TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

Increased safety for motorcycle and moped riders

Joint strategy version 2.0 for the years 2012-2020

MOPED- och MOTORCYKEL BRANSCHENS RIKSFÖRBUND

NTF Säker trafik

Rikspolisstyrelsen

Sveriges Kommuner och Landsting

SMC Sveriges MotorCyklister

SVERIGES TRAFIKSKOLORS RIKSFÖRBUND

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Preface

Both motorcycles and mopeds fulfil important transport needs for their users. They are also lifestyle-related vehicles to a large extent, which enrich many people's leisure time. Due to the growing congestion and the demand for energy-efficient transport, they may also meet important future needs in society.

The proportion of unprotected road users who die in accidents is predicted to increase up until 2020, primarily due to the continued growth in the number of vehicle-related fatalities. This will lead to increased focus on the area of unprotected road users, which encompasses motorcyclists and moped riders.

The joint motorcycle and moped strategy from 2010 has now been developed and modified in accordance with new EU goals and knowledge, as well as the measures of the stakeholders. The objective of the new strategy is to demonstrate how the number of motorcycle and moped fatalities can be halved, and how the number of seriously injured can be reduced by 40% between the years 2010 to 2020.
Identified in the strategy are the areas where the greatest possibilities exist for instituting measures in order to contribute to achieving these goals. Deficiencies of knowledge to be remedied have also been identified, which will provide better supporting information for effective solutions in the future.

The strategy will constitute an aid for the planning of activities for authorities, organisations and other stakeholders within the area. This presupposes that everybody adopts measures in their activities in order to achieve the road safety goals, individually or collaboratively.

It will be a challenge, but it is possible to achieve the set objectives.

August 2012

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Increased safety

Motorcycles and mopeds comprise part of the transport system and therefore part of the road safety work as well. The work is directed primarily at the operational areas indicated. These are, as much as possible, based on research and experience, and they are the areas where the greatest measurable effect can be achieved. We must continually increase our knowledge and understanding of motorcycles and mopeds in the transport system, and take measures based on that knowledge. This is important so that the stakeholders shall make it possible to achieve the goals for 2020 together.

The strategy only applies to two-wheeled motorcycles and mopeds that are used on roads.

Interim goals, prioritisations and possibilities

The strategy is founded on the management of road safety goals model which provides the basis of Vision Zero. The goal of the strategy is to clarify which types of measures are required for the number of motorcycle and moped fatalities to be halved, and for the number of seriously injured (medical disability for 10% or more) to be reduced by 40 per cent by the year 2020, based on the level in 2010. In 2010, there were 37 motorcycle and 8 moped fatalities as well as 58 motorcycle 45 moped serious injuries.

The strategy is consistent with the overview or interim goals that were presented in Spring 2012 (1). The overview describes the levels of different traffic conditions, for example, compliance with speed limits that are required in order to achieve a fifty per cent reduction, based on 2010 levels. This strategy focuses on safer motorcycle and moped traffic, and describes the safety potential of the various operational areas. The strategy shows that the total potential within these areas is sufficient to achieve a fifty per cent reduction in fatalities. Unfortunately the possibility does not currently exist to break down the potential of all the operational areas with regard to serious injuries. There are good reasons to believe that these operational areas have the potential to reduce the number of serious injuries by 40%, as the compilation of facts shows that the problem areas relating to fatalities and serious injuries often overlap. However, further development of analysis methods in order to identify potential for reduced number of serious injuries.

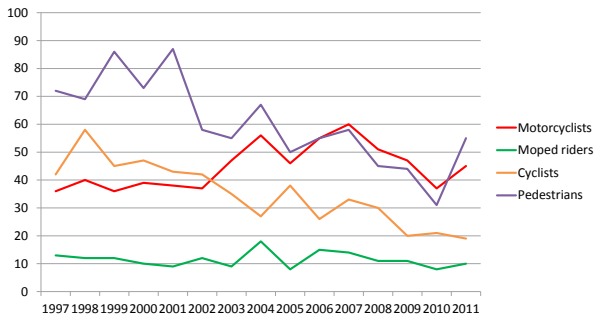


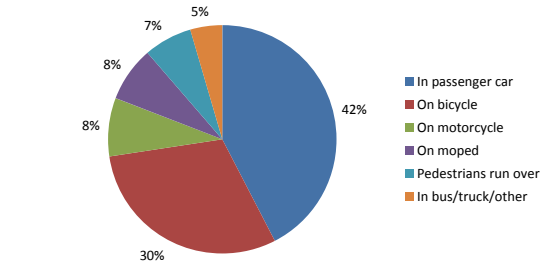
Diagram 1: Trend of the number of fatalities of unprotected
Source: Police reported traffic accidents road users

Cooperation and prioritisation

The strategy presupposes that all stakeholders within their own areas of responsibility implement, individually or cooperatively, initiatives at the local, regional, national and international level. The stakeholders contribute primarily by directing their attentions onto the prioritised operational areas in their activities.

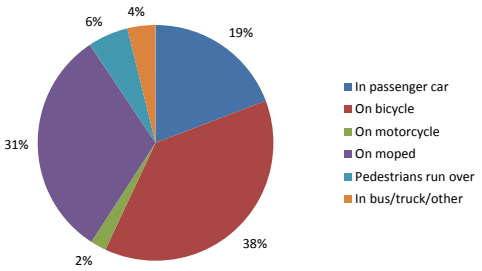
The work shall be based on facts and scientific grounds

The prioritisations that are made shall be based on facts and scientific grounds as much as possible. Part of the strategy involves the need for research and innovation being emphasized nationally and internationally.



he greatest number of serious injuries occur in passenger cars and on bicycles. pproximately the same number of motorcyclists and moped riders sustain injuries.
9 serious injuries, based on 97,143 persons who received medical treatment, as reported in STRADA 2007-2011 August 15

Diagram 2: Proportion of seriously injured (medical disability for 10% or more) road users grouped by method of transport



Children and young people were seriously injured on bicycles and mopeds in the majority of cases.
409 seriously injured children based on 19,399 children who received medical treatment, as reported in STRADA 2007-2011 August 15

Diagram 3: The proportion of children and young people (0-17 years) with medical disability of 10% or more grouped by method of transport.

Monitoring

The strategy is clearly linked to the management of goals in the road safety work. The core of the management of goals is to monitor the road safety trend annually on the basis of the goals set. The indicators are measurements of different traffic conditions that are relevant to follow from a road safety perspective. In turn, each indicator has its own goal.

The indicators after the 2012 overview are the following:

- Compliance with speeds limits, national and municipal road networks (passenger car, heavy traffic, motorcycle)
- Sober road users
- Usage of seat belts
- Usage of helmets (bicycle and moped)
- Safe passenger cars
- Safe motorcycles (ABS)
- Safe state roads
- Safe pedestrian, bicycle and moped passages (PCM passages)
- Maintained pedestrian, bicycle and moped paths (PCM paths)

All indicators relate to motorcycle or moped safety except for the usage of seat belts indicator. Also monitored is how large the proportion of fatal accidents is in which a contributing factor was fatigue, distraction or lacking visibility as well as tuning and other technical defects of mopeds.

Sweden's Motorcycle and Moped and Motorcycle Council performs an annual reconciliation of the stakeholders' activities.

Regular development of the strategy

The strategy document shall be developed on the basis of the results relating to number of serious injuries and fatalities, the activities that the stakeholders have conducted and new knowledge. The development will follow the overview intervals of the work on interim goals, which entails a new overview in 2016 at the latest. During 2014, however, an extra overview will be made. The Swedish Transport Administration will take the initiative towards this and it will be done together with the other stakeholders.

Prioritised operational areas for motorcycles

The most important factor for increasing motorcycle safety is the developing measures that prevent accidents. There are huge consequences for motorcyclists during an accident even at low speeds.

The operational areas that are prioritised are:

- increase the number of motorcycles with ABS brakes
- increase the number of motorcyclists who ride within the speed limit
- increase focus on visibility and alertness
- safer roads and streets
- reduce extreme behaviour on motorcycles

The amount of mileage done by motorcycles equipped with ABS and the number of motorcyclists who ride within the speed limits are assessed as having the greatest effect on road safety.

Increase the number of motorcycles with ABS brakes

The number of new motorcycles with ABS sold has increased from approximately 15 per cent in 2008 to 62 per cent in 2011. If all motorcycles on the roads have ABS brakes, there is the potential for saving 21 lives per year. In the long term, this will contribute to nearly a halving of the number of motorcycle fatalities. The motorcycles that are currently being sold without ABS will still be ridden in 2020 and afterwards to a large extent. The results are a delayed effect of ABS, and the maximum potential will not therefore be able to be achieved until 2020. ABS brakes on motorcycles reduce the risk of being killed or seriously injured in an accident by approximately 50 per cent. For accidents at intersections, the risk will be reduced by approximately 70 per cent. The goal for 2020 is that 70 per cent of mileage done on motorcycles will occur on ABS-equipped motorcycles. During 2011, the proportion was calculated at 23 per cent. A Swedish study that was presented in 2009 demonstrates that ABS brakes on motorcycles have very large effects on road safety. The publication of these results and, not least, the attention it received in the industry press has already begun to affect both the selection of ABS-equipped motorcycles available and the demand for them. The results were later confirmed by several other international studies, see appendix 4. The fastest and most effective way of achieving a very high number of ABS-equipped motorcycles on the roads is to influence selection and demand, stimulate further technological development and utilise other market mechanisms. All in all, this has led to Sweden being a current world leader in the area.

Examples of measures that were implemented in the area:

- • National Association of Moped and Motorcycle Industries, McRF, measures the number of motorcycles with ABS sold and influences the selection of suppliers. McRF has set the goal that 75 per cent of motorcycles sold by member companies' in 2015 shall be equipped with ABS.
- Insurance companies have begun to reward their customers through, for example, rebates on insurance premiums if the motorcycle has ABS
- In the assessment of a motorcycle's performance in industry magazines, ABS is emphasized.
- SMC has measured the acceptance for ABS which showed that it is high. 80 per cent intend to choose a motorcycle with ABS when they purchase or exchange a motorcycle (4).

The way forward:

- The motorcycles that are currently being sold without ABS will still be ridden in 2020 and afterwards to a large extent. It is therefore very valuable to continue the successful work of influencing the selection and demand for motorcycles with ABS.
- It is likely that a decision will be made within the EU which means that ABS will become compulsory for new motorcycles over 125cc from 2017 onwards.

Increase the number of motorcyclists who ride within the speed limit

The Swedish Transport Administration's analyses of fatal accidents (2009-2011) shows that only 3 out of 10 motorcyclists involved in fatalities were assessed as having ridden within the speed limit. In nearly 4 out of 10 fatal accidents, the motorcycle's speed was assessed as being well above the applicable speed limit (more than 30 km/h). In a further 3 out of 10 fatal accidents, the motorcycle's speed was assessed as being between 10 and 30 km/h above the applicable speed limit. 7 out of 10 motorcyclists involved in fatal accidents who rode well above the displayed speed rode a motorcycle of the super sport model. Speed limit violations can be both a cause for an accident occurring and worsen the injury outcome. All measures that lead to a reduced number of speed limit violations have an immediate positive effect and therefore contribute strongly to reaching the goal for 2020. The goal for 2020 is that 80 per cent ride within the speed limits. If the perceived risk of speed checks should increase, it is likely that more people would obey the traffic rules. With the current legislation, it is difficult to identify who was riding the motorcycle without stopping the rider.

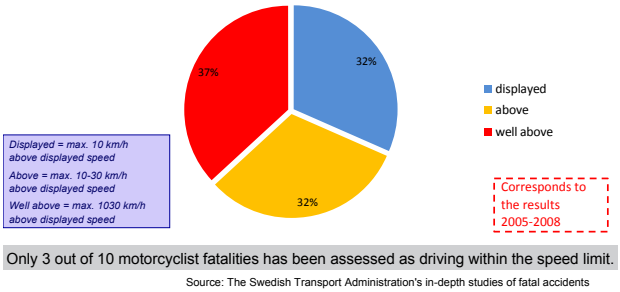


Diagram 4: Assessed speed in fatal accidents involving motorcycles 2009-2011 (114 fatalities)

Examples of measures that were implemented in the area:

- The Swedish Transport Administration has conducted speed measurements which show that over half of all car drivers and motorcyclists violate the speed limits (5).
- SMC and NTF conducted an attitude study among SMC members which demonstrated that the acceptance of obeying the speed limit is low (4).
- SMC addresses the issue of speed in further training and in other communication with members.
- SMC have intensified further training of "sports bike riders" with the aim of making them participate more in the development of safety. They have begun to modify the training with the new knowledge about the importance of increasing insight about risks and reduced skills training.
- SMC have encouraged members to ride within the speed limits, even past ATC cameras.
- The police perform speed checks.

The way forward:

- SMC is developing questions and routines to be able to monitor members' acceptance of speed limits over time.
- McRF is developing an ethical attitude towards suppliers' marketing strategies linked to the message about behaviour.
- The Swedish Transport Administration is developing measurement methods and updating the measurement plan for 2020 in order to be able to monitor the speed limit trend on motorcycles.
- The National Police Board will examine the speed checking methods for motorcyclist violations as well as raise the issue within the Board's European Cooperation.
- The provisions regarding confiscation of vehicles should be applied in the same way during the reporting of negligence in traffic (e.g., gross speed violations) as during unlawful riding and drunken driving. This possibility is not utilised very often at present. The NPB intends to disseminate information to police and prosecutors relating to the possibility of confiscating motorcycles.
- The formation of opinions relating to motorcycles and speed needs to be developed. SMC becomes an important channel for communicating speed issues since it represents a trustworthy party to motorcyclists.
- Measurements and goals need developing by concerned parties in the area. See also the area concerning extreme behaviour.

Increase focus on visibility and alertness

Increased visibility and alertness have great road safety potential. Research in the area shows that you must work on both increasing visibility among motorcyclists and increasing alertness from other road users in order to reduce the number of collisions. Factors to be taken into consideration are vehicles, the road environment and road users. An important question is what proportion are alertness problems and visibility problems respectively, as well as what measures are relevant for each area.

Examples of measures that were implemented in the area:

- There are a large number of international studies in the area, but it is unclear as to what types of measures are effective.
- In autumn 2009, SMC started a campaign called "See us", with press releases, meeting places around the country, polemical articles and a film. A website was created at the same time www.seoss.nu where you can publish knowledge in the area, measures that have been implemented in other countries, material that can be used both by motorcyclists and other road users, and research in the area. Collected on the website are press clippings from all accidents where a motorcycle and another road user have been involved.

The way forward:

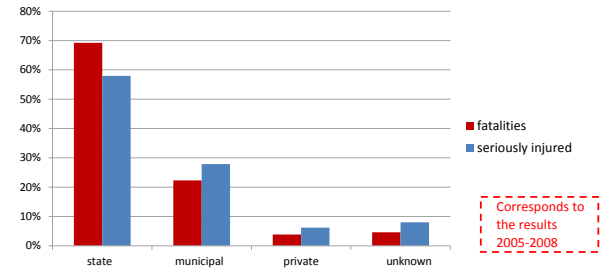
- Additional research is required which shall result in proposals for effective measures.
- SMC continues to work with the issue via the website www.seoss.nu..

Safer roads and streets

The Swedish Transport Administration's analyses of fatal accidents (2009-2011) shows that 7 out of 10 motorcyclist fatalities, and 6 out of 10 seriously injured were riding on the state road network. Approximately 5 motorcyclists per year die in collisions with guard rails. It was assessed that in 1 out of 10 fatal accidents, defects in the roadway were of crucial importance. These relate primarily to loose gravel and tracking. Motorcyclists and moped riders are defined in the Road Safety Act as unprotected road users that need particular attention.

Examples of measures that were implemented in the area:

- The Swedish Transport Administration, in cooperation with SMC, has compiled a description of the particular needs of motorcyclists that should be taken into consideration in connection with the planning, formulation, construction as well as operation and maintenance (6).
- The Swedish Transport Administration's standards for operation and maintenance measures, as well as road construction requirements, have been raised (7).
- The Swedish Transport Administration has developed a focus document for guard rails and bridge rails, where motorcycle traffic is taken into consideration in a better way (8).
- SMC has appointed special road investigators with the aim of being locally responsible for road matters to the Swedish Transport Administration and the municipalities.
- The Swedish Transport Administration has appointed regional contact persons for motorcycles and mopeds with the aim of, among other things, guiding the SMC road investigators in contact with the Swedish Transport Administration. The contact person shall also spread new knowledge about motorcycle and moped issues throughout the region as well as making the planners aware of the particular needs of motorcycle and moped traffic in the plans.



7 out of 10 fatalities and 6 out of 10 serious injuries on the state road network

Source: Police reported traffic accidents

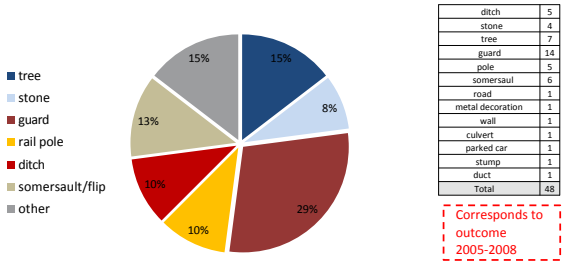
Diagram 5: road authorities in motorcycle accidents with fatalities (127) and serious injuries (910) between 2009-2011

The way forward:

- The standards for operational and maintenance measures, as well as road construction requirements, have been raised. This applies primarily to attendance time for cleaning after mending is performed. The requirements are being raised in connection with new operational procurements, which means that the implementation will take approximately 4-5 years. The possibility of speeding up the process of implementation will be tested as well as increasing compliance.
- Motorcycles and mopeds are established in a better way in the Swedish Transport Administration's new "Requirements and advice for the design of roads and streets" which replaces the earlier "VGU - design of roads and streets". New incremental and any remaining needs need to be paid attention to in connection with future overviews.
- The Swedish Transport Administration is developing methods for measuring the motorcycle traffic flow to provide the supporting information for planning of measures and developing criteria for when the motorcycle traffic flow should be considered to be significant.
- During 2012, the Swedish Transport Administration will implement demonstration projects using the installation of guard rails with protection from sliding underneath the guard rail. The projects shall provide experiences from operation and maintenance, and make it easier to assess working life, need for repairs and costs.
- The Swedish Transport Administration shall establish a procedure in order to highlight the road projects that can be considered as having significant motorcycle traffic. For the highlighted road projects, requirements can then be applied for newly erected guard rails on slip roads and dual carriageway roads to be built with protection from sliding underneath the guard rail.

For the highlighted road projects, or at least those lying on the TEN-T road network, requirements can also be applied for the newly erected guard rails to be constructed with smooth lower rails as a way to meet the requirements in the Road Safety Act of taking unprotected road users into consideration establish requirements that newly erected guard rails shall be equipped with a smooth corrugated rail as a method of fulfilling the requirements in the Road Safety Act with regard to unprotected road user.

- On low-trafficked road networks, guard rails that do not have any function can be dismantled.
- Criteria for how a side lateral area shall be cleared in order to be better for a motorcyclist who is exiting the road are currently lacking. Development is required in this area, including monitoring trends.



In 3 out of 10 accidents involving only one vehicle (single-vehicle accident), the motorcyclist died in colliding with the guard rail, which corresponds to 1 out of 10 of the total number of fatalities.

Source: The Swedish Transport Administration's in-depth studies of fatal accidents

Diagram 6: The collision object in fatal single-vehicle accidents involving motorcycles during 2009-2011 (48 accidents)

Reduce extreme behaviour on motorcycles

The majority of motorcyclists are road safety conscious road users. There are, however, a few factors which recur time after time in fatal accidents amongst motorcyclists. We call the factors ”extreme behaviour”, and it has contributed to 50-70 per cent of fatal accidents in the last five years. It relates to a group that is difficult to reach and influence with traditional road safety measures. Extreme behaviour in this context has been defined as: riders who clearly violate speed limits, ride without a driving licence, drive aggressively, or with alcohol or other drugs in their system..

Examples of measures that were implemented in the area:

- SMC has defined extreme behaviour.
- The Swedish Transport Administration has produced introductory facts about accidents in the area.
- SMC has produced polemical articles, press releases and highlighted the issue in different forums where it is discussed intensely.
- Insurance companies. In cases of gross negligence, road injury compensation can be adjusted (reduced). Damage to the motorcycle (insurance against damage to vehicle) can be reduced or be forfeited completely in cases of extreme behaviour such as high speed or if the rider was not sober.
- The police perform speed checks

The way forward:

- This is a group that in many ways chooses to place themselves outside that law. The problematic of extreme behaviour relates to attitudes and norms among one or several subgroups of motorcyclists. They need to be identified and described so that it is then possible to formulate conceivable measures and strategies.
- Facts about extreme behaviour and consequences for motorcycle insurance need to be made visible, among both motorcyclists and their relatives. Relatives are often the owners of the motorcycle in accidents involving extreme behaviour (9% compared to 3% of others).
- The provisions regarding confiscation of vehicles should be applied in the same way during the reporting of negligence in traffic (e.g., gross speed violations) as during unlawful riding and drunken driving. This possibility is not utilised very often at present. The NPB intends to disseminate information to police and prosecutors relating to the possibility of confiscating motorcycles.

Prioritised operational areas for mopeds

The most important factor for safe moped traffic is to limit the consequences of accidents. A moped rider who uses a helmet in the right manner has a reasonable chance of survival in an accident, if the speed is no more than 45 km/h, and has a good chance of survival, if the speed is no more than 30 km/h

The operational areas that are prioritised are

- reduced tuning and technical defects
- increased and correct usage of helmets
- safer roads and streets

Reduced tuning and technical defects

Great potential exists for the reduction of the number of moped accidents that are caused by the moped having been tuned of having technical defects. The Swedish Transport Administration's analyses of fatal accidents (2005-2011) show that only 4 out of 10 mopeds involved in fatal accidents had no known technical defects. At least 23 per cent of the mopeds involved in fatal accidents were tuned. In fatal accidents where the driver was under 18 years of age, at least half of the mopeds had been tuned. There is a relatively large number of unrecorded cases. The number of unrecorded cases is a result of no technical investigation having been done, which is particularly normal among accidents involving older moped riders. The tuning is not necessarily the cause of the accident, but it definitely affects the grade of the injuries through the speed being higher when the accident occurs. In addition to tuning, there are also technical defects, for example, inferior lighting and brakes. These are also important for additional work. A need exists for the development of methods that make more effective monitoring possible, as it currently requires a great deal of resources. Increased compliance may be expected if conditional driving licences and moped licences can be revoked after the crime of tuning.

Examples of measures that were implemented in the area::

- McRF has taken a clear position against providing parts for tuning, and imposes requirements on its members to do the same.
- For the last seven years, NTF has been cooperating with Sveriges Motorcykelhandlares Riksförbund (Swedish National Federation of Motorcycle Dealers - SMR) and Cykel Motor and Sportfackhandlaran (Cycle Motor and Sport Industry Dealers - CMS) in order to counteract tuning of mopeds. Cooperating dealers are working actively to reduce the number of tuned mopeds. One of the ways this is done is through a non-tuning agreement with NTF.

McRF has also participated in the cooperation regarding the counteracting of trade in tuning parts.

- The suppliers and workshops can question theguarantee if the moped is tuned.
- The insurance companies do not provide compensation for mopeds which contain components that increase the speed.. It has been shown that the person who has the financial interest (the parent) in the moped is more careful to ensure that the moped is not tuned.
- The police perform speed checks
- A new requirement of compulsory training for being able to ride a moped was established in October 2009. A new driving licence class, AM has been introduced in order to be able to ride a class I moped, and the requirement of a conditional driving licence was introduced to be able to ride a class II moped.

The way forward:

- Work is currently being done to reduce the number of dealers that sell tuning parts for mopeds. This work should continue.
- The Swedish Transport Agency is participating in the work of designing a framework regulation that addresses both requirements for tuning prevention measures and the conditions for market monitoring.
- The Swedish Transport Agency and National Police Board will work together to find conceivable solutions that can facilitate the monitoring of and measures against tuned mopeds.
- The Swedish Transport Agency is investigating the possibilities that exist for revoking driving licences or conditional driving licences after the crime of tuning has been committed.

- Knowledge about compensation from moped insurance being reduced in cases involving tuned mopeds needs to become more widespread.
- Local cooperation where parents, schools, medical personnel, police and others participate is an important contribution.

Increased and correct usage of helmets

The Swedish Transport Administration's analyses of fatal accidents (2005-2011) demonstrates that almost 5 out of 10 moped drivers involved in fatalities were not wearing a helmet, or lost the helmet during the accident. Increased and correct usage of helmets for moped riders would lead to an average of 3 less fatalities per year. The majority of those who lost their helmet were under 18 years old. Helmet usage is a key determinant of the risk of being seriously injured or not. The risk of being seriously injured is 67 per cent lower for those wearing a helmet
than for those not wearing a helmet. Increased compliance could be expected if conditional driving licences and moped licences were revoked after a violation of the helmet regulations.

Examples of measures that were implemented in the area:

- NTF measured helmet usage in 70 municipalities in 2011 and has discussed the results with parent groups among others.
- The police perform speed checks
- The wearing of personal protective gear is included in the compulsory training for moped riders.

The way forward:

- The Swedish Transport Administration has commissioned VTI to start measuring moped helmet usage starting in 2012, in a similar manner that measurement is performed for bicycle helmets.
- NTF are undertaking a new helmet project in 70 municipalities during 2012.
- Two research projects concerning mopeds and young moped riders have been commenced by the Swedish National Road and Transport Research Institute (VTI) in collaboration with the Länsförskäkringar Research Fund. The role of the parents with regard to the safety of young people shall be examined as well as a deepening of knowledge about the causes of moped accidents and group affiliation as a young moped rider. Helmet usage and tuning of mopeds will also comprise part of the analysis. The final report with proposals for measures is expected in autumn 2013.
- There is a need to develop working methods and methods of monitoring.
- The Swedish Transport Agency is investigating the possibilities that exist for revoking driving licences or conditional driving licences after violation of the helmet regulations.
- The formation of public opinions where parents, schools, medical personnel, police and others can participate in local cooperation is important. A suitable forum for this is the crime prevention work that is being driven by the police authorities and others in many municipalities.

Safer roads and streets

Most of the moped fatalities occurred on the state road network. Most of the serious moped injuries occurred on the municipal road network. Class I mopeds have dominated moped sales in the last ten years, and this has meant that most of the moped fatalities and serious injuries
have occurred on class I mopeds. Mopeds do not have a natural place in the traffic system at present. To mix mopeds and pedestrians creates insecurity and disruption, especially for children, the elderly and the disabled. It is important to create a safe and secure place for both mopeds and pedestrians. It is important
that the decisions made about where it is most suitable for mopeds to be ridden, take into account local conditions. On some routes it is preferable for class I mopeds to also be permitted on cycle lanes. Well-functioning operation and maintenance of PCM paths in urban areas as well as street design are essential for the safety
of unprotected road users. Moped riders are also viewed as unprotected road users who require special consideration in accordance with the Road Safety Act.

Examples of measures that were implemented in the area:

- As a first step, mopeds have been established in the Swedish Transport Administration's "Requirements and advice for the design of roads and streets" which replaces the earlier "VGU - the Design of Roads and Streets".
- The Swedish Association of Local Authorities and Regions (SKL) has produced the "Pedestrian, bicycle and moped handbook", which focuses on design of operation and maintenance.

The way forward:

- Mopeds have been implemented in a better way in the Swedish Transport Administration's new rules for street design. The area needs to be highlighted in the ongoing improvements.
- When the bicycle infrastructure is developed, conscious decisions must be made about the best location for mopeds.
- SKL intends to influence the municipal work through handbooks and conferences.
- The Swedish Transport Administration intends to produce a renewed study on the effects of also permitting class I mopeds on a number of pedestrian, bicycle and moped paths.

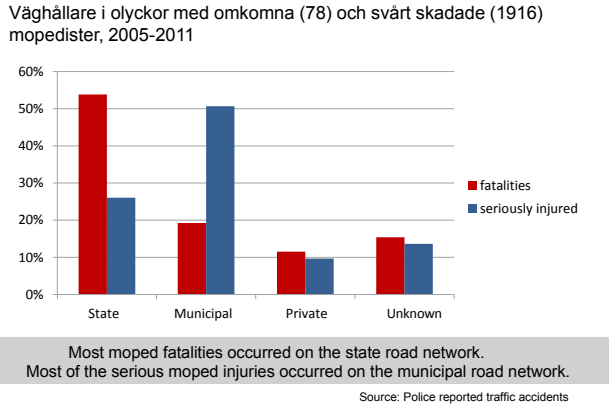


Diagram 7: road authorities in moped accidents with fatalities (78) and serious injuries (1916) between 2005-2011

Motorcyclists and moped riders

Motorcyclists

The number of newly registered motorcycles has fallen in recent years. The number of motorcycles in traffic and the mileage done by them has almost doubled during the 2000s. The number has levelled out in recent years, and remained at approximately 300,000 motorcycles in traffic during the summer. The most common motorcycle in Sweden is a custom model, followed by standard and veteran motorcycles (9). The trend at present is that more and more people are choosing off-road vehicles.

The motorcycle owners

The average age of a motorcycle owner has increased to approximately 50, and has thereby almost doubled over a 25 year period. Approximately 70 per cent of motorcycles are owned by men, approximately 10 per cent by women and approximately 20 per cent by legal entities (10). Motorcyclists who were granted authorisation for riding a motorcycle with their driving licences for passenger cars without performing special tests (up until 1975, class A was granted when a class B driving licence was granted) accounted for 1 in 5 fatal accidents between 2009-2011 They are under-represented since almost half of mileage on motorcycles is carried out by riders who were granted their class in this way.

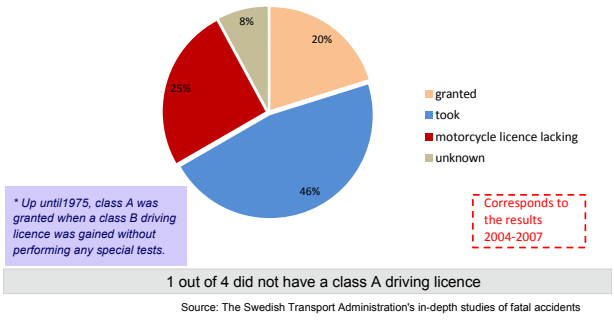


Diagram 8: Possession of driving licence in fatal accidents involving Motorcycles 2009-2011 (114 fatalities)

Motorcycle licence

The number of class A driving licences has decreased each year since 2004 except for 2011, when a small increase was noted. The number of new driving licence holders with A1 has decreased to approximately 500 proportion per year. Both the number and women taking a class A driving licence is falling. The average age among those who take a class A driving licence was just over 30 during the 2000s, which can be compared with just over 16 during the 1960s and 1970s (11). The Karolinska Institutet's register study shows that the largest group of motorcyclists (who have taken a class A driving licence) are those who took the motorcycle driving licence during the 2000s (9). Considering that the number of those taking a driving licence has fallen since 2004, the number of motorcyclists will likely fall as well.

Attitude to road safety

Motorcyclists are, like other road user groups, concerned about their safety. The majority always use full-body personal protective equipment and many supplement this with back protection. In several investigations, the majority say that on their next purchase they will choose a motorcycle with ABS. Motorcyclists have a more negative attitude than car drivers to riding when they are under the influence of alcohol or drugs. Motorcyclists are positive about further training after completing the basic training. In a comparison with car drivers, it is only when it comes to speed that motorcyclists have a worse attitude to road safety measures (4).

Technological development
Negotiations are presently taking place regarding a new ordinance that relates to the approval of motorcycle models from 2017 onwards. A section of the ordinance will require ABS on all motorcycles over 125cc. It remains to be seen whether it is ABS (anti-lock braking system) or CBS (combined braking system) on motorcycles with 51-125cc. The decision is expected in 2012.

Environment
Cars have had an exhaust emissions requirement for many years, but the first requirements for motorcycle exhaust emissions cleaning was introduced as late as 1999 through Euro 1. The requirements became more rigorous in 2003 through Euro 2, and from 1 January 2007, only new motorcycles that met the requirements of
Euro 3 could be enter the market. In the forthcoming ordinance, the requirements for exhaust emissions will be made even more rigorous through Euro 4, 5 and 6. Sustainability requirements will be imposed on exhaust emission cleaning equipment as well as requirements for onboard diagnostics that provide warning when this system is not functioning. Noise pollution is the most common environmental problem with regard to motorcycles, since many people replace the original mufflers.

Motorcycle licence

On 1 November 2009, compulsory risk education was introduced in two parts for anyone applying for a motorcycle driving licence.

The new regulations for driving licences shall apply from 19 January 2013. These including the raising of the minimum age for class A to 24 from 21. Those who have had class A2 for two years, however, will be able to take class A at 20 years of age.

Moped riders

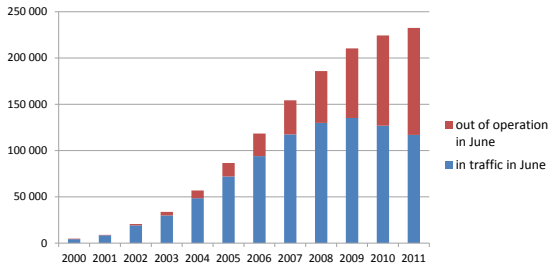
The number of registered mopeds (class I) has increased since they began to enter the market in 1999 and amounted to approximately 232,000 in 2011. In the middle of the summer, however, half of class I mopeds were out of operation.
The number of class II mopeds, where registration is not required, has fallen during the same period. The insurance industry estimated the number of class II mopeds in traffic during summer 2011 to be approximately 40,000. The total number of mopeds in traffic during summer 2011 was approximately 160,000.

When the new class AM was introduced in 2009, the number of issued AM driving licences fell dramatically. The trend has now increased once more. The number of issued AM driving licences was 20,335 in 2011, with approximately 6,000 conditional driving licences being issued (11).

The number of 15 year olds has decreased by 30 per cent in the last 5 years. From 2015, the number will increase again. This is an indication that the number of moped riders might increase again as well.

It is not solely 15 year olds who ride mopeds these days. Other groups have discovered that it is easy to travel by moped through city centres and that mopeds are easy to park. In rural areas, the moped is a popular vehicle for young people in particular, and meets their requirements for travelling on their own.

With regard to insurance for mopeds, the range is relatively large. Many people buy second-hand mopeds. As their value is not always high enough to contemplate taking out comprehensive insurance, partial insurance or simply third-party insurance is taken.



The number of registered class I mopeds has increased over time, in the middle of Summer, however, half of class I mopeds were out of operation

Diagram 9: Number of registered and out of operation class I mopeds respectively

Technological development

Mopeds have undergone considerable technological development in recent years with , for example, sturdier frames, larger wheels, better lighting (which increases visibility) and better brakes. Mopeds have also become better environmentally. Increasing numbers of models have four-stroke engines, and the two-stroke motor has evolved. Both two and four-stroke motors have catalytic exhaust emission cleaning, which is positive from an environmental perspective. A number of manufacturers have introduced mopeds with electric motors. These are under development and their range is becoming much greater. The proportion of mopeds in this category is estimated to increase in the next few years, thanks in large part to them appealing to people with great interest in the environment.

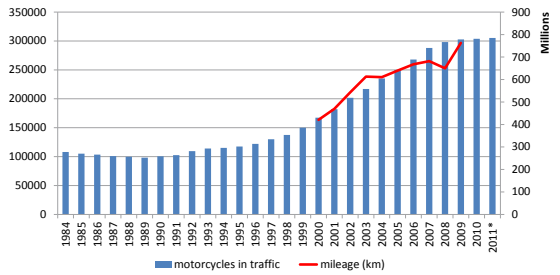
Driving licences and conditional driving licences for mopeds

In order to increase road safety, the rules for being able to ride a class I or II moped were changed on 1 October 2009. A new driving licence class was introduced, AM, a compulsory requirement to begin to ride a class I moped. At the same time it became necessary to gain a conditional driving licence to ride a class II moped.

Motorcycle accident trends

The supporting information that was used is primarily the Swedish Transport Administration's in-depth studies of motorcycle and moped fatalities between 2005-2011. (2). More comprehensive supporting information is reported on the Swedish Transport Administration's website, in the form of PowerPoint slides showing the trend of fatalities and serious injuries among motorcyclists and moped riders.

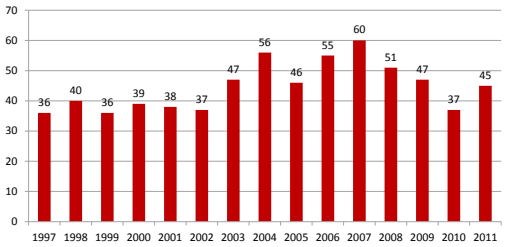
The number of motorcycles in traffic and the mileage done by them has nearly doubled during the 2000s. The number has levelled out in recent years, and stood at approximately 300,000 motorcycles in traffic during Summer.



The number of motorcycles in traffic and the mileage they do has doubled in the last 10-12 years

Diagram 10: The number of motorcycles in traffic versus mileage (Vehicle inspection) 1984–2011

During the last 10 years, there have been 481 motorcycle fatalities and 3,525 serious injuries in road traffic, according to police information. Medical care departments reported
390 serious injuries in 2007. In 2011, the number of serious injuries was 338. A "serious injury" applies to people who are assessed as having a medical disability as a result of the accident. This is a fall in the number of seriously injured people of 52 people (13 per cent). The annual reduction from 2007 to 2011 is 3 per cent. Despite the number of motorcycles in traffic having increased, the numbers of fatalities and seriously injured has not increased at the same rate. This means that the risk per vehicle of a fatality or serious injury in traffic has fallen. Since the risk of being killed or seriously injured falls with increasing age and experience, one explanation may be that the average age of motorcycle owners has nearly doubled during a25 year period, up to approximately 50 at present. Nearly 9 out of 10 motorcycle fatalities or serious injuries were male riders.



There were 481 motorcycle fatalities in road traffic during the last 10 years.

Source: Police reported traffic accidents

Diagram 11: Trend of the number of motorcycle fatalities.

The single most common type of accident where motorcyclists die are single-vehicle accidents (4 or 10), where the motorcyclist collides with an object on the road environment. Of these objects, 1 out of 4 are natural, such as trees or rocks, while 3 out of 10 are guard rails of different types during single-vehicle accidents. This means that collisions with the guard rail represent 1 out of 10 accidents where the motorcyclist dies. 76 per cent of single-vehicle accidents happen during a curve. Overall, collisions with motor vehicles represent 50 per cent of fatalities, while single-vehicle accidents represent 44 per cent and the remaining 6 per cent are collisions with wildlife and other..

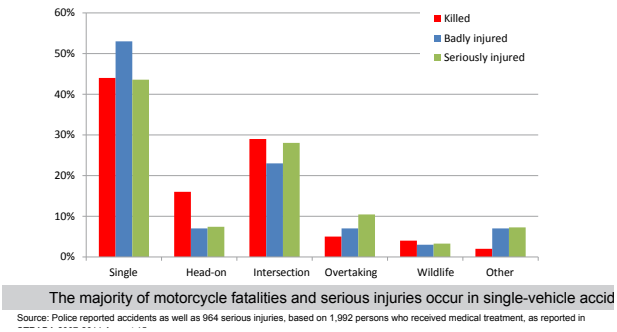


Diagram 12: Number of motorcycle injuries per type of accident

The second most common type of accident where motorcyclists have died are accidents on intersections (1 out of 3). In nearly all intersection accidents, the car driver has driven out or turned in front of the motorcyclist. In 7 out of 10 accidents the motorcyclist has been assessed as riding 10 km/h above the displayed speed limit, and in 4 out of 10 accidents the motorcyclist was more than 30 km/h over the displayed speed limit.t Only 3 out of 10 motorcyclist fatalities has been assessed as driving within the speed limit.

In nearly 4 out of 10 fatal accidents, the motorcycle's speed was assessed as being well above the applicable speed limit (more than 30 km/h). In an additional 3 out of 10 accidents, the motorcycle's speed was assessed as being between 10 and 30 km/h above the applicable speed limit. 7 out of 10 motorcyclists who rode well above the displayed speed during the fatal accident rode a motorcycle of the supersport model. The types of motorcycles involved in fatalities have varied over recent years, but supersport models are still involved in the majority of accidents. 4 out of 10 of the motorcycles that were involved in fatalities between the years 2009 and 2011 were of the supersport class. This type of motorcycle represents approximately 10 per cent of the motorcycles in traffic. Of those who have owned their motorcycle for less than 3 years, 2 out of 3 rode a supersport model.

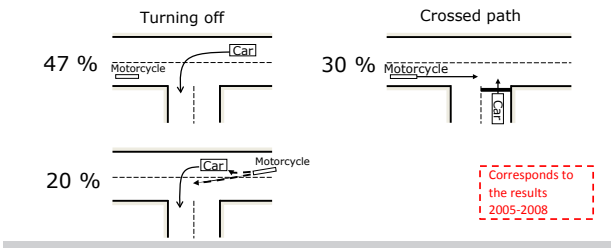


Diagram 13: The course of events in intersection-related motorcycle fatalities between 2005-2011 (99 accidents)

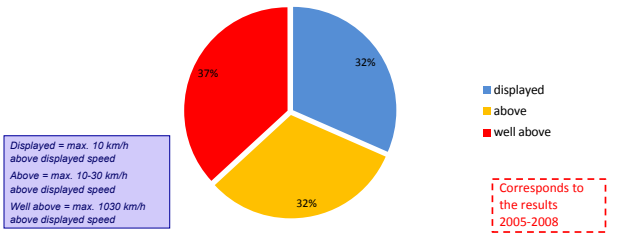


Diagram 14: Assessed speed in fatal accidents involving motorcycles 2009-2011 (114 fatalities)

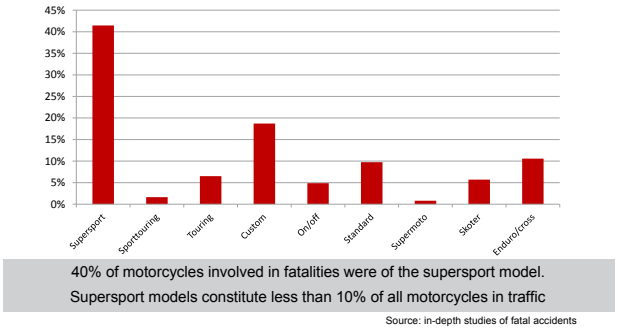
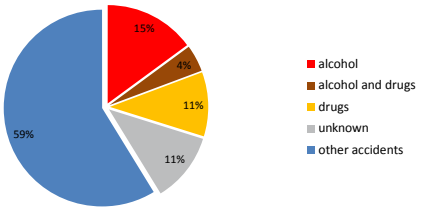


Diagram 15: Proportion of motorcycle classes involved in fatal accidents 2009-2011 (127 fatalities)

Nearly 1 out of 3 motorcyclists involved in fatalities between 2009-2011 were under the influence of alcohol or other drugs. For the period 2005-2008 this was 1 out of 4. Nearly half of the riders who were not sober were under the influence of other drugs than alcohol, which is a doubling of the number from 2005-2008. Of those without class A who died, 2 out of 3 were under the influence or alcohol or illegal drugs. At least 1 out of 6 motorcyclists involved in fatalities were not wearing or lost their helmet during the accident. Nearly all motorcyclists without helmets involved in fatalities were under the influence of alcohol or. did not possess a motorcycle driving licence. 7 out of 10 fatalities and 6 out of 10 serious injuries on the state road network The remaining accidents occurred primarily on municipal streets.

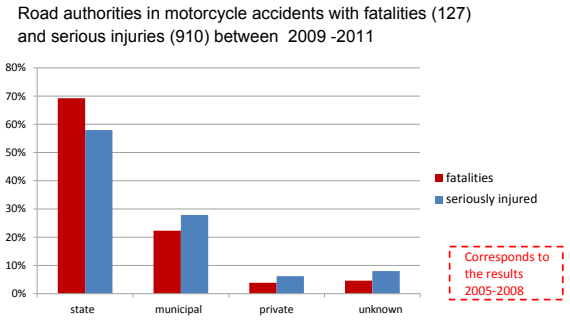


Almost 1 out of 3 motorcyclists involved in fatalities were under the influence of alcohol or drugs (for the period 2005-2008 it was 1 out of 4)

Almost half of the riders who were not sober where under the influence of drugs other than alcohol (a doubling from the period 2005-2008)

Source: The Swedish Transport Administration's in-depth studies of fatal accidents

Diagram 16: Alcohol and drugs in fatal accidents with motorcycles 2009-2011 (114 fatalities)

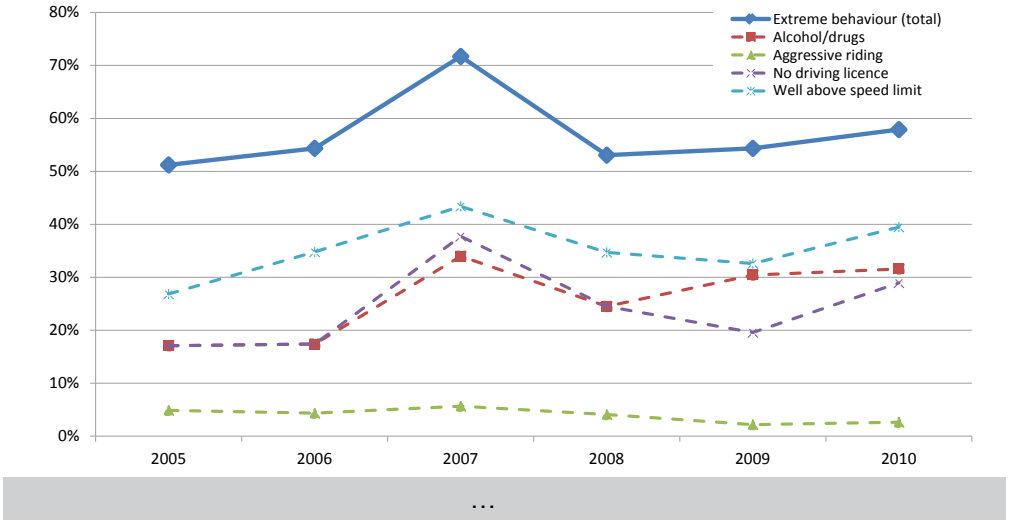


7 out of 10 fatalities and 6 out of 10 serious injuries on the state road network

Source: Police reported traffic accidents

Diagram 17: Distribution of motorcycle accidents with fatalities (127) and serious injuries (910) between 2009-2011 by road authorities

Extreme behaviour occurred in 50-70 per cent of fatal accidents with motorcycles.



Source: The Swedish Transport Administration's in-depth studies of fatal accidents

Diagram 18: Trend of the proportion of motorcyclists involved in fatal accidents with extreme behaviour, 2005-2010

1. Unlawful riding: The rider has no authorisation to ride a motorcycle. Either the rider has never undergone training for a driving licence and therefore does not have the knowledge required to ride a motorcycle, or the driving licence has been revoked. Within this group, the other three extreme behaviours are overrepresented. This group represents 25 per cent of all fatalities 2005-2010

Fatal accidents involving riders without motorcycle driving licences 2005-2010

		Fatal accidents without	all fatal accidents
	numb	65	263
	%	25%	-
Single-vehicle accidents		62%	41%
Average age rider		30	39
Alcohol or drugs		60%	26%
If alcohol, average % BAC		1,6	1,4
Rider is the legal owner		32%	63%
Rider without helmet		20%	7%
Cross/enduro motorcycle		22%	6%
Supersport motorcycle		37%	38%
Unregistered motorcycle		12%	3%
Motorcycle out of operation		35%	11%
Assessed speed above speed limit		42%	36%
Dark, dawn or dusk		46%	24%
Rural area		46%	70%
Municipal street		55%	27%

Diagram 19: Fatal accidents with riders without driving licences differ Source: in-depth studies of fatal accidents significantly from other fatal accidents.

Source: in-depth studies of fatal accidents

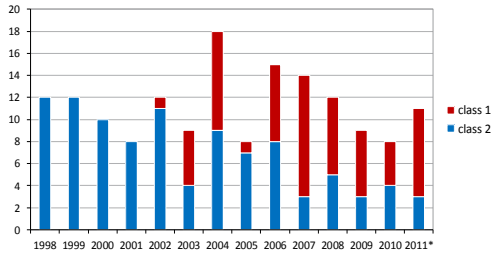
2. Riding under the influence: Rider under influence of alcohol, drugs and medicine that affect riding negatively. This group represents 26 per cent of all fatalities between 2005-2010. The group correlates strongly with unlawful riding, since 60 per cent of fatalities where the rider did not possess class A were under the influence.

3. Aggressive riding: The motorcyclist rides in an aggressive manner in relation to other road users. This relates to, for example, back wheel riding, overtaking at great speed and such like. This group represents 2-3 per cent of all fatalities, but correlates strongly with the group involving very high speeds.

4. Very high speeds: The rider rides at a speed that exceeds the limit for suspension of a driving licence, that is, 30 km/h or more in excess of the speed limit. This group represents 37 per cent of all fatalities between 2009-2011.

Trend of moped accidents

Over the last ten years, 116 moped riders have died and 2,650 have been seriously injured, according to police reports. The majority of fatalities or serious injuries occurred on class I mopeds. 4 out of 10 of those who died as well as 7 out of 10 who were seri ously injured on a moped were children or youths (<17years). Almost 9 out of 10 moped fatalities or serious injuries were male riders. Health and medical centres reported 548 serious injuries in 2007. In 2011, the number of serious injuries was 321. This is a fall in the number of seriously injured people by 227 (41 per cent). The annual reduction from 2007 to 2011 is 8 per cent.

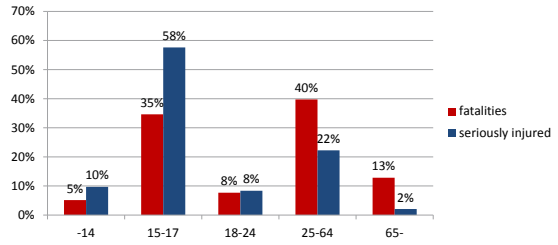


In the last ten years, approximately 12 moped riders have died per year
In recent years, most of the fatalities occurred on class I mopeds.

Source: Police reported traffic accidents

Diagram 20: Trend of the number of moped fatalities.

4 out of 10 of those who died as well as 7 out of 10 who were seriously injured on mopeds were children or youths (<17 years old). The majority of children who died and were seriously injured were 15 years old.

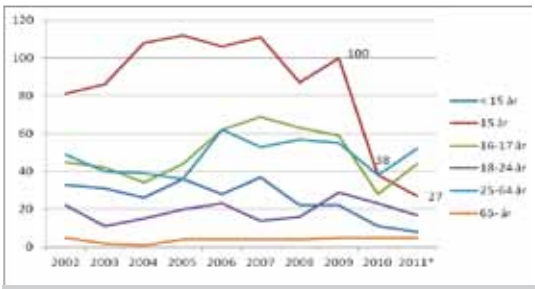


4 out of 10 fatalities and 7 out of 10 of those seriously injured on mopeds were children or youths (<17 years old)

Source: Police reported traffic accidents

Diagram 21: Age distribution in moped accidents with fatalities (78) and serious injuries (1,916), 2005-2011

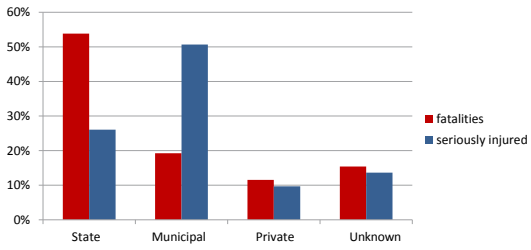
After the introduction of the AM driving licence for class I and conditional driving licences for class II in autumn 2009, the number of seriously injured 15 year olds has fallen in both 2010 and 2011.



Source: Police reported traffic accidents

Figur 22: Åldersutveckling i olyckor med svårt skadade mopedister 2002-2011

Most moped riders died on the state road network and most moped riders were seriously injured on the municipal road network.



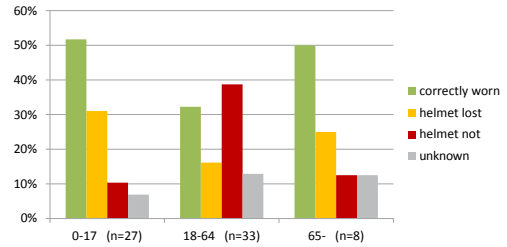
Most moped fatalities occurred on the state road network.
Most of the serious moped injuries occurred on the municipal road network.

Source: Police reported traffic accidents

Diagram 23: road authorities in moped accidents with fatalities (78) and serious injuries (1916) between 2005-2011

2 out of 3 who died or were seriously injured, according to police reports between 2005-2011, were involved in a collision with another vehicle. According to information from the health authorities, the majority (6 of 10) were injured in single-vehicle accidents and 3 out of 10 were seriously injured in collisions with other motor vehicles.

Almost 5 out of 10 moped riders involved in fatalities were not wearing, or lost, their helmet during the accident. The majority of those who lost their helmet were under 18 years old. The wearing of a helmet has proven to be a crucial element in the risk of being seriously injured or not. The risk of being seriously injured is 67 per cent lower for those wearing a helmet compared to those not wearing a helmet.

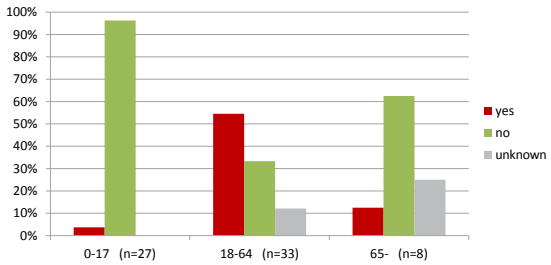


Almost 5 out of 10 moped riders involved in fatalities were not wearing or lost their helmet during the accident.

Source: The Swedish Transport Administration's in-depth studies of fatal accidents

Diagram 24: Use of helmet in fatal accidents involving mopeds 2005-2011 (68 fatalities)

In the 18-64 age group there are more fatalities were the rider was under the influence of alcohol or drugs than where the driver was sober. Among those under 18 years of age, the proportion of fatalities where the rider was under the influence was 3 per cent.

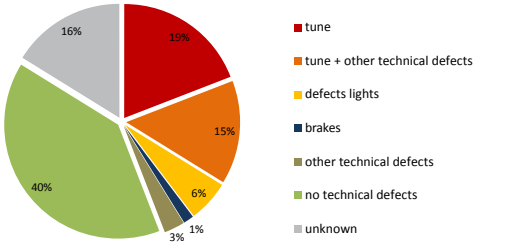


In the 18-64 age group there were more fatalities under the influence than sober

Source: The Swedish Transport Administration's in-depth studies of fatal accidents

Diagram 25: Alcohol and drugs in fatal accidents with mopeds 2005-2011 (68 fatalities)

Only four out of 10 mopeds involved in fatal accidents were without known technical defects. At least 23 per cent of the mopeds involved in fatal accidents were tuned. In fatal accidents where the driver was under 18 years of age, at least half of the mopeds had been tuned. There is a relatively large number of unrecorded cases. The number of unrecorded cases is a result of no technical investigation having been carried out, which is quite normal among accidents involving older moped riders. The fact that no technical investigation was conducted is an indication in itself that there was no suspicion of tuning, and most of the unknown cases therefore probably belong to the non-tuned group.



Only four out of 10 mopeds were without known technical defects

Source: The Swedish Transport Administration's in-depth studies of fatal accidents

Diagram 26: Technical defects in fatal accidents involving mopeds 2005-2011 (68 fatalities)

Analysis of the potential of the operational areas

Analysis of the potential of the operational areas	Potential mc	Potential moped
Visibility/alertness		
Visibility/alertness other road users	6	3
Right competence other road users	2	1
alertness motorcyclist/moped rider	5	4
Safe streets and roads		
Visibility-improving road environment	6	4
Central barrier	6	3
Safe intersections in urban areas	4	3
Safe intersections on rural roads	8	4
Safe lateral reserves	6	3
Motorcycle-adapted median and side guard rail	5	1
Clean, intact and even road surface	2	<1
Repair measures on roads	<1	<1
Class I moped on cycle lanes (non-urban areas)	-	3
Safe usage		
Extreme behaviour	26	-
Correct competence motorcyclist and moped rider	16	6
Correct usage of helmet	4	3
Full-body protective clothing	3	4
Non-lending	9	2
Medical requirements	7	2
Safe group riding	4	-
Rested rider	3	-
Appropriate driving licence category	13	9
Pillion passenger	-	4
Safe vehicle		
ABS	21	-
Anti-theft device	3	1
alcohol ignition interlock system/sobriety	8	4
E-call	4	<1
Traction control	5	-
Airbag	7	-
Speed support system	>15	-
No technical defects	2	4
Non-tuned mopeds	-	3
Visibility-improvement other vehicles	3	-
Only registered vehicles on the road	3	-

During the period 2005-2008, there were on average 53 motorcyclist and 12 moped rider fatalities per year.

The preceding table shows the maximum potential (number of lives saved per year) for different operational areas for motorcyclists and moped riders. The total potential, however, cannot be calculated by adding the potentials for all operational areas, since these overlap with each other. The analysis is based on facts from fatal accidents 2005-2008.
Each operational area is described more comprehensively below. With regard to serious injuries, the accident data does not enable the level of detail that is requires for the analysis of potential in each operational area.

Visibility and alertness

Visibility and alertness of other road users has been assessed on the basis of the number of fatalities in accidents where the decisive factor was that the other party did not see or notice the motorcyclist or moped rider. Accidents with solely obscured visibility as a result of obstacles in the road environment have not been included in the calculations. The effect is considered to be certain. However, it is difficult to distinguish visibility from alertness, i.e., to distinguish between accidents in which the collision was due to the other party really not seeing the motorcycle and those due to the attention of the other party having been attracted by something else.

As regards the alertness of the motorcyclist, the effect is linked to the accidents in which the alertness of the motorcyclist was considered to have been the critical factor in the occurrence of the accident. This assessment is considered to be fairly certain, since there are often obvious relationships in accidents between lack of alertness and the occurrence of the accident.

Right competence of other road users is linked to the same accident causes as those for the area of right competence of the motorcyclist. With regard to the assessment of traffic situations, however, a few additional reasons apply including the misjudgement of speed and braking distances. The assessment in these cases is also relatively certain.

Safe streets and roads

A visibility-improving road environment has the potential for preventing accidents in which impaired visibility due to obstacles in the road environment was a decisive factor, for example, on intersections or in a curve with obscured visibility. However, the effect is somewhat uncertain, since visibility improvements do not necessarily improve alertness, even though they most probably improve the opportunity for detecting motorcyclists and moped riders.

The central barrier is assessed as having the effect of preventing head-on collisions and collisions during overtaking. Those accidents where the motorcyclist has lost control and collided with oncoming traffic have been excluded, since it is highly unlikely that a central barrier would have prevented the resulting injuries. A Swedish study from 2009 (12) demonstrated that serious and fatal accidents have fallen significantly on newly constructed roads with central barriers as well as with cable barriers. On the basis of the in-depth studies, however, the effect is assessed as being somewhat uncertain since it is not possible to rule out that the fatal accident would have occurred regardless of there being a central barrier. If a guard rail is used, the choice of guard rail and its placement might also be significant for the outcome of the accidents, but the effect is uncertain.

In urban areas, the reconstruction of standard intersections into roundabouts is considered as being able to prevent the majority of fatal accidents, excluding those involving very high speeds. It is difficult in some cases to assess the speed at which the accident would have been preventable, and the effect is thus somewhat uncertain. One precondition, however, is that the design of the roundabout does not result in an increased risk for injury during collisions.

Safe intersections on rural roads have great potential since many intersection accidents occur on rural roads. The accidents involving very high speeds have been removed for the same reason as for intersections in rural areas The effect is uncertain, primarily because there are no completely safe design alternatives that have been tested and evaluated with motorcyclists in mind.

The term safe lateral reserves means that the area immediately adjacent to the road is cleared of objects (such as posts, trees and stones) that could be dangerous if a vehicle were to collide with them. The effects of this relate to single-vehicle accidents,

where the risk is reduced of someone being killed in a collision with an object in the lateral reserve. However, it is difficult to determine whether the motorcyclist would have continued out into the terrain and collided with some other object if the lateral reserve had been cleared. The effect is therefore uncertain.

Side guard rails are the most common collision object in fatal single-vehicle accidents. International research shows that the risk of being killed is 15-80 times higher for a motorcyclist compared with a car driver who collides with a guard rail without having any protection. The potential of a more motorcycle-adapted side guard rail has been assessed to apply to those accidents where the guard rail constituted the primary collision violence. In those accidents where the speed was very high, the design of the guard rail probably lacked any significance for the possibility of survival. The effect is somewhat uncertain since it is unknown how many of those who collided with a side guard rail would have survived a collision with a more motorcycle-adapted guard rail.

A sound, clean and smooth road surface is expected to prevent accidents in which the condition of the road surface is decisive for the occurrence of the accident. This also applies to patching work on the road. This effect appraisal is certain According to police reports, the friction factor was of significance for the occurrence of the accident in ten per cent of motorcycle accidents.

It is not possible at present to permit class I mopeds on cycle lanes. Regulation amendments that make this possible, where it is unsuitable for mopeds to ride on the roads, such as 2+1 roads, could increase the safety of moped riders. This effect is calculated on the basis thatthe cycle lanes that exist outside of urban areas would be permissible for class I mopeds. If more cycle lanes were constructed, the effects would be greater as a result.

Safe usage

The potential of preventing extreme behaviour has been defined in this context as preventing accidents where the decisive cause was very high speed, that the rider had no driving licence or under the influence of alcohol or other drugs, or that the rider rode very aggressively in another manner.

The effects of motorcyclists and moped riders having the right competence applies to those accidents where the decisive factors are connected to the assessment of the traffic situation, dangerous behaviour or rider skills such as braking technique or taking curves. The effect is not certain, since what actually caused the accident can be difficult to assess in some cases. In many cases there are clear links between the aforementioned operational areas, for example, extreme behaviour and unlawful riding.

There is a certain effect for helmet usage in those cases where the person who died was not wearing a helmet and a doctor was of the opinion that they would have survived had they worn one. The same applies to protective clothing.

In approximately 25% of fatal accidents the rider of the motorcycle is not the actual owner. Not lending the motorcycle or moped to somebody else may therefore have the effect of preventing these accidents, besides those accidents involving stolen vehicles. The effects could be certain, since the measure limits access to motorcycles and mopeds in the same way as an alcohol ignition interlock system or an anti-theft device. However, this is uncertain since it is sometimes difficult to assess when a motorcycle has been borrowed from the in-depth studies. In addition, lending in connection with fatal accidents is often combined with alcohol and the lack of protective equipment. It can also be difficult to determine whether the owner is the actual user of the motorcycle, known as ”dummy insurance”. This results in the potential being considered as very uncertain.

Medicinal requirements are also difficult to caculate

the effects of. The measure is not actually linked to the usage, but more to the possibilities of riding a motorcycle on the road. However, the effect is important to highlight, and how large they are is based on an assessment of those cases where illness is a possible cause for the accident occurring. These assessments are also difficult to make, and the effect is therefore assessed as uncertain.

There is potential to prevent those accidents that occur in connection with group riding, through this being done in a safer manner. The size of the effect is assessed on the basis of those accidents that occurred during group riding, and where the accident occurred as a result of poor assessment of the traffic situation by the motorcyclist. However, the effect is uncertain since it is difficult to assess the extent to which safer group riding would have prevented these accidents.

Assessing whether fatigue was the cause of an accident is generally difficulty and even more difficult for motorcycle accidents. The effect of well-rested riders therefore becomes somewhat uncertain, even if a few cases occur where suspicions exist that the rider fell asleep on the motorcycle.

The assessment of the effects of the correct driving licence class are based on accidents where the motorcyclist or moped rider does not possess the driving licence class. Hypothetically, the accident could have been avoided if the rider had had the correct class and thereby better competence. The effects are uncertain, however, since the group without driving licences are more often killed when under the influence of alcohol or drugs, without helmets and/or on a vehicle that they do not own. It is therefore difficult to assess whether driving licence class by itself would have been sufficient for avoiding the accident.

Increasing the age limit for having a pillion passenger to 18 years could reduce the number of those fatal accidents connected to pillion riding. It is, however, uncertain whether pillion riding was of decisive importance for the occurrence of the accident, and the effect has therefore been classes as uncertain.

Safe vehicles

The effect of anti-lock braking systems (ABS) is assessed to be a 40 per cent reduction of all types of accidents involving injuries to people. The assessment is viewed as certain, since a number of scientific studies, including one of Swedish accident data (3), have demonstrated that ABS have approximately this effect.

An anti-theft device eliminates the risk of accidents involving stolen motorcycles and mopeds, while sober riders and alcohol ignition interlock systems reduce the risk for accidents where alcohol-affected motorcyclists or moped riders die as a result of their own mistakes. Both the effects are considered certain, since the riders in these accidents would not have been on the roads if the motorcycles had had an anti-theft device or alcohol ignition interlock systems.

The E-call alarm system is assessed as having an effect in those single-vehicle accidents where the person who died was found more than one hour after the accident occurred, and where a doctor has assessed that they did not die upon impact. The effect is somewhat uncertain however, since it is difficult to assess how many of these fatalities would have been avoided if the accident had been discovered earlier.

Traction control (TC) is assessed as having an effect in those accidents where the decisive factor was over steering or back wheel riding.

Airbags on motorcycles are assessed as having an effect in those accidents where the motorcyclist was still sitting on the motorbike at the time of collision and where the speed did not exceed 70 km/h. The effect has been assessed as uncertain since very few motorcycles are sold with airbags. Consequently there have not been any evaluations made of this system on actual accidents.

Support systems for maintaining speeds are not common on motorcycles. Theoretically they have the potential to prevent those accidents were speed has been the decisive cause of the accident. This assessment, however, is uncertain if not very uncertain, since no evaluations of this system have been done on actual accidents. