driving and abnormal sleepiness.

– There are many books about sleep but still relatively few about sleepiness. It is exciting to see that interest in the field might possibly be growing, says Anna Anund.

In *Sleepiness – Causes, Consequences and Treatment*, Cambridge University Press has brought together all the leading clini-

ans and researchers in the field of sleep. The aim of the book is among other things to give readers skills in drawing up various diagnoses and evaluating sleepiness diagnostically. It contains an exhaustive section that describes treatments for various types of sleep disruption and also shows how sleepiness affects our quality of life.

*Anna Anund's doctoral thesis, Sleepiness at the wheel, was published in 2009 and can be found on Karolinska Institutet's website. The Swedish version, Trötthet i samband med bilkörning, is also available on VTI's website.*



## Via Nordica in Reykjavik 2012

It is with great pleasure that the Icelandic Road Administration invites you, on behalf of the Nordic Road Association (NVF), to attend the 21<sup>st</sup> Nordic Road Congress, Via Nordica 2012, to be held in Reykjavik, Iceland, on 11–13 June 2012. The Via Nordica congress is arranged by NVF every four years.

Via Nordica 2012 offers experts and others within our field an excellent opportunity to share ideas, learn from each other and establish new contacts. In addition to the professional programme, you will have the opportunity to explore Iceland's renowned natural attractions through available guided tours or individually.

The slogan for the congress is Via Nordica – at a crossroads. It brings into focus the challenges we face today, not least in the field of road transport and the environment, and our need to make some fundamental decisions on what route to take and where to head in the near future.

The congress is also open to experts beyond the Nordic countries, who would like to share our experiences and bring international elements to this Nordic congress.

The congress will take place in Harpa, the new Reykjavik Concert Hall and Conference Centre in the city centre.

In the period 2008–2012, 14 technical

committees and two theme groups of NVF have been working towards the Via Nordica 2012. The committees are responsible for most of the parallel sessions at the conference. This congress is therefore the culmination of four years' hard work. The Via Nordica 2012 Program Committee is mostly responsible for the Plenary sessions.

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[www.vianordica2012.is](http://www.vianordica2012.is), [www.nvfnorden.org](http://www.nvfnorden.org)



PHOTOS: ICERA



# Individual conceptions steer our perception of environmental risks

*In an environment context, there are several fields of research that need to be developed. It is important to continue to investigate what drives the individual's willingness to reduce their environmental impact. The possibilities of driving simulators to conduct repeatable experiments might be a usable tool for understanding the relationship between different factors' environmental impact.*

**W**hen transport measures are being designed it is important to know how individuals perceive environmental risks and what they are willing to do to reduce them.

In order to increase our understanding

of choices in stated preference studies, psychological models can be used. Among other things, economic literature shows that people do not always do what is rational. Increased risk does not necessarily mean that willingness to pay to minimise the risk also increases.

Both psychological theories and research support the claim that high risk perception does not always mean environment-friendly behaviour. The relationship between risk perception and behaviour can instead be indirect. Even if an individual perceives environmental problems as being related to their own car use, they may need to plan for reduced car use before a change can be made.

VTI recommends continued research with a focus on willingness to pay for new technology that reduces emissions from cars. Such a study would shed light on whether psychological theories can show what impact individual conceptions, choices and types of behaviour have on choice contexts.

Regarding the relationship between driver behaviour and environmental risks, there are many factors that can originate with the driver, the vehicle, the design of the road and unplanned situations and conditions along the road. Virtual environments might also be an important tool. Driving simulators allow the surrounding environment to be controlled so that it is identical for all test subjects. For example, it would be possible to investigate how driving behaviour in an unplanned driving situation is affected by training in EcoDriving and what long-term effects such training has.

*Katarina Ljungdahl, VTI, Sweden*

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## Reflective reindeer



Author: Anne Sofie Nielsen,  
NPRA, Norway

*Traditionally, reflective devices are worn by pedestrians and cyclists who wish to stay visible to drivers during Norway's dark winters. During the winter of 2010–2011, two thousand reindeer wore them too.*

**F**ive hundred reindeer are killed annually in traffic in the northernmost county of Norway, Finnmark. Every year, the Norwegian Public Roads Administration (NPRA) registers several traffic accidents



occurring when cars hit the animals, or when drivers swerve to avoid them. Simple reflective devices are currently being tested in an attempt to reduce these accident numbers.

