Every Accident is one too many

- a shared responsibility

Danish Road Safety Commission National Action Plan, 2013-2020

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Foreword

The objectives set in the Road Safety Commission's National Action Plan for 2001–2012 were ambitious and I have to admit that many of us doubted if we could achieve them.

Along with many others, I am delighted to say that together we achieved these objectives, and the number of road users killed or injured on Danish roads has halved since 2001. In fact, the number of deaths on the roads is the lowest since 1930, when accident statistics were first compiled.

These excellent results have not been achieved by the Road Safety Commission simply setting them as targets. They have been achieved by public and private bodies and citizens – both individually and collectively – making an effort and taking responsibility for realising the objectives in the Action Plan.

The Road Safety Commission has now completed work on its National Action Plan covering the period to 2020. It is not possible to put a figure on the number of road accident victims that should be considered socially acceptable, as one person killed or injured on the roads is always one too many. Nevertheless, the Commission has again opted to set clear and ambitious targets – no more than 120 deaths, 1,000 serious injuries and 1,000 minor injuries on our roads in 2020.

Like the previous Action Plans, the recommendations in the new Action Plan have been drawn up as an "ideas catalogue" with suggestions for possible actions to inspire the relevant players in the fight to reduce the number of deaths and injuries on Danish roads.

I would like to take this opportunity to thank everyone who has helped to produce this Action Plan, and I would urge you all to look out for yourselves and each other in the traffic.

Karsten Nonbo
Chairman of the Danish Road Safety Commission

Every accident is one too many - a shared responsibility

The Danish Road Safety Commission National Action Plan 2013-2020

Structure

The Danish Road Safety Commission

Composition

Representatives (voting)

Karsten Nonbo, MP, representing the Danish Liberal Party (Chairman)
Jan Johansen, MP, representing the Social Democratic Party (Vice-Chairman)
Kim Christiansen, MP, representing the Danish People's Party
Jeppe Mikkelsen, MP, representing the Social Liberal Party
Jonas Dahl, MP, representing the Socialist People's Party
Henning Hyllested, MP, representing the Unity List
Leif Mikkelsen, MP, representing the Liberal Alliance
Mike Legarth, MP, representing the Conservative People's Party
Bente Bendix Jensen, Member of Esbjerg City Council, representing Local Government Denmark (LGDK)
Erik Østergaard, Chief Executive, representing Danish Transport and Logistics (DTL)
Jens Loft Rasmussen, Director, representing the Danish Cyclists' Association
Jens Røn, State Prosecutor, representing the Director of Public Prosecutions
Jørgen Aarestrup Jensen, Negotiations Secretary, representing the United Federation of Danish Workers (3F)
Lene Michelsen, Finance Director, representing MC Touring Club and the Danish Motorcycle Council
Niels Henrik Larsen, Head of Unit, representing the Danish Ministry of Justice
René Arnt, National Chairman, Driving Instructors, representing the Union of Danish Driving Instructors
Thomas Jørgensen, Head of Unit, representing the Danish Ministry of Transport
Thomas Møller Thomsen, Chief Executive, representing the Federation of Danish Motorists (FDM)

Consultative experts (non-voting)

Anders Rosbo, Director, as consultative expert for the Danish Road Safety Council
Bo Jonassen, Police Sergeant, as consultative expert for the Police Union in Denmark
Ivar Gøthgen Hejde, Senior Medical Officer, as consultative expert for the National Board of Health
Leif Lorenzen, Head of Division, as consultative expert for the Danish Transport Authority
Mogens Kjærgaard Møller, Deputy Chief of Police, as consultative expert for Copenhagen Police
Niels Buus Kristensen, Head of Department, as consultative expert for DTU Transport
(the Technical University of Denmark)
Ole Friis, Deputy Chief of Police, as consultative expert for East Jutland Police
Steffen Rasmussen, Head of Section, as consultative expert for the City of Copenhagen
Sven Krarup Nielsen, Senior Consultant, as consultative expert for the Danish Road Directorate
Thorkild Fogde, Commissioner of Police, as consultative expert for the Danish National Police

Secretariat

Jørgen Jørgensen, Principal, Ministry of Justice (Secretary)
Christina Hjeresen, Principal Administrative Assistant, Ministry of Justice (Secretarial Assistant)

About the Action Plan

The Danish Road Safety Commission started work on a new Action Plan in May 2012.

The Road Safety Commission's Monitoring Group is tasked with following up on the Action Plan which expired at the end of 2012, and assisting the Commission with ideas and suggestions in the work to draw up the new Action Plan for 2013–2020. The Monitoring Group has set up a Working Group to help with this.

The Monitoring Group comprises:

Jan Johansen, MP, representing the Social Democratic Party (Chairman)
Allan Nyring, Deputy Chief Superintendent, representing the Danish National Police
Aziza Bjorholm-Petersen, Principal, representing the Ministry of Transport
Jens Loft Rasmussen, Director, representing the Danish Cyclists' Association
Jesper Sølund, Documentation Manager, representing the Danish Road Safety Council
Marianne Foldberg Steffensen, Head of Department, representing the Danish Road Directorate
Niels Henrik Larsen, Head of Unit, representing the Danish Ministry of Justice
Peter Dyrelund Jakobsen, Vehicle Inspector, representing the Danish Transport Authority
Steffen Rasmussen, Head of Section, City of Copenhagen, representing Local Government Denmark (LGDK)
Sven Krarup Nielsen, Senior Consultant, representing the Danish Road Directorate
Søren Lauridsen, Public Affairs Manager, representing the DTL (Danish Transport and Logistics)
Torben Lund Kudsk, Head of Department, representing the Federation of Danish Motorists (FDM)
Tove Hels, Senior Researcher, representing DTU Transport (the Technical University of Denmark)
Jørgen Jørgensen, Principal, Ministry of Justice (Secretary)

The Working Group comprises:

DTU Transport (Senior Researcher Tove Hels and Senior Consultant Lotte Larsen)
LGDK (Head of Section Steffen Rasmussen and Traffic Engineer Anne Eriksson, City of Copenhagen)
The Danish National Police (Superintendent Jørn Pakula Andreasen)
The Danish Transport Authority (Vehicle Inspector Peter Dyrelund Jakobsen)
The Danish Road Directorate (Technical Coordinator Lis Hillo Lørup and Mette Engelbrecht Larsen MSc and Senior Consultant Sven Krarup Nielsen)
The Danish Road Safety Council (Documentation Manager Jesper Sølund, Special Consultant Søren Troels Berg and Special Consultant Morten Kramer Nielsen). This last body acted as the secretariat for this work.

Guide for the reader

The Action Plan begins with a summary of the current situation, touching on the principal challenges in achieving the goal of fewer deaths and injuries. Part 1 then contains a number of more detailed sections on the objectives, background and preconditions, while Part 2 describes the ten focus areas with details of the measures that can help to bring about a positive trend in the accident figures. The Action Plan concludes with a brief overview of the need for research and knowledge and a more detailed description of the measures to be taken.

Introduction

There have been major changes on the roads since 1988, when the Danish Road Safety Commission produced its first national action plan. The number of vehicles has risen, the state and municipalities have expanded the road network, and cars have become much safer. The 1988 action plan was a first for Danish road safety, and since then, changing action plans have maintained the course towards a targeted and effective national effort to reduce deaths and injuries on the roads. This action plan replaces the last revision from 2007.

Over time, the Road Safety Commission's national action plans have provided a framework for the efforts of state, regional, municipal and private operators in the last 25 years. The mutual obligation to improve road safety has been a contributory factor in the drop from over 700 road users killed and almost 13,000 injured at the end of the 1980s to around 200 killed and 4,000 injured today. The lives saved and the fall in the number of road users injured naturally mean that fewer families have had to deal with the consequences of a road accident. Society has also gained significantly, because fewer deaths and injuries have meant less expenditure on rehabilitation and social security costs. In other words, it pays to invest in road safety – both for the individual and for society.

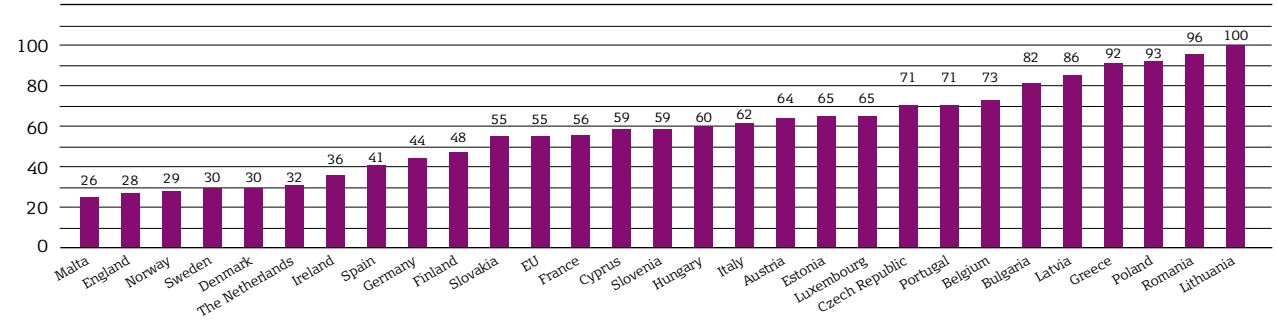
The Road Safety Commission's view is still that every accident is one too many. The action plan is based on the idea that accidents can be prevented and the severity of personal injuries can be reduced by legislation and monitoring, education and campaigns as well as road engineering and safety equipment in vehicles. The action plan can be seen as an ideas catalogue and a management tool for the players, which can be used in the short term and in the long-term strategic perspective. The action plan focuses on the changes and improvements in road safety that the players mentioned in the plan are responsible for.

The Road Safety Commission has set a goal that there should be no more than 120 deaths, 1,000 serious injuries and 1,000 minor injuries on the roads in 2020. The Commission has therefore opted to follow the EU's objective from 2010 of halving deaths on the road by 2020, and has also set a similar target for the numbers of serious and minor injuries. This is tighter than the targets set in previous action plans for a reduction in the number of deaths and injuries.

In the Commission's view, it is realistic to achieve the 2020 objective if the necessary policy decisions are taken and the necessary resources are allocated. In this action plan, the objectives are framed as 10 focus areas in which the Commission believes the greatest effect can be achieved by taking action. The measures described under each focus area are the approaches that can be applied if road safety is to be improved further. The 10 focus areas are supported by measurement points that can give the players an indication of whether the overall objective can realistically be achieved by 2020.

The Nordic countries have been at the forefront of road safety in Europe for many years. Sweden, Norway and Denmark were all in the top five in 2011 in terms of the smallest number of deaths per million inhabitants. It is worth working to maintain this position.

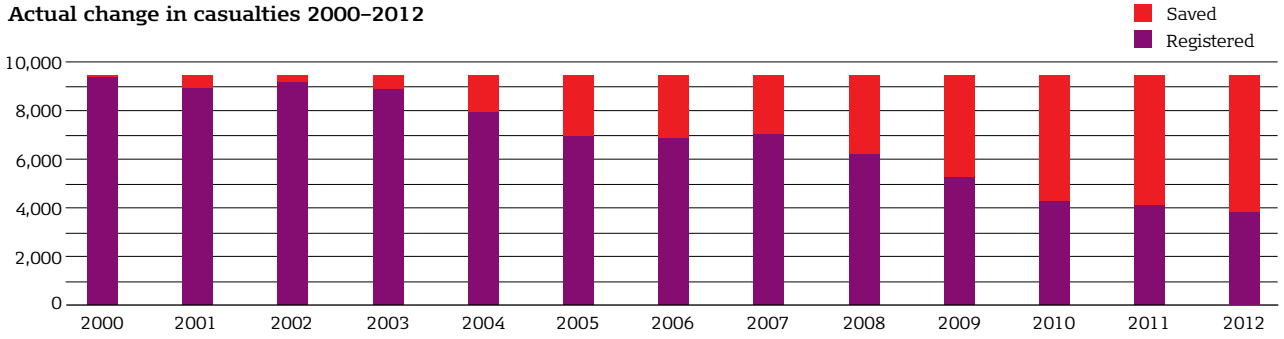
Number of deaths per million inhabitants, 2012



Number of deaths per million inhabitants in 2012 – EU. Number of deaths per million inhabitants in 2012 – EU.

If we look at the 13-year period from 2000 – when "Action Plan 2000: Every accident is one too many" was published – to 2012, the trend in the number of deaths and injuries on the roads has been particularly positive. The graph below shows the actual trend in the number of casualties (deaths plus injuries) in the period 2000–2012 highlighted in red. The green part of the columns shows the reduction in the number of casualties for a given year compared to 2000.

Actual change in casualties 2000–2012



Source: Danish Road Directorate accident statistics

From 2000 to 2012, the number of casualties fell by 61%, saving a total of 35,245 casualties in this period. Converted to 2010 prices, this represents a socioeconomic saving of approximately DKK 71 billion if we consider only the directly measurable costs of road accidents – such as hospital and healthcare costs, the costs of the police and emergency services, working days lost and the cost of damage to property.

The Road Safety Commission is aware that the implementation of the individual measures needs to be viewed in a broader political and socioeconomic context. Better road safety depends on the corresponding resources. Conversely, investments in infrastructure, changes in behaviour and tax policy regarding

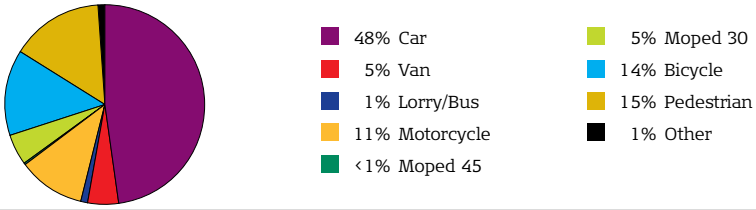
safety equipment can pay for themselves, in the form of savings in rehabilitation costs, social pensions and lost capacity for work, for example.

Public and private players all have a binding obligation to safeguard road users as best they can. The action plan is a practical management tool for the players responsible for road safety. An owner has been identified for each measure. The suggested measures are often framed worded as proposals for concrete activities related to a given objective, but the measures may also be of a more general and indirect nature, such as promoting research and knowledge.

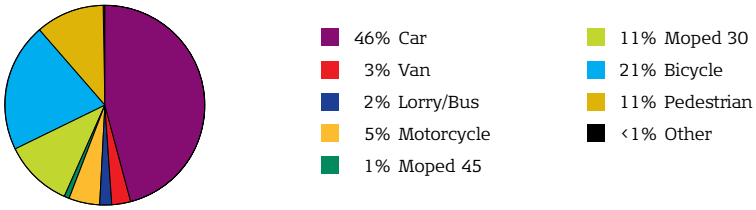
Who gets hurt on Danish roads?

In 2010–2011, 475 road users were killed on the roads, and according to police records, 8,192 people persons suffered serious or minor injuries. These persons used the following types of transport:

Deaths



Serious or minor injuries



Percentage breakdown of the numbers of road users killed and injured in road accidents in 2010–2011, by type of transport. Source: Danish Road Directorate accident statistics

Definition of traffic accident, killed in traffic and seriously injured
According to the police's definition, a traffic accident is an accident involving at least one driving element and occurring in a publically accessible traffic area. Therefore, accidents on private property and solo accidents among pedestrians do not count as traffic accidents in the official statistics. People who die within 30 days as a result of a traffic accident count as people killed in traffic. Those included in the police report under bodily injury and any type of injury other than "minor injuries only" count as seriously injured.

It can be seen from the two charts that the largest number of deaths and injuries occurred in passenger cars, which reflects the fact that cars are the commonest form of transport on Danish roads. The road users killed and injured may have been either drivers or passengers. The majority were drivers.

Two out of every five road users killed or injured were "vulnerable road users", i.e. pedestrians, cyclists or moped riders. One reason for this is that, in accidents involving cars and vulnerable road users, it will typically be the vulnerable road users who come off worst.

Some 5% of those injured on the roads were motorcyclists, but if we look only at those killed, motorcyclists make up a much larger proportion. Hence, injuries to motorcyclists are often very serious.

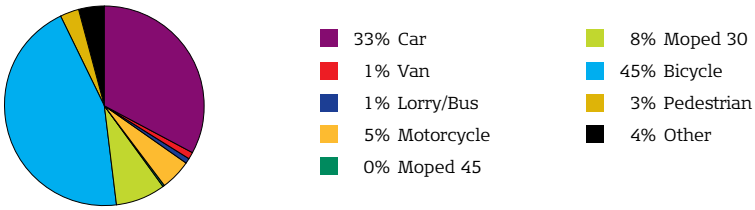
There are very few road users killed or injured in lorries, buses and vans, because they often escape injury thanks to the size and weight of their vehicles.

Better accident data is a prerequisite

Danish traffic safety work is essentially based on the official accident data reported by the police on accidents involving personal injury. Details of traffic-related casualties are also recorded in the national patient register. These details include injury figures originating from A&E department or hospital visits where the patient states that the injuries are the result of a road accident.

From the national patient register, we know that the real accident figures are significantly higher if we compare the casualty figures from accidents reported by the police with injury data from A&E departments. Injuries to "vulnerable road users" in particular are under-reported by the police records. Although the majority of the injured road users are slightly injured, severe injuries are also under-reported.

Injuries reported by A&E departments, hospitals and the police



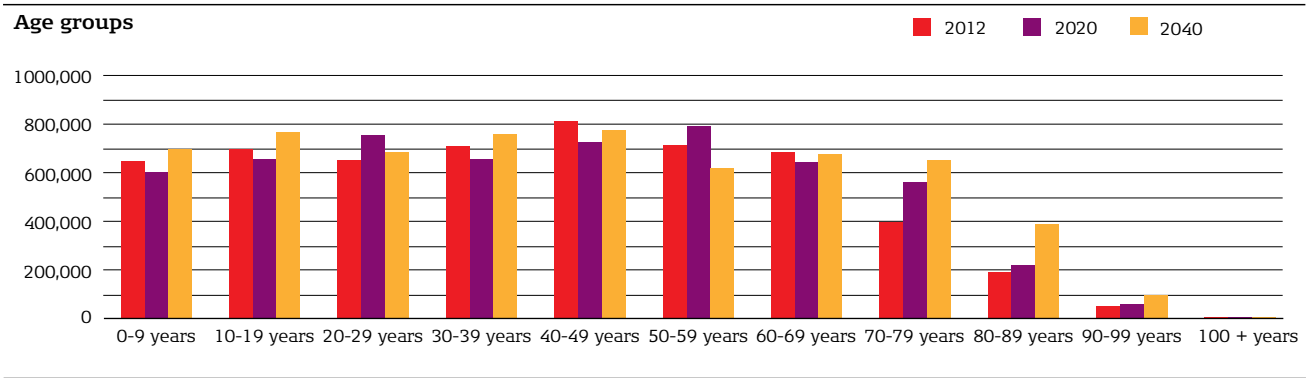
Percentage breakdown of personal injuries reported by A&E departments, hospitals and the police in 2011, where it was stated that the injuries resulted from a road accident.
Source: Statistics Denmark

The chart shows the breakdown of personal injuries recorded in the national patient register and police records. It can be seen that the breakdown of injuries differs from the police records of persons killed and injured, e.g. with a much higher proportion of injuries to cyclists. The explanation for this is that the injuries recorded in the national patient register are often so minor that they do not need to be recorded by the police, and also that some of the injuries may have occurred on private land.

Systematic nationwide recording and use of A&E department data in addition to the more detailed information from the police would provide a better basis for decision-making, both nationally and locally, and would reinforce Danish road safety efforts. To make this possible, the present system of recording visits to A&E department needs to be improved. As the A&E department data includes more minor injuries than the police records, it is absolutely crucial that in future the A&E department data should contain precise details of the degree of injury to the persons involved. This is no longer the case, now that the diagnoses come from the national patient register only. Nor does the data from the A&E department currently give any indication of where the accident happened or a description of the sequence of events. These details, which are currently optional, should be made mandatory if the A&E department data is to be used by the various stakeholders in road safety work. An improvement in A&E department records so that data can be used in a targeted way in road safety efforts requires substantial investment, e.g. in the form of additional resources in A&E departments for recording and training and for the subsequent quality assurance of the data.

Demographics

The proportion of elderly road users is rising fast in Denmark. The charts below show the breakdown of the Danish population by age groups in 2012 and the expected breakdown into the same age groups in 2020 and 2040.



Breakdown of the Danish population by age groups in 2012 and expected breakdown into the same age groups in 2020 and 2040.
Source: Statistics Denmark

As a result, the number of older road users is growing, and elderly road users today are fortunately remaining active and mobile into their later years. As mobility is an important part of daily life, the transport system must be capable of meeting these demographic challenges and changes. It is thus an important task for society to provide good mobility facilities and a safe transport system for all types of road user. This could be a challenge for transport policy, because older road

users are more vulnerable and thus face a greater risk of injury when an accident happens. This is especially true of cyclists and pedestrians. As our biggest cities grow, priority should be given to the work of creating safe routes for cyclists and pedestrians.

Ageing brings changes, some of them reflected in driving behaviour. There is insufficient knowledge and understanding of these changes in terms of patterns of activity, preferences, experience and driving ability, for example. With this knowledge, we will be in a position to document the needs of the ageing population in relation to the transport system and provide safe mobility for the elderly. This will also benefit other road users.

Globalisation brings increased mobility across national frontiers, producing a greater volume of traffic both across our borders and within the country, with a large number of domestic journeys made by foreigners. It is important to monitor this trend in order to take action if the accident figures worsen with the number of foreign drivers. An example of this is where the so-called "mirror group" within the Danish Transport Authority informed foreign lorry drivers, who had no knowledge of the Danish tradition of cycling, about right-turn accidents involving lorries and cyclists.

Technology

Passive and active safety in cars will bring completely new ways of supporting and safeguarding road users.

Euro NCAP is already acting as a catalyst for larger numbers of safe cars for consumers, and measures such as seat-belt alarms, stability systems and airbags have had a positive effect on the number of injuries in the last ten years. Intelligent traffic systems can also help to improve road safety and safeguard all road users.

Denmark is one of the leading countries in the EU when it comes to implementing and using modern technology at home and at work. The Road Safety Commission is very anxious that progress in new road safety technology should be quickly implemented in vehicles.

Technological development is also giving rise to new forms of transport, which may create new challenges for road safety. The recent growth in alternative motorised vehicles such as electric bicycles, scooters, etc. needs to be closely monitored to prevent new types of accident.

A positive trend in technological aids can counter the errors that all road users make to a greater or lesser extent, and prevent them developing into serious accidents. Technology does not free individual road users from their personal responsibility to drive carefully and legally, but it does release funds to create a better traffic situation for the individual and the community.

The spread of new safety technology via a policy of financial incentives, e.g. switching from road taxes to per-kilometre charges or offering tax relief for documented safety-promoting technologies, could also have a favourable effect on road safety.

Effective action means focusing on the essentials

Effective action must necessarily take as its starting point the real challenges for road safety. It has been crucial to the work of the Road Safety Commission that the suggested actions have been chosen on the basis of an assessment of their effect on the fundamental road safety problems. The main actions therefore fall into 10 focus areas, broken down by known accident problems and the relationship to certain groups of road users, types of accident or frequently occurring causes. A number of specific measures are proposed for each of the focus areas. These measures have been selected according to their expected ability to prevent accidents of the relevant kind or reduce the number of casualties.

The ten focus areas are as follows:

1. **Speeding**

2. **Alcohol and drugs**

3. **Inattention**

4. **Failure to wear seat-belts and helmets**

5. **Pedestrians**

6. **Cyclists and moped riders**

7. **Young drivers up to age 24**

8. **Accidents with oncoming traffic**

9. **Single-vehicle accidents**

10. **Accidents at rural junctions**

The ten focus areas will be reviewed on a regular basis between now and 2020 by establishing measurement points as a basis for the necessary actions. At the same time, there remains a need for up-to-date knowledge and research to qualify the work of understanding road users and the complex interaction between road users and technology that we see on the roads. Please refer also to the section of the action plan on the need for research and knowledge.

The action plan sets out a series of measures to improve road safety. Each of these actions can help to improve road safety, but it is the interplay between the measures that brings the best results.

In the view of the Road Safety Commission, the first requirement for effective action is satisfactory base data, e.g. A&E department data, allied to priority investment in research and expanded fatal accident statistics and accident investigation details. The impact of the measures and their cost-effectiveness need to be prioritised through research and evaluations to make the best possible use of public funds. In parallel with the action plan, supporting fact files have been drawn up to give the players an insight into the possible effects of the individual measures in a simple and accessible form. In this connection, it is important to stress that horizontal comparisons cannot be made. The effect of a major road-building project cannot be compared to the effect of legislative measures, campaigns or vehicle technology. These are different factors that act on each other. It is the combination that will enhance Danish road safety.

Security on the roads

The action plan aims to reduce the number of road accidents and focuses especially on accidents in which road users are injured or killed. The focus of the action plan is on safety measures. In the general debate, road safety is often confused mixed up with security, ease of travel and comfort, and many actions are put forward as road safety measures where they really relate to ease of travel, for example. A measure that improves road safety may have a positive or a negative effect on security and/or ease of travel; one example might be a measure to reduce speeds on a route through a town. This improves security for vulnerable road users while improving safety for all. However, it reduces the ease of travel for drivers who want to go that way, while it is easier for drivers turning out of side-roads. It is important to inform road users of the safety reasons behind the changes made, in order to obtain greater acceptance of the changes among road users. That is why safety measures should be implemented in parallel with information to road users about the effect of each measure on safety.

PART 1: OBJECTIVES, BACKGROUND AND PRECONDITIONS

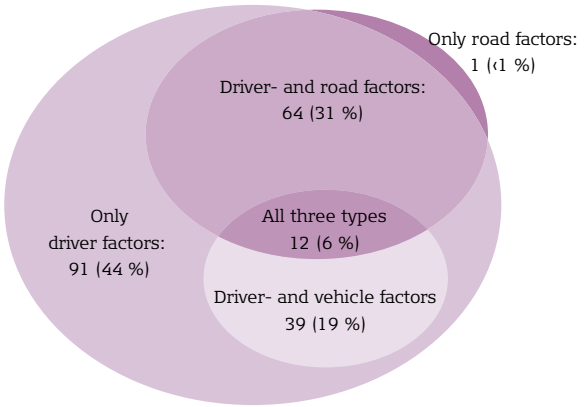
Every accident is one too many

"Every accident is one too many" has been the guiding vision behind road safety work in Denmark since 2000. In the revised action plan "Towards new objectives 2001–2012" from 2007, "Every accident is one too many" was supplemented by "Road safety starts with you", to emphasise the individual road user's responsibility for promoting road safety.

The individual road user's duty to drive safely, obey the rules of the road and especially to set a good example by showing consideration and care is still the main precondition for safer traffic. Our knowledge of the behaviour of road users has improved in recent years, so we can now supplement this personal responsibility with measures that mitigate road users' unconscious errors and bad habits. Then we can take more targeted action against the few who show no consideration for others by driving dangerously. A lack of consideration for others might include running a red light and thus exposing other road users to unnecessary risk.

Various Danish and international in-depth surveys have shown that the behaviour of road users is one reason why accidents happen. The chart below shows an analysis of the contributory factors behind 207 accidents analysed in detail by the Danish Road Accident Investigation Board Denmark (HVU). The breakdown shows that road users' errors and bad habits contributed to more than 90% of all the accidents analysed[1].

In the light of this, the Danish Road Safety Commission considers it important to work to change road users' behaviour.



Number of accidents with road users, vehichles and road factors.

Analyses by the Danish Road Accident Investigation Board Denmark (HVU), DTU Transport and the Danish Road Directorate's detailed statistics of fatal accidents show that road users can be split into two groups according to how risk-aware they are in the traffic.

1) "Why do accidents happen?" Danish Road Accident Investigation Board Denmark, 2009.

The majority of road users exhibit behaviour where they make errors without meaning to and occasionally break the rules, possibly because they do not know the law or interpret it in their own way. These may include road users who are inattentive because they are distracted, who do not look around them or do not react adequately to the situation. There may also be road users who drive over the speed limit or a little too fast for the conditions.

This type of road user causes the majority of accidents. These can be prevented or made less serious by improving roads and surrounding areas to minimise the risk of error. In-vehicle technologies that assist drivers and an increased focus on driving through campaigns, information, training and monitoring can also help with accident prevention.

The Danish Road Safety Commission aims to ensure that errors by road users do not cause serious accidents.

Another, smaller group are the dangerous drivers, who deliberately expose themselves and others to unnecessary risk. They accept or even deliberately court danger without really assessing the risk of being involved in an accident.

It is hard to come up with a road network or a vehicle design that allows for this behaviour in every way. Even if the road network were to be arranged and road safety work organised on the basis of accepting that road users make errors, there is a limit to what vehicle and road design can do. The relatively few accidents that result from risky behaviour should be tackled by means that deter drivers from behaving in this way. This could mean more frequent police controls and in-vehicle equipment to prevent things like speeding or drink-driving.

The Danish Road Safety Commission aims to limit dangerous driving as far as possible

Research by DTU Transport (e.g reseach into young drivers) and the specific surveys by the Danish Road Accident Investigation Board have revealed a need for different types of measures depending on the type of accident they seek to prevent. For example, some measures may affect one group of road users but will not have the same effect on other groups. This action plan contains suggested measures aimed at all types of behaviour on the roads.

Under the banner of "Every accident is one too many", the Danish Road Safety Commission is working to ensure that:

- road users' errors in traffic do not cause serious accidents
- dangerous driving is kept to a minimum

We all have a responsibility - the interplay between public authorities, individuals an social society

Danish road safety is influenced by many players, ranging from public authorities and interest groups to the media. This is a strength, and provides for public acceptance of measures and a lively debate on how to improve road safety for all. Together with road users' own personal responsibility to act responsibly and carefully on the roads, a strong sense of community can bring down the accident figures and create safer transport.

This strength is evident when the players work together to improve road safety. Actions against speeding on primary roads bear witness to close cooperation between the players, with the Danish Road Directorate, municipalities and police working together for many years to build roundabouts and erect "black spot" signs, for example. The haulage industry, trade unions, the Danish Cyclists' Association, the Danish Road Safety Council, the Danish Transport Authority, the police, Local Government Denmark, the Danish Road Directorate and the Danish Road Accident Investigation Board (AIB) have worked together on a number of initiatives to prevent right-turn accidents between cyclists and lorries. The initiatives have raised awareness among drivers and cyclists and contributed to a fall in the number of right-turn accidents.

"Horizontal" cooperation is to be intensified in the coming years. The authorities in particular have a leading role to play, because the public sector employs more than 700,000 road users. Drawing up and implementing road safety policies – which could include guidelines for professional drivers, for example – in workplaces can create better driving behaviour, and private companies can follow suit. Safer driving can save companies money in fuel and insurance costs.

The Road Safety Commission aims to involve a wide range of players in its work to prevent road accidents in Denmark. The Commission therefore urges anyone who can help to improve road safety to do so. The task of reducing the number of road users injured on the roads cannot be tackled by one player alone. The Road Safety Commission advises every single player to do what they are best at, and to promote and develop effective measures in their area.

The players defined in the action plan as being responsible for initiating the suggested measures are mainly public bodies – but private companies and interest groups also have an important role to play in implementing the measures.

Public bodies: Public bodies have a responsibility to work to reduce the number of road accidents. In particular, the Ministry of Justice and the Ministry of Transport play a major role in relation to road safety.

The Ministry of Justice is responsible for the regulation of road traffic and safety, including drawing up draft laws and administrative regulations within this area. The Ministry of Justice also includes key services like the police, who handle traffic control, and the Danish Road Safety Council is closely connected to the Ministry as provided by the Council´s byelaws.

The Danish Road Safety Council is a private foundation whose purpose includes promoting traffic safety by propagating awareness and acceptance of the dangers and difficulties faced by road users in traffic, and – within the framework of legislation – to work for the implementation of road safety measures. In this context, the Danish Road Safety Council is also responsible for the long-term national campaigns and information service. Furthermore, the Road Safety Commission was established by the Minister of Justice.

The Ministry of Transport is responsible, through the Danish Transport Authority, for rules on vehicle equipment etc. and, via the Danish Road Directorate, for the national road network. The Danish Road Directorate also acts as the secretariat for drawing up the rules of the road, and is responsible for the national accident database and for investigating fatal accidents. The Danish Road Accident Investigation Board reports to the Minister for Transport, and has carried out in-depth analyses of frequently occurring accidents of a serious nature since 2001.

The Ministry of Children and Education, the Ministry of Taxation and the Ministry of Health and Prevention also play major roles in connection with research and measures in the matter of road safety and treatment.

The municipalities are important players in the effort to prevent road accidents. The municipalities are responsible for a large part of the Danish road network and therefore play an important role in relation to road engineering, campaigns and information, as they are close to citizens, particularly school pupils. Practically all municipalities are striving to improve road safety. Many municipalities draw up road safety management plans, most of them based on the Road Safety Commission's action plans. A survey of the country's 98 municipalities conducted by Local Government Denmark in 2012 showed that 77 of them had a road safety plan, while 84 reported that they were working on road safety issues in schools. It is crucial for the municipalities to continue this work. The Road Safety Commission also advises the municipalities to take an active part in ensuring that resources continue to be set aside for local campaigns which can complement and support national campaigning efforts.

The regions are responsible for the treatment of accident victims in the country's hospitals. Fast and effective treatment can save lives and reduce the risk of permanent disability after a road accident. The hospitals are also in possession of important data which can be used to supplement the police records of road accidents and hence target the preventive work being carried out by other players concerned with road safety.

It is a crucial task for the regions, together with the police and the municipalities, to ensure that there is better and more systematic recording of road users injured on the roads and treated in the country's A&E department. Localising these accidents and identifying the types of accident and vehicle can help immensely to reduce the number of serious and minor injuries treated by the A&E department.

The private sector: Private players see their primary interest in developing good products to optimise their revenue. This interest can create incentives to improve road safety. This can be most clearly seen in the insurance sector, which has a long tradition of supporting initiatives to reduce road accidents and injuries. Transport companies, carrying both passengers and freight, may see a financial benefit when the number of accidents in their business is reduced. Vehicle importers, vehicle manufacturers and dealers and producers of accessories for vehicles develop and sell vehicles and technology to help drivers to drive more safely. This reduces problems for the segment of vehicle buyers who want to prioritise safety. To a slightly lesser extent, bicycles and cycling accessories are being developed to promote safety on the roads. Companies may also see an advantage in displaying social responsibility in areas like road safety and the environment. The industry organisation Danish Transport and Logistics (DTL) has worked consistently to promote road safety, e.g. in the campaign "Road safety at eye level", which has reached 70,000 children. The Union of Danish Driving Instructors plays a crucial role in training future road users. Interest groups such as the Danish Cyclists' Federation and the Federation of Danish Motorists (FDM) also aim to safeguard their members' interests in relation to road safety and run campaigns in this area. This work includes imposing requirements on relevant institutions such as the highway authorities (state and municipalities), and also informing their members about safe behaviour on the roads. It is essential for authorities and other players to involve interest groups in their efforts to improve road safety.

Many of the initiatives proposed in the action plan serve to improve the scope for other players to act. This is true of research and development work, which can help to provide the players with new knowledge. They can then target and tailor their efforts. DTU Transport and Aalborg University play key roles in this.

Forward-looking role of the players

In the future, the players should work even more closely together to achieve their objective. The Road Safety Commission urges those involved in road safety work to define their responsibilities within the overall effort and draw up plans to implement a targeted and effective programme. All players should also realise that many of these initiatives may entail costs – economic, organisational and/or political. On the other hand, the gains made may be multiplied both for society and for the players themselves in the form of savings on sick days, avoidance of material damage, and increased satisfaction among citizens and employees.

The Road Safety Commission also stresses the importance of the players "opening doors" to each other by coordinating their efforts and making it easier for each other to work to reduce the number of accidents and injuries in the most effective way from a socioeconomic perspective.

The municipalities play a major role in local road safety work. To maintain this in the future, the Road Safety Commission recommends that:

- the municipalities back up the Commission's national action plan, national objectives and proposed actions
- the municipalities set up road safety boards across municipal boundaries, involving local players such as the police, local businesses in the transport sector and interest groups
- state authorities provide knowledge and tools that can help to make the municipalities' road safety work more effective

International cooperation

In the coming plan period, the Danish Road Safety Commission expects this work to generate new initiatives that are not covered in this action plan. International players will continue to have an important role – as they do today. One example of this is Euro NCAP, which has promoted the development of safe vehicles since 1997 and has also influenced developments in parts of the world other than Europe.

Public procurement and tendering

A general opportunity for the public sector players is that they can influence road safety by the process and quality that they apply to their procurement and tendering procedures. This can have a major bearing on road safety, for both passenger and freight transport. Public procurement can thus set new standards for:

- driver training
- safety equipment in vehicles, such as alcohol locks and emergency braking systems
- special requirements for vehicles in city traffic

Examples are the City of Copenhagen's procurement of waste management services, which calls for low cabs on the lorries to improve the drivers' view of cyclists and pedestrians on urban roads.

The Road Safety Commission recommends that the public sector players include these new ideas for road safety work in their business plans or action plans for municipal road safety work.

ISO standards

An overall organisational measure that could be of great help when procuring transport is the introduction of a new ISO standard for road traffic safety management in public and private companies, ISO 39001. The ISO standard enables companies to identify ways of helping to reduce the number of accidents and injuries by regularly and systematically examining their organisation and making improvements. ISO certification can therefore be expected to ensure that a company keeps up with technological and organisational developments in this area.

The public sector generates large volumes of freight and passenger transport, and by selecting ISO-certified companies, it can ensure that transport is as safe as possible.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Objectives

Concrete objectives

The EU has an objective – based on the figures from 2010 – to halve the number of deaths on the roads by the end of 2020. The Danish Road Safety Commission has chosen to adopt the EU's objective and also – again based on the figures from 2010 – to halve the number of serious and minor injuries on the roads by 2020.

We aim to halve the number or deaths, serious injuries and minor injuries on the roads in 2020 compared to 2010.

In 2010 there were 255 road users killed on Danish roads. Halving this by 2020 would mean 127 deaths. To produce a clearer and more distinct objective, the figure of 120 has been chosen, which is equivalent to 10 deaths per month. This is a more ambitious target than in previous action plans, and the aim is to reach the objective in a shorter time.

In 2020 there should be no more than 120 road users killed on Danish roads.

In 2010, 2,063 road users suffered serious injuries and 2,090 suffered minor injuries on the roads. Halving these figures by 2020 would mean 1,032 road users with serious injuries and 1,045 with minor injuries. Again, we have opted to express these targets in round numbers, so an objective of no more than 1,000 serious and 1,000 minor injuries has been set for 2020. The advantage of choosing round numbers is that they are easier to remember and communicate.

In 2020 there should be no more than 1,000 road users seriously injured on Danish roads.
In 2020 there should be no more than 1,000 road users suffering minor injuries on Danish roads.

This objective represents a decrease of 53% in the number of road users killed and 52% in the number of serious and minor injuries from 2010 to 2020.

The following interim targets have been adopted for the individual years:

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020
Deaths	167	161	155	149	144	138	132	126	120
Serious injuries	1,952	1,833	1,714	1,595	1,476	1,357	1,238	1,119	1,000
Minor injuries	1,659	1,577	1,494	1,412	1,330	1,247	1,165	1,082	1,000

The trend in the number of personal injuries on the roads up to the starting point for the objective was positive, with a general decrease of 54% in the period 2001–

2010. While working on this action plan, the Road Safety Commission was pleased to see a further significant drop in the number of road users killed in both 2011 and 2012. Part of the explanation may be the financial crisis which has led to less traffic on the roads. When the economy picks up again, the challenge will be to maintain this positive trend. That is why initiatives will be launched from the start of the action period, to increase the likelihood of achieving the objective in 2020. We cannot afford to wait. The objectives for injuries in the period 2012–2020 compared with the actual trend since 2001 can be seen in the chart below.

Number of road users killed, or who sustained serious or minor injuries on the roads from 2001 to 2012. Source: Danish Road Directorate accident statistics

All measurements are based on road accidents recorded by the police, which are included in the Danish Road Directorate accident statistics.

The accident statistics only cover accidents in which road users suffered injury, and which were reported to the police. If there is a road accident where the police are not involved, it will not be recorded in the statistics. Moreover, the accident will only be recorded as a road accident if it happened in a public place and there was at least one driver or rider involved. The accident statistics therefore do not include data on all accidents on the roads.

Correlating the register of causes of death and records of visits to A&E department and hospital admissions has shown that practically all accidents in which one or more road users die are recorded, and accidents resulting in serious injuries are recorded more frequently than those involving minor injuries. Accidents involving vehicles are also more likely to be reported than accidents to cyclists, pedestrians and moped riders.

Every year, Statistics Denmark compiles figures for the total number of casualties in road accidents, which are the sum of accidents reported by the police, A&E departments and hospitals. The latest figures from 2011 show that around 10% of all casualties on the roads are reported by the police. So the total also includes accidents that do not fall within the definition of a road accident, such as accidents to individual pedestrians or accidents on private land. However the vast majority of the most serious accidents – particularly fatal accidents – will be picked up by the police records. Although this is not currently measurable, the action plan by its very nature also aims to reduce the number of accidents occurring but which are not recorded by the police.

The trend in the number of personal injuries recorded by the police in 2001–2011 can be viewed against the entries in the national patient register, as shown in the table below:

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2011
Police	8,888	9,244	8,613	7,787	6,778	6,703	6,897	6,176	5,138	4,158
Only A&E departments	37,885	39,755	37,570	38,025	38,095	37,472	40,049	33,982	34,279	36,620
Only hospitals	1,319	1,260	1,033	923	781	805	846	664	680	494
Total	48,092	50,259	47,216	46,735	45,654	44,980	47,792	40,822	40,097	41,272

Personal injuries reported by the police, A&E departments and hospitals, 2001–2011. 2010 is omitted. Source: Statistics Denmark

Focus on the most frequent accidents

To achieve the objectives for 2020, we need a coordinated effort on several fronts at the same time.

To obtain the greatest possible effect, efforts will be concentrated on the following ten focus areas, which basically cover all accidents involving death or injury on Danish roads:

1. **Speeding**
2. **Alcohol and drugs**
3. **Inattention**
4. **Failure to wear seat-belts and helmets**
5. **Pedestrians**
6. **Cyclists and moped riders**
7. **Young drivers up to age 24**
8. **Accidents with oncoming traffic**
9. **Single-vehicle accidents**
10. **Accidents at rural junctions**

"Detailed statistics of fatal accidents" is a pilot project to extend the recording of all fatal accidents on the roads in 2010–2014. We have assessed which factors contributed to the occurrence of fatal accidents and which aggravated the extent of injuries.

This knowledge helps to ensure that the target of 120 deaths in 2020 is realistic, provided that we take targeted action against the factors that often cause accidents and aggravate injuries.

Experience from 2010 and 2011 show that a large proportion of the fatal accidents in those two years were due to the behaviour of road users. In 2010 and 2011 there were a total of 439 fatal accidents on the roads. Using the detailed statistics of fatal accidents, it is possible to assess the proportion of fatal accidents that fall within each of the action plan's ten focus areas:

1. **Speeding:**
   In **41%** of fatal accidents, speeding is thought to have contributed to the accident happening.
2. **Alcohol and drugs:**
   In **25%** of fatal accidents, the effects of alcohol, drugs and/or medication are thought to have contributed to the accident happening.
3. **Inattention:**
   In **38%** of fatal accidents, inattention is thought to have contributed to the accident happening.
4. **Failur to wear seat-belts and helmet:**
   In **28%** of fatal accidents, failure to wear a seat belt and/or helmet is thought to have contributed to the extent of the injuries.
5. **Pedestrians:**
   17% of fatal accidents involved pedestrians.
6. **Cyclists and moped riders:**
   20% of fatal accidents involved cyclists and moped riders.

7. **Young drivers up to age 24:**
   19% of fatal accidents involved young drivers.
8. **Accidents with oncoming traffic:**
   23% of fatal accidents were collisions with oncoming traffic.
9. **Single-vehicle accidents:**
   28% of fatal accidents were single-vehicle accidents.
10. **Accidents at rural junctions:**
    16% of fatal accidents occurred at rural junctions.

There is a certain overlap in the fatal accidents; an accident can often be attributed to more than one factor, such as speeding and drink-driving. There will not be the same extended recording of accidents involving injury as for fatal accidents, but the trend in injuries has previously closely matched that for deaths. We can therefore assume that this trend will continue. Since 2001 the number of deaths has fallen by 49%, while the numbers suffering serious or minor injuries have gone down by 45% and 59% respectively. This shows that the actions taken to bring down the number of road users killed on the roads have also affected the number of serious and minor injuries.

Prerequisites for reaching targets

In the Road Safety Commission's view, it is realistic to achieve the 2020 objective if the necessary policy decisions are taken and the necessary resources are allocated.

This view is partly based on our knowledge of the trend over the last few years and of the measures that can address accidents within the different focus areas. For each of the ten focus areas, there are suggestions for specific measures which experience shows can prevent accidents of the relevant type. For most measures, "fact files" have been produced to give a more detailed assessment of the potential for reducing accidents and injuries, and the estimated investment costs.

However, the targets cannot be achieved by these measures alone. The whole of this road safety work is underpinned by legislation, training of road users, operation and maintenance of the road network by the highway authorities, etc., which is not explicitly mentioned under the individual focus areas.

At the same time, improvements in road safety can be made by virtue of developments in some areas that this action plan neither can nor should control. This is especially true of automotive technology.

Socioeconomic implications

Road safety comes at a cost and many of the suggested measures require fresh investment, both private and public. However, the costs of implementing the plan need to be set against the not insignificant economic gain that better road safety will bring.

Each accident is not just a tragedy for the individual and their immediate family. There are also great costs to society, such as hospital charges, associated with road accidents, and so there is also an economic benefit if the number of casualties on the roads can be reduced.

The economic benefits of achieving the Road Safety Commission's objectives in terms of the number of road users killed and injured can be calculated in several ways.

Socioeconomic costs

One way of assessing the economic consequences is to look at the socioeconomic costs that society can expect to save by preventing accidents and personal injuries on the roads.

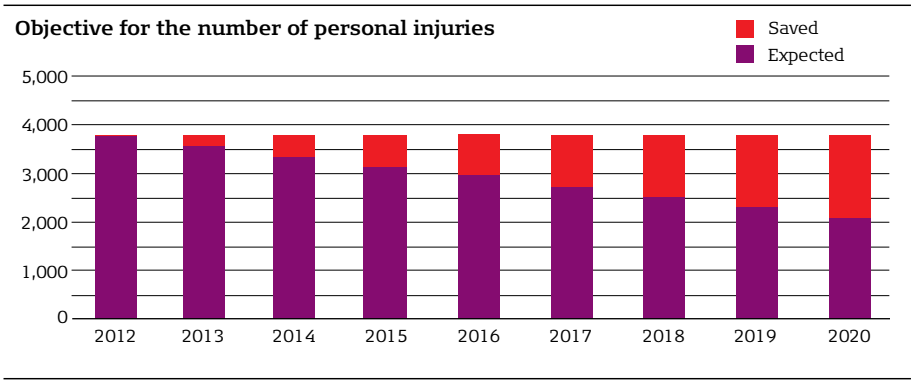
The socioeconomic costs of road accidents are calculated using so-called transport-economic unit prices. These are regularly calculated and updated by DTU Transport and include key indicators and unit prices to be used for valuation in socioeconomic analyses of the transport sector.

The unit prices for the socioeconomic costs of road accidents include not only the directly measurable expenses but also the so-called welfare loss. The welfare loss is a cost that represents a valuation of lost lives and capacity. The welfare loss can be taken as an expression of what road users generally think it is "worth" to prevent road accidents over and above the directly measurable costs such as hospital and health care charges, the costs of the police and emergency services, lost earnings and the costs of making good material damage.

Based on the transport-economic unit prices from 2009, the average socioeconomic costs per casualty on the roads are:

Injury-related costs in danish kroner (treatment, care etc.):	DKK 767,003
Material damage:	DKK 2,040,607
Total (excl. welfare loss):	DKK 2,807,610
Welfare loss:	DKK 1,844,580
Total (incl. welfare loss)	DKK 4,652,190

Over the whole 8-year period from 2013 to 2020, implementation of the Road Safety Commission's objectives will reduce the number of personal injuries by some 7,500. The decrease is illustrated in the charts below.



Objective for the number of personal injuries in the second half of 2011 compared to the first half of 2012 and for 2013–2020 (in violet), and the expected number of injuries saved in 2013–2020 (in red).

A reduction of 7,500 injuries gives a socioeconomic saving of approximately DKK 21 billion in directly measurable costs. Then there is a saving of approximately DKK 14 billion in welfare loss. This gives a total saving of DKK 35 billion.

Apart from those directly involved, the families of road users killed and seriously injured in road accidents are often affected by what has happened to such an extent that they also need help and support from public bodies. Fatal accidents have a major impact on the health, work and social lives of the bereaved. These costs are not included in the above examples of economic costs arising from road accidents.

Public expenditure from injuries on the road

The public expenditure associated with injuries resulting from road accidents includes the direct costs to various public bodies of hospital treatment (A&E department, admissions and outpatient visits), costs of rehabilitation, care and equipment, and social security costs (sickness benefits, unemployment benefits, cash benefits, rehabilitation, flexjobs and early retirement pensions). As the public expenditure is calculated from the date on which a person is recorded in the national patient register, rescue work, ambulance services, the police, material damage and delayed journeys for other road users are not included. Nor are the costs of one's own doctor or specialist, medication, loss of production and welfare, and transport costs and rehabilitation.

The transport-economic unit prices are the socioeconomic costs of personal injuries on the roads. The costs included are the costs of the police and emergency services, treatment costs, net loss of production, welfare loss and the costs of material damage. As these are socioeconomic costs, they do not necessarily have any impact on public finances.

Public expenditure, on the other hand, is relevant in terms of assessing how much the public sector gets back when it invests in road safety. Public expenditure always involves spending money, which is not always the case with socioeconomic costs. For example, the pain and discomfort caused by a road accident are a cost to society, but they are not an expense as they are not associated with any payment.

Based on details of 41,272 injuries resulting from road accidents in 2011 from the national patient register, it has been calculated that the annual public expenditure associated with casualties on the roads is around DKK 2.5 billion for casualties occurring in 2011. The great majority of these are less serious injuries that only entail expenses for a single visit to the A&E department.

The public expenditure is split between municipalities, regions and the state, as shown in the chart. It should be emphasised that the figures need to be interpreted with a degree of caution, partly because the expenses may vary according to the specific method of calculation.

Public expenditure

The distribution of public expenditure on injuries generated in the traffic

It can be seen that the local authorities bear the brunt of the costs associated with injuries on the roads. This is because many of the seriously injured victims of road accidents are granted early retirement pensions after a number of years, which are largely funded by the local authorities. The local authorities also pay part of the costs of hospital treatment. The remaining expenses are split roughly one-third to the state and one-sixth to the regions, which only pick up costs associated with hospital treatment.

The bulk of the public expenditure is made up of increased social security costs. Although only a relatively small proportion of road accident victims are so seriously injured that they need social security, the added costs are nevertheless so significant, both per year and over a number of years, that they exceed the other expenses.

Casualties also entail significant expenditure on hospitals, while the costs of care and equipment make up the smallest part of the expenditure.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Technology improves road safety - a look into the crystal ball

The development of automotive technology is progressing fast. There is no doubt that we are experiencing a revolution in driver support systems which help the driver to act correctly and appropriately in a critical situation. If this is insufficient, the system can take control either to prevent or reduce the severity of the accident. Systems and extra equipment that are now standard in new vehicles, as well as systems that are about to be launched, represent a positive trend in road safety.

Denmark can take a lead in disseminating this technology by proactively applying tax breaks to promising technologies used in new vehicles in Denmark, and insurance companies can be spurred to create financial incentives to use new technology. Through the EU and European organisations, we can influence this development, e.g. through the international cooperation that authorities and organisations like the Danish Transport Authority, the Danish Road Directorate, the Danish Road Safety Council and FDM are involved in.

Passive and active safety

In 2012, DTU Transport published its report on "The development of passive safety in vehicles – degrees of injury for drivers of passenger cars and vans". The study was based on all accidents in 2004–2010. One of the conclusions was that if all vehicles had been one year newer, the number of vehicle drivers killed would have been reduced by 7%, those seriously injured by 3.5% and those suffering minor injuries by almost 1.5%.

However, this study looked only at the effect of passive safety in the vehicles: deformation zones, seat-belt tensioners, airbags, etc. – in other words, the equipment that lessens the consequences of the accident. But the greatest potential lies in active safety equipment, and hence reduces the number of accidents.

At the end of 2012, DTU Transport published its report on "The effect of automotive technology on road safety – a manual". As an example of active safety equipment, this report describes the safety effect of electronic stability control, which has become widespread in Denmark in recent years. The report states that electronic stability control reduces the risk of a single-vehicle accident by 34%. This result matches findings from other countries.

Previously, the introduction of ABS brakes had an impact on road safety, and in the future electronic emergency braking systems and inattention and tiredness alarms could save many serious accidents.

Strategy for disseminating safety technology

Efforts to disseminate safety technology in Danish vehicles could take the form of a two-pronged strategy:

- The existing vehicle stock will be replaced, with the oldest and least safe vehicles being scrapped. A proactive financial incentive policy will promote this renewal of the vehicle population.
- This should encourage a situation where new vehicles are fitted with the latest available technology. This could be done via tax breaks for new and promising technology, for example, or by changing the tax structure.

The potential of technological development can be considered in the following three areas:

- technology that prevents deliberate risky driving
- technology that helps the road user
- technology that makes the accident less serious

The knowledge of the technological possibilities that the Road Safety Commission obtained while drawing up this Action Plan will be out of date in a few years. Driverless vehicles, which are very rare today, are likely to develop further by 2020. This underlines the need to monitor developments closely and support their dissemination with concrete actions. Similarly, the use of IT on the road network, e.g. via dynamic speed regulation on congested sections, can help to adjust drivers' current speed to the conditions and thus avoid accidents.

Technology outside the vehicle will also do more to provide for safer traffic. This includes automated roadside systems that can assist the police in monitoring traffic, and automatic traffic control. Stationary and mobile police control can identify drivers who cross at red or blatantly break the law and fail to consider other road users.

Technology that prevents deliberate risky driving

Deliberate risky driving can be prevented by existing technologies such as:

- intelligent speed adaption which prevents the driver from exceeding the speed limit;
- alcohol ignition interlocks, which prevent drink-driving.

Requirements could be imposed for these systems to be installed as part of a penalty, or they could be factory-fitted or retro-fitted as a matter of course.

Technology that helps the road user to behave correctly

The vast majority of road users behave quite sensibly in traffic and have no intention of deliberately breaking the rules or driving in a risky way. For these road users there are many systems that can help:

- digital speed maps and voluntary use of guidance systems that help the driver not to go faster than the speed limits, either with an alarm or a physical restriction.
- lane monitors that warn drivers when they deviate from their lane, e.g. crossing the line through inattention.
- distance sensors and automatic emergency braking systems which minimise the risk of rear-end collisions, e.g. in case of sudden congestion.
- impairment (tiredness) detectors which register the driver's performance and observe whether he or she needs a break.
- blind spot detectors, which keep an eye on the vehicle's blind spots and give a visual or audible alarm if another vehicle is in the blind spot.
- reversing sensors which safeguard pedestrians, cyclists and other road users when the vehicle is reversing.
- ABS on motorcycles.
- black boxes that record driving behaviour right before an accident can influence behaviour.

Safety technology that makes the accident less serious

Active safety technology cannot prevent all accidents, so it is important to focus also on the development of passive safety technology that can limit the extent of injuries if there is an accident.

There are limits to the forces the body can withstand, so it is important for the vehicle to be designed in such a way that the body and the internal organs are affected as little as possible. Here, the technological development of the vehicles is essential, and great progress has been made in recent years. Safety technology such as speed limiters and emergency braking systems will also help to reduce the collision speed and hence the impact on the body.

Denmark's vehicle population is not being replaced at a rate that can gain the maximum effect from technological development. This underlines the need for a proactive tax policy to promote the use of safety technology in new vehicles.

Examples of effective safety technology are:

- reinforced cabins and crumple zones – the vehicle should be designed so that the impact on everyone in the vehicle is reduced to the minimum;
- airbags outside and inside to protect passengers inside the vehicle and "vulnerable road users" outside;
- seat belt tensioning systems to ensure that the belts work effectively;
- seats that protect the body, head and neck as effectively as possible, e.g. against whiplash injuries.

Ways of promoting technological development

Although Denmark does not manufacture vehicles, we have several ways of influencing development in Europe and to some extent ensuring that Danish vehicles are as safe as possible. In recent years, Euro NCAP's tests have helped prompt motor manufacturers to design vehicles that meet stringent safety requirements. Euro NCAP can also be given much of the credit for the increased safety of vehicles today. The continued tightening of the requirements in Euro NCAP to gain five stars, and the replacement of the vehicle population to bring in more newer vehicles with better safety and hence better Euro NCAP ratings, will further improve vehicle safety in the future.

Denmark should continue to back up Euro NCAP by making test results a parameter for setting the registration fee, and by including results from Euro NCAP in the consumer information from the Danish Transport Authority.

Denmark has every opportunity to play a full part in this work.

Denmark was one of the countries in Europe which most rapidly achieved the highest proportion of new vehicles with ESC (electronic stability control), which stops vehicles from skidding. This was due to a tax break which made it attractive for vehicle importers to fit ESC as standard in Danish vehicles. Thus, there are ways of using tax breaks to quickly get the latest technology into new Danish vehicles. Another way is to encourage insurance companies to offer reduced premiums for vehicles fitted with new technology.

Finally, we should consider increasing the tax on vehicles that do not have a sufficient level of safety equipment, such as vehicles that score badly in Euro NCAP.

When new and revised rules are drawn up for vehicles in the EU, Denmark should push for the requirements for vehicles to be set at a high safety level.


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PART 2: FOCUS AREAS AND MEASURES

Focus areas - general

The Danish Road Safety Commission has opted to focus efforts in the coming years on ten areas:

1. **Speeding**
2. **Alcohol and drugs**
3. **Inattention**
4. **Failure to wear seat-belts and helmets**
5. **Pedestrians**
6. **Cyclists and moped riders**
7. **Young drivers up to age 24**
8. **Accidents with oncoming traffic**
9. **Single-vehicle accidents**
10. **Accidents at rural junctions**

The focus areas have been chosen with a view to solving the biggest road safety problems, as identified from the accident statistics.

The ten focus areas are described below on the basis of a template which briefly presents the problem, sets out the facts and outlines what can be done to bring about an improvement. The suggested measures have been chosen according to the observed frequency of accidents, combined with knowledge of the road safety effects of each measure. All the measures are listed at the end of the Action Plan.

The focus areas are not listed in any order of priority.

Selection of focus areas

The selection of the ten focus areas is primarily based on two data sources from the Danish Road Directorate:

1) the general accident statistics
2) the detailed statistics of fatal accidents

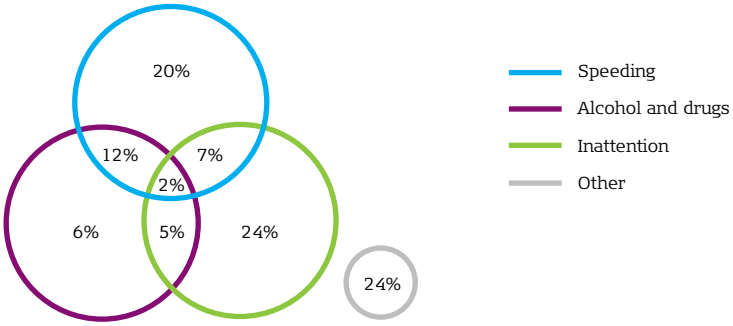
The primary source was the general accident statistics, which contain details of all road accidents and personal injuries recorded by the police on public roads in Denmark. From the details of accidents involving personal injury and recorded by the police in the period 2006–2010 (a database of approximately 3000–4000 such accidents per year), we have examined what types of accident occur most frequently and which groups of road users are most vulnerable.

The accident statistics do not cover all the required details of the accidents. So it is not possible to assess what circumstances had a bearing on the accidents occurring, nor is it possible to judge what might have contributed to making some of the accidents more serious than others. Similarly, there is no detailed information logged on the behaviour of road users before and during an accident. A further source, related to the behaviour of road users, has therefore been used as a basis for identifying the focus areas: the detailed statistics of fatal accidents.

In these statistics, all fatal accidents in 2010 and 2011 are examined more closely to assess, among other things, what accident and injury factors played a part in any given fatal accident. Data on driver behaviour has also been collected and evaluated. As there are relatively few fatal accidents each year on Danish roads, the database for the detailed statistics of fatal accidents is smaller than for the general accident statistics. In 2010 there were 231 fatal accidents with a total of 255 road users killed, and in 2011 there were 208 fatal accidents with 220 deaths in total. The database is thus much more detailed, but also much narrower in scope.

The ten focus areas are grouped into four wider groups:

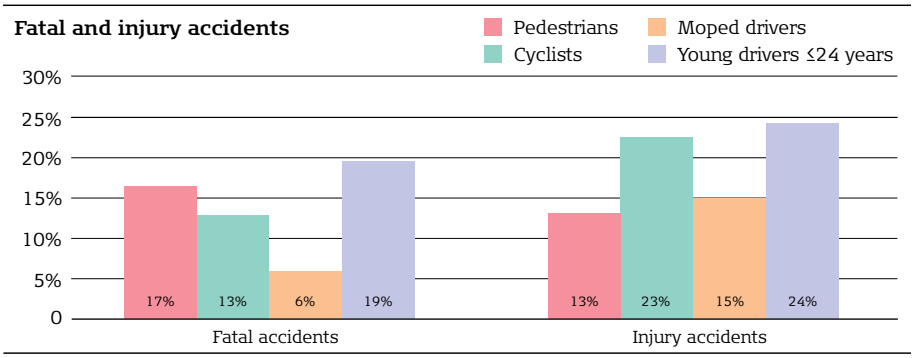
Focus areas 1–3 are behaviour-related areas which are either unreliably recorded or not described in the general accident statistics. These three areas have therefore been identified mainly on the basis of experience from the detailed statistics of fatal accidents on the basis of accident factors – i.e. the circumstances judged to have had a crucial bearing on the incidence of fatal accidents in 2010–2011. The chart shows the share of fatal accidents in these three areas.



Percentage breakdown of fatal accidents in 2010–2011 by accident factor.
Source: Danish Road Directorate detailed statistics of fatal accidents

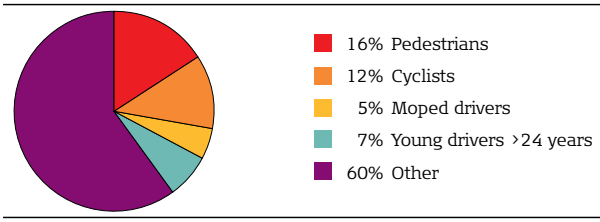
Focus area 4, the failure to wear seat-belts and helmets, is also a behaviour-related area. The use of safety equipment may be an unreliable parameter in the general accident statistics. That is why this focus area is mainly documented in the detailed statistics of fatal accidents, which look at injury factors such as a lack of seat-belts or helmets – i.e. circumstances judged to have had a crucial bearing on the extent of injuries.

Focus areas 5–7 have to do with groups of road users who are particularly over-represented in the accident statistics. These areas have been identified from the general accident statistics.

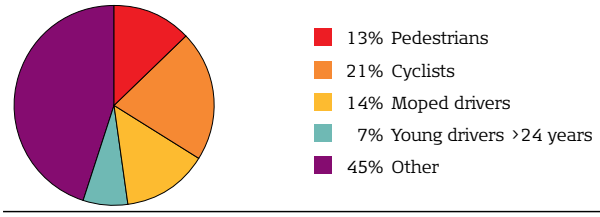


The share of respectively fatal and injury accidents in 2010-2011 by accidents with pedestrians, cyclists, moped drivers and young drivers up to 24 years. Note that there might be overlaps between the type of accidents. Source: The Danish Road Directorate accident statistics

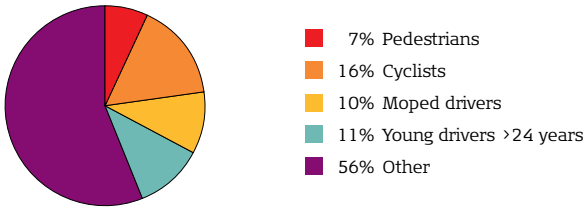
Deaths



Serious injuries



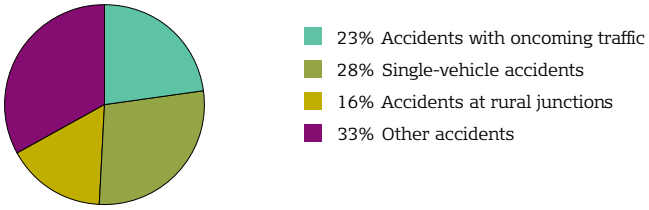
Minor injuries



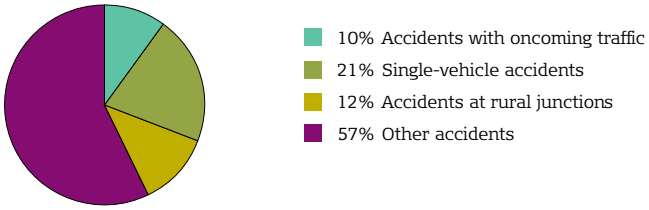
The distribution of fatalities, serious and minor injuries in 2010-2011 to pedestrians, cyclists, moped drivers, young drivers up to 24 years and other road users.
Source: The Danish Road Directorate accident statistics

Focus areas 8–10 concern specific types of accident that are over-represented in the statistics. These three areas have also been identified from the general accident statistics.

Fatal accidents



Injury accidents



The proportion of fatal and injury accidents in 2010-2011 by solo accidents, meeting accidents, accidents at intersections in rural areas and other accidents.
Source: The Danish Road Directorate accident statistics

Measurement points

In order to track developments in each of the ten focus areas, a number of measurement points have been established.

These should not be taken as targets but as a direction for development.

For some of the focus areas, the measurement points are linked to accident figures from the accident statistics; in other places, there are different measurements closely tied to the measurement point. For example, the measurement point for "failure to wear a seat-belt or helmet" is defined as the trend in the use of safety belts and cycle helmets from the Danish Road Safety Council's retrospective belt and helmet counts.

What the measurement points have in common is that they are based either on accident figures or on other measurements that are already being taken. Therefore, no additional resources are needed to track developments on an ongoing basis.

Until 2020 the measurement points will be used in regular status notes to the Action Plan, to produce an overview of the extent to which the guidance is being followed or whether the area should be examined again.

For the focus areas where the figures are based on the accident statistics, the base year is calculated as an average for 2009–2011 to reduce the risk of any impact from short-term fluctuations.

The measurement points used in this Action Plan are at the national level and cannot be directly transferred to measurement points for the individual players. A local authority or a company can define its own measurement points, such as the number of passenger vehicles in the company with five Euro NCAP stars or the proportion of children who wear cycle helmets. The defining feature of a measurement point is that it should be easily measurable and have a documented connection to improved road safety – either by preventing accidents involving road users or by reducing injuries.

Ongoing measures

In parallel with the measures described under the focus areas, there are important ongoing initiatives which contribute to an improvement in road safety. These may be official activities which do not attract the same attention from day to day but are nevertheless essential for road safety. Police controls, the work of the highway authorities and training in primary schools are examples of this.

Police controls benefit road safety because targeted and effective policing helps make road users respect the rules of the road. At the same time the controls operate in conjunction with national campaigns, typically as follow-up to a campaign. The aim of police controls is not to maximise the number of convictions but to have a significant impact on changing driver behaviour.

Training, from lessons for children in the youngest school classes up to actual driving lessons in Danish driving schools, is crucial to ensuring that the road users of the future will be able to travel safely and responsibly in traffic. The Danish Road Safety Council works closely with the local police, municipalities and schools to make road safety interesting and relevant to children in school. This involves things like walking tests for the youngest pupils, cycling tests in the 3rd and 6th grade and school patrols. For the oldest pupils, who are about to leave school, one important task is to raise awareness of the risks that inappropriate behaviour on the roads can entail.

Finally, the basic operation and maintenance of the road network by the highway authorities is a precondition for sustaining current levels of road safety. The highway authorities can usefully apply road safety parameters in their choice of roadside fittings and invest in road safety equipment.

The Road Safety Commission advises the country's highway authorities to use a number of methods and activities to target and tailor their road engineering efforts in particular. Because these activities are not actually technical measures, they are not tied to a specific focus area, just as there are no actual calculations of the potential for road safety and the expected effect.

The Road Safety Commission advises the country's highway authorities to prioritise the following suggested measures:

- road safety audits
- road safety inspections
- systematic accident reduction through road safety engineering measures
- local road safety and speed limit plans

A road safety audit is a systematic and independent safety review of highway projects. The aim is to make new and improved roads as safe as possible. The systematic process increases the likelihood of unsuitable road designs etc. being detected in time so that they can be changed before the construction work takes place. This will reduce the risk of accidents and the need for subsequent costly rebuilding of the finished facility.

A road safety inspection is a systematic and independent safety assessment of existing roads, basically following the same procedure as a road safety audit. A road safety inspection is used to identify and rank possible hazards on existing roads. Suggested solutions are also proposed, which can then be prioritised. Road safety inspections can also play a major role in operations carried out for reasons other than pure road safety, as they may provide a good opportunity to make road safety improvements where resources are to be used anyway for renewal and maintenance.

Accident prevention with the aid of systematic identification and subsequent rectification of black spots is generally recognised as one of the most effective and profitable road safety measures. A black spot is a junction or a stretch of road where there are more accidents than would be expected from the volume of traffic and the nature of the road. The method is intended to target actions at the places in the road network where there is the greatest chance of preventing accidents. A number of black spots are identified at regular intervals. These are then analysed in detail to determine ways of improving road safety. When a number of proposed solutions have been submitted, they are prioritised by comparing the expected reduction in accidents and injuries with the expected cost of construction.

Local road safety and speed limit plans are a particularly useful tool for the local authorities. Road safety plans can focus on measures to promote safety on the roads and activities to change road users' behaviour within a defined period. A road safety plan may contain a speed limit plan as a starting point, or this may be drawn up independently of the road safety plan. Speed limit plans provide a basis for working with the local police to set local speed limits, and will help in the longer term to match the design of the roads to the speed limits and the speeds at which road users drive. This will prevent a large number of accidents in one fell swoop.

In parallel with these activities, the Road Safety Commission recommends that work should continue in each road sector to establish and develop roads that are self-explanatory – both in planning rules and in practice. We should strive for simple, clear road design which helps to regulate priorities at junctions, makes it easier to read the course of the road and helps drivers choose the right safe speed for the road. In this connection, we should also work to ensure that only the necessary information is provided, so that road users can focus on the essentials.

Focus area no. 1

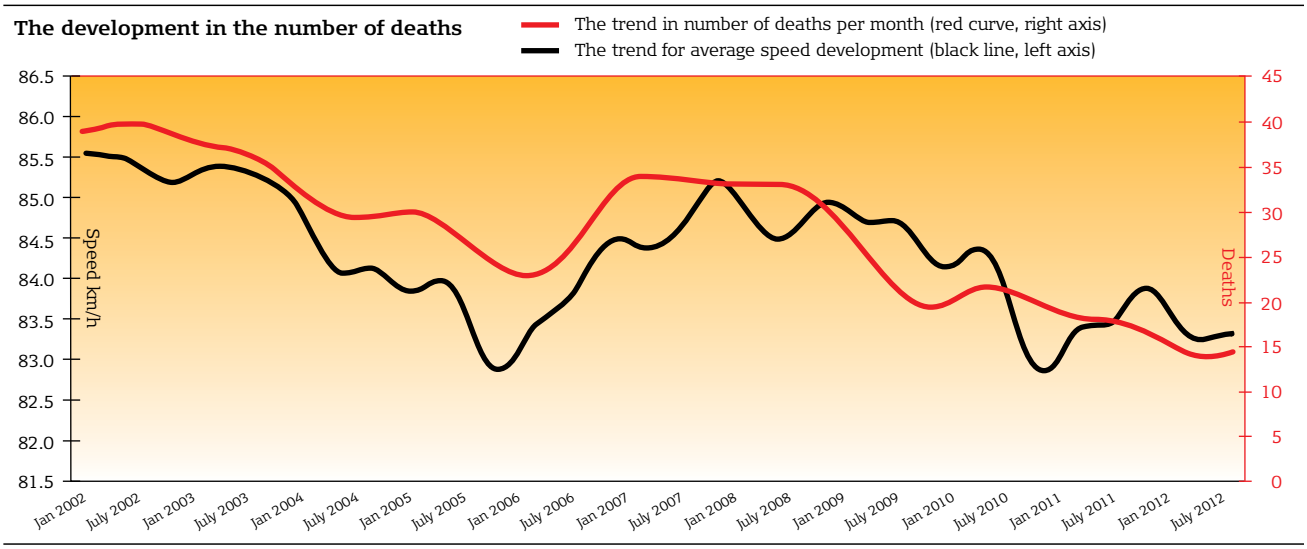
Speeding

Speeding is a contributory factor to accidents and their severity. As can be seen from the table below, speeds have been decreasing in recent years, but road users still exceed the speed limits on Danish roads. This is especially true on primary roads, where more than 60% of road users drive faster than is allowed. It is also on primary roads that most accidents happen.

So it is on these roads that a decrease in average speeds will have the greatest effect on the number of accidents. Differentiated speed limits (both downwards and upwards), governed by the safety level of the road, may help to reduce the number of accidents. If speeds increase on selected primary roads, however, we can only expect a decrease in accidents if there are substantial investments in the roads to achieve a satisfactory level of safety.

It is a well-documented fact that, the higher the general speed on the roads, the more accidents will happen, and the more serious they will be. The Danish Road Accident Investigation Board has repeatedly documented the impact of high speed on accidents. Even slight speeding can dramatically exacerbate an accident. Road users from all parts of society break the speed limits.

As the chart below shows, historically there is a clear correlation between the number of deaths and average speeds on the roads.



Trend in the number of deaths per month (in red) compared to the trend in average speeds (in black) from January 2002 to September 2012 inclusive. Source: Danish Road Directorate accident statistics and the "speed barometer"

Facts about high-speed accidents

Speed is an unreliable parameter in the general accident statistics, and experience from the detailed fatal accidents statistics shows that speed is often recorded too conservatively in the accident statistics. In the detailed accident statistics, it is

estimated that in 40% of fatal accidents in 2010–2011, excessive speed in relation to the speed limits or the conditions contributed to the accident happening.

With regard to **fatal accidents** where excessive speed was an accident factor, we find that, compared to other fatal accidents, they more often:

- occurred in rural areas (Figure 1)
- were single-vehicle accidents (Figure 2)
- happened in the dark (Figure 3)

As to **the drivers** who were speeding in fatal accidents, we find that, compared to drivers who did not drive too fast, they more often:

- were drivers of passenger vehicles and motorcycles (Figure 4)
- were men (Figure 5)
- were young drivers up to 24 years old (Figure 6)

Figure 1
Shows the percentage distribution of fatal accidents with high speed as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by urban and rural zone.

Figure 2
Shows the percentage distribution of fatal accidents with high speed as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by single-vehicle accidents and other types of accidents.

Figure 3
Shows the percentage distribution of fatal accidents with high speed as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by lighting conditions at the time of the accident.

Figure 4
Shows the percentage distribution of drivers who were driving too fast compared to drivers who were not driving too fast in fatal accidents in 2010–2011, with a breakdown by gender.

Figure 5
Shows the percentage distribution of drivers who were driving too fast compared to drivers who were not driving too fast in fatal accidents in 2010–2011, with a breakdown by gender.

Figure 6
Shows the percentage distribution of drivers who were driving too fast compared to drivers who were not driving too fast in fatal accidents in 2010–2011, with a breakdown by age groups 0–24 and 25 and over.

Figure 1

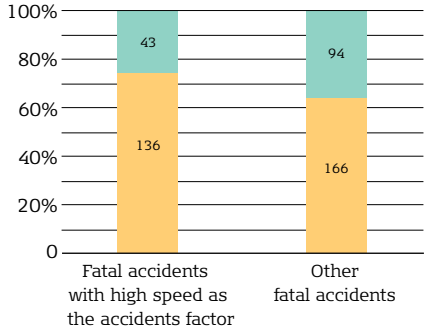


Figure 2

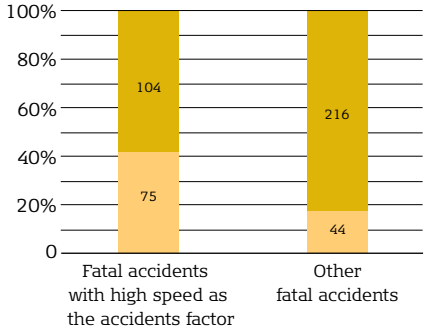


Figure 3

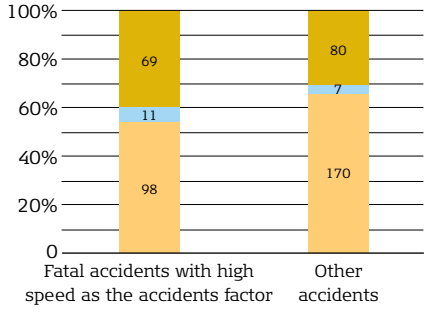


Figure 4

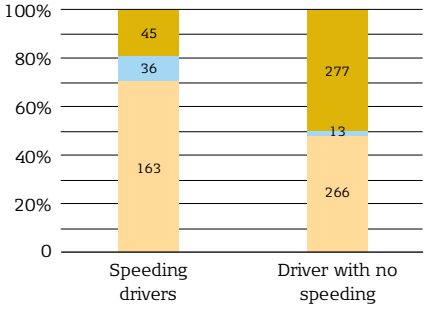


Figure 5

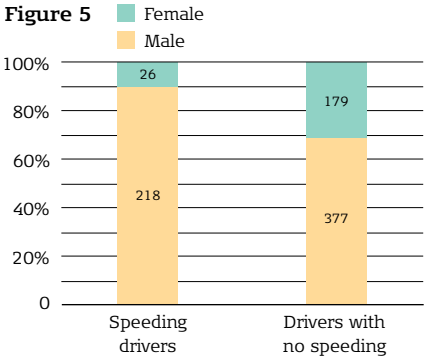
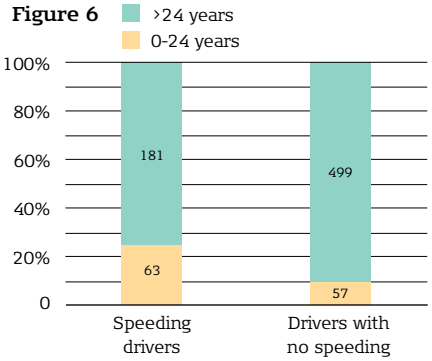


Figure 6



What can be done?

When Danes drive too fast, this reflects the fact that many drivers underestimate the effect of speed on the risk of an accident happening. According to researchers, the human brain is not built to perceive the risk of high speed, which underlines the need for society to regulate and prevent accidents.

Studies have shown that Danes are generally happy to keep to the speed limits[2]. So it is a social task to help road users to reduce their speed. The view is that police controls, technological development, road engineering, legislation and information and awareness campaigns will have a positive effect in reducing speeds. The Road Safety Commission believes that efforts should be concentrated on accidents in rural areas and targeted mainly at motorcyclists and young male vehicle drivers.

2) TrygFonden and Mandag Morgen.

The measurement point for a successful action is a general decrease in average speeds on primary roads.

Measurement point – Speeding

Proportion of journeys exceeding the speed limit, expressed as an average of breaches on urban and rural roads. The measurement point has been taken from March–October, as the conditions are not then affected by night frost, snow or other adverse winter weather.

Base:	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Prop. (Mar-Oct)	63.4%	60.8%	60.2%	-	-	-	-	-	-	-	-

Source: Danish Road Directorate "speed barometer"

Suggested measures

Legislation, sanctions and controls

1.1. Targeted police control
1.2. Access to electronic data from vehicles
1.10. Penalty point system when 20% over the speed limit
1.11. Owner's liability for traffic offences
1.17. Greater use of ATC
1.18. Legal requirement for reflective jackets

Education and communication

2.1. Road safety policy in companies
2.4.1. Speed campaigns
2.4.8. Campaigns on "reading the road"

The roads

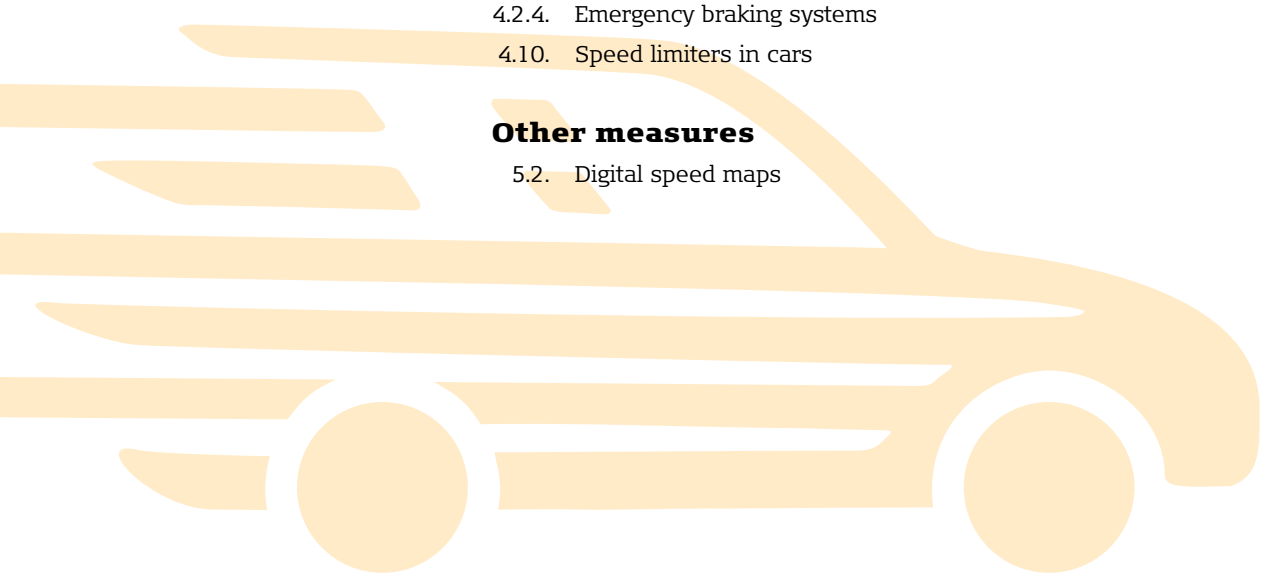
3.1. Road safety audits
3.2. Road safety inspections
3.3. Systematic accident reduction through road safety engineering measures
3.4. Municipal action plans
3.5. Local speed plans
3.6. Self-explanatory roads
3.10. Speed reducing measures
3.14. Greater scope for establishing speed limit zones
3.20. "2 minus 1" roads in the countryside
3.21. Local speed limits at rural junctions
3.22. Variable speed limit signs
3.23. "Your speed" signs
3.25. Construction of roundabouts

Vehicles

4.1. Black boxes
4.2.4. Emergency braking systems
4.10. Speed limiters in cars

Other measures

5.2. Digital speed maps



Focus area no. 2

Alcohol and drugs

One of the success stories in Danish road safety is that we have managed to change the attitude of road users to drink-driving. From being generally accepted at the end of the 1970s, it is now socially unacceptable to drive under the influence of alcohol. The number of drink-driving accidents has fallen, but they still account for the greatest proportion of the most serious accidents. Drink-driving therefore remains a problem.

Driving under the influence of narcotics or medication has only come to the attention of road users in recent years. The police have been given powers to screen drivers who may be affected more thoroughly than before, and more road users have been charged. Young road users have the biggest problems with narcotics. Older road users, on the other hand, have to be careful about driving and medication: they may take the wrong dose, for example. As the Danish population includes more and more elderly road users, it is essential to monitor this trend and launch campaigns and educational measures.

However, the greatest difference to road safety will still come from efforts targeted at drink-driving.

Facts about alcohol and drugs

It is estimated that in 25% of fatal accidents in 2010–2011, the effects of alcohol or drugs contributed to the accident happening. The figures for narcotics and medication are very low. For accidents involving personal injury as a whole, the general accident statistics show that at least one driver of a motor vehicle had a blood alcohol level over 0.05% in 13% of cases.

With regard to fatal accidents where drink was an accident factor, we find that, compared to other fatal accidents, they more often:

- happened in the dark
- happened at weekends
- were single-vehicle accidents
- involved speeding

Figure 1
shows the percentage distribution of fatal accidents with driving under the influence of alcohol as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by lighting conditions at the time of the accident.

Figure 2
shows the percentage distribution of fatal accidents with driving under the influence of alcohol as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by days of the week.

Figure 3
shows the percentage distribution of fatal accidents with driving under the influence of alcohol as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by single-vehicle accidents and other types of accidents.

Figure 1

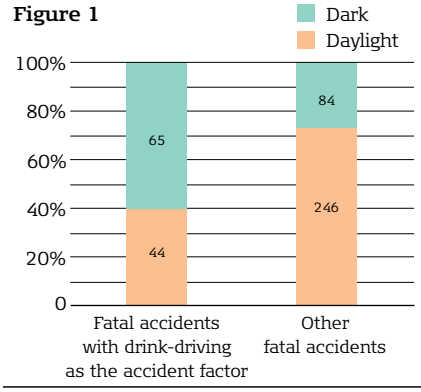


Figure 2

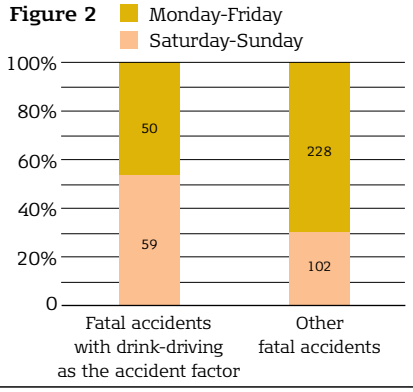
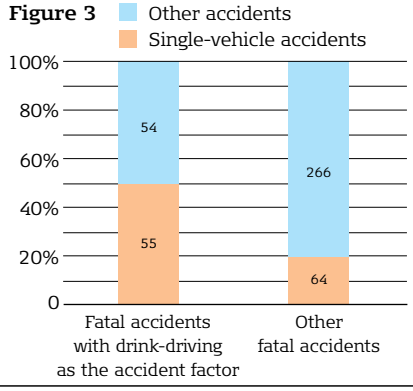


Figure 3



As to the drivers involved in fatal accidents while over the alcohol limit, we find that, compared to drivers who were not, they more often:

- were moped or motorcycle riders
- were men
- were under 25
- did not use seat-belts
- were speeding

Figure 4 Not intoxicated drivers / Intoxicated drivers

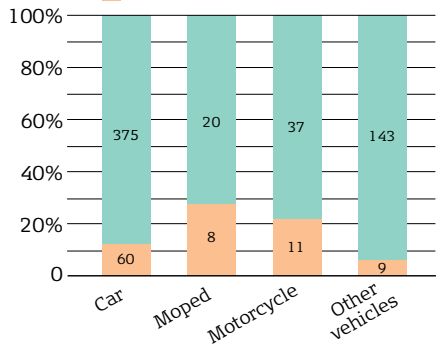


Figure 5 Female / Male

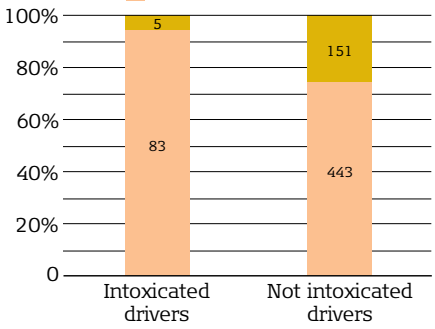


Figure 6 › 24 years / 0-24 years

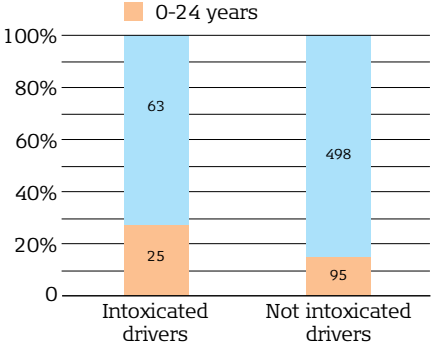


Figure 4 shows the percentage distribution of drivers of cars, motorcycles, mopeds and other motor vehicles in fatal accidents in 2010–2011 with a breakdown by whether or not they were over the legal limit for driving under the influence of alcohol.

Figure 5 shows the percentage distribution of motor vehicle drivers who were over the legal limit for driving under the influence of alcohol compared to drivers who were not over the legal limit for driving under the influence of alcohol in fatal accidents in 2010–2011, with a breakdown by gender.

Figure 6 shows the percentage distribution of motor vehicle drivers who were over the legal limit for driving under the influence of alcohol compared to drivers who were not over the legal limit for driving under the influence of alcohol in fatal accidents in 2010–2011, with a breakdown by age groups 0–24 and 25 and over.

There is thus great potential for preventing accidents caused by alcohol and drug use if we concentrate our efforts on night-time and weekend accidents and target young men.

Drink-driving – what can be done?

Drink-driving accidents are often single-vehicle accidents and happen in the evening or at night. This may mean that the person concerned has been drinking, either alone or together with other road users. Drink-driving after social contact with others can be prevented by campaigns focusing on other road users' responsibility and ability to intervene.

Drink-driving where the driver may suffer from general alcohol abuse can be effectively prevented by the use of alcohol locks. Studies show, for example, that the reduction in relapses by drunk drivers is greater by a factor of 65–90% compared to taking away their driving licence. It is therefore recommended that alcohol locks should also be included as part of a wider programme of treatment and prevention[3].

In the longer term and as vehicle technology develops, alcohol locks fitted as standard could help to prevent both types of drink-driving.

3) SWOV Fact sheet "Driving under the influence of alcohol" http://www.swov.nl/rapport/Factsheets/UK/FS_Alcohol_UK.pdf

A general blood alcohol limit of 0.02% for all road users would eliminate any doubt in drivers' minds as to their fitness to drive. Sweden has seen good results from such a reduction, and Denmark would do well to follow suit. Studies show that road users want this sort of limit, and reducing the blood alcohol limit will emphasise that it is socially unacceptable to drive under the influence[4].

4) See e.g. Danish Road Safety Council, Study (position paper)

As drink-driving is by far the most serious problem compared to narcotics and medication, the measurement point will focus on reducing the number of deaths and injuries associated with it.

Measurement point – Alcohol and drugs

Number of road users killed and injured in accidents where at least one driver of a motor vehicle has a blood alcohol level over 0.05%.

Avg.	2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	651	608	485	-	-	-	-	-	-	-	-

Source: Danish Road Directorate accident statistics

Suggested measures

Legislation, sanctions and controls

1.1. Targeted police controls
1.2. Blood alcohol limit of 0.02%
1.3. Offer of treatment for those convicted of drink-driving
1.4. Wider use of screening alcometers
1.5. Wider use of instruments for screening driving under the influence of drugs

Education and communication

2.1. Road safety policy in companies
2.4.3. Drink-driving campaigns

Vehicles

4.11. Alcohol ignition interlocks in cars
4.13. Electronic driving licences

Focus area no. 3

Inattention

"When you are driving, just drive." This simple slogan should be easy to follow, but recent studies have shown that it is not so simple. Many road users focus on other things that grab their attention rather than on what is essential for driving. Both specific studies by the Danish Road Accident Investigation Board and the results from the detailed statistics of fatal accidents indicate that inattention is among the most frequent causes of accidents.

Inattention may be caused by many things. Studies from Sweden show that tiredness is a factor in at least one in four fatal accidents. Then there are a large number of potential distractions both outside and inside the vehicle that can take the driver's attention away from the traffic and create dangerous situations.

Facts about accidents caused by inattention

It is estimated in the detailed accident statistics that in 38% of fatal accidents in 2010–2011, insufficient attention contributed to the accident happening.

With regard to fatal accidents where inattention was an accident factor, we find that, compared to other fatal accidents, they more often:

- were accidents with oncoming traffic
- were single-vehicle accidents
- happened at junctions
- were due to excessive speed

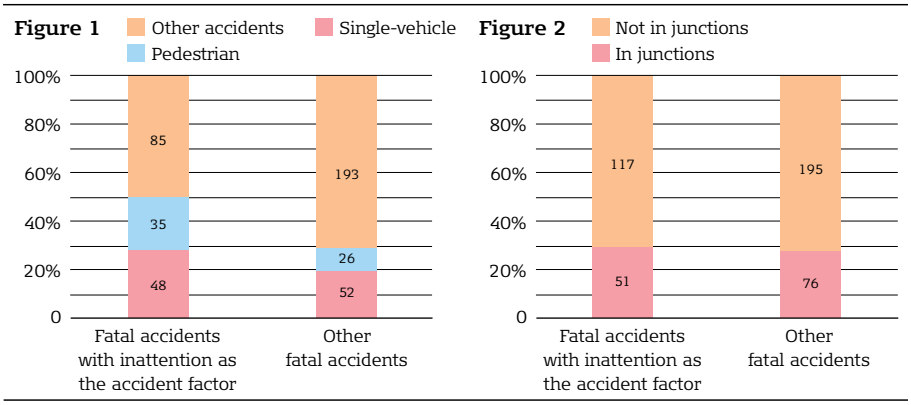


Figure 1
shows the percentage distribution of fatal accidents with inattentive driving as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by head-on accidents, accidents involving pedestrians and other accidents.

Figure 2
shows the percentage distribution of fatal accidents with inattentive driving as an accident factor compared to other fatal accidents in 2010–2011, with a breakdown by accident location.

What is inattention – and what can be done?

Recent research has increased our knowledge of inattention on the roads, and this makes a crucial difference compared with earlier action plans. We have become much better at understanding what inattention is.

This can be illustrated by the figure below:

Distraction type		Description
Visual distraction		When the driver looks away from the traffic
Cognitive distraction		When the driver's mind is focused on something other than the traffic
Manual distraction		When the driver lets go of the steering wheel with one or both hands
Auditory distraction		When the driver listens to something other than the traffic

These four types of distraction affect the road user's ability to drive safely in different ways and can occur in different combinations depending on the type of distracting action being performed. Texting while driving, for example, causes visual inattention (eyes taken off the road), cognitive inattention (thoughts diverted by what to type) and manual inattention (using the phone). It is estimated that 70% of road users are distracted by things inside the vehicle and the remaining 30% by distractions outside[5].

As modern technology is increasingly incorporated in vehicles, the number of distractions inside the vehicle increases, and technology that is not basically designed for driving raises a number of challenges that need to be addressed by legislation, information and campaigns.

A proactive tax policy to promote technological aids will have a preventive effect on the number of accidents. Campaigns can raise awareness of inattention and have a positive effect on behaviour, including providing concrete tools to prevent e.g. tiredness or the use of handheld mobile phones while driving.

On and around the roads, things like illuminated and moving adverts compete for road users' attention, moving their focus from the traffic and increasing the risk of accidents. By striving for a simple and easily understood road environment and reducing the quantity of information directed at road users, we can limit the number of accidents caused by inattention.

[5] Møller et al. (2010): Distraktion i forbindelse med bilkørsel (Distraction while driving). Report 3, February 2010. DTU Transport.

Measurement point – Inattention

Proportion of drivers who admit to engaging in distracting actions while driving:

Base	Udg.pkt 2012[6]	2013	2014	2015	2016	2017	2018	2019	2020
Prop.	20.9%	-	-	-	-	-	-	-	-

Source: Danish Road Safety Council position tracking

6) Respondents to the Danish Road Safety Council's position tracking survey say that they use handheld or hands-free phones, look at or key into the phone, use GPS, take care of children or look for things in the car at least "once in a while". This is based on figures for Q4/2012 and Q1/2013.

Suggested measures

Legislation, sanctions and controls

1.1. Targeted police controls

1.2. Access to electronic data from vehicles

Education and communication

2.1. Road safety policy in companies

2.4.2. Inattention campaigns

2.4.6. Campaigns focusing on the important function of parents as role models

2.4.8. Campaigns on "reading the road"

The roads

3.6. Self-explanatory roads

3.11. Reduction in distractions outside the vehicle

3.15. Rumble strips on country roads

3.16. Central crash barriers on major roads

3.21. Local speed limits at rural junctions

3.22. Variable speed limit signs

Vehicles

4.1. Black boxes

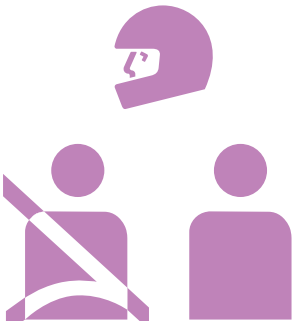
4.2.1. Lane monitors

4.2.2. Blind spot detection systems

4.2.3. Drowsiness detection systems

4.2.4. Emergency braking systems

Focus area no. 4



Failure to wear seat-belts and helmets

Safety belts are the cheapest and most effective safety equipment in vehicles. The vast majority of vehicle users wear seat-belts and the proportion is rising. In 2010, 92% of all drivers and passengers in private cars wore seat belts.

The rate of helmet use by motorcyclists and moped riders is high, and the use of cycle helmets also displays a rising trends for all age groups.

Among motorcyclists and moped riders, around one-fifth of those killed or seriously injured were not wearing a helmet. This is in sharp contrast to the 97% who normally wear a helmet, which makes those who do not use helmets massively over-represented in the accident statistics.

Facts about seat-belt and helmet use

It is estimated that in 28% of fatal accidents in 2010–2011, failure to wear a seat-belt and/or helmet contributed to the extent of the injuries. For accidents involving personal injury in general, 18% of road users killed or injured in vehicles were not wearing a seat-belt, and 41% of those killed and injured on motorcycles, mopeds and bicycles were not wearing a helmet.

As to those killed and injured in vehicles who were not wearing a seat-belt, we find that, compared to other road users killed and injured, they more often:

- were men
- were under the influence of alcohol
- were under 25

For those killed and injured on motorcycles and mopeds who were not wearing a helmet, we find that, compared to other road users killed and injured, they more often:

- were under the influence of alcohol

Figure 1
shows the percentage distribution of people wearing seatbelts or not wearing seatbelts in cars in which someone was killed, seriously injured or slightly injured in 2010–2011.

Figure 2
shows the percentage distribution of people wearing helmets or not wearing helmets while riding motorcycles, mopeds or bicycles when killed, seriously injured or slightly injured in 2010–2011.

Figure 3
shows the percentage distribution of people killed or injured in cars when seatbelts were not being worn compared to cars where seatbelts were being worn in 2010–2011, with a breakdown by gender.

Figure 1 With seat-belt or not stated / Without seat-belt

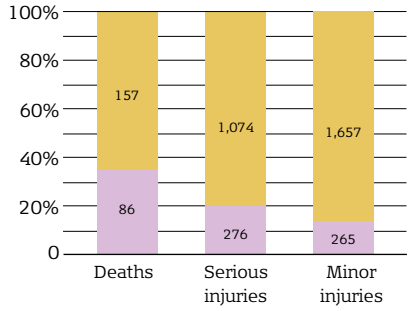


Figure 2 With helmet or not stated / Without helmet

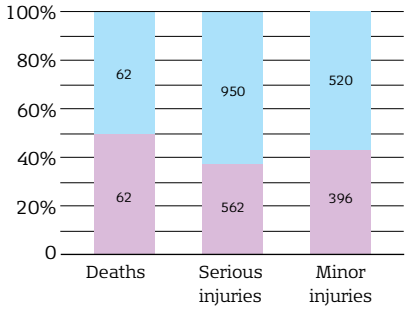


Figure 3 Female / Male

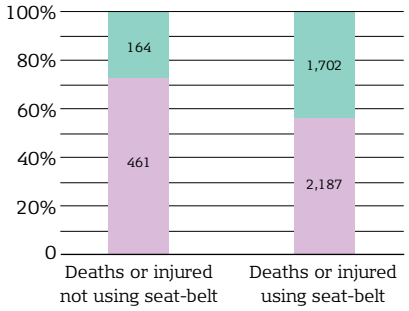


Figure 4
shows the percentage distribution of people killed or injured in cars when seatbelts were not being worn compared to cars where seatbelts were being worn in 2010–2011, with a breakdown by the influence of alcohol.

Figure 5
shows the percentage distribution of people killed or injured in cars when seatbelts were not being worn compared to cars where seatbelts were being worn in 2010–2011, with a breakdown by age groups 0–24 and 25 and over.

Figure 4

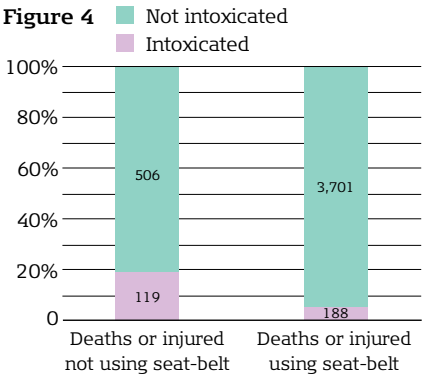
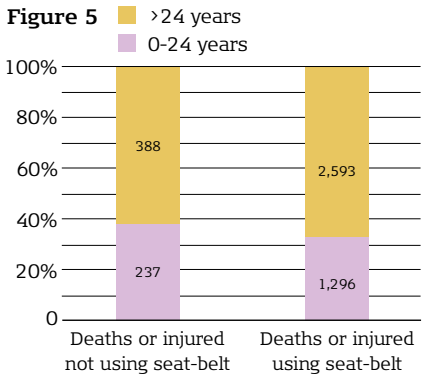


Figure 5



Efforts directed at failure to wear seat-belts and helmets are likely to have the greatest effect if they are combined with efforts directed at young male road users who drive while under the influence of alcohol.

What can be done?

Seat-belts save lives, and the increased use of seat-belts since 2000 has both spared road users from physical injury and saved society from paying hospital costs etc. The reason for the high rate of seat-belt use is a combination of campaigns, legislation on safety equipment for children and penalties for not wearing a seat-belt along with the wider use of seat-belt alarms.

The remaining group of road users who still do not wear seat-belts can be reached effectively by measures such as seat-belt reminders, tighter laws and communication efforts directed at the relevant target groups.

The rate of helmet use among motorcyclists is high, and the exceptions have to be viewed in conjunction with police efforts directed at specific groups within society. At the same time, the focus for the ordinary motorcyclist could usefully be on the use of other safety equipment such as clothing and reflectors.

Over the years, campaigns and general information have helped to increase the numbers of cyclists who wear helmets. The Road Safety Commission believes that these initiatives should continue to 2020.

Measurement point – Failure to wear seat-belts and helmets

Proportion of drivers and passengers who wear seat-belts:

Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Target 2020
Passenger cars	92%	-	94%	-	-	-	-	-	-	-	-	-

Source: Danish Road Safety Council: Use of helmets 2012 among cyclists and moped cyclists

Proportion of adult cyclists wearing helmets:

Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Target 2020
Cycle helmet	25%	26%	28%	-	-	-	-	-	-	-	-	

Source: Danish Road Safety Council: Use of helmets 2012 among cyclists and moped cyclists

Suggested measures

Legislation, sanctions and controls

1.1. Targeted police controls

1.13. Penalty point system for failure to wear a seat-belt

Education and communication

2.1. Road safety policy in companies

2.4.7. Campaigns for increased use of seat-belts

Vehicles

4.12. Wider use of seat-belt alarms

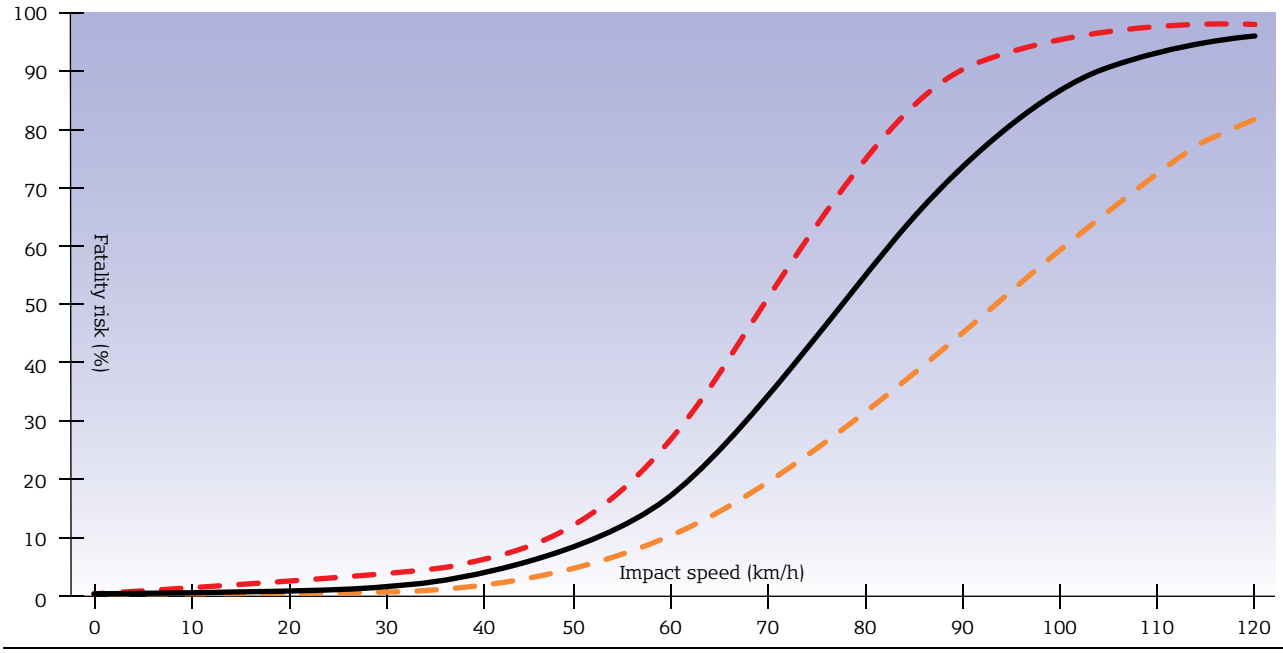
Focus area no. 5

Pedestrians

All citizens are pedestrians at some point. As pedestrians, we are particularly vulnerable when an accident happens. Our general human physiology is not built to withstand collisions at high speed or with heavy objects, so accidents are often serious.

There are serious consequences as a result of a pedestrian being hit by a car. And the faster the car is going, the greater the risk of serious injury. The chart below, which represents the latest research in this area, shows the effect on adult hit head on by a car.

Pedestrian accidents



Percentage risk of being killed as a pedestrian compared to speed in km/h. Source: Erik Rosén, Autoliv Research, NVF, May 2011

Accidents involving pedestrians most frequently happen at junctions in urban areas. Older people and children are usually the most vulnerable – the former because they become more infirm with age, and the latter because they have not yet developed a full understanding of the dangers of traffic.

Facts about accidents involving pedestrians

17% of fatal accidents in 2010–2011 involved pedestrians. For accidents involving personal injury as a whole, the general accident statistics show that 13% of cases involved pedestrians.

With regard to fatal accidents involving pedestrians, we find that compared to other fatal accidents, they more often:

- happened in urban areas
- happened in the dark
- involved one or more inattentive road users

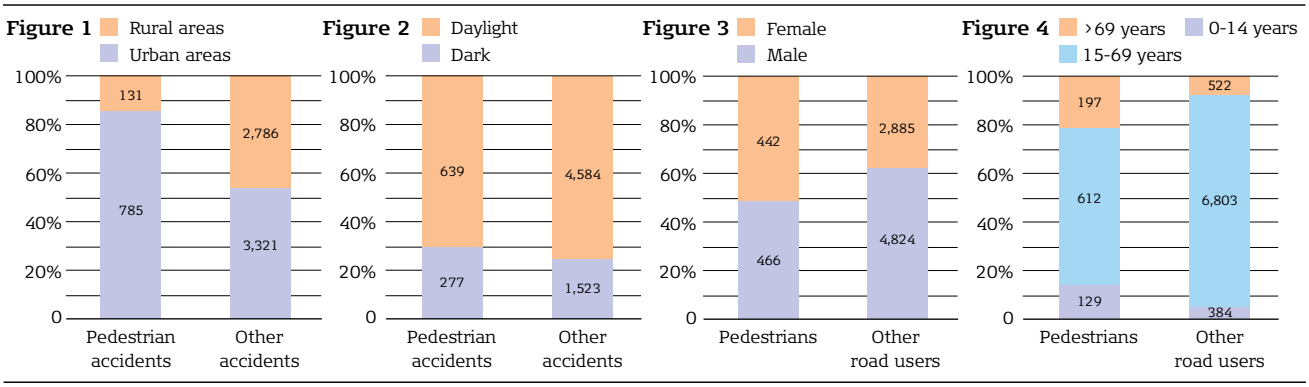


Figure 1 shows the percentage distribution of accidents involving personal injury to pedestrians compared to other accidents involving personal injury in 2010–2011, with a breakdown by urban and rural zone.

Figure 2 shows the percentage distribution of accidents involving personal injury to pedestrians compared to other accidents involving personal injury in 2010–2011, with a breakdown by lighting conditions at the time of the accident.

Figure 3 shows the percentage distribution of pedestrians killed or injured compared to other people killed or injured in 2010–2011, with a breakdown by gender.

Figure 4 shows the percentage distribution of pedestrians killed or injured compared to other people killed or injured in 2010–2011, with a breakdown by the following age groups: 0–14, 15–69 and 70 and over.

Compared to other road users killed and injured, pedestrians more often:

- were women
- were children under 14
- were elderly (70 years and over)

Pedestrians are vulnerable road users who are often seriously injured on the roads. 16% of those killed in 2010–2011 were pedestrians, while 13% of serious injuries and 7% of minor injuries were to pedestrians.

It is important to note that pedestrians are a group of road users under-represented in the accident statistics, because a large proportion of accidents to pedestrians are not reported to the police and therefore not recorded in accident statistics.

The extent of non-serious accidents to pedestrians can therefore be assumed to be greater than the accident statistics suggest.

What can be done?

Road engineering and a general focus on speed in towns will have a beneficial effect on the reduction in the number of pedestrians killed and injured. Particular attention should be given to busy roads where, most accidents tend to happen. The growing number of older pedestrians requires special initiatives, which will also benefit other groups. Continued municipal efforts to provide crossing facilities will be a step in the right direction for the safety of pedestrians.

Some of those killed on motorways are pedestrians who have got out of their vehicles after an accident or breakdown. Greater use of reflective jackets can prevent some of these accidents.

Technology should also be an area for action, perhaps in the form of special emergency braking systems in cars. Finally, training in schools and school patrols can improve the safety of school children where traffic is involved.

Measurement points – Pedestrians

Number of pedestrians killed and injured

Avg.	2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	470	460	422	-	-	-	-	-	-	-	-

Source: Danish Road Directorate accident statistics

Suggested measures

Legislation, sanctions and controls

1.18. Legal requirement for reflective jackets

Education and communication

2.2. Traffic policy in schools

2.3. Traffic policy in voluntary associations

2.4.6. Campaigns focusing on the important function of parents as role models

2.12. Wider use of reflectors

The roads

3.4. Municipal action plans

3.10. Speed reducing measures

3.12. Better design of junctions and crossing places in towns

3.12.1. Improved crossing facilities for pedestrians

3.12.2. Crossings at give-way junctions

3.12.3. Stop lines placed further back

3.13. Signalling improvements

3.14. Greater scope for establishing speed limit zones

3.20. "2 minus 1" roads in the countryside

3.22. Variable speed limit signs

3.23. "Your speed" signs

3.27 Cycle lane in the countryside

Vehicles

4.2.4. Emergency braking systems

4.2.5. Reversing sensors

4.2.6. Pedestrian-friendly fronts with external airbags

4.3. Renewal of vehicle stock

Other measures

5.1. Improved A&E department records

Focus area no. 6

Cyclists and moped riders

Denmark is internationally renowned as a leading country for cycling. Cycling is the primary means of transport for many people in our big cities. It is also generally safe to cycle in Denmark, which is why many children cycle to and from school.

With so many people cycling, there will, of course, be more accidents to cyclists than in countries we normally compare ourselves with where fewer road users ride a bicycle. However, this does not mean that we should accept that we have more bicycle accidents, as it is always possible to improve safety for those who choose the bicycle as a means of transport.

Moped accidents are a particular challenge that we need to take special steps to address.

Cyclists and moped riders are two very different groups of road users. The suggested measures therefore take account of this difference and the demographic breakdown and social characteristics of the use of this type of transport.

Facts about accidents involving cyclists and moped riders

In 13% of fatal accidents in the period 2010–2011, at least one cyclist was involved, and in 6% of fatal accidents there was at least one moped rider involved. In accidents involving personal injury during 2010-2011 at least one cyclist was involved in 23% of cases, and at least one moped rider was involved in 15% of cases.

12% of road users killed on the roads in 2010–2011 were cyclists and 5% were moped riders. Of those seriously injured on the roads, 21% were cyclists and 14% were moped riders. 16% of minor injuries were to cyclists and 10% to moped riders.

It is important to note that cyclists and moped riders are a group of road users under-represented in accident statistics because a large proportion of accidents to cyclists and moped riders are not reported to the police and therefore are not recorded. The extent of non-serious accidents to cyclists and moped riders can therefore be assumed to be greater than the accident statistics suggest. The Road Safety Commission therefore recommends that there should be better recording of this type of accident via a combination of A&E department data and official accident statistics.

With regard to accidents involving injury to cyclists and moped riders, we find that, compared to other accidents involving injury, they more often:

- happened in urban areas
- happened at junctions

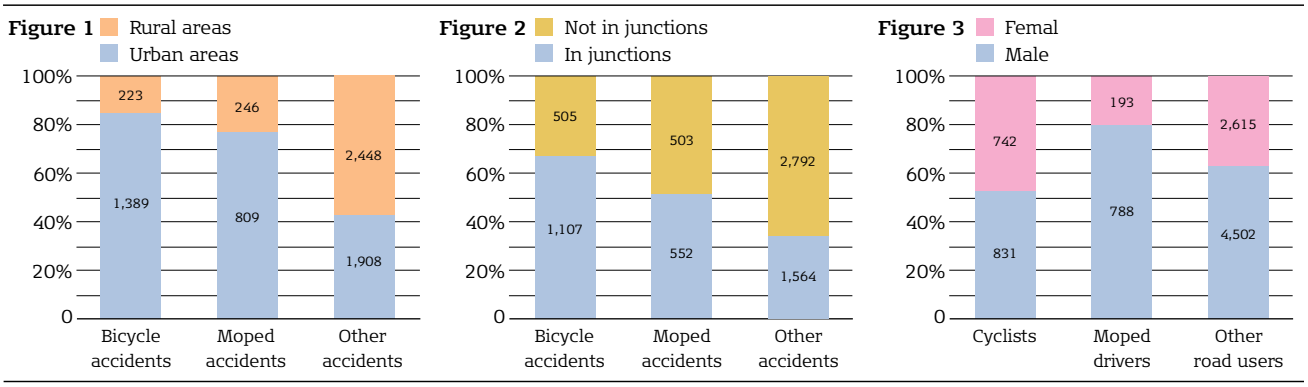


Figure 1
shows the percentage distribution of accidents involving personal injury to cyclists and moped riders respectively compared to other accidents involving personal injury in 2010–2011, with a breakdown by urban and rural zone.

Figure 2
shows the percentage distribution of accidents involving personal injury to cyclists and moped riders respectively compared to other accidents involving personal injury in 2010–2011, with a breakdown by crossroad accidents and non-crossroad accidents.

Figure 3
shows the percentage distribution of cyclists and moped riders killed or injured compared to other people killed or injured in 2010–2011, with a breakdown by gender.

Figure 4
shows the percentage distribution of cyclists killed or injured compared to other people killed or injured in 2010–2011, with a breakdown by the age groups 0–14 and 15 and over.

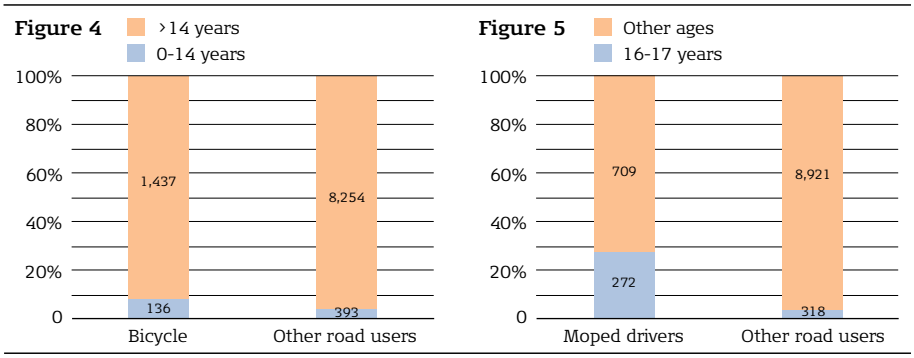
Figure 5
shows the percentage distribution of moped riders killed or injured compared to other people killed or injured in 2010–2011, with a breakdown by the age group 16–17 and other age groups.

Compared to other road users killed and injured, we find that they more often:

- were women
- were children under 14 years

Compared to other road users killed and injured, we find that, they more often:

- were men
- were aged 16–17
- were under the influence of alcohol



Accidents with cyclists and moped riders can best be prevented by efforts in urban areas and particularly at junctions. For moped riders, specific measures could usefully be targeted at male riders aged 16–17.

What can be done?

Cyclists need to have a better understanding of dangers at junctions. Initiatives such as right-turn campaigns have helped, but other areas call for action too. There is a constant need for campaigns and police controls on the use of lights, behaviour on the road and other measures.

More speed limit zones in towns – particularly on busy roads – could be an effective way of preventing accidents with cyclists. As the vast majority of accidents with cyclists in towns happen at junctions, better design of these junctions is needed if the number of cyclists killed and injured is to be reduced.

Cyclists can enhance their own safety by wearing a helmet and fitting good lights. Helmets will have a positive effect on the number of serious head injuries, and campaigns can support the increased use of helmets.

Campaigns and police controls are important ways of preventing moped accidents, which are often due to inappropriate behaviour.

The law on mopeds was tightened in the period 2011/2012 with a requirement for training for riders and more penalties for offences. It is important to monitor developments closely to ensure that this remaining group is included.

Measurement point – Cyclists

Number of cyclists killed and injured:

Measurement point	Avg 2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	815	860	839	-	-	-	-	-	-	-	-

Source: Danish Road Directorate accident statistics

Measurement point – Moped riders

Number of moped riders killed and injured:

Measurement point	Avg 2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	546	478	395	-	-	-	-	-	-	-	-

Source: Danish Road Directorate accident statistics

Suggested measures

Legislation, sanctions and controls

1.1. Targeted police controls

Education and communication

2.2. Traffic policy in schools

2.3. Traffic policy in voluntary associations

2.4.4. Campaigns on the risks to cyclists at junctions

2.4.5. Campaigns for increased use of helmets

2.4.6. Campaigns focusing on the important function of parents as role models

2.12. Wider use of reflectors

The roads

3.4. Municipal action plans

3.10. Speed reducing measures

3.12. Better design of junctions and crossing places in towns

3.12.2. Crossings at give-way junctions

3.12.3. Stop lines placed further back

3.12.4. Truncated cycle lane

3.13. Signalling improvements

3.14. Greater scope for establishing speed limit zones

3.20. "2 minus 1" roads in the countryside

3.22. Variable speed limit signs

3.23. "Your speed" signs

3.27. Cycle lanes in the countryside

3.28 Separation of cyclists and motor vehicles at roundabouts

Vehicles

4.2.2. Blind spot detectors in systems

4.2.4. Emergency braking systems

4.2.5. Reversing sensors

4.2.6. Pedestrian-friendly fronts with external airbags

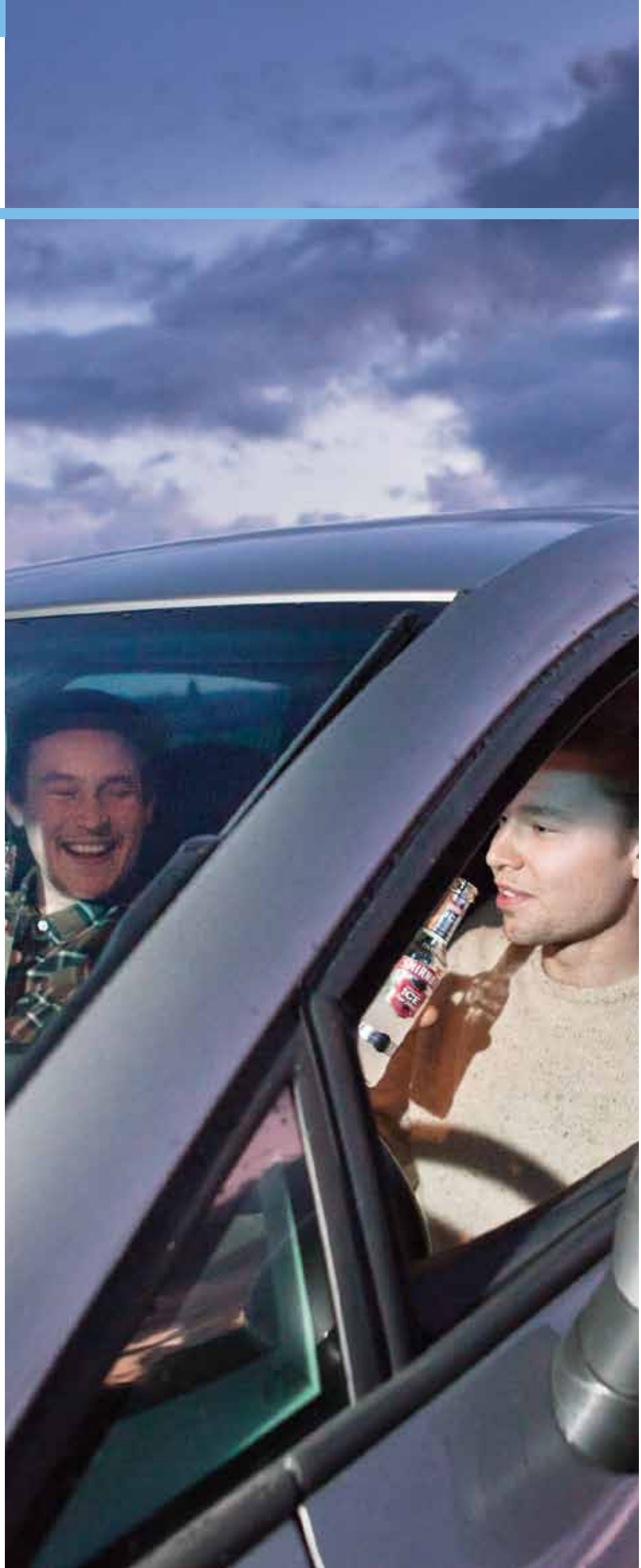
4.3. Renewal of vehicle stock

4.14. In-vehicle technology to prevent right-turn accidents

Other measures

5.1. Improved A&E department records

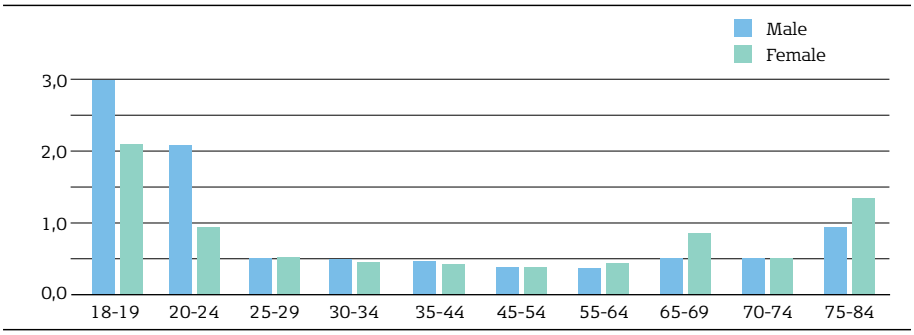
Focus area no. 7



Young drivers under 24

It is a constant challenge to aim for fewer deaths and injuries to young drivers. The latest research shows that young men in particular are not sufficiently mature mentally to understand all the risks when in traffic. A lack of insight and knowledge as well as and social and cultural standards are also factors and can have a harmful effect on road safety.

Young drivers are at far greater risk on the roads than older road users. This can be seen from the total risk, which expresses the risk of being involved in an accident in which road users are killed or injured in relation to the amount a person drives.



Total risk for car drivers in 2010 by age and gender (deaths and serious injuries per 10 million km).
Source: DTU Transport, Risk on the roads 2007–2010, 2012

In this context, however, it is important to stress that the vast majority of young road users obey the law and drive carefully. That does not change the fact that individual young drivers constantly make errors that can have serious consequences. This underlines society's duty to help the young driver in particularly critical situations through good road design and better in-vehicle technology.

Facts about accidents involving young drivers under 24

In 19% of fatal accidents in 2010–2011 at least one young driver aged up to 24 was involved. In accidents involving personal injury in general, at least one young driver aged up to 24 was involved in 24% of cases.

Figure 1
shows the percentage distribution of accidents involving personal injury to young motorists up to the age of 24 compared to other accidents involving personal injury in 2010–2011, with a breakdown by urban and rural zone.

Figure 2
shows the percentage distribution of accidents involving personal injury to young motorists up to the age of 24 compared to other accidents involving personal injury in 2010–2011, with a breakdown by lighting conditions at the time of the accident.

Figure 3
shows the percentage distribution of accidents involving personal injury to young motorists up to the age of 24 compared to other accidents involving personal injury in 2010–2011, with a breakdown by single-vehicle accidents and other accidents.

Figure 1

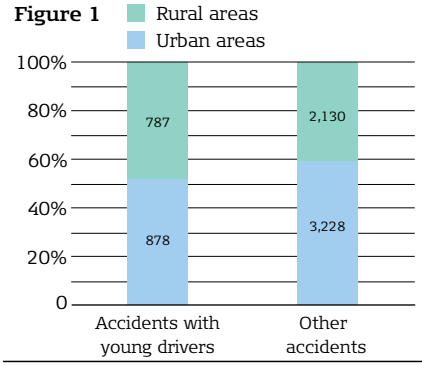


Figure 2

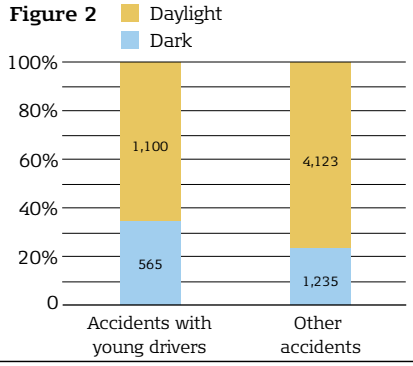
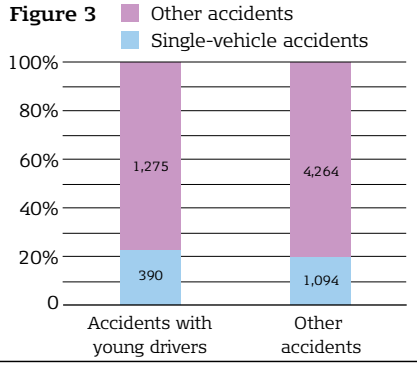


Figure 3



7% of those killed and 7% of those seriously injured in 2010–2011 were young drivers up to age 24. 11% of minor injuries were associated with the same group. Compared to other accidents, personal injuries involving young drivers under 24, more often:

- happened in rural areas
- happened in the dark
- were single-vehicle accidents

Figure 4 Female / Male

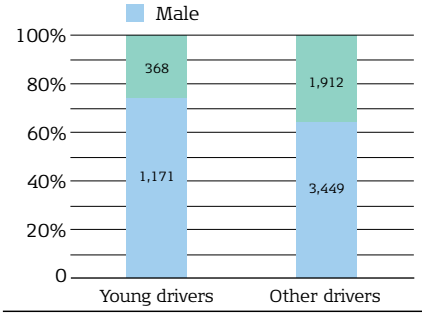


Figure 5 With seat-belt or not stated / Without seat-belt

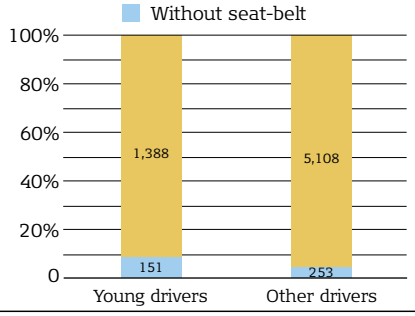


Figure 6 Not intoxicated / Intoxicated

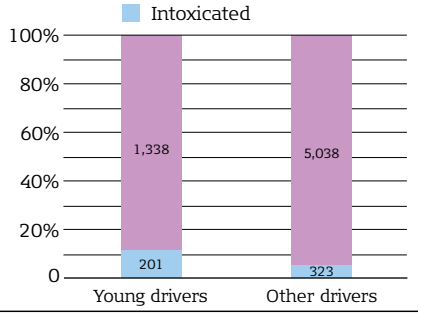


Figure 4 shows the percentage distribution of young motorists compared to other motorists in accidents involving personal injury in 2010–2011, with a breakdown by gender.

Figure 5 shows the percentage distribution of young motorists compared to other motorists in accidents involving personal injury in 2010–2011, with a breakdown by the wearing of seatbelts.

Figure 6 shows the percentage distribution of young motorists compared to other motorists in accidents involving personal injury in 2010–2011, with a breakdown by driving under the influence of alcohol.

Compared to other drivers involved in accidents causing injury, young drivers, more often:

- were men
- did not use seat-belts
- were under the influence of alcohol

What can be done?

An overhaul of driver training (which dates back to 1986) is needed. The high accident risk among young road users is mainly due to factors linked to their age and their lack of experience and good habits. This means the ability to anticipate dangerous situations – and act accordingly.

Many countries have introduced graduated driving licences, where drivers are given progressively more freedom as they gain experience. Denmark should monitor the effect of these practices to ensure that any Danish decision to introduce graduated driving licences is taken on a well-documented basis.

Young road users' parents play a crucial role in how their children behave whilst driving in traffic. The Road Safety Commission therefore recommends working with parents and their role as examples to their children, as young road users copy their parents' behaviour.

Simpler and more understandable road layout will especially benefit young and inexperienced road users, who do not have the experience to see through complex traffic situations.

Measurement point – Young drivers up to age 24

Number of deaths and injuries in accidents involving at least one car driver under 24 years old:

Measurement point	Avg 2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	1,150	1,028	842	-	-	-	-	-	-	-	-

Source: Danish Road Directorate accident statistics

Suggested measures

Legislation, sanctions and controls

1.1. Targeted police controls
1.2. Access to electronic data from vehicles
1.10. Penalty point system when 20% over the speed limit
1.11. Owner's liability for traffic offences
1.12. Blood alcohol limit of 0.02%
1.13. Penalty point system for failure to wear a seat belt

Education and communication

2.2. Traffic policy in schools
2.3. Traffic policy in voluntary associations
2.4.1. Speed campaigns
2.4.2. Inattention campaigns
2.4.3. Drink-driving campaigns
2.4.6. Campaigns focusing on the important function of parents as role models
2.4.7. Campaigns for increased use of seat belts
2.4.8. Campaigns on "reading the road"
2.10. Better driver training
2.11. Better driving instructor training

The roads

3.19.1. Clearing of verges
3.19.2. Establishment of safety zones
3.19.3. Crash barriers beside the road

Vehicles

4.1. Black boxes
4.2.1. Lane monitors
4.3. Renewal of vehicle stock
4.10. Speed limiters in cars
4.12. Wider use of seat-belt alarms
4.13. Electronic driving licences

Other measures

5.1. Improved A&E department records

Focus area no. 8

Accidents with oncoming traffic

Accidents with oncoming traffic are where two vehicles collide head on or hit each other from the side. They are therefore often called frontal collisions. Accidents with oncoming traffic happen when one of the vehicles involved moves to the wrong side of the road because of excessive speed, a hazardous overtaking manoeuvre or lack of attention.

Accidents with oncoming traffic are violent because they often happen at high speed, and the higher the speed, the more serious the accident. Road users who are hit on their own side of the road often have little or no time to react and avoid the collision. Therefore, road design and in-vehicle technology may be among the most effective ways of preventing accidents of this type.

Facts about accidents with oncoming traffic

23% of fatal accidents in the period 2010–2011 were accidents with oncoming traffic. For accidents involving personal injuries in general, the statistics show that 10% were accidents with oncoming traffic. Accidents with oncoming traffic are thus among the most serious types of accident.

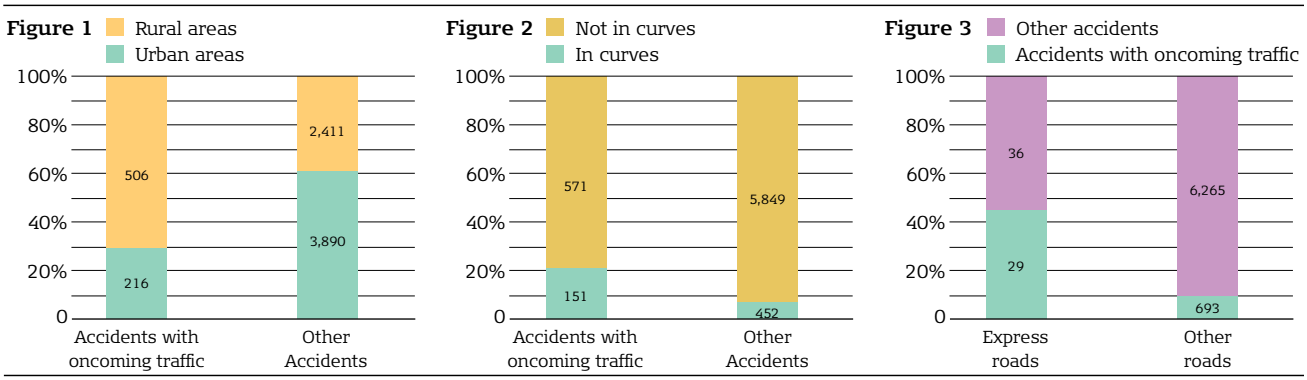
With regard to fatal accidents with oncoming traffic, we find that, compared to other accidents causing injury, they more often:

- happened in rural areas
- happened on bends
- happened on busy roads
- involved one or more inattentive road users

Figure 1
shows the percentage distribution of head-on accidents compared to other accidents involving personal injury in 2010–2011, with a breakdown by urban and rural zone.

Figure 2
shows the percentage distribution of head-on accidents compared to other accidents involving personal injury in 2010–2011, with a breakdown by road design.

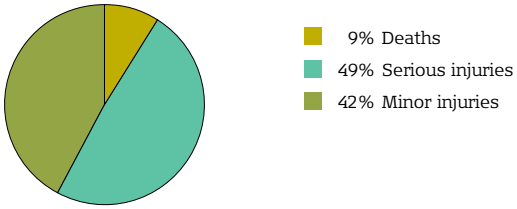
Figure 3
shows the percentage distribution of accidents involving personal injury on dual carriageways compared to other accidents involving personal injury in 2010–2011, with a breakdown by head-on accidents and other accidents.



Efforts to reduce the number of accidents with oncoming traffic should therefore be concentrated on rural areas, bends and busy roads.

Accidents with oncoming traffic are among the accident types causing the most deaths in relative terms, as 9% of those involved are killed. In other accidents, the percentage of road users killed is just under 5%.

Accidents with oncoming traffic



The distribution of casualties in accidents with oncoming traffic in 2010-2011 in fatalities, serious and minor injuries.
Source: The Danish Road Directorate accident statistics

What can be done?

In general, measures against speeding and driving while under the influence and measures to increase driver awareness can reduce the number of accidents with oncoming traffic.

Improvements to primary roads, with rumble strips, widening on bends and the creation of 2+1 roads can prevent accidents with oncoming traffic. The creation of 2+1 roads demands substantial investment, but if we target the most accident-prone stretches of road, these investments will pay for themselves through lives saved and injures prevented.

Road engineering can usefully be supplemented with automatic traffic control, either stationary or mobile, as trials have demonstrated the preventive effect of this measure. As in other areas, in-vehicle technology will also have a positive effect here.

Measurement point accidents with oncoming traffic

Number of persons killed and injured in accidents with oncoming traffic:

Measurement point	Avg 2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	585	511	396	-	-	-	-	-	-	-	-

Source: Danish Road Directorate accident statistics

Suggested measures

Legislation, sanctions and controls

1.2. Access to electronic data from vehicles

1.10. Penalty point system when 20% over the speed limit

Education and communication

2.4.1. Speed campaigns

2.4.2. Inattention campaigns

2.4.8. Campaigns on "reading the road"

The roads

3.1. Road safety audits

3.2. Road safety inspections

3.3. Systematic accident reduction through road safety engineering measures

3.4. Municipal action plans

3.5. Local speed plans

3.6. Self-explanatory roads

3.15. Rumble strips on country roads

3.16. Central crash barriers on major roads

3.17. Widening in the centre on bends

3.18. Marking of bends

3.19. Establishment of safe run-off areas

3.19.1. Clearing of verges

Vehicles

4.1. Black boxes

4.2.1. Lane monitors

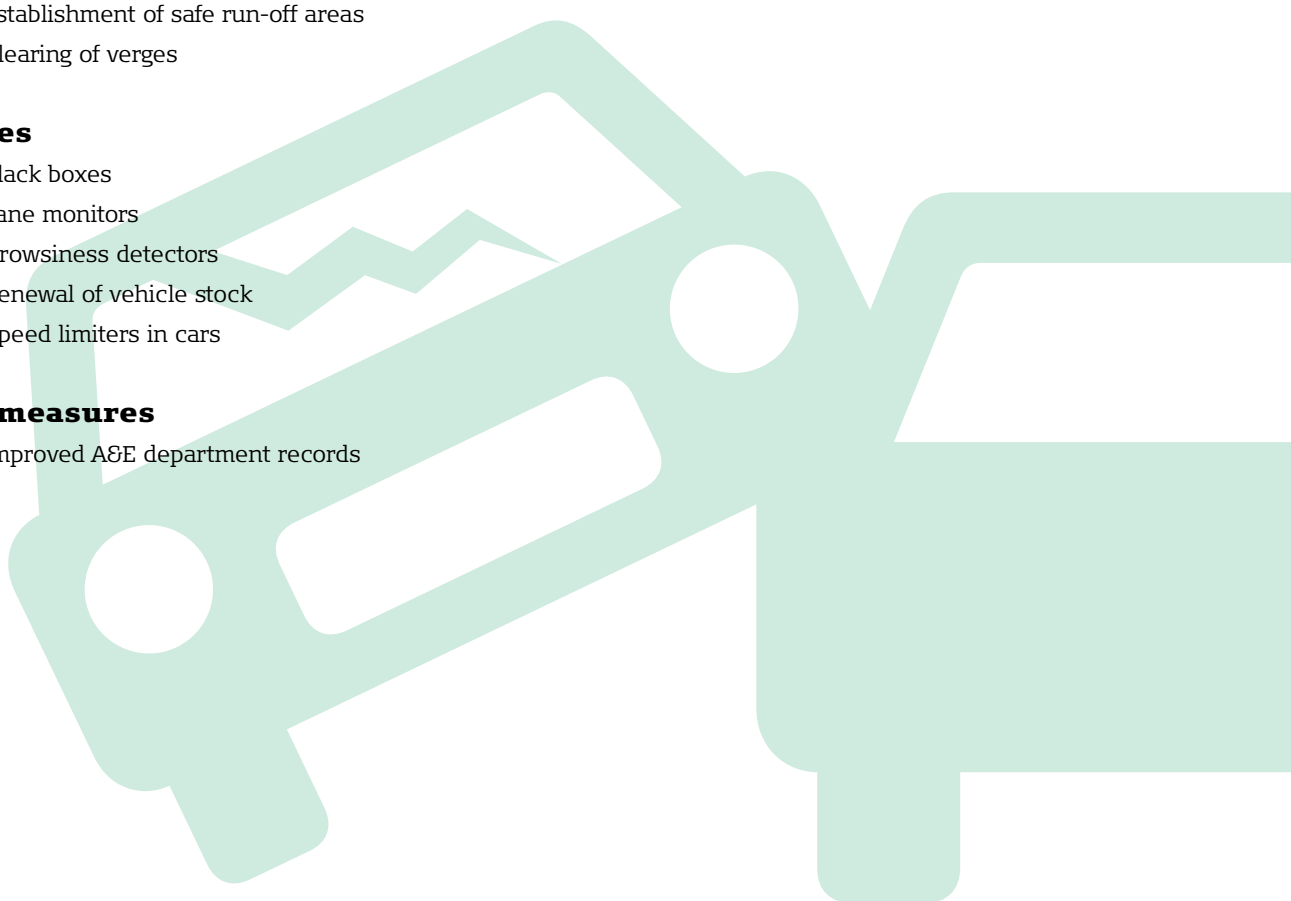
4.2.3. Drowsiness detectors

4.3. Renewal of vehicle stock

4.10. Speed limiters in cars

Other measures

5.1. Improved A&E department records



Focus area no. 9

Single-vehicle accidents

Single-vehicle accidents are accidents involving just one vehicle. These accidents often happen when the vehicle runs off the road, possibly because the driver has lost control. The accidents are typically serious if objects off the road, such as trees, are hit or if the driver is not wearing a seat belt.

Single-vehicle accidents can often seem incomprehensible; how can a driver go wrong where there are no immediate hazards? The police can find it hard to record the exact reason, but studies conducted by the Danish Road Accident Investigation Board[7], for example, and the detailed statistics of fatal accidents indicate that speeding is often a large part of the explanation. As road users, we have a sub-conscious tendency to underestimate the significance of speed. This is true of both car drivers and motorcyclists.

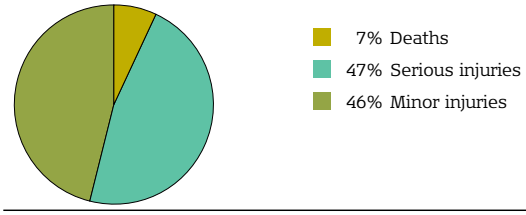
[7] *HVU, Report no. 7, 2011*

General inattention or attention to the wrong thing is also parts of the explanation. Drink-driving is another factor.

Facts about single-vehicle accidents

28% of fatal accidents in 2010–2011 were single-vehicle accidents. For accidents involving personal injury as a whole, the general accident statistics show that 21% of cases were single-vehicle accidents.

Single-vehicle accident



Proportion of accidents involving death and injury in the period 2010–2011 broken down into single-vehicle accidents. Source: Danish Road Directorate accident statistics

With regard to single-vehicle accidents, we find that, compared to other accidents causing injury, they more often:

- happened in rural areas
- happened in the dark
- involved motorcycles

Figure 1 shows the percentage distribution of single-vehicle accidents compared to other accidents involving personal injury in 2010–2011, with a breakdown by urban and rural zone.

Figure 2 shows the percentage distribution of single-vehicle accidents compared to other accidents involving personal injury in 2010–2011, with a breakdown by lighting conditions at the time of the accident.

Figure 3 shows the percentage distribution of accidents involving personal injury with motorcycles compared to other accidents involving personal injury in 2010–2011, with a breakdown by single-vehicle accidents and other accidents.

Figure 1

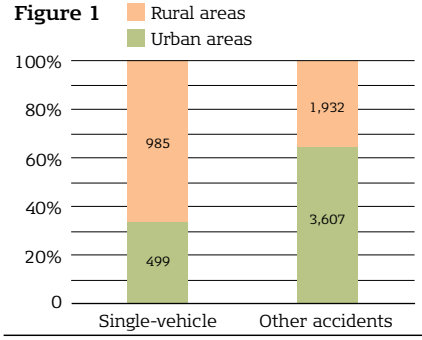


Figure 2

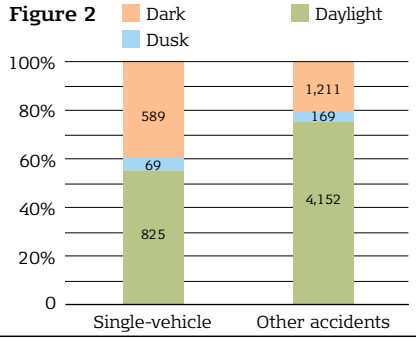
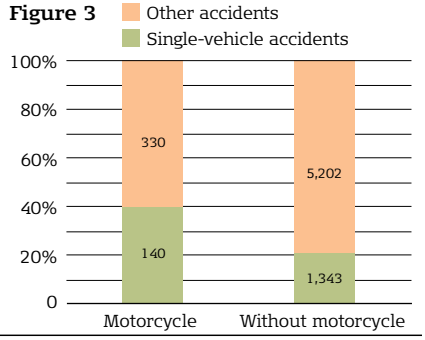


Figure 3



With regard to young drivers, we find that, compared to other drivers involved in accidents causing injury, they more often:

- were men
- were under the influence of alcohol
- were driving too fast

Figure 4

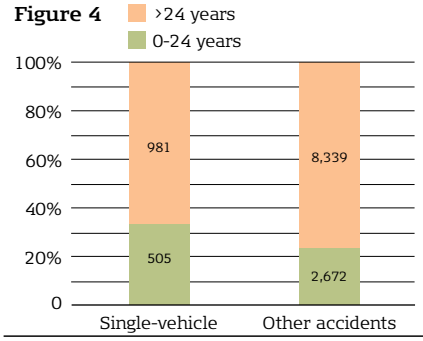


Figure 5

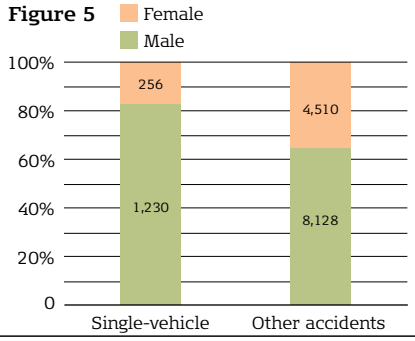


Figure 6

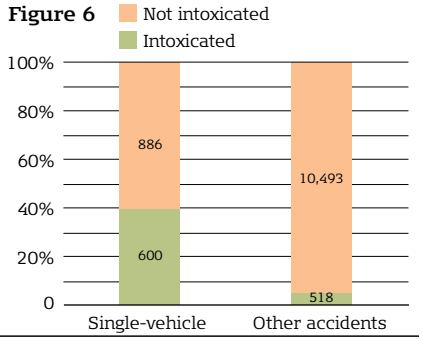


Figure 4 shows the percentage distribution of drivers in single-vehicle accidents compared to other drivers in accidents involving personal injury in 2010–2011, with a breakdown by the age groups 0–24 and 25 and over.

Figure 5 shows the percentage distribution of drivers in single-vehicle accidents compared to other drivers in accidents involving personal injury in 2010–2011, with a breakdown by gender.

Figure 6 shows the percentage distribution of drivers in single-vehicle accidents compared to other drivers in accidents involving personal injury in 2010–2011, with a breakdown by driving under the influence of alcohol.

What can be done?

Measures to reduce speed in general will have a positive impact on the number of accidents. These include technological solutions and increased police controls using automatic traffic control systems. Wider use of ABS brakes on motorcycles will have a positive effect.

Measures to improve concentration will also be beneficial. These may include tiredness detectors or "lane monitors'". Measures to prevent drink-driving will also have a direct effect on the number of accidents.

In terms of road engineering, improvements in markings and widening in the centre of bends will prevent drivers leaving the road. Another accident prevention measure could be to improve verges so that road users are not startled and do not react inappropriately if they drive onto the verge.

Establishing safety zones by removing solid objects at the sides of the road or erecting crash barriers will prevent personal injuries if an accident should happen. The same applies to the increased use of seat belts.

Measurement point – Single-vehicle accidents

Number of persons killed and injured in single-vehicle accidents:

Measurement point	Avg 2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	1,026	925	770	-	-	-	-	-	-	-	-

Source: Danish Road Directorate accident statistics

Suggested measures

Legislation, sanctions and controls

1.2. Access to electronic data from vehicles
1.10. Penalty point system when 20% over the speed limit
1.14. Offer of treatment for those convicted of drink-driving
1.15. Wider use of screening alcometers
1.16. Wider use of instruments for screening driving under the influence of drugs

Education and communication

2.4.1. Speed campaigns
2.4.2. Inattention campaigns
2.4.3. Drink-driving campaigns
2.4.8. Campaigns on "reading the road"

The roads

3.1. Road safety audits
3.2. Road safety inspections
3.3. Systematic accident reduction though road safety engineering measures
3.4. Municipal action plans
3.5. Local speed plans
3.6. Self-explanatory roads
3.15. Rumble strips on country roads
3.16. Central crash barriers on major roads
3.18. Marking of bends
3.19. Establishment of safe run-off areas
3.19.1. Clearing of verges
3.19.2. Establishment of safety zones
3.19.3. Crash barriers beside the road
3.20. Establishment - two minus one roads in the countryside

Vehicles

4.1. Black boxes
4.2.1. Lane monitors
4.2.3. Drowsiness detectors
4.3. Renewal of vehicle stock
4.10. Speed limiters in cars
4.11. Alcohol locks in cars

Other measures

5.1. Improved A&E department records
5.2. Digital speed maps

Focus area no. 10

Accidents at rural junctions

Findings from the detailed statistics of fatal accidents from 2010–2011 show that insufficient or inadequate awareness is often seen as a contributory factor in accidents at junctions. Often the lack of awareness is combined with excessive speed by the driver on the major road. The driver who is crossing then misjudges the time needed for the other driver to pass.

The accidents may also be due to misjudgement of the time it takes to come out of the side road combined with excessive speed by the driver on the through road. It is often also due to inattention on the part of the driver who is crossing, or attention directed at the wrong thing.

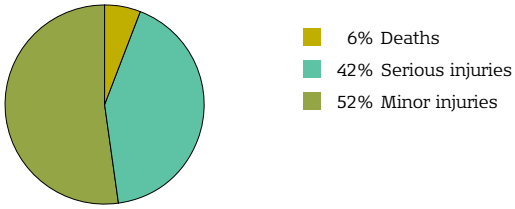
Facts about accidents at rural junctions

Junctions include crossroads, three-way crossings, roundabouts and entrances/exits. 16% of fatal accidents in the period 2010–2011 happened at rural junctions. Of accidents involving personal injuries in general, 12% happened at rural junctions.

In accidents at rural junctions, the proportion of minor injuries is a little larger than for other types of accident, as can be seen from the chart below.

A feature of accidents involving personal injury at rural junctions in 2010–2011 is that accidents in daylight are over-represented. 82% of accidents involving personal injury at rural junctions happened in daylight and it emerges that the drivers in these cases are often elderly.

Accidents at rural junctions



Personal injuries in accidents at rural junctions in the period 2010–2011 broken down into deaths, serious injuries and minor injuries. Source: Danish Road Directorate accident statistics

What can be done?

Although accidents at junctions often result from error on the part of road users, a lot can be done with changes in road engineering. Reducing the amount of information and the number of collision points and making it easier for the road users to see where they are going will reduce the risk of accident – e.g. by improving visibility, reducing speeds or changing the junction layout.

In addition to the road engineering measures efforts should be stepped up with regard to road users' reading and understanding of junction situations – e.g. via campaigns and road signs. Many of the drivers in these accidents are elderly.

Here, targeted campaigns and communication measures may be effective. As speed is a key factor in accidents at junctions, measures directed at speeding will also have a beneficial effect.

Measurement point – Accidents at rural junctions

Number of persons killed and injured in accidents in the countryside at cross-roads, three-way junctions, other junctions, roundabouts, entrances/exits and junctions between roads and separate tracks.

Measurement point	Avg 2009-2011	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Killed and injured	667	560	528	-	-	-	-	-	-	-	-

Source: Accident statistics

Suggested measures

Legislation, sanctions and controls

1.2. Access to electronic data from vehicles
1.10. Penalty point system when 20% over the speed limit

Education and communication

2.4.1. Speed campaigns
2.4.2. Inattention campaigns
2.4.8. Campaigns on "reading the road"
2.4.9. Communication about the risk to elderly road users at junctions

The roads

3.1. Road safety audits
3.2. Road safety inspections
3.3. Systematic accident reduction through road safety engineering measures
3.4. Municipal action plans
3.5. Local speed plans
3.6. Self-explanatory roads
3.21. Local speed limits at rural junctions
3.22. Variable speed limit signs
3.24. Road blocks
3.25. Construction of roundabouts
3.26. Left-turn lanes at give-way junctions in the countryside
3.28. Separation of cyclists and motor vehicles at roundabouts

Vehicles

4.1. Black boxes
4.2.4. Emergency braking systems
4.3. Renewal of vehicle stock
4.10. Speed limiters in cars

Other measures

5.1. Improved A&E department records

Need for research and knowledge

The Road Safety Commission continues to strengthen its objective of improving research into road safety. This will provide an ever greater and better knowledge base that can be used both to identify new road safety measures and to assess the cost-effectiveness of the individual measures.

The need for new research-based knowledge falls into two categories: the general need for knowledge in the road safety field, and specific research needs to be linked to each of the ten focus areas. The research needs are also split into three sub-categories:

A. Strategic research efforts, i.e. multiple connected initiatives carried out within a major research area such as the effect of safety equipment or road safety in an ageing society. Strategic research efforts raise the level of knowledge across a whole area.

B. Individual, well-defined research efforts based on a known need within a pre-existing research area.

C. Other efforts that are not actually research but may generate important knowledge in other ways. These may be data collection or analysis projects etc. within specific areas, such as monitoring the trend in the number of road users driving under the influence of drugs over a number of years.

Area	Title of initiative	Type of initiative
General research needs	Evaluations of information campaigns	Strategic research project
	Who has a "right" to the road?	Specific research project
	Safety effects of vehicle technology	Strategic research project
	Road safety in an ageing society	Strategic research project
	Extended statistics on fatal accidents to be continued	Other project
	Use of data from the emergency services for black spot screening	Other project
	Development of prioritisation and evaluation tools	Strategic research project
	Research into infrastructure	Strategic research project
	Patterns in accident data from the national patient register compared with the Danish Road Directorate accident data	Specific research project
	Road safety in rural districts	Specific research project
	Tools for road safety assessments with changing traffic flows	Specific research project
Research needs linked to the ten focus areas		
1. Speeding 	The Danes and speed	Other project
	Speed and accidents	Specific research project
	Reasons for speeding	Specific research project
	Importance of social norms in relation to speeding	Specific research project
2. Alcohol and drugs 	Best practice with alcohol locks	Other project
	Monitoring the presence of alcohol, narcotics and other drugs on the roads	Other project
3. Inattention 	Safety effects of different types of information – outside the vehicle	Specific research project
	Extent and risk of different types of distraction – inside the vehicle	Specific research project
4. Failure to wear seat belts and helmets 	See under focus area 6. Cyclists and moped riders	
5. Pedestrians 	No proposal	
6. Cyclists and moped riders 	Cycling culture	Specific research project
	Which cyclists, in which accidents and where?	Specific research project
	Type of accidents involving cyclists, and preventive measures	Specific research project
7. Young drivers under 24 	Importance of neurobiological development to young road users' ability to drive safely	Specific research project
	Importance of parents for young road users' approach to risk	Specific research project
	Psychosocial mechanisms behind risky behaviour	Specific research project
	Strengths and weaknesses of different types of driver training	Specific research project
8. Accidents with oncoming traffic 	No proposal	
9. Single-vehicle accidents 	See under focus areas 3. Inattention and 7. Young drivers under 24	
10. Accidents at rural junctions 	No proposal	

Overview of measures

1. Legislation, sanctions and controls

General measures

1.1. Targeted police controls *(Focus areas 1, 2, 3, 4, 6, 7)*

Target police controls are a form of control aimed at particular areas or specific offences. There is good experience in the use of targeted police controls and the method is widely used. The use of targeted police controls is effective as a supplement or follow-up or as direct objective of behaviour-changing campaigns.

(Owner: Ministry of Justice)

1.2. Access to electronic data from vehicles *(Focus areas 1, 3, 7, 8, 9, 10)*

In newer cars, electronic vehicle data can be gathered in the car's computer system. This data can be used in conjunction with analyses of the cause of accidents and research into road accidents.

(Owner: Ministry of Justice)

Specific measures targeted at one or more focus areas

1.10. Penalty point system when 20% over the speed limit

(Focus areas 1, 7, 8, 9, 10)

Some road users see the penalty point system as their most important speed limit. Reducing the threshold for when speeding results in a penalty point may therefore reduce the number of road users who exceed the speed limit.

Therefore, the Road Safety Commission proposes that the threshold for a penalty point should be reduced from 30% to 20% on roads with speed limits of at least 60 km/h.

(Owner: Ministry of Justice)

1.11. Owner's liability for traffic offences *(Focus areas 1, 7)*

Identifying the driver in the case of automatic traffic control places a heavy administrative burden on the police. Some countries have framed their law in such a way that the owner of a vehicle may be held liable if the vehicle has been involved in a speeding offence. Good use can be made of this experience in Denmark, e.g. in connection with speeding below the thresholds for a penalty point.

(Owner: Ministry of Justice)

1.12. Blood alcohol limit of 0.02% *(Focus areas 2, 7)*

Young road users in particular are at increased risk of an accident at lower blood alcohol levels. Reducing the limit will thus reduce the number of accidents involving young road users.

At the same time, a reduction will eliminate any doubt in the minds of drivers who have drunk too much to drive and will emphasise that it is socially unacceptable to drive after drinking.

(Owner: Ministry of Justice)

1.13. Penalty Systems for failure to wear a seat belt or helmet

(Focus areas 4, 7)

Quite a small group of drivers and motorcyclists do not consistently wear a seat belt or helmet when driving or riding in traffic. This group is heavily over-represented in the accident statistics.

Earlier studies carried out by the Danish Road Safety Council indicate that approximately half of those who do not wear a seatbelt would do so if they risked picking up a penalty point

(Owner: Ministry of Justice)

1.14. Offer of treatment for those convicted of drink-driving

(Focus areas 2, 9)

Introduction of mandatory screening sessions with an abuse consultant (as soon as possible after being charged) for drink-drivers with blood alcohol levels over 0.12%. Subsequent offer of treatment to those who have an alcohol problem that actually requires treatment, possibly in combination with an alcohol lock.

(Owner: Ministry of Justice)

1.15. Wider use of screening alcometers *(Focus areas 2, 9)*

By widening the use of screening alcometers to determine drivers' alcohol concentration, the police will be able to breathalyse every motorist they stop.

(Owner: Ministry of Justice)

1.16. Wider use of instruments for screening driving under the influence of drugs *(Focus areas 2, 9)*

To show the intake of euphoriants and/or non-prescription medication, a special screening instrument can be used in major targeted controls by the police and in general police controls on drivers. The screening instrument will effectively help to establish on the spot whether there are grounds for taking a blood sample in any given case.

In 2012 the police were empowered to use screening instruments to indicate driving under the influence of drugs. Based on the experience gained, this will be extended to all the country's police forces.

(Owner: Ministry of Justice)

1.17. Greater use of automated traffic control *(Focus area 1)*
Automatic traffic control (ATC) is a collective term for speed controls using automatic recording equipment. ATC using mobile ATC (photo vans) is supplemented with fixed position speed camera controls and point-to-point speed controls (also known as section controls). The relevant locations in the road network are selected on the basis of known speed levels and accident frequency.
(Owner: Ministry of Justice and Ministry of Transport)

1.18. Legal requirement for reflective jackets *(Focus areas 1, 5)*
Many European countries have introduced a requirement for reflective jackets in cars, to be worn in case of an accident or breakdown. A similar requirement in Denmark could reduce the number of "pedestrians" injured on the country's roads and motorways.
(Owner: Ministry of Justice)

2. Education and communication

General measures

2.1. Road safety policy in companies *(Focus areas 1, 2, 3, 4)*
It is recommended that public and private companies should introduce a road safety policy with clear rules on drink-driving, speeding, use of seat belts, mobile phones, etc.)
(Owner: Danish Road Safety Council, Ministry of Transport and Ministry of Justice)

2.2. Traffic policy in schools *(Focus areas 5, 6, 7)*
A traffic policy involves parents as good role models and ensures that the children leave school with good road habits. A traffic policy in schools encourages children and their parents to behave appropriately in traffic. Pupils are also prepared for the 10 most dangerous years on the roads, which they face when they finish compulsory schooling. Schools are urged to draw up and adopt a traffic policy.
(Owner: The municipalities and the Danish Road Safety Council)

2.3. Traffic policy in voluntary associations *(Focus areas 5, 6, 7)*
It is recommended that municipalities should work with the recipients of public subsidies to introduce a traffic policy and thereby ensure that children and young road users can travel safely to and from leisure activities and provide safe transport to and from meetings and other events.
(Owner: The Municipalities and the Danish Road Safety Council)

'

2.4. Communication and information campaigns

Behaviour-changing actions should be carried out, along with communication efforts to back up and explain other initiatives in the road safety field.

2.4.1. Speed campaigns *(Focus areas 1, 7, 8, 9, 10)*

This effort will be extended in the future to focus on driving not only within the speed limit but also according to the conditions – such as weather, road conditions and density of traffic – which account for around half of accidents in which speed was a contributory accident/injury factor according to figures from the Danish Road Accident Investigation Board and the Detailed statistics of fatal accidents.

2.4.2. Inattention campaigns *(Focus areas 3, 7, 8, 9, 10)*

Behaviour-changing communication activities should be carried out. These should focus on the importance of being alert in and to traffic and should address the following areas:

- General distraction
- Attention to the right things (in relation to single-vehicle accidents, accidents at junctions and accidents with oncoming traffic)
- Tiredness
- Safety equipment to warn the driver or intervene in case of inattention

2.4.3. Drink-driving campaigns *(Focus areas 2, 7, 9)*

Communication remains a high priority in preventing both occasional and repeated drink-driving.

The aim of the campaign activity is multi-faceted, e.g.:

- The potential drink-driver is directly compelled to leave the car behind
- Those around the drink-driver are urged to intervene
- The socially unacceptable nature of drink driving is stressed.

2.4.4. Campaigns on the risks to cyclists at junctions *(Focus area 6)*

These should focus on the importance of proper awareness at junctions, so that cyclists are more alert to other road users' intentions. They should also focus on "looking out for yourself'", regardless of whether you are "within your rights".

2.4.5. Campaigns for increased use of cycle helmets *(Focus area 6)*

Cyclists are especially vulnerable to head injuries in road accidents. Increased use of cycle helmets can be achieved through campaigns, for example.

2.4.6. Campaigns focusing on the important function of parents as role models *(Focus areas 3, 5, 6, 7)*

It is a well-documented fact that parents' attitudes and behaviour have a much greater bearing on their children's behaviour in traffic than many parents realise. Campaigns should be directed at parents, to focus on their function as role models.

2.4.7. Campaigns for increased use of seat belts *(Focus areas 4, 7)*
The small minority of the population who do not use seat belts are heavily over-represented in the injury figures. There is a continuing need for specific communication efforts aimed at this group and those around them.

2.4.8. Campaigns on "reading the road" *(Focus areas 1, 3, 7, 8, 9, 10)*
Driving too fast for the conditions is a factor in many accidents. Campaigns should focus on reading the road correctly and choosing the right speed for the road, weather and traffic conditions.

2.4.9. Communication about the risk to elderly road users at junctions *(Focus area 10)*
Studies by the Danish Road Accident Investigation Board indicate that older road users often find it hard to see and judge the position at junctions, especially in the countryside. There is thus a need to communicate to older road users about proper awareness, especially at rural junctions.

(Owner: Danish Road Safety Council. The campaigns should be run in close collaboration with municipalities and the Police in particular.)

Specific measures targeted at one or more focus areas

2.10 Better driver training (graduated driving licence, private driving practice *(Focus area 7)*
Driver training should be modernised to reflect the knowledge that exists in the road safety field. Driver training in Denmark has not fundamentally changed since 1986. Many other European countries have introduced graduated driving licences and private practice areas as part of driver training.
(Owner: Ministry of Justice)

2.11 Better driving instructor training *(Focus area 7)*
Driving instructor training should be modernised to reflect the knowledge that is available concerning road safety and teaching. Controls on driving instructor training should also be introduced.
(Owner: Ministry of Justice)

2.12 Wider use of reflectors *(Focus areas 5, 6)*
Reflectors improve road safety for pedestrians. There is a need for a constant focus on the importance of reflectors through campaigns or actions in schools.
(Owner: Ministry of Justice and the Danish Road Safety Council)

3. The roads

General measures

3.1. Road safety audits *(Focus areas 1, 8, 9, 10)*
A road safety audit is a systematic and independent review of road safety conditions for all groups of road users in a new road or transport system. The aim of a road safety audit is to make new and improved roads as safe as possible before they are built and before any accidents happen. A road safety audit can point up hazardous faults or defects in new roads and traffic regulation measures and help to ensure that these are rectified, thus reducing the expected number of accidents.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.2. Road safety inspections *(Focus areas 1, 8, 9, 10)*
A road safety inspection is a method of systematic and period retrospective assessment of the safety conditions on existing roads. A road safety inspection may include an assessment of the same parameters as a road safety audit, or it may cover a subset of all the aspects of the road that have a bearing on road safety.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.3. Systematic accident reduction through road safety engineering measures *(Focus areas 1, 8, 9, 10)*
Systematic accident reduction through road safety engineering measures is a collective name for a number of methods of targeting and streamlining efforts modifying accident-prone locations in the road network, such as "accident blackspots" and "potential blackspots". Based on analyses of actual accidents, proposed solutions are drawn up to improve road safety at the relevant locations.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.4. Municipal action plans *(Focus areas 1, 5, 6, 8, 9, 10)*
The municipalities should continue to produce road safety plans, putting the focus on measures to promote safety on the roads and activities to change road users' behaviour within a defined period, e.g. four years.
A road safety plan may contain a speed limit plan, or this may be drawn up independently of the road safety plan (see below).
(Owner: The Municipalities)

3.5. Local speed plans *(Focus areas 1, 8, 9, 10)*

Local speed plans can form the basis for establishing differentiated speed limits. By adjusting the speed limits according to the condition of the roads, we can strive for a better match between the design of the roads, the speed limits and the actual driving speeds.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.6. Self-explanatory roads *(Focus areas 1, 3, 8, 9, 10)*

Self-explanatory roads are a wider initiative aimed at ensuring that the roads clearly signal to road users what behaviour – including choice of speed – is desired at the location in question. The idea is that roads of the same class should have a uniform and recognised design when it comes to transverse profile elements, speed limits, signs, lighting etc., so road users are helped to choose their behaviour and speed.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

Specific measures targeted at one or more focus areas

3.10. Speed reducing measures *(Focus areas 1, 5, 6)*

Speed reducing measures on roads in urban areas mainly cover speed bumps and chicanes, but also visual features such as markings, surfaces and roadside fittings, and soft physical features such as chicanes, gentle curves, rumble strips, etc. Establishing speed control measures should ensure that drivers adhere to the planned speed limit on a given stretch of road.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.11. Reduction in distractions outside the vehicle *(Focus area 3)*

Distractions in the road environment such as excessive signage or advertising along the road take road users' attention away from the traffic and result in accidents and injuries. It therefore makes sense to direct greater efforts towards removing unnecessary distractions in the road environment, so that only the necessary and sufficient information is present along the roads. "Moving" adverts are a relevant focus area in this connection, as they are designed to attract attention.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.12. Better design of junctions and crossing places in towns

(Focus areas 5, 6)

Injuries to cyclists and moped riders can be largely attributed to accidents at junctions in urban areas, while injuries to pedestrians are mainly associated with crossing the road. In terms of improving road safety for cyclists and moped riders, measures are needed to ensure that drivers of motor vehicles are more aware of the need to look out for cyclists and moped riders, in the form of signals and priority crossings. For pedestrians, the focus is on ways of making it safer for them to cross the road.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.12.1 Improved crossing facilities for pedestrians *(Focus area 5)*

Constructing crossing facilities such as footbridges and subways to reduce the risk of accidents to pedestrians is crucial to improving road safety for pedestrians. Crossing facilities at road level could include traffic islands and speed reducing measures. Combining pedestrian areas with crossing signals, central islands, raised areas or railings will improve road safety for pedestrians crossing the road.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.12.2 Crossings at give-way junctions *(Focus areas 5, 6)*

Crossings at intersections with compulsory right of way should be established by taking footways and possibly cycle lanes across the end of the side road. This measure will force road users on the side road to give way to pedestrians and cyclists crossing. Crossings should generally be placed on less-busy side roads. Placing crossings on side roads gives visual emphasis to the intersection and is designed to ensure that drivers on side roads are better able to recognise the intersection and the need to give way. The crossing will also help to reduce speeds.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.12.3 Stop lines placed further back *(Focus areas 5, 6)*

At junctions controlled by traffic lights, the stop line for motor vehicles can be placed 5 metres back from the stop line for cyclists and moped riders, or the pedestrian area if there is no cycle lane. The purpose of moving the stop line is especially to help lorry-drivers turning right to see cyclists and/or pedestrians going straight on at junctions controlled by traffic lights.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.12.4 Truncated cycle lanes *(Focus area 6)*

On roads with cycle lanes, truncated cycle lanes can be set up at the approaches to junctions controlled by traffic lights and a separate right-turn lane, with the cycle lane ending 15–25 metres before the junction (stop line) and the cyclists routed into the right-turn lane. One reason for truncating the cycle lane is to increase motorists' and cyclists' awareness of each other by bringing them closer together and at the same level.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.13. Signalling improvements *(Focus areas 5, 6)*

Signalling improvements at intersections are aimed at creating visual awareness of cyclists and moped riders or separating them in time from the other (turning) traffic and thus avoiding conflicts. The pure signalling improvements include separate phases for cycle and car traffic, a "pre-green'" light for cyclists and an extended interval between phases.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.14. Greater scope for establishing speed limit zones *(Focus areas 1, 5, 6)*

A revision of the Circular will make it easier for municipalities to gain approval for speed limits of 40 km/h or 30 km/h, especially on local roads, by establishing speed zones. The aim is to reduce speeds and thus improve road safety on local roads and less-important highways.
(Owner: Ministry of Justice)

3.15. Rumble strips on country roads *(Focus areas 3, 8, 9)*

Placing rumble strips on roads causes a rumbling noise and vibration in vehicles when their wheels come into contact with the strips. Rumble strips can be either be applied as bumps in the asphalt (on an existing road) or pressed down into the asphalt while it is still soft (on new or resurfaced roads). Rumble strips can be placed in the middle of the road to counter head-on collisions or at the side to counter swerving off the road, and are mainly relevant to road safety efforts in the countryside.
(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.16. Central crash barriers on major roads *(Focus areas 3, 8, 9)*

Central crash barriers on roads in the countryside should be set up to prevent head-on collisions. Central crash barriers on two-lane roads can be combined with widening the road into a "2+1 road"' in order to preserve overtaking opportunities. The main purpose of the crash barrier is to lessen the degree of injuries in the event of an accident.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.17. Widening in the centre on bends *(Focus area 8)*

Centre widening is achieved by increasing the width of the carriageway and marking a hatched area between the two directions. A hatched area helps to show the line of the bend, and the increased distance between the two sides helps to prevent accidents with oncoming traffic.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.18. Marking of bends *(Focus areas 8, 9)*

Improved marking is a possible measure on bends in efforts to prevent accidents where drivers leave the road in the countryside. Bend marking can be supplemented by background highlighting with directional arrows, warning signs or information signs showing the recommended speed through the bend. On the busiest roads in the countryside, a visual guide can be provided by means of lane markings (strips) and edge-posts beside the road. These elements basically help to indicate and describe the line of the bend to road users.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.19. Establishment of safe run-off areas *(Focus areas 7, 8, 9)*

To prevent accidents where a vehicle drives off onto the verge, an effort can be made to enable the driver to regain control of the vehicle and to reduce the extent of injuries by removing or shielding fixed objects at risk of colliding with vehicles. Providing run-off areas includes clearing verges, establishing safety zones and placing crash barriers beside the road. The three different types of measure are aimed at the same type of accident. Clearing verges and establishing safety zones can usefully be done in combination.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.19.1 Clearing of verges *(Focus areas 7, 8, 9)*

The reason for clearing verges is to increase the chance of maintaining or regaining control over the vehicle if it runs onto the verge. Verge-clearing has the effect of increasing the load-bearing capacity of the verge, limiting the step up to the carriageway and making the verge more even. The verge could be reinforced with various types of surfacing or by changing its composition to increase the load-bearing capacity.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.19.2 Establishment of safety zones *(Focus areas 7, 9)*

For road safety reasons, there should be an area, or safety zone, outside the carriageway which is clear of any fixed objects at risk of colliding with vehicles and designed in such a way that a vehicle which unintentionally leaves the road does not overturn or come to a sudden standstill. By making a targeted effort to remove fixed objects and alter the profile of steep ditches and banks, the severity of many single-vehicle accidents can be reduced.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.19.3 Crash barriers beside the major roads in the countryside

(Focus areas 7, 9)

If crash barriers are erected beside major rural roads, drivers who are about to drive off the road will be caught by the crash barrier and the speed and direction of the vehicle changed in a controlled way. Erecting crash barriers is relevant along major roads where there is not enough room for a safety zone beside the road. This measure is particularly aimed at reducing the severity of single-vehicle accidents which happen because drivers are distracted or fall asleep at the wheel and accidentally drive off the road.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.20 Establishment of "2 minus 1" roads in the countryside

(Focus areas 1, 5, 6, 9)

"2 minus 1" roads have one lane to handle traffic in both directions. The lane has a wide hard shoulder on both sides marked with wide dotted edge lines. The hard shoulders act both as a continuous give-way area for oncoming vehicles to pass each other, and as a lane for cycles and mopeds. "2 minus 1'" roads should be combined with traffic-calming measures to achieve the desired speed-reducing effect. The purpose of "2 minus 1'" roads is particularly to improve conditions for light road users where there is no cycle lane or even a footpath.

(Owner: The Municipalities)

3.21 Local speed limits at rural junctions *(Focus areas 1, 3, 10)*

Establishing local speed limits of 60 km/h or 70 km/h at rural junctions makes road users more aware that passing through the junction demands extra attention. The intention behind local speed limits with static signs is to make road users passing through aware that there is an increased risk of accidents around the junction.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.22 Variable speed limit signs *(Focus areas 1, 3, 5, 6, 10)*

Variable speed limits signs are set up as dynamic indicators that allow the speed limit to vary over time. Variable speed limit signs can be set up around junctions or on selected stretches of road. Erecting variable speed limit signs makes it possible to reduce the speed limit where there is an increased local risk of accidents. Variable speed limit signs are designed as dynamic signs which light up when they are activated, making them more conspicuous to road users than normal fixed signs.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.23 "Your speed" signs *(Focus areas 1, 3, 5, 6)*

Electronic speed displays or "Your speed'" signs are placed beside the road. The equipment measures the individual driver's speed as they approach the speed display. The speed display shows the speed of the individual vehicle. The display flashes if the road user exceeds the indicated speed, and thus makes them aware that they are breaking the speed limit. "Your speed" signs are intended to reduce speeds and thus reduce the risk of serious accidents.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.24 Road blocks *(Focus area 10)*

A road block is a physical arrangement and should be clear to see, perhaps with the aid of planting and barrier posts. It may take the form of a dedicated road block at a 4-way junction, two staggered T-junctions, or blocking smaller crossings/entries to roads in the countryside. The greatest road safety effect comes from dedicated road blocks at accident-prone rural 4-way junctions with give-way signs.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.25 Construction of roundabouts *(Focus areas 1, 10)*

This measure involves converting existing junctions into roundabouts – mainly rural 3 or 4-way junctions with give-way signs. Constructing roundabouts is intended to reduce the number of accidents at junctions, including speed-related accidents at and around junctions, as roundabouts have the effect of reducing speeds.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.26 Left-turn lanes at give-way junctions in the countryside

(Focus area 10)

Providing left-turn lanes at 3 and 4-way junctions with give-way signs can be an effective way of reducing the number of accidents at rural junctions. The lane arrangements may take the form of traffic islands with kerbs or painted hatched areas. Left-turn lanes particularly reduce the number of accidents where a vehicle coming from behind runs into a stationary vehicle waiting to turn left, and accidents where drivers turning left collide with oncoming vehicles.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.27 Cycle lane in the countryside *(Focus areas 5, 6)*

Cycle lane in the countryside can be constructed as one-way cycle lane on both sides of the road, a two-way cycle lane on one side or a two-way path following its own route. One reason for providing cycle lane is to improve road safety for cyclists and moped riders. Cycle lanes are also used to improve ease of travel and security for cyclists and moped riders and are therefore regarded as a way of promoting the use of bicycles.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

3.28 Separation of cyclists and motor vehicles at roundabouts

(Focus areas 6, 10)

Cyclists and motor vehicles can be separated at roundabouts by constructing separate cycle lane distinct from the area used by motor vehicles, with cyclists giving way to motor vehicles in the entry and exit lanes to the roundabout. In many cases, a separate two-way cycle lane may be constructed to compensate for the reduced ease of travel that cyclists turning left have at roundabouts, where cyclists in the main roadway do not have to give way to motor vehicles entering and leaving the roundabout.

(Owner: Ministry of Transport/Danish Road Directorate and the Municipalities)

4. Vehicles

General measures

4.1. Black boxes *(Focus areas 1, 3, 7, 8, 9, 10)*

A small computer fitted in the car constantly records the vehicle's speed (and sometimes other parameters) over a 30-second period, for example. When the car is hit in a traffic accident, the information is locked and it is then possible to go into the box and see what the vehicle was doing in the last 30 seconds before the accident.

(Owner: Ministry of Justice and Ministry of Transport/Danish Transport Authority)

4.2. Technological solutions in vehicles

Greater use of new safety technology solutions can be achieved through increased use of tax breaks and working through the EU to disseminate the systems, such as:

4.2.1. "Lane monitors" that warn drivers drifting out of their lane *(Focus areas 3, 7, 8, 9)*

A system of cameras/sensors keeps an eye on edges/lines on the carriageway, and if the driver crosses a line (other than when turning or changing lanes, when the indicators are used), a warning is given in the form of a sound, a light, or a reaction in the steering wheel or seat. Advanced systems actually turn the wheel slightly back towards the lane the vehicle is about to leave.

4.2.2. Blind spot detection systems *(Focus areas 3, 6)*

A system of sensors can detect whether there is another road user in the area diagonally behind the car. If the driver is intending to change lanes (e.g. indicating), the system will warn them with a light and possibly a noise.

4.2.3. Drowsiness detection systems *(Focus areas 3, 8, 9)*

A system that uses a camera pointed at the driver or – more likely with new development – can detect that the driver is tired from the way the vehicle is being driven.

4.2.4. Emergency braking systems *(Focus areas 1, 3, 5, 6, 10)*

A camera/radar/sensor system detects when the car is about to run into something in front of it without the driver reacting. In this case, the car will brake automatically.

4.2.5. Reversing sensors *(Focus areas 5, 6)*

A system of sensors detects objects behind the car when it reverses. The system gives sound or light warnings or displays warning symbols in front of the driver. More advanced and more expensive systems include cameras.

4.2.6. Pedestrian-friendly fronts with external airbags

(Focus areas 5, 6)

The front end of a car may be more or less "rounded" or "soft". An external airbag could inflate and shield the hardest parts of the car (particularly the corners) when it hits a pedestrian/cyclist.
(Owner: Ministry of Taxation, Ministry of Justice and Ministry of Transport/Danish Transport Authority)

4.3. Renewal of vehicle stock *(Focus areas 5, 6, 7, 8, 9, 10)*

Economic incentives to be introduced to replace vehicle stock, e.g. by way of scrapping premiums or tax breaks.
(Owner: Ministry of Taxation and Ministry of Justice)

Specific measures targeted at one or more focus areas

4.10 Speed limiters in cars *(Focus areas 1, 7, 8, 9, 10)*

"Speed limiters in cars" is a collective term for intelligent speed adjustment systems installed in cars to ensure that they cannot exceed the speed limits. They may do this either by informing the driver that they are exceeding the speed limit or by the system itself intervening directly to stop the vehicle driving too fast.
(Owner: Ministry of Justice, Ministry of Transport/Danish Road Directorate)

4.11. Alcohol ignition interlocks in cars *(Focus areas 2, 9)*

Alcohol ignition interlocks were adopted as a matter of policy in 2010 as a possible sanction for drink-drivers, but have still not been brought into use.
(Owner: Ministry of Justice)

4.12. Wider use of seat belt alarms *(Focus areas 4, 7)*

A seat belt alarm makes a sound and/or lights up if you do not fasten your seat belt. There is now an EU requirement for an alarm on the driver's seat, but it can be fitted to all seats.
(Owner: Ministry of Taxation, Ministry of Justice and Ministry of Transport/ Danish Transport Authority)

4.13. Electronic driving licences *(Focus areas 2, 7)*
The possibility of introducing electronic driving licences is being investigated. The system could ensure that the vehicle can only be started if a driver with the right licence tries to do so. Electronic driving licences would be especially effective against drivers without a licence or road users who have their licence revoked for drink-driving, for example.
(Owner: Ministry of Justice)

4.14. In-vehicle technology to prevent right-turn accidents *(Focus area 6)*
Better visibility from lorries. Visibility to the right and along the right side of lorries/trailers is now provided by mirrors that allow the driver to see areas directly in front of the cab, to the right of it, down along the right side of the unit and 45 degrees out to the right. These mirrors are an EU requirement. Up to 25% of new lorries are sold in Denmark with a supplement to the mirrors in the form of cameras that provide the same (or better) visibility.
(Owner: Danish Road Safety Council, Ministry of Transport/Danish Transport Authority, Ministry of Transport/Danish Road Directorate, the Municipalities and the transport industry)

5. Other measures

General measures

5.1. Improved A&E department records *(Focus areas 5, 6, 7, 8, 9, 10)*
A&E department records of personal injuries on the roads should be incorporated into road safety work as a supplement to the more detailed and precise records kept by the police. If the quality of the records from the national patient register is improved, e.g. by noting and describing the degree of injury, they can be linked to the accident statistics containing the accidents recorded by the police, significantly improving the data base for road safety work.
(Owner: The Regions and the Police)

5.2. Digital speed maps *(Focus area 1)*
A national digital speed map is a digital map base in which the speed limits on the Danish road network are geocoded. The map base is dynamic, so it always reflects the current fixed and temporary speed limits. Establishing a digital speed map is a precondition for establishing intelligent speed adjustment systems.
(Owner: Ministry of Transport/Danish Road Directorate)