NORDIC

ROAD AND TRANSPORT RESEARCH | NO.3 | 2009

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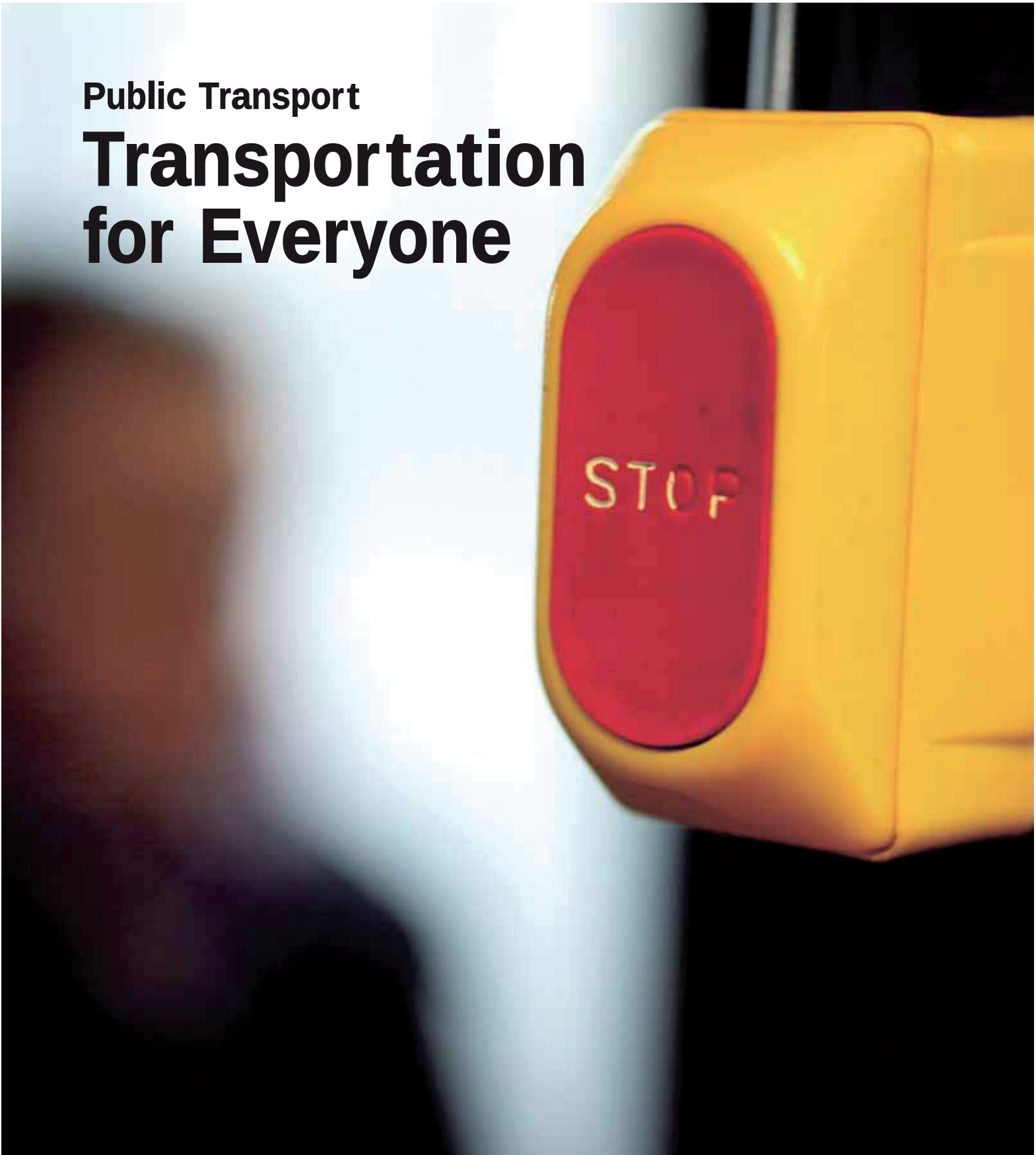
Public Transport

Transportation for Everyone



News from

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 three 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.

Correspondence about the contents of the publication:

Please write to the author or to the respective publishing organisation.

Requests for back issues, and notification of address changes:

Readers outside the Nordic countries: please write to the Editor-in-chief at the VTI in Sweden.

Readers in the Nordic countries: please contact the publishing institution of your country.

Addresses: see back cover.

Graphic Design
Johnny Dahlgren Grafisk produktion AB, Linköping, Sweden

Issue 3,900

ISSN 1101-5179

Cover
Photos.com

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HMAT Workshop 2010

Human Modelling in Assisted Transportaion
June 30–July 2 2010, Lake Maggiore, Italy

First HMAT 2010

As co ordinators of the European project ITERATE, VTI has the pleasure to invite you to the HMAT (Human Modelling in Assisted Transportation) Workshop. HMAT is a three day Workshop sponsored by the European projects ISi-PADAS, ITERATE and HUMAN, which belong to the Seventh Framework Programme and are partially funded by the European Commission.

In modern society, the human being is considered the central element of the design process, as well as the major source and contributor to accidents. Therefore, the human error modelling has to be implemented into design processes and in safety assessments of innovative technologies to ensure the appropriate consideration of human factors in highly assisted systems.

To this end, the projects ISi-PADAS, ITERATE and HUMAN will provide, in different domains, an overall model of the joint cognitive systems, represented by the human in control, the governed machine and the working environment. This model will be able to provide an improved understanding of the human factor and to predict performance and behaviour of the human and interaction with innovative technologies in normal and emergency situations, for all the surface transport modes and for cockpit environments. Moreover, the implementation of the model of human error in a design perspective can be integrated in risk-based approaches that enable to assess the consequences of erroneous behaviour and to develop appropriate countermeasures.

The objective of this Workshop is to confront models, methods and tools developed within the projects with the ongoing research worldwide and to provide an environment for fruitful exchange of ideas.

Read more: www.hmat-ws.eu
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magnus.hjalmdahl@vti.se

RS4C 2010

Road Safety on Four Continents
22–24 March 2010, Abu Dhabi, the United Arab Emirates

Together with the United Arab Emirates National Transport Authority we have the pleasure of inviting you to the 15th International Conference "Road Safety on Four Continents" in Abu Dhabi.

The conference is organized by the Swedish National Road and Transport Research Institute (VTI), together with the National Transport Authority of UAE. The conference is supported by GRSP (Global Road Safety Partnership), FERSI (Forum of European Road Safety Research Institutes), TRB (Transportation Research Board) and ECTRI (European Conference of Transport Research Institutes).

The main objective of the conference is to explore emerging research and development in the area of Road Safety. Other objectives are furthering the application of research results and involving developing countries and countries in transition to join in both as conference presenters and delegates. A special emphasis will be towards road safety challenges and problems in the region, i.e. in and around the United Arab Emirates.

The conference topics and themes will attract the international research community, national safety experts, decision makers, road safety engineers and planners, traffic law enforcement officials and many others with an interest in road safety development.

Main themes of the conference are:

- Exchange of new findings on road safety
- Transfer of road safety knowledge
- Exchange of evaluated good practises.

Read more: www.vti.se/RS4C
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Dear Subscriber of the Nordic Road & Transport Research

Through the magazine we wish continuously to supply you with the latest results of the Nordic transport research. Now we would greatly appreciate if you could help us to define the best current way to do it by filling this **Reader Survey.**

This year it is exactly twenty years since Nordic Road & Transport Research was published for the first time. A lot of research done in the Nordic countries in the field of transport during these years has, through the magazine, reached out to readers all over the world.

As you know, the magazine is published as a paper issue as well as on the website nordicroads.com. We now wish that you could let us know which way of publishing you value most by answering the reader survey you will find on the website

nordicroads.com.

Please, take some minute or two and let us know your opinion! Thank you!

The editorial board of the Nordic Road & Transport Research

Dr. Krishna Prapoorna Biligiri – guest researcher at VTI from the United States

Krishna Biligiri started as a guest researcher at VTI in the beginning of October. He will, in collaboration with other VTI researchers, work on a European Union directive project PERSUADE (Poroelastic Road Surface: an Innovation to Avoid Damages to the Environment). Krishna Biligiri will assist VTI in the development of poroelastic road surfaces by implementing and conducting mechanical and durability test procedures in order to optimize the composition and the overall performance of the poroelastic road surface materials. He will also work on characterizing pavement noise of these materials. Apart from the aforementioned tasks, he will act as a VTI team member and contribute to any needed work within his expertise.

What did you do before you came to VTI?
Since January 2009, I have been working as a Research Scientist at Arizona State University (ASU) in the United States of America. Over the last five years, I have worked on several asphalt pavement modification projects including asphalt rubber and fiber-reinforced asphalt concrete. I am an active committee member of several professional organizations such as the Transportation Research Board, American Society of Testing and Materials, and Rubber Pavements Association. Since November 2008, I have been an Executive Fellow and lifetime member of the International Road Federation.

What education do you have?
I gained a Ph.D. degree in civil and environmental engineering from ASU with the emphasis on advanced pavement material characterization and tire/pavement noise. I also have a Master's degree in civil and environmental engineering from ASU and a Bachelor's degree in civil engineering from Visvesvaraya Technological University, India.

What are your thoughts about your new job?
It is a privilege and lifetime opportunity to work at VTI! I am very grateful to those at VTI whose untiring efforts have brought me to this place. The VTI facilities are stupendous and world class and the people here are friendly, smart and competent.

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Smart Card Ticketing in Trondheim Delivers Substantial Benefits to Society

PHOTO:ANNE MARI NORHEIM, NPRA, NORWAY

Systematic evaluations of smart card ticketing systems for public transport are few and far between. A cost benefit analysis of a recently implemented smart card system in Trondheim reveals a net present value in excess of what traditional road projects normally deliver. Intelligent transport systems such as smart cards can deliver huge benefits to society and often at a fraction of the costs of other transport investments.

Morten Welde, NPRA, Norway

Electronic ticketing on public transport based on smart cards is gaining momentum worldwide. The implementation of smart card systems is, however, a complex process that includes legal, economical and technological issues. It is widely recognised that smart cards can deliver benefits for public transport operators, but due to its complexness implementation can come at considerable cost. Therefore, it is more than likely that a commercial appraisal from the perspective of the public transport operator will reveal costs higher than benefits and hence economic non-viability.

However, very few, if any, investments in public transport are profitable from a pure commercial perspective. Investments are motivated by the positive externalities generated by the service, the potential for user scale economics (often referred to as the Mohring effect) and the alleged public good characteristics of public transport. When deciding whether or not to implement smart card ticketing systems we should hence evaluate the investment from a social perspective, that is, quantify costs and benefits to society as a whole following the principles of social cost benefit analysis.

The Norwegian city of Trondheim has recently implemented a fully interoperable electronic ticketing scheme (t:kortet). After one year of operations, the NPRA has carried out a cost benefit analysis of the scheme focusing on net overall benefits deriving from effects on passengers, bus company, local transport authority and the rest of society. The main benefit for bus passengers from smart cards is time savings from time saved boarding buses and paying for tickets. Although a small time saving for the individual, all passengers already on the bus will save time at every stop when passengers pay using smart cards so total time savings for passengers are significant and constitute 60% of estimated total benefits. This is an example of user scale economics. Further passenger benefits include increased time table reliability and reduced need for cash. The bus company is benefits from reduced delays and increased reliability because of less time is spent at bus stops. This could allow the bus company to reduce the number of buses or increase the service level to passengers.

The analysis of NPRA shows that the smart card ticketing system in Trondheim delivers a positive net present value of 90 million Norwegian crowns or a benefit cost ratio of 1.05, meaning that 1 Norwegian crown invested in the smart card system will deliver a benefit to society equal to 2.05. This is higher than what is usually provided through traditional transport expenditure and reassuring to those that have questioned the success of the system after some start up problems. Since we have applied conservative estimates throughout and a predicted lifespan of only ten years it is likely that our analysis errs on the pessimistic side and that the net benefit is likely to be higher.

Contact: Morten Welde, NPRA. E-mail: morten.welde@vegvesen.no

Read more (only in Norwegian): Welde, M. (2009): Samfunnsøkonomisk nytte av elektroniske betalings- og billetteringssystemer. Statens vegvesen Vegdirektoratet, Teknologiavdelingen. Teknologirapport nr. 2568.

Safe School Transportation in New EU project

SAFEWAY2SCHOOL is an EU project within the 7th framework programme. The project started in September 2009 and is scheduled to end in August 2012. The aims are to design, develop, integrate and evaluate technologies for providing a holistic and safe transportation service for children, from their home door to the school door and vice versa, encompassing tools, services and training for all key actors in the relevant transportation chain.

Helena Sederström, VTI, Sweden

SAFEWAY2SCHOOL includes optimal route planning and rerouting for school buses to maximize safety, on-board safety applications (i.e. for speed control and seat belts), "intelligent" bus stops, effective warning and information systems for bus drivers, children, parents and the surrounding traffic; as well as training schemes for all actors.

Between 1994 and 2001, 361 children were injured or killed during transportation to/from their school in Sweden, whereas 455 were killed or injured in Austria only in 2007, and 97 were killed in Italy in 2005.

In a single school bus accident in Greece in 2003, 20 children lost their lives. Different as the above numbers may be, they all tell us one thing: Crashes involving school buses and crashes involving children travelling to and from school are far from negligible and require further efforts to be drastically reduced.

The project's innovative systems, services and training schemes will be tested in four sites in Europe, including northen (Sweden), the central (Austria), the south (Italy) and the eastern (Poland) Europe concerning the evaluation of usability, efficiency, user acceptance and market viability at the same time taking into account the very different ways to transport children to and from across the different European regions as well as key cultural and socio-economic aspects.

To visualize parts of the system and the basic idea behind a pre-pilotstudy using an onboard system for navigation, route guidance, information about children and communication between the bus, bus stop and child has been done in Sweden.

PHOTO: VTI/HEJDLOSA BILDER

For more information:
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Read more:
www.saferider-eu.org/safeway2school

Technology Improves School Transport

Existing technology is used to improve routines for children during travel on school transport and to make it easier for the bus drivers to detect dangerous situations and prepare themselves for these.

Magdalena Green,
VTI, Sweden

In Sweden Every day, about 400,000 children travel to school with the school transport service. Crash statistics show that, generally speaking, safety is good in spite of the fact that one or two children are killed every year in conjunction with school transport. The most risky situation is when the children are outside the bus. One contributory reason may be the lack of routine. In the project Smart, safe school transport, existing technology is used to increase the degree of routine and to make it easier to improve the safety and security of school transport journeys for the children.

Driver support systems

In the project, a driver support system has been developed which increases the degree of routine, makes it easier for the driver to detect dangerous situations and to communicate with the children during the journey. The system is made up of already existing technology; it is only new ways of using these that have been found.

The technical support system is designed with reference to a “door to door” journey perspective, i.e. a holistic approach. The system comprises navigation along the school transport routes, information about the children, and the names of children who will join and leave the bus at different stops. The buses have also been fitted with technical equipment “tag” to establish communication between the children and the bus/bus stop, but also to make sure that safety belts are used and to increase facilities for keeping an eye on the children inside and outside the bus.

With the focus on the whole journey perspective and the situations when the children are vulnerable road users, two workshops were arranged. At one of these, there were discussions with firms in the school transport branch in order to devise the best possible functions for this type of driver support system. The other was attended by experts in the field and resulted in a selection of components to be included in the driver support system.

The system is based on a vehicle computer with a vehicle mounted navigation system and a communications network between the children, the bus and the bus stop. The network consists of three components; an "electronic reflector-tag" which the children wear, a communication sensor in the buses and a newly developed warning system at the bus stops.

Tests on the system

Two buses were fitted with the new system and two bus stops were equipped with flashing lights. The journeys and the bus stops of a total of 130 children were loaded into the system. The children were given transmitters, “tags”, to enable communication between child and bus, and also between the children and the bus stops. The two buses used in the test were driven normally by two regular drivers, and also systematically by five relief drivers.

The system was in operation in the town of Kristianstad in 2008 and was then evaluated in the form of discussions with focus groups and interviews with the children and the drivers, as well as diary studies made together with the drivers. Speeds were also measured before and after the installation of the flashing lights at the bus-stops.

The perceptions of the drivers regarding the use of the driver support system showed that the technical systems included

PHOTO: AMPARI SOLUTIONS

in the experiment were used and found useful, and increased the degree of routine, and that the technical solutions had given the drivers a greater opportunity to detect dangerous situations and to prepare themselves for these. The descriptions by the children also confirm that the system had increased their feeling of security. Speed measurements showed that flashing lights at the busstops significantly reduced the speed.

The objective of the project has been achieved, but several matters remain to be solved. What is probably most important is that a single solution is not sufficient, but a holistic approach must be adopted. A driver support system, however good it is, will not provide its full benefit unless the drivers, children, parents and municipal staff are trained at the same time in order to enhance their awareness of road safety, and give them a greater understanding of the needs and conditions of children.

Contact: Anna Anund, VTI, anna.anund@vti.se
Read more: Smart Safe School Bus, a pilot study in Kristianstad, VTI publication R649

PHOTO: VTI/HEJDLÖSA BILDER

New Forms of Payment for the Provision of Public Transport

A starting point for a recent project regarding the forms of contracting for the provision of public transport was to examine the conditions for a trial on increased delegation of the pricing and planning of public transport. The hypothesis was that an agreement that provided greater freedom of action would provide incentives for the operators to promote a development towards a higher degree of goal attainment.

Roger Pyddoke, VTI, Sweden

One way of designing such an agreement is to give the operator, within a "net agreement" framework, freedom of action within specified limits to set prices and to design the service with respect to route, time table, etc.

– We believe that a net agreement, depending on how it is formulated and on the undertakings made by the public transport authority, can provide a driving force for such a development, says Roger Pyddoke of VTI.

– The term net agreement refers to a contract where the operator retains the ticket revenue and possibly receives a certain additional grant to operate the traffic. The operator therefore submits a tender corresponding to the grant or to the total costs of providing a certain service, less the ticket revenue.

If costs exceed revenue, the operator thus submits a bid corresponding to the cost required to make ends meet. A gross agreement, on the other hand, is an agreement where the ticket revenue is transferred to the principal and where the bid represents the total cost of providing a certain service, i.e. the gross cost.

Using data for the 1997–2005 period, VTI compared bus transport in 18 mid-sized Swedish towns. The analysis demonstrated that in towns with net contracts, ticket prices were on average higher and the number of trips was smaller than in towns with gross contracts. Both total costs and subsidies were, however, lower in towns with net contracts than in towns with gross contracts. In addition, a regular user survey, Kollektivtrafikbarometern, indicated that users were more satisfied by the services in towns with net cost contracts.

The research does therefore not corroborate the hypothesis that net cost contracts provide stronger incentives to achieving public transport authority objectives. The empirical support for drawing policy conclusions is, however, weak with respect to the number of observations and the number of parameters which can not be controlled in the analysis. The project has therefore also suggested a framework for implementing a trial for testing these issues in a systematic way.

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Jan-Eric Nilsson, VTI, jan-eric.nilsson@vti.se
Read more: New contract forms in public transport, VTI publication R625

Pedestrians in Danger

PHOTO: VTI/KATJA KIRCHER

The public is encouraged to use public transport since this has a positive influence on both the environment and road safety. But the route to reach public transport may be full of risks. Almost 30,000 pedestrians were injured and reported by hospitals to a national database between 2003 and 2008.

Magdalena Green,
VTI, Sweden

In order to safeguard the "whole-journey perspective", it is important that the road user should be able to reach public transport in a safe and convenient way, whether on foot or by bicycle. Many factors influence the choice of the road user whether to walk or cycle, and whether the transport will be safe.

The standard of the road surface has great importance for the choice to walk or to cycle the whole journey or parts of this. A large proportion of the injuries reported can be attributed to insufficient maintenance, such as slippery conditions or potholes in the road. VTI has therefore initiated a project which studies the risk of injuries to pedestrians, with the focus on the importance of maintenance. The project will study the 30,000 injured pedestrians registered over the period 2003–2008 in STRADA, the database in which the police and hospitals register accidents.

Statistics show a clear difference between men and women regarding injured pedestrians; as many as two thirds of those injured are women. The cause of this difference has not yet been investigated. One explanation may be that women walk more than men, but it is not part of the project to examine exposure data.

The project will continue during the whole of 2010.

Contact: Gudrun Öberg, VTI, gudrun.oberg@vti.se

The AKTA Project: Facilitates Everyday Life for Visually Impaired Persons

On the express bus in the county of Møre og Romsdal, north western part of Norway, a project called AKTA has been conducted. The main objective of the project was to make it easier for visually impaired persons to travel with public transport. By the use of a real time system for buses and mobile telephones among the users, the visually impaired persons are ensured to get on board on the correct bus departure and off at the right bus stop.

Steinar Simonsen, NPRA, Norway

AKTA is in Norwegian an abbreviation for "Attraktiv Kollektiv Transport for Alle" (English: Attractive Public Transportation for All). Phase 1 of the project, which was conducted in 2007, has been a joint venture project between the Norwegian Association of the Blind and Partially Sighted, NPRA, the County of Møre og Romsdal, the Traffic Information Agency in Møre og Romsdal, SINTEF, AB Thoreb and Nettbuss AS. The Research Council of Norway has heavily contributed by funding the project. The project was divided into a phase 1 with the pilot installation in the county of Møre og Romsdal and a phase 2 with a recommendation for adjustment for urban traffic.

Surely everybody travelling with public transportation waiting for the bus has been wondering when the bus will arrive or if it has already passed. Real time information on monitors at the bus stop and messages on the mobile phone will communicate the demand for information. But what about the blind and weak-sighted? How shall they get hold of this information and how shall they manage to stop the right bus at the busstop?

The AKTA project aimed for solving this problem. The starting point was a real time service which had been available on the express buses in the county of Møre og Romsdal since 2006 where 12 buses, with a real time information system delivered by AB Thoreb, were operating the 200 km long distance between the cities of Volda, Ålesund, Molde and Kristiansund.

This is how the system works:

1. The traveller gives a message by the web or SMS to the real time system about a wanted trip with the express bus from a particular bus stop at a certain time of departure, and how many minutes before (i.e. 10 minutes) arrival the real time information is wanted.
2. When the bus is approaching the bus stop, the real time information will be sent to the traveller's mobile phone in accordance with the order.
3. Additionally the passenger who has required assistance gets a SMS for instance two minutes before the bus arrives. At the same time the real time system sends a message to the driver of the bus that a person in need for assistance will enter the bus at the relevant stop.
4. As an additional service AKTA can send a SMS to the passenger two minutes prior to the arrival at the destination.
5. The bus driver will also receive a message two minutes before a person who wants assistance is going to leave the bus.

In phase 2 of the project SINTEF has looked closer into details about what information is relevant to communicate, how the information should be presented and time of transmission based on the need of different users when the AKTA functionality for use in town areas is introduced.

Also in this phase of the project there has been a close co-operation with the organizations of the disabled. One of the recommendations is that need for assistance messages to the driver can, by misuse, constitute a vulnerable part of the concept.

The test person makes the reservation.

Message to the driver about traveller in need for assistance.

Message about bus arrival on the mobile phone.

Contact established between the weak-sighted and the driver.

PHOTO:

This is, at the same time, very important for some user groups. And so one should consider the establishment of a database where a person must be registered as user (simply with the mobile telephone number) before the system executes a reservation for assistance message. The system can also be useful for other users than the visually impaired.

The AKTA test in the county of Møre og Romsdal gave the visually impaired the necessary safety to get on the correct bus. In particular this aspect will be important by the transfer of the project to urban traffic where many bus routes are using the same stop. In the delivery of real time information and traffic signal priority for the public transport, which will be introduced during 2010, a demand for this functionality is included.

Contact: Steinar Simonsen, NPRA.
E-mail: steinar.simonsen@vegvesen.no
More information (only in Norwegian):
SINTEF- rapport, arkivkode 50350303. AKTA-evaluering av demonstrator
SINTEF- notat, prosjektnummer 50350307.
AKTA – sluttføring av assistansemeldinger

Road Pavements and Fuel Consumption

With the increasing focus on energy consumption and therefore on CO_2 emissions, NCC Roads, The Danish Road Institute and Dynatest International have cooperated on finding possibilities to reduce energy consumption from road transport, this has been done by looking at pavement technology, new material types, mix designs, paving techniques and new requirements for functional and structural properties.

By Bjarne Schmidt Danish Road Institute, Per Ullidtz, Dynatest International, Birgitte Eilskov Jensen NCC Roads

The energy consumption to move vehicles forward is basically used to overcome the internal friction of a vehicle, its aerodynamic resistance and rolling resistance. Of the three major components to overcome, rolling resistance consumes a significant amount of energy.

If one looks at the components that cause rolling resistance, deformations in the tyre carcass, tread and side walls, deformations in the tire material from the pavement surface and finally deformations in the road pavement itself are the parameters that need to be investigated.

The different components' contribution to the total rolling resistance depend on numerous things such as the tire construction and the materials used, the road pavement's evenness and texture as regards functional requirements and the stiffness of the road construction as regards structural requirements etc. There is no doubt that both evenness and texture have a significant influence on the rolling resistance. Several investigations have shown that an optimisation of these parameters will contribute to a reduction in CO_2 emissions for the road transport.

However, the influence of structural properties on rolling resistance is a continuing subject for discussion, and the question whether a stiff concrete pavement will provide a significantly lower rolling resistance than a softer and more flexible asphalt pavement needs to be investigated.

In the study, the influence of different parameters on rolling resistance was investigated. Special tests using a Falling Weight Deflectometer (FWD) were performed by NCC Roads, Dynatest International and The Danish Road Institute on a newly constructed motorway in order to analyse the influence of pavement stiffness on rolling resistance. The FWD tests were carried out in such a way that the complete loading and deformation cycle in the centre of the loading plate was recorded as shown in figure 1.

The energy loss may be determined by plotting the force against the deformation as shown in figure 2. The area of the hysteresis between the loading and unloading phase of the test determines the energy loss from that particular pavement.

The energy loss determined from a FWD test is not directly comparable with rolling resistance. The real rolling resistance is believed to be approximately 70 – 80% of the maximum energy loss determined by the FWD test. Under a rolling wheel, the pavement is already deformed in front of the wheel. In order to investigate the possible influence of different structural properties and pavement materials on the

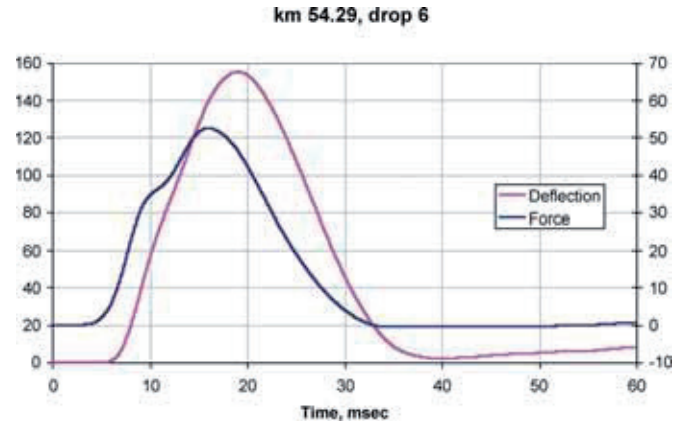

Figure 1

PHOTO: PHOTOS.COM

energy loss and hence rolling resistance, several FWD test were carried out on pavement sections on a freeway in Denmark in late summer 2009. The pavements included a normal asphalt pavement structure, a so-called high modulus pavement and a pavement with a cement stabilised bearing layer.

The conclusion of the tests is that the part of the rolling resistance influenced by the deformation in the pavement seems to be very limited and therefore the effect on energy consumption which can be obtained by using stiffer pavements is also very limited. The test showed that even if the contribution from the deformation on rolling resistance was completely eliminated, the maximum reduction on the complete rolling resistance would be less than 4% for trucks and a significantly lesser contribution when looking at passenger cars.

For pavements with very low structural capacities, it is anticipated that a larger proportion of the rolling resistance can be related to the pavement structure and perhaps add up to 20%. The partners in the project therefore believe that the primary effort to reduce rolling resistance and hence CO_2 emission and energy consumption shall be targeted towards the functional properties of the pavement such as evenness and texture.

Within a few months, the three partners in the project will publish a report on the results obtained.

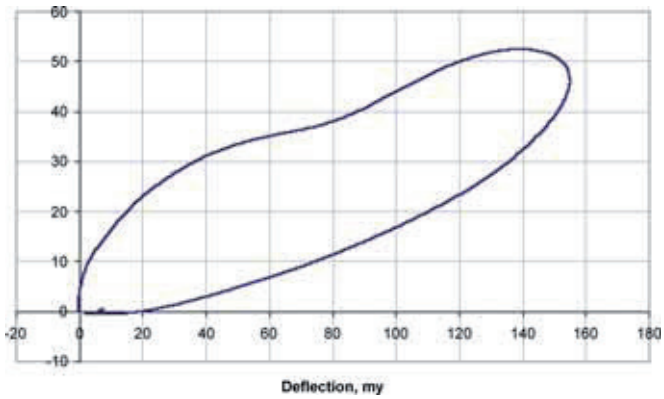

Figure 2; Hysteresis curve

Child Pedestrians' Quality Needs

Cost 358 is to present a handbook on Pedestrians' Quality Needs in 2010 for all age groups. The main objective is to provide knowledge of pedestrians' quality needs and how these needs relate to structural and functional interventions, policy making and regulation to support walking conditions across the EU and other interested countries. The framework for child pedestrians' quality needs is summarised below.

Charlotta Johansson, LTU, Sweden
Lars Leden, VTT, Finland

The quality needs of children are strongly linked to their age. Toddlers are at risk on driveways and in other relatively protected areas, since they are drawn to moving vehicles rather than avoiding them (Schieber and Thompson, 1996). Children from the age of 18 months have the ability to fantasise and the physical ability to escape from their surroundings.

It is widely accepted that pre-school children cannot experience a viewpoint or attitude other than their own. If children can see someone else, such as a car or driver, they tend to think that the other person can see them even though they may be standing between parked cars. Midtland (1995) and Schieber and Thompson (1996) argue for a break point at 6 or 7 years. The difference between that age group or younger compared with older children is considerable in terms of [safe] road-user behaviour. The difference is assumed to depend largely on deficiencies in attention and cognitive abilities, rather than on inadequate perception. There can be significant differences between the behaviour of children when they cross a street at a pedestrian crossing (MacGregor, et al, 1999).

PHOTO L LEDEN.

Already during their earliest years children develop the motor skills that enable them to run and jump.

The next stage lies between age 7 and the teens (Schieber and Thompson, 1996, Connely et al, 1998 and Arnold et al, 1990). At this age, children examine the environment logically and grow accustomed to forming hypotheses about it. Such skills can be used to recognise dangerous situations, but children's behaviour becomes inconsistent because they are still learning how the traffic environment works. In their teens, people become able to think in abstract terms and understand events even though they themselves have not experienced them. It then becomes possible to consider a vehicle's speed and distance simultaneously. Cognitively, crossing the street is a difficult task, and children have not developed the necessary capabilities before the age of 11 or 12. Children under 12 have difficulty estimating the direction, speed, and distance of vehicles in motion (Piaget 1969, von Hofsten, 1980 and 1983, Leden, 1989, Foot et al, 1999, and MacGregor et al, 1999). As early as 1969 Piagets suggested theories that children make decisions that lead to dangerous road-user behaviour because of their inability to understand the connection between time, speed and distance. Therefore, the tendency of children to run out in front of cars can make sense in the child's conceptual world (Cross, 1988).

Younger children accept the same distance gaps when crossing a street in front of cars travelling towards them irrespective of the speed of the cars (Connely, et al, 1998), i.e. children assume shorter time intervals when the vehicle speeds are higher, and longer time intervals when the speed is lower. Most children make 'safe' assessments when vehicle speed is low, but not when the speed is high. One conclusion is that children younger than nine cannot make safe assessments of time intervals to vehicles in traffic. Similar results were produced by Demetre and Lee (1992), with children choosing shorter time intervals than adults; however, children also missed more safe time intervals, so that in some cases children were more careful than adults.

PHOTO L LEDEN.

A 5th grade pupil thinks it is dangerous to use the pedestrian crossing at the intersection because "You feel all dizzy."

Children's ability to choose safe ways to cross a street, i.e. their assessment of safe routes or places to cross a street, also increases with age (Ampofo-Boatang et al, 1993, Lee et al, 1984). Younger children do not understand, either, that an obscured view of

cars is less safe for crossing the street (Demetre and Gaffin, 1994).

In the early eighties Von Hofsten suggested that children's development as road users depends on their absorbing more information about their environment over time, so that the information flow gives guidance about what is required as a road user. Moreover, young children lack experience of crossing streets and therefore cannot do so safely, since they do not know what to watch out for in traffic (Foot et al, 1999).

The ability of children to cross a quiet street, cross a street with parked cars, and cross a street at an intersection improved after training (Rothengatter, 1984, Van Schagen 1988). However, research has shown that training children is not clearly linked to their true behaviour in real traffic, nor what behaviour can be considered to be safe, or regarded as undesirable, in traffic. Training children to be in traffic can give them better knowledge about how to cross a street safely, for example, but does not mean that their behaviour will improve in terms of acting more safely. Nor can it be established that training leads to a blind faith in the person's ability and thus to new dangers. An alternative possibility may be that it is important to train children in safe road behaviour. It is suggested that what children need is practical knowledge instead of descriptive knowledge.

Car drivers bear the responsibility for child safety in traffic, along with the children's parents. It is motorists' inadequate knowledge and anticipation of how children can react that constitutes the threat to child safety, so it is the drivers who should apply strategies for driving safely on roads where there are children. With the right arrangements, education of children can be seen as a component in preparing them for traffic, but that does not mean that we can trust the results of the training. The traffic environment should be designed and regulated so that motorists can take greater responsibility. Pre-school children should not encounter cars in their playing and walking areas. In exceptional cases, they can interact with vehicles travelling at a maximum speed of walking pace. Children aged 7–12 years should not cross at locations where vehicle speeds exceed 15–20 km/h. For older children the same principles apply as for adult unprotected road users: they should not cross at locations where vehicle speeds exceed 30 km/h. This applies to routes to school, to the homes of friends and to other leisure activities. However, measures other than low speed are needed to fully meet the needs of children.

Source:
http://www.ltu.se/forskning/1.16009?l=en&pureId=2135427&pureFamily=dk.atira.pure.families.publication.shared.model.Publication
and http://www.walkeurope.org/
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Østre Tangent – Connecting Bjørvika to the Inner City

When a harbour area occupied with traffic and container-ports is to be transformed to a vibrant new neighbourhood, with 5,000 new living-spaces, 20,000 new work-spaces, the main library and some of the city's largest tourist-destinations, new routes and roads are needed to serve the neighbourhood's new transport needs. One of those, the Eastern Tangent, will span over the track-area east of Oslo's central station.

Johanne Solheim, NPRA, Norway

The Eastern Tangent (directly translated from the Norwegian, Østre Tangent) is a steel-truss bridge which will span 158 metres over the track-area east of Oslo's central station. The bridge will connect the new Bjørvika with the inner city and contribute to traffic reductions in the new Bjørvika.

The Eastern Tangent will be built using elements which are to be launched out on two permanent and two temporary foundations in the track-area. In order to disturb the train traffic as little as possible, this will go on at night. The elements are currently under production in the Netherlands, and will be transported to Bjørvika by sea in the early months of 2010.

When completed, both the permanent foundations and the steel-truss elements will support the traffic load. This solution was chosen to minimise the need for foundations and construction work in the busy rail grounds. A reinforced concrete construction would have needed four foundations in the track-area, whilst a steel-truss construction only needs two.

The bridge has two individual parts. To the east there is a lane for pedestrians and cyclists, to the west a three lane road for regular traffic. The highest point of the steel construction will be 35 metres above ground.

The project is modelled using 3-D technology, a first for the Norwegian Public Roads Administration. When the bridge is completed there will also be a 3-D, "as-built" model to look back upon.

The bridge will open by the end of 2010, and come as an addition to an existing bridge over the track-area, and a pedestrian bridge that is currently under construction.

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http://www.vegvesen.no/Vegprosjekter/Bjorvika/In+English

The ITS Scheme for Low Emission Zone in Norway

Norwegian Public Roads Administration has created a bill and a proposal for a Low Emission Zone scheme for Norwegian cities. The limit given by EU for legal pollution related to the annual nitrogen dioxide, are exceeded in several Norwegian cities.

Pål Rosland, NPRA, Norway

In order to legally drive a heavy vehicle registered as a Euro class 4 or lower, charge must be paid in a Low Emission Zone (LEZ). The electronic devices that are and will be used in Norwegian urban toll rings have to be used by all buses and heavy vehicles in the Norwegian LEZ. The vehicles will be controlled electronically from fixed and outpatient control stations. Those who violate the provisions are required to pay a penalty. The solution is appropriate for the cities Bergen, Oslo and Trondheim. In any case, the charge paid for one zone is also valid for another zone in Norway.

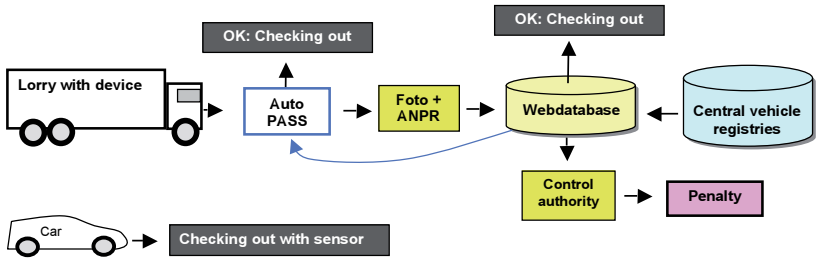
The Norwegian scheme is quite different from others in Europe. It's independent of vehicle technology, but strictly connected to the weight classes and the emission standard described as Euro classes. The charge is fairly high and it is progressive depended on the classes. The highest fee is app 5,000 a year, and regards buses and trucks over 12 tonnes in the Euro class 1 or lower. A heavy vehicle under 12 tonnes in the Euro class 2 or above has to pay app. 1,200 a year. It is possible to pay for one day or a month. As cities in Norway today have tolling systems based on automatic number plate recognition (ANPR) and an elective electronic unit onboard the vehicles (OBU), the LEZ scheme will be based on this charging system. Meanwhile the Norwegian LEZ scheme will claim OBU and prepayment. Vehicles owners must ensure that the vehicle has mounted legal OBU, and that fee is paid before the execution of the zone.

In order to drive legally on Norwegian roads annual fee and responsibility insurance must be paid in advance. A similar principle, we believe also to apply for lawful driving inside a LEZ. The control system can then be limited to the control system based on a spot test; something that is important to ensure privacy. Moreover, the system will be easier to manage since the owner of the vehicle is given the responsibility and the burden to run legally inside the zone. When the control system detects that everything seems to be in order, the computing system will delete the data of the passage. In any case 20 percent of vehicles will be photographed and automatic number plate recognized. If someone chooses to cheat, it is 20 percent risk of being detected each time he runs the zone.

The Norwegian LEZ system will not apply to light vehicles. These should therefore not be verified. To ensure that this does not occur, the control station will be equipped with sensors that collect news about if the vehicle is heavy or light. We have yet to find methods that enable the use of cars in the LEZ without causing serious interference with privacy.

The alternative to a charging system is the prohibition of the most polluting vehicles. A prohibition is less smooth and can not be used against vehicles that are in the mid-range, that neither pollute most or least. These constitute the majority of the truck fleet, and is thus for the majority of the air pollution.

A progressive tax will increasingly affect vehicle owners to choose the options to pay this fee. The options are to use the best vehicles in the zone the other outside, or replace the truck, or run less in the zone. It is most economically advantageous to buy a new vehicle than to pay fees in many years.



ITS scheme for the Norwegian low emission zone. When you pre-pay, enter the correct vehicle so you get the correct fee. Data on your vehicle is transferred from central vehicle registries. The control system performs random checks to see if everything is OK.

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Safety Effects of Intelligent In-vehicle Systems

Safety impacts of intelligent vehicle systems have been assessed with an advanced tool that was designed to cover the impacts in a structured and systematic way. The systems showed significant potential to reduce fatalities and injuries in the transport system.

Pirkko Rämä, VTT
Finland

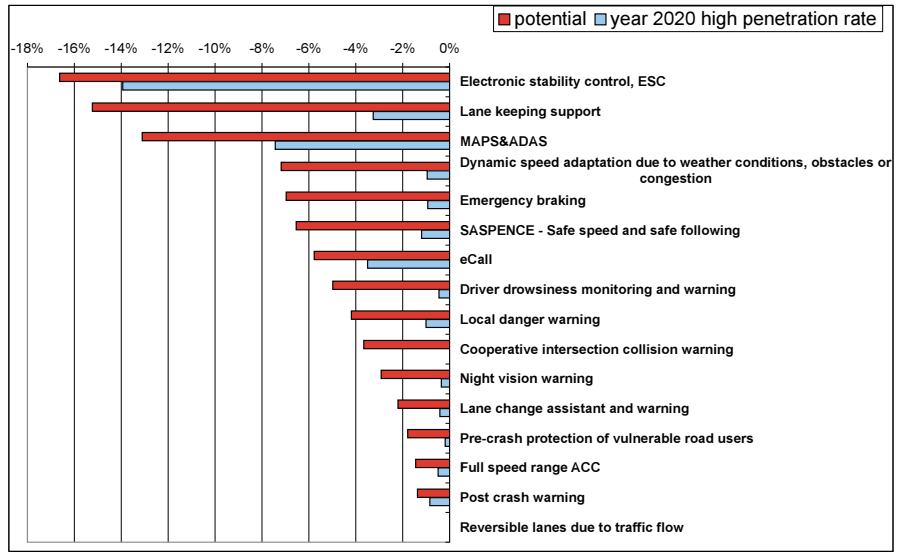
In the EU's sixth framework programme, safety impacts of intelligent vehicle systems (IVS) were assessed. The aim was to provide estimates for safety impacts of a selection of IVS for target years (2010, 2020 and 2030) and penetration scenarios.

A systematic approach to cover the impacts

The method developed for the safety impact assessments was based on previous understanding of the impact mechanisms of intelligent transport systems. The three main dimensions of road safety – exposure, accident risk and severity of consequences – were covered by nine behavioural mechanisms: (1) direct in-car modification of the driving task; (2) direct influence by roadside systems; (3) indirect modification of user behaviour; (4) indirect modification of non-user behaviour; (5) modification of interaction between users and non-users; (6) modification of road user exposure; (7) modification of modal choice; (8) modification of route choice; and (9) modification of accident consequences. The power of the assessment tool was to systematically take into account the assessed effectiveness of the IVS to prevent the targeted fatalities and injuries, the share of relevant accidents, the assumed fleet penetration of the systems, and the assumed accident trend.

Considerable potential to improve traffic safety

The IVS have considerable potential to decrease fatalities and injuries in road traffic. Specifically, the potential to prevent fatalities was highest for the electronic stability control (ESC), followed by the lane keeping support system, the warning system for exceeding the speed limit, and accident-prone sites (MAPS&ADAS). The effects of ESC and MAPS&ADAS were substantial also in estimates for 2020. Because of low penetration levels of many systems, however, the estimated effects for 2020 were in general substantially lower in comparison with the potential.



Estimated safety impacts on fatalities (%) of 16 IVS. "Potential" assumed 100% fleet penetration of systems; "Year 2020 high penetration rate" assumed a promoted penetration in 2020.

The most prominent systems showed considerable potential to contribute to a safer transport system. Even some individual systems showed considerable savings, e.g. ESC in the assumed high penetration in 2020 would contribute to avoid 2,900 fatalities and 50,000 injuries. Overall, the studies provided concrete, unified estimates of traffic and safety effects, and provided a central input for the cost-benefit calculations which estimated monetary value for these benefits. In the future, when more accurate data is likely to be available, the safety estimates can be further improved.

The results provided perspectives on the market introduction of IVS, and can be used to provide guidance in their deployment. The results support decision making for research programmes in terms of focus and funding, as well as awareness, promotion and deployment activities at the EU, national and regional levels. These outcomes could also be used by policymakers, road operators, and driver clubs as a basis for terms of investment, promotion and deployment decisions. Industry and insurance organisations may be able to use this research for developing product and innovation strategies.

The results are based on studies carried out in eIMPACT, PReVAL and CODIA projects. The research was funded by the EU (Information Society Technologies and Media), VTT and other participating partners.

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Read more: Kulmala, R., Leviäkangas, P., Sihvola, N., Rämä, P., Francsics, J., Hardman, E., Ball, S., Smith, B., McCrae, I., Barlow, T. & Stevens A. 2008. Co-operative systems Deployment Impact Assessment, Final study report. CODIA Deliverable 5.
http://www.eimpact.info/
http://www.preventip.org/en/prevent_subprojects/horizontal_activities/preval/

Road Pavement Ageing and Traffic Noise Levels

Traffic noise emission is known to increase as the pavement gets older. SILENCE was an EU research project on transportation noise in the 6th framework program, including a task to provide models for the effect of pavement ageing on the noise reducing effect of road pavements. This task was carried out by the Danish Road Institute/Danish Road Directorate. Existing measurement data on long-time noise performance of pavements was collected from partners in the SILENCE project from Belgium, Denmark, France, Germany, the Netherlands, Poland, Sweden, and United Kingdom. A series of data from a Californian noise study was also included.

Jørgen Kragh and Hans Bendtsen,
Danish Road Institute/Road Directorate

The results were analyzed with the focus on the increase in traffic noise levels per year of service life for different types of pavements. The scatter of the results was large. No indication could be found that any model for the relation between pavement age and noise emission (polynomial, logarithmic or exponential) would yield a better fit to the data than a simple linear relation between vehicle noise level and pavement age. This may be due to the observed scatter in measurement results.

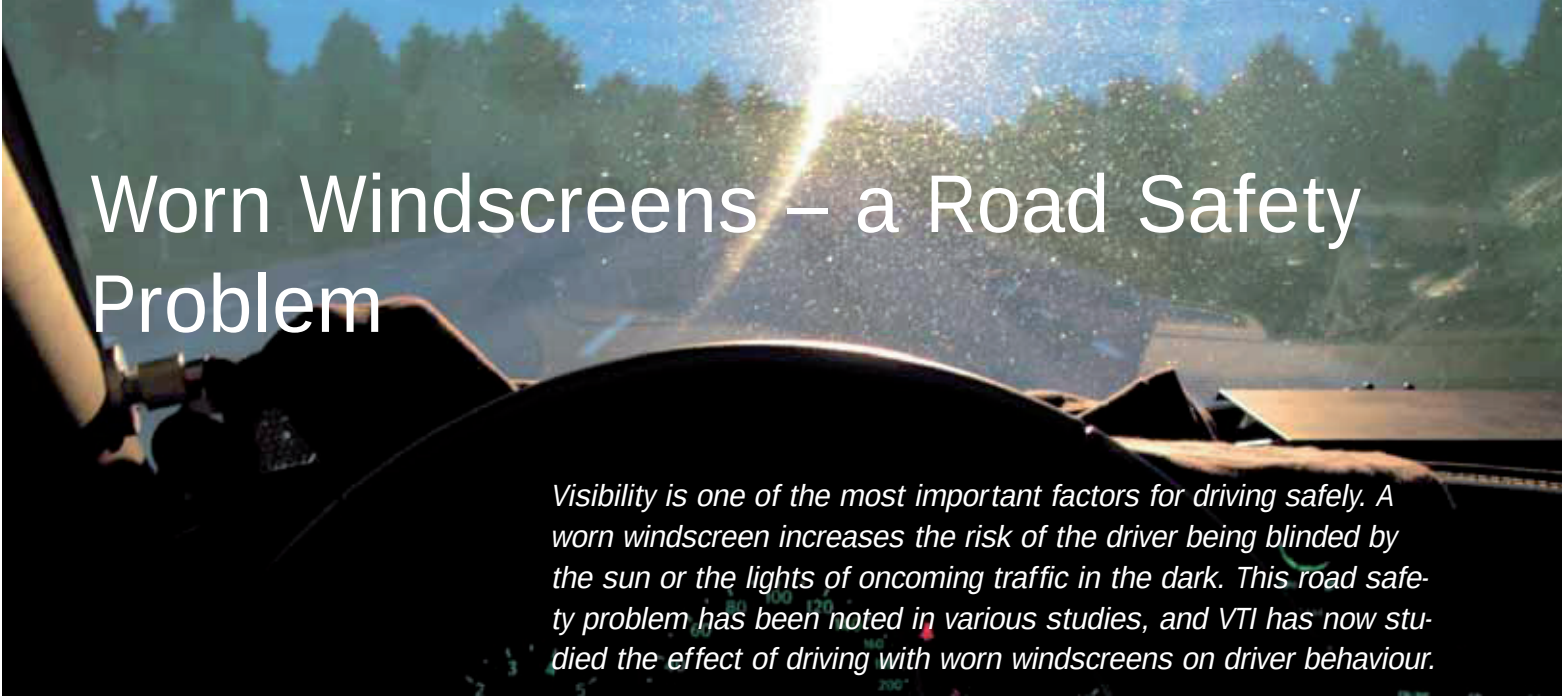
PHOTO:

Therefore, a simple linear model was selected. This study did not include an analysis of traffic noise level frequency spectra in relation to ageing.

The table summarizes the average value of slopes to be expected for linear time histories of vehicle noise levels. For both light and heavy vehicles, the slope to be expected for dense asphalt pavements is in the order of 0.1 dB per year of pavement service time. This applies to high speed as well as low speed roads. For porous or open graded asphalt pavements, the time history slope for light vehicles can be expected to be in the order of 0.4 dB per year on high speed roads, and 0.9 dB per year on city streets with low traffic speed. Heavy vehicle noise levels can be expected to increase 0.2 dB per year on high speed roads with open/porous pavements. Data was not available for heavy vehicles on low speed porous/open pavements.

Surface type	Light vehicles		Heavy vehicles	
	High speed [dB/Year]	Low speed [dB/Year]	High speed [dB/Year]	Low Speed [dB/Year]
Dense asphalt (DGAC)	0.1	0.1	0.1	0.1
Porous / Open graded asphalt (PAC/OGAC)	0.4	0.9	0.2	-

Reference: 1. Road Surfacings - Noise reduction time history. Jørgen Kragh. Road Directorate/Danish Road Institute, DRI report 161, 2008. See: www.roadinstitute.dk



Worn Windscreens – a Road Safety Problem

Visibility is one of the most important factors for driving safely. A worn windscreen increases the risk of the driver being blinded by the sun or the lights of oncoming traffic in the dark. This road safety problem has been noted in various studies, and VTI has now studied the effect of driving with worn windscreens on driver behaviour.

PHOTO: VTI

Magdalena Green,
VTI, Sweden

A worn windscreen increases the risk of glare, which may have the result that the driver does not see objects or persons on or near the road in time. This may, in turn, mean that there is less chance of preventing an accident.

Simulator study

In a simulator study, VTI has examined the behaviour of drivers when they were affected by glare from windscreens with different degrees of wear. Three windscreens were used in the study – a new one, one with a mileage of 150,000 km and one with a mileage of 350,000 km.

A study was made in which glare caused by simulated sunlight affects both the driving behaviour and sight distance of the driver. The variables which have an effect on driving safety are first registered. The primary objective of measuring the sight distance is to make it possible to make comparisons with previous studies. A total of 24 test subjects drove the same loop three times, once with each windscreen. The drivers had to pass two obstacles on each run. Glare was created in the simulator by mounting a lamp in front of the windscreen of the simulator. The lamp simulated the sun when low down in the sky.

The test persons said that they regarded both the simulated environment and the driving tasks in the simulator as relatively realistic.

Worn windscreens increase the risk of accidents

Particles in the air subject windscreens to great stresses and give rise to a sand blasting effect on the glass. Windscreens are also exposed to considerable mechanical damage, mainly from the windscreen wipers. The result of this is that light is refrected incorrectly and sight deteriorates, for example when the sun is low in the sky or when meeting oncoming traffic in the dark.

The effect of glare varies depending on how worn the windscreen is. In the test the sight distance was measured. The results showed that the sight distance was reduced when the worn windscreens were used. The difference in detection distance between the best and worst windscreen was ca 130 m. This is a reduction, on average, by ca 65 per cent.

– When we investigated what happened when the drivers had to take evasive action to avoid obstacles on the road, we saw that they managed this less well when they were driving with a windscreen that was worn, says Anne Bollng who worked in the study. Drivers detected the obstacle later, braked harder and their manoeuvre was more sudden, in spite of the fact that they had lowered their average speed by ca 15 km/hour. These results indicate a driving behaviour that is more risky or, in other words, has lower road safety.

Some drivers did not manage at all to avoid the obstacle but drove over it. None of the passages with obstacles, when driving with the new windscreen, resulted in a collison, while four per cent of the passages with the second most worn windscreen, and eight per cent of the passages with the most worn windscreen, resulted in a collision. When one considers that in real traffic this may have caused a road accident, the results indicate that there is a large accident risk in driving with a worn windscreen in difficult conditions such as oncoming lights.

Even though this is a study in a simulator environment, with its limitations, it can be stated that driving behaviour is adversely affected when the driver faces the lights of oncoming traffic with a worn windscreen. In real traffic there are several other factors that may influence sight and glare, such as dirt and rain on the windscreen. There is therefore a risk that, in real traffic, the effect on driving behaviour may be much greater than what could be measured in this study.

Contact: Anne Bolling, anne.bolling@vti.se
Read more: Worn windscreens, Simulator study, a VTI publication R657A

Myths and Facts about Congestion Charging

There are several myths and confusions about what congestion charging is and what it is not. Such myths may have led to the reluctance of the general public and decision makers to accept congestion charging in Norwegian cities. This paper clarifies several of those myths as part of a study being conducted by the NPRA to increase the understanding of the benefits of congestion charging.

James Odeck, NPRA, Norway

Congestion charging is a system of charging road users during peak hours and its main objective is to reduce travel delays and greenhouse gas emissions, while at the same time improving public transit systems. The toll charges are set to reduce congestion to an acceptable level and, hence they vary by time of the day. Toll rates are significantly higher during peak hours. When there is no congestion, for example at night, the rates can be set equal to zero.

Quadruple benefits and good support

Congestions charging give quadruple benefits: (1) congestion reduction, (2) pollution and noise reduction , (3) revenue generation which can be used to improve public transport and, (4) reduction or postponement of costs of building new roads. Reduced congestion implies reduced travel time and reduced pollution and noise translates into improved quality of life for citizens. Revenues used to improve public transport imply a reduction of subsidies to the public transport. Congestion charging also leads to better utilization of the existing road capacity. Hence, it can save or postpone the cost of building new roads. In Norway where there are cordon tolls, congestion charging does not come as an addition, but as a replacement.

Studies in Norway show that, if given the choice between cordon tolls and congestion charging the public prefer the latter. The transport industry also acknowledges the benefits of congestion charging. As one transport industry executive recently expressed "we go for congestion charging because it will increase accessibility and reliability for commercial transport. For us, time is money".

The use of revenues

To gain support for congestion charging, the revenues should be used to improve public transport to ensure that that those tolled-off from roads get an adequate means of transport. The Norwegian parliament (Stortinget) has already sanctioned, as a rule of thumb, that revenues from any congestion charging scheme should be divided 50–50% between the central and the local governments and should be used for transportation purposes, like the improvement of public transport.

Congestion charging is a success in Stockholm

The aim of the Stockholm congestion charging scheme was to reduce the traffic level by about 10–15%, especially during peak hours. The public transport system was upgraded half a year before its implementation. After the congestion charging was implemented, the traffic was reduced by about 22% and the local air pollution was reduced by 10–14%. Later, in a referendum, the majority voted in favour because of its positive impacts. Implementation in Norway will, however, be cheaper since an effective technology for toll collection is already in place as is evident in the cordon toll systems.

Demystifying the myths of congestion charging

The NPRA has the goal of objectively to inform the public of what congestion is and what it is not. The Institute of Transport Economics (TØI) and Urbanet Analyse AS, were engaged to demystify the myths. Some of the results are listed below.

Myth: Congestion charging is something different from ordinary road tolls.

Correct: For the road user, road tolls are a flat rate independent on when they drive, while congestion charges vary by time of day and space.

Myth: Congestion charging is not an effective means for reducing congestion.

Wrong: Results from Stockholm show a 22% reduction in traffic volume in the city centre while London achieved a reduction of 21%.

Myth: No one else than those caught up in congestion suffer from it.

Wrong: If you are caught up in congestion you delay others and more noise and local pollution is created, which are a hazard to others.

Myth: The use of revenues to improve public transport does not benefit those who pay the congestion charge.

Wrong: The larger the number of public transport users, the better the road space. The worse the public transport system is, the worse the conditions for road users become because more people will use cars. Congestion becomes comparatively worse if the revenues are not used to improve public transport.

Myth: Congestion charging will hurt the

transport industry as it means increased cost of transport.

Wrong: The transport industry has a higher value of time. The reduction of congestion implies the reduction of time costs.

Myth: Congestion charging will hurt families with small children because such families must drive in rush-hours to deliver children to schools and kindergartens.

Wrong: Congestion charging imply less traffic so that families will save invaluable time and save children from pollution due to congestion.

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More information (only in Norwegian):

- Fordelingsvirkninger av køprising
http://www.urbanet.no/publisering/nytt-notat-fordelingsvirkninger-av-kprising
- Myter og fakta om køprising
http://www.toi.no/getfile.php/Publikasjoner/T%D8I%20rapporter/2009/1010-2009/1010-2009-nett.pdf

Self-explaining Roads

Edge lines, rumble strips and the width of the road are examples of self-explaining road design. But what effect do they have on road safety and how can responsible for road design select the correct measure?

Magdalena Green,
VTI, Sweden

A significant reduction in casualties can only be achieved by taking action on all three elements of the safe road system: driver, vehicle and road. Improving road infrastructure safety can be achieved by making roads forgiving and self-explaining. Self-explaining roads reduce crash likelihood and forgiving roads mitigate the severity of the outcome of a crash.

A self-explaining road indirectly makes it clear to the road user how to behave, for example making it clear that overtaking is unwise by "explaining" the preferred speed through the design of the road markings or by applying rumble strips. In Europe there are a large number of solutions for creating self-explaining roads, a knowledge which will now be collected and evaluated in the view of road safety.

The project SPACE

SPACE, Speed Adaptation Control by Self Explaining Roads will identify solutions that offer the greatest potential safety gains through a state of the art review, international expert panel review, interactive visual tools and driving simulator experiment. This will lead to tools that can identify unsafe or non-explaining areas of the network and that are able to estimate the potential safety benefits of the road safety measure. These tools will register change in driving behaviour and also explain why this or these changes occur. The developed tools will be used for evaluation of different measures aiming to find a self-explaining road. Other aims are to determine the speed adaption and situational awareness benefits of different self-explaining design measures. A comparison will be done of different approaches leading to recommended common strategies.

The work will be focused on rural roads and having Vision Zero and transnational benefits of the projects outcome in mind. Other considerations and limitations will be to look on effects of combination of measures, different road types and conditions, as well as different road user categories.

PHOTO: PHOTOS.COM

The results will be presented as guidance in technical notes and more comprehensively in a project report. Findings will be made available to road authorities, researchers and practitioners across Europe.

Successful cooperation

The ERA-NET programme was introduced in the sixth EU framework programme with the aim of improving European cooperation in research and development. Eleven national road administrations in Europe have combined to form ERA-NET Road and provided funds for a number of research programmes with a total budget of 1.5 million Euro.

In the spring of 2009 a call was made for such a research programme in the field of road safety, under the name Safety at the Heart of Road Design. In consequence of this call, FEHRL, Forum of European National Highway Research Laboratories, initiated a meeting of its members with the aim of coordinating a proposal. Around ten countries were represented, and the meeting resulted in six proposals, in several of which VTI was involved. The proposal Space was accepted by ERA-NET Road. A total of 18 project-proposals were submitted and five of these were approved by the programme committee.

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