Two thousand reindeer were fitted with either a reflective collar or a reflective antlerclip in December 2010. The animals will be followed carefully to see if this marking

gives any changes in the accident numbers. Kristian Øvernes from the NPRA is in charge of the project.

– Our focus is to reduce the number of people that are injured and killed in traffic accidents, but it might also reduce the economic losses for reindeer-herders and suffering for the animals that are hit, he says.

The measure is relatively inexpensive; one reflective device costs about 0.2 euro. A reindeer killed in traffic costs approximately 5 000 euro.

The study is not over yet, but after more than two months, not a single reindeer fitted with a reflective device has been found killed in traffic. To put this into perspective, the owner of the 2 000 marked reindeer has found twenty of his 3 500 unmarked reindeer killed in traffic.

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# Bike-and-ride in Oppland county



Stine Fredriksen and Solveig Rueslätten,  
Opplandstrafikk, Norway

*Bringing your bicycle on a public bus is not always easy. The county of Oppland in Norway is about to make it very simple. As a part of a new strategy to encourage its constituents to choose public transport and environmentally friendly forms of travel, bicycle-racks will be attached to the rear end of public buses in the region.*

The early origins of the project can be traced back to the summer of 2007, when the Summer-bus which drives between tourist destinations Lillehammer,



PHOTO: OPPLANDSTRAFIKK

Hafjell and Hunderfossen started providing an open bicycle trailer to allow its customers to take their bicycles on board.

In 2010, Opplandstrafikk, the regional public transport administration, and Transnova, an environmental transport program under the Ministry of transport

and communications, initiated the production of a prototype bicycle-rack that fits at the rear of the bus, and has space for five bicycles. The goal for this project was to increase predictability for the bike-riders by creating seamless junctions between popular bike-routes and public transportation.

The project is a part of a larger scheme initiated by the Department of communications to boost public transport in the Lillehammer region.

With support from Transnova, Opplandstrafikk can provide bicycle-racks on 40-60 buses in the Lillehammer region during the summer of 2011. The routes include the Lillehammer region, and the popular tourist and cycle destinations of Sjusjøen, Nordseter, Hafjell and Skeikampen.

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# Dust on roads can be reduced

Dust binding, road sweeping and early grit removal may be some ways of minimising road dust. The relevance of the measures listed, however, differs depending on the type of road and the speed of the traffic. In order to find out more about measures to minimise road dust in the Nordic countries, two environmental researchers have made a study of operation and maintenance measures against road dust and assessed their potential.

– The problem with road dust is a mosaic of sources, road users' behaviour, meteorological conditions and the actions of the road manager. In our study the main focus is on measurements, means and strategies that have to do with operation and maintenance. Within the project we have also developed a sampler for road dust called a Wet Dust Sampler that we have now begun



PHOTO: VTI/MATS GUSTAFSSON

to use in other R&D projects, says researcher Mats Gustafsson, VTI.

*Tanja Magnusson, VTI, Sweden*

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# The car is monitoring your behaviour

*Most modern cars have electronic systems that store a wealth of data on speed, braking and other driving behaviours. Three out of five people in Norway are not aware of this, according to a report from the Institute of Transport Economics.*



Torkel Bjørnskau, TØI,  
Norway

**T**he survey studied how privacy can be threatened by the increased use of information technology in road safety measures, and measured acceptance for such technology in the population.

Three different systems were examined: Automatic speed control over a certain distance (line detection ATK), Intelligent speed adaptation (ISA) and Event data recorders (EDR). Each of these systems can collect data on your driving behavior for a shorter or longer period of time.

## Event data recorder

Modern cars are controlled by electronic components. They are also equipped with diagnostic tools that can extract data about the functioning of these components, to be used in connection with repairs and service. The nature of the data that manufacturers can retrieve varies, and is currently somewhat unclear, but what is clear is that this has major privacy implications.

Behavioral data describing speed, instrument use, safety belt use and so on are often detected without the car owner's awareness. Such data are also interesting for the police to help with accident investigations. There are companies that specialize in extracting such information.



*Behavioral data describing speed, instrument use, safety belt use, etcetera are often detected without the car owner's awareness.*

The EDR is a "black box" that records a variety of data immediately before, during and after the accident. The Danish insurance company ALKA has a scheme where you get a 40 per cent cheaper insurance premium if you have such a "black box" installed.

The focus on EDRs in Europe and the Nordic countries is small compared with the United States, where such data are actively used for investigation of accidents and blame apportionment.

## Section control

Section control, the registration of average speeds over road sections, has also implications for privacy. The system photographs all the cars and drivers to control the vehicle's average speed over a distance. If the average speed is below the speed limit, all information from the two registration points are deleted. At surplus speed the system sends the picture to a back-end system

(administration/police) for further action.

The system is being tested on three routes in Norway. In Sweden, the measure has been discussed, but the authorities have decided not to implement it for reasons of privacy.

## Intelligent speed adaptation (ISA)

ISA may be designed as so-called supportive systems that alert the driver if the speed limit is exceeded, or that make it impossible to exceed the speed limit. If the system is based on information from GPS and digital road maps with speed limits, or from intelligent signs that communicate with the vehicles, it could hardly be said to have privacy implications.

The situation would be otherwise, however, if the system were to log positions, movements and speed. Such a system has in fact been introduced in the fleet cars of the Swedish and Norwegian Road Authorities, where data logs include information about when and where vehicles have been speeding. Since this is done at group level and over longer periods, however, it is impossible to identify individuals.

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# Historic road and railroad construction in Norway



*The E6 Highway stretches from Svinesund in the south-east to Kirkenes in the north of Norway. The Norwegian Public Roads Administration (NPRA) is upgrading the section of the road between Gardermoen and Biri from a two-lane road to a four-lane road with a central reserve. The Dovrebanen Railroad stretches from Oslo to Trondheim. The National Rail Administration is building a double-track between Eidsvoll and Hamar. Currently, this stretch is the most heavily trafficked single-track stretch of railroad in Norway.*



Einar Sjøberg, NPRA, Norway

**T**o save several hundred million NOK, the Ministry of transport and Communications decided to coordinate the two projects on the stretch of road and railroad that goes along Norway's largest lake, Mjøsa.

The Norwegian National Rail Administration and the NPRA have together drawn up the local plans for the development. Construction will begin in 2012. The project is the largest collaborative project between the two transport agencies in history.

Coordinating the projects in the planning phase has helped create good, holistic solutions for the transport corridor. The construction phase of the two projects can theoretically be halved by coordinating the projects, and the local environment will have one rather than two construction phases to deal with. The largest benefit of coordination will be achieved by coordinating the transport and recycling of landfill masses. Excavation residues from the E6 road construction, rock, will be used to construct the Dovrebanen railway embankment.

To organise the planning and construction, the National Rail Administration and the NPRA established the joint project E6-Dovrebanen, named after the road (E6)

and the rail stretch (Dovrebanen). The project covers a 23 kilometer long stretch of road and railroad between Minnesund in Eidsvoll municipality to Espå in the municipality of Stange.

## Collaboration in practice

The joint E6-Dovrebanen project began in 2005. A simple structure for collaboration between the two agencies was formed for the planning phase. The construction phase of the project, which commences in 2012, will bring an even closer collaboration. In this phase the E6-Dovrebanen project will have a single project management office comprised of employees from both agencies. Systems and processes in the two agencies are different in several areas, for instance in regards to accounting and HSE regulations. A great deal of planning and adjustment is needed to create a unified project organisation.

The project has been divided into three contracts. In addition, rail-technical staff, management staff and technical staff will be serving all three contracts. Those working with the contracts will be managing the construction of road and rail on one of three specific stretches. Rail-technical staff will cover the whole stretch of rail. Those working in the technical staff will support the three contracts in areas like geology, construction, HSE, environment and landscape architecture. The management

staff will support the project with finances, external and internal communication and reporting.

The project management consists of one project manager and one assistant project manager from each of the NPRA and the National Rail Administration. The same principle applies to the rest of the organisation. This will ensure technical quality and quorum in all levels.

## A project within the projects

The E6-Dovrebanen project constitutes the third phase of the expansion of the E6 between Gardermoen and Kolomoen, while the rail part is the first phase of a new double-track between Eidsvoll and Hamar. The road project will reduce the number of serious accidents on the E6 and stimulate growth and development in the central eastern part of Norway. The railroad project can potentially reduce travel time between Oslo and Hamar with one hour and double the number of railway departures. Together the two projects will significantly increase accessibility to and within the region.

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PHOTO: HARALD AAS

# Unintended effects found in most transport policy measures

A negative unintended effect of the CO<sub>2</sub>-differentiation of vehicle taxes in Norway has been higher share of diesel cars and thus higher emissions of NO<sub>x</sub> and PM 10 particles.

*The Optic research project has identified a list of 79 different types of transport measures adopted in Europe. Unintended effects were reported in the majority of the examples, predominantly on the negative side.*



Nils Fearnley and Harald Aas, TØI, Norway

**O**ptimal policies for transport in combination (Optic) is a research project under EU's seventh framework programme and coordinated by TØI.

Optic will help improve and optimise the use of existing infrastructure through more efficient, combined use of policy tools, and encompasses best practices within different fields of transport policy making.

It is remarkable that unintended effects were reported for the majority of the examples in the inventory, predominantly on the negative side, although positive effects and examples with mixed consequences are also reported.

One example is CO<sub>2</sub>-differentiation of vehicle taxes in Norway. While it reportedly contributed to reduce CO<sub>2</sub> emissions from the new car fleet, a negative unintended effect has been higher share of diesel cars and thus higher emissions of NO<sub>x</sub> and PM 10 particles in urban areas.

Unintended effects of transport policy can also extend beyond the transport sector to policy domains as diverse as education, health and the economy.

The Optic project recommends a mix of quantitative and qualitative assessment approaches to policy making. This way, all effects of transport policy – intended and unintended – may be anticipated before the policy is implemented.

It means that potential supplementary measures can be planned together with the main policy measure to address undesired outcomes or increase acceptability for controversial measures.

The reports published at Optic's website give different examples of complex policy making processes and how to evaluate them and identify unintended effects in advance. For instance, in 2009 the German government introduced a 2 500 euro bonus when a new car was purchased and the old one handed in for scrappage. The measure was intended to stimulate Germany's car manufacturing in a time of economic downturn and to reduce the stock of high emission cars.

These intended effects could be reproduced with transport model Tremove, but an unintended effect of scrapped cars being exported to other countries would not be covered by the model. This example indicated that models may reveal only partially the entire complexity of cause-effect relations. In these cases the report recommends to early apply additional, so called structurally open methods (mainly qualitative) to discover such effects not covered by the models.

In the second stage of policy package analysis, the project recommends to conduct mainly structurally closed methods, generally applied by analysts and experts in the field. Given the results obtained, the policy packaging process once again should open up and results are reflected considering potentially affected stakeholders.

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# Computational dummy model of an average female to reduce whiplash injuries

*Whiplash injuries occur frequently in traffic accidents and women are affected more often than men. In an effort to reduce whiplash injuries, an EU project called ADSEAT, coordinated by VTI, is being conducted. The project focuses on innovative seat design and in providing guidance on how we can best assess the effectiveness of a car seat in protecting both male and female passengers from whiplash injuries.*

**D**espite many attempts to reduce the occurrence of whiplash injuries, they are still the most common non-fatal consequence of traffic accidents. When it comes to injuries that lead to permanent disability, European insurance companies say that whiplash injuries account for approximately 70 per cent of their total costs.

Anti-whiplash systems exist today for passenger vehicles that can reduce the risk of injury in rear-end collisions. Even with the most recently developed anti-whiplash systems, the risk of suffering a whiplash injury is still higher for women than for men. One reason for this may be that the BioRID II crash test dummy used today for testing protection against whiplash injuries is based on an average male. In order to reduce the occurrence of injuries in both men and women, the project is focusing primarily on how factors such as gender affect the risk of being injured. During the ADSEAT project a computer model of an average female, called EvaRID, is being developed.

## Analysis carried out

The work being done in ADSEAT has already attracted the attention of both the automotive industry and authorities around the world. Since the ADSEAT project began in 2009, available data on whiplash injuries has been analysed with promising results. In ADSEAT a number of biological tests have been conducted. By studying dynamic

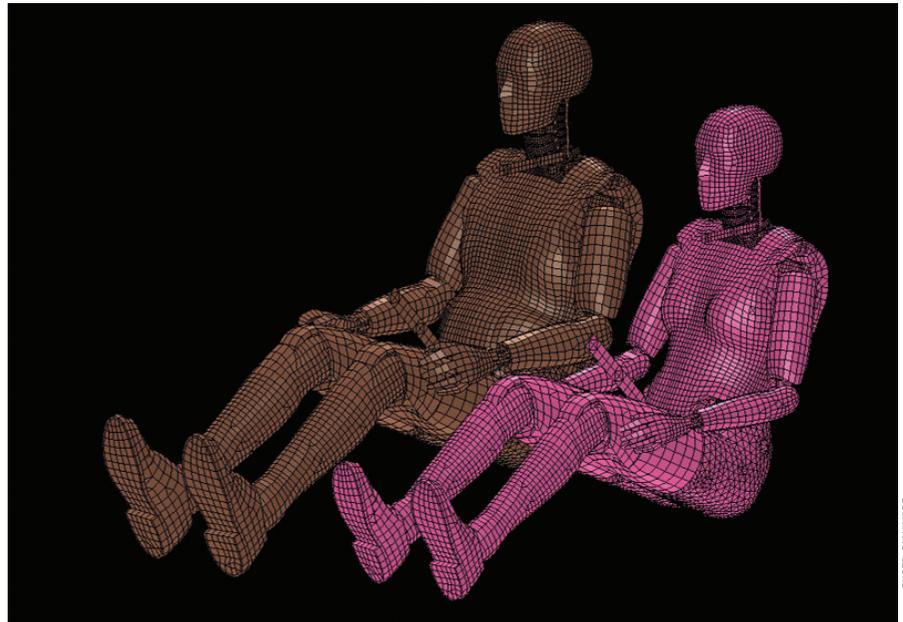


PHOTO: DYNAMORE

and proportional differences between men's and women's bodies the tests form the foundation for the continued development of EvaRID.

## Better evaluation with guidelines

In addition to EvaRID, interactive software is also being developed over the course of the project. This will be able to be used to demonstrate the mechanisms that take place in the body when a whiplash injury occurs. The software will also make it possible to show how parameters like gender and car seats affect the risk of whiplash injuries occurring.

For the individual car driver ADSEAT will give tips on what sitting position reduces the risk of injury in a low-speed collision. A number of guidelines and recommendations for evaluating car seats will also be drawn up. These will hopefully lead to seats in future having better built-in protection against whiplash injuries. Both for females and for males.

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# Pavement performance in the future climate

*The project “Pavement performance and remediation requirements following climate change” (P2R2C2) was completed in 2010 by a consortium of four partners: University of Nottingham in the UK, VTT in Finland, ZAG in Slovenia, and SINTEF/NTNU in Norway. The project was financed through the Era-net-road programme “Road owners coming to grips with climate change”.*

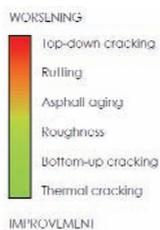


Inge Hoff, SINTEF, Norway

A few climate scenarios were used to predict how damages in pavements like rutting and different types of cracking were influenced. A major problem facing any project trying to look into the future is the uncertainty of the climate scenarios. Several scenarios exist based on different assumptions on CO<sup>2</sup> emissions in the future. Judging from the lack of progress in the international negotiations on emissions reductions it is probably best to use the most pessimistic scenario as the basis for predictions.

All of the scenarios agreed on increased temperatures, especially in central and southern Europe and increased rainfall in Nordic countries especially western parts of Norway. The temperature increase in the Nordic countries is moderate with only a few degree's increase in average maximum temperature.

Modelling performance for different climate scenarios using the M-EPDG showed a moderate increase in top-down cracking and rutting due to increased temperature. The effect of increased rainfall gave almost no change in the modelling. However, weakening of base layers is believed to be a problem, at least for roads where increased amounts of water can enter the pavement structure. Figure 1 shows how the different types of damages react to climate change.



*Figure 1 Impacts of climate change on pavements.*

Other negative effects of increased rainfall such as local flooding, increased risk of landslides, and more costly winter maintenance are likely to dominate the problems experienced with pavements.

Based on the research in the project, the following recommendations have been made:

- routine material formulations that can be employed at the next reconstruction/rehabilitation event

- adoption of new design criteria regarding temperature and return period of storm flows that now need to be developed (regionally specific)
- paying more attention to the efficiency of drainage systems, particularly to make them self-cleaning and easily inspectable
- resurfacing of ‘perpetual pavements’ with more rut resistant and stripping-resistant materials than originally planned – materials that are readily available at a minimal cost differential, and
- stabilization of many of the unsealed pavements in the mid and southern parts of the Nordic countries, or overlaying them with bound layers.

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# Safety effects of in-vehicle technologies



Virpi Britschgi, VTT, Finland

*If designed ergonomically and used appropriately, In-vehicle technologies (IVT) have the potential to enhance traffic safety. User-centered design and evaluation of systems in real traffic is important, especially because users report interacting with the systems although they have challenges understanding how they work.*

**S**ince cruise control and a speed limiter are typically part of a car's original equipment, differences in the car fleet correlate with the penetration of systems in

addition to driver age and annual mileage. Drivers typically reported setting the cruise control speed at or above the speed limit, which may increase the mean speed.

Most of the drivers favored entering the destination into the navigation system when the car was not moving, but one third did so while driving. More than half of the respondents reported using a cell phone while driving. Use of a cell phone while driving is expected to increase in the new aging cohorts. This may be of concern in the future.

Cruise control was considered to be mostly a comfort system and was seen to be most useful on motorways when the traffic density is low. Some drivers indicated concern over driver distraction or problems understanding how the system works. A speed limiter and speed alert were considered to be most useful in controlling the speed and improving traffic safety.

A navigation system was considered to be most useful when the driver is in an



PHOTO: VIIVAKATA KIRCHER

unfamiliar environment or lost. Some drivers were concerned about the reliability of the navigation system and difficulty understanding the system's functionality. Over 70 per cent of the respondents indicated that they avoid using a cell phone when in a complex driving situation.

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## One-camera system might be enough to measure eye movement

*Driving and operating a vehicle is to a great extent a visual task. It is therefore important in driver behavior studies to be able to measure where the driver is looking. Studies now show that using a one-camera system might be enough to get satisfactory results.*

**M**easuring eye movement can be done unobtrusively and remotely in real-time with camera based eye tracking. The most common remote eye tracking systems use multiple cameras in order to give satisfactory results. However, promising results using only one camera has recently emerged on the market.



In a study performed at the competence centre ViP (Virtual prototyping and assessment by simulation), eye tracking systems with one and three cameras were compared during various measurement conditions. The results indicate that both availability and accuracy are affected by many different factors. The most important factors are the number of cameras that is used and the angular distance from straight ahead.

In the central region (straight ahead) both one-camera and three-camera systems have a high degree of accuracy and availability. However, the results deteriorate with

increasing distance from the central region. This is an effect which falls harder upon the one-camera system.

Advantages with a one-camera system are that it is cheaper, easier to operate and easier to install in a vehicle. A multi-camera system will, on the other hand, provide higher availability and accuracy for areas that are far from the road centre. A one-camera system is thus mostly suitable for in-vehicle applications such as systems that warn drivers for sleepiness or distraction while multi-camera solutions are preferable for research purposes.

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**Link to the final report:** [www.nordicroads.com](http://www.nordicroads.com)

# School bus signs should be digital

*When getting on and off buses, passengers are exposed to risks from other traffic. Situations involving children on their way to and from school are particularly hazardous. When choosing signs for school buses VTI recommends signs with some form of movement since these catch the eye more than a plain symbol.*

**A**t the request of the Swedish Transport Administration VTI conducted a study with the purpose of designing a sign that is



PHOTO: VTI/HEIDOLSA BILDER

conspicuous, understood and respected. Based on the findings from the study VTI recommends that signs with some form of movement should be used since these can be seen most clearly. A digital sign can probably be designed so that it has the same,

or better, detection and readability as a traditional school bus sign.

The result from the findings should be investigated in a further study of digital signs that have high contrast of brightness and colour against the background. Most truly the respect of passing vehicles will improve if they know not only what to look for but also what to do (drive 30 kilometres per hour).

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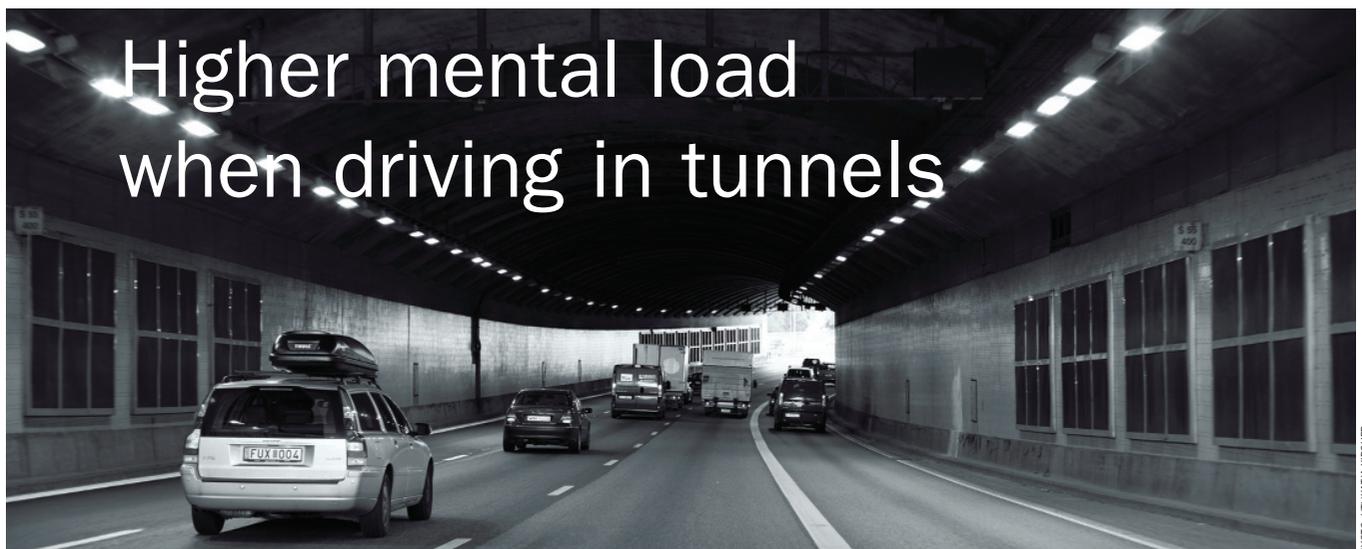


PHOTO: VTI/KATJA KIRCHER

*Some people think it is unpleasant, others get bored. Perceptions of driving in tunnels vary and their design affects drivers in different ways. ITS measures can contribute to increased safety.*

**C**hristopher Patten, one of VTI's researchers, has made a simulator study to investigate how a tunnel's design affects driving behaviour.

– Driving through a tunnel is different,

he says. Sound, light and visibility differ from normal roads and the margin for error is smaller. Accidents can have greater consequences and tunnels can be difficult to evacuate.

Katja Kircher, also a researcher at VTI, has investigated how ITS measures can contribute to counteract monotony and tiredness, effects that driving in a tunnel can have on drivers. In a literature review she has found that very little is known about driving behaviour in tunnels. Different situations probably need different measures. Research concerning car drivers is generally about what happens

when they are overloaded, not when they are understimulated.

– Drivers must be allowed to be human and care about things that in fact are not important. Technology must help them to notice the right things at the right time.

*Eva Abrahamsson, Textproduktion, Sweden*

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# The power of myth

## Do yesterday's truths form the basis for today's transport policy?

*The field of transport research has gone through major changes over the last four decades. Centrally, the idea of roadway expansion as a means of relieving traffic congestion in urban areas has largely been abandoned by the scientific community. Why then, do politicians still see road building as a solution to urban traffic problems? Is modern transport policy based on outdated truths?*



Eivin Winsvold, Human Geography, University of Oslo, Norway

There is no longer any lack of climate-friendly ambitions in the transport sector in Norway. Politicians, planners and researchers all seem to agree that emissions from transport must be cut, and there also seems to be a common understanding of how this goal could be achieved.

Despite this apparent consensus, politicians still, in many cases, lead a policy that provides for future growth in traffic, and therefore increased greenhouse gas emissions.

Oslo Package Three, the largest infrastructure investment in Norway to date, is a good example of a project that increases capacity for vehicular traffic, thus allowing for more cars on the roads. Politicians in Oslo and the neighbouring county of Akershus defend the package by emphasizing that a large portion of the money will be dedicated to improve public transport, and they thus attempt to sell the package as an environmentally friendly transport plan for the future. Transport researchers, however, are less impressed with the environmental profile of the package, and condemn the package as an "environmental disaster" and "one gigantic plan for road construction and private car transport". How can it be that experts and politicians have such different views of the same plan?

One possible reason for the discrepancy

between politicians' and researchers' opinion of the Oslo Package Three, may be that the two groups perceive important notions within the field of transport differently. Interviews conducted with the politicians behind the Oslo Package Three as part of the work with my thesis support this hypothesis. Several of the politicians I interviewed believe, for instance, that increased capacity on the European Route E18 west of Oslo will relieve congestion in the Oslo area, and they do not fear that adding more lanes will increase traffic volumes. Former commissioner of transport in Oslo City, Peter N. Myhre of the Progressive Party, says it this way:

"Transport researchers need to get out in the real world. There are many cases in which expansion of road capacity has solved the problem."

Several of the politicians express skepticism about the validity of professional transport research. When a critical report on the Oslo Package Three was released in 2007, Peter N. Myhre's suggestion was "to put the report in a drawer, close and lock the drawer, throw away the key and move on as planned". Progressive Party member Jøran Kallmyr, successor to Myhre as Commissioner of Transport in Oslo, agrees that the critical report should be locked down in a drawer. He argues that the scientific community, especially the Institute of Transport Economics (TØI), co-author of the report in question, follows its own agenda, and thus can not be trusted to provide politicians with professional advice:

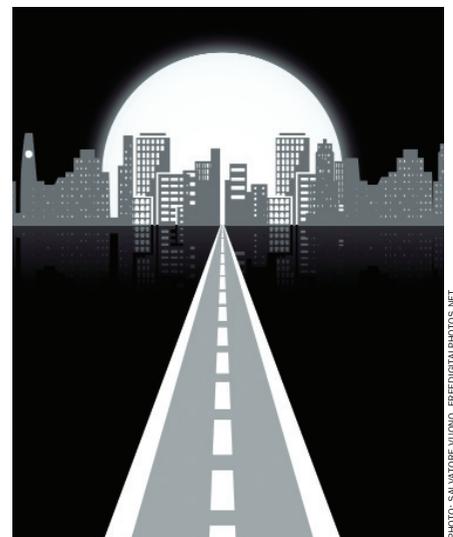


PHOTO: SALVATORE VUONO, FREDIDIGITALPHOTOS.NET

*A highway to the future? Or a blast from the past?*

"The Institute of Transport Economics [...] are acting very politically. They have a philosophy that calls for restrictions [on private cars]."

Though there have been major changes in the field of transport research in recent decades, these changes do not necessarily have implications for how politicians think about transportation. Old myths are surprisingly long-lived. As Norwegian playwright Henrik Ibsen says: "There is no victorious power in being right" (The Pretenders, 1867).

**More information and link to publication:**  
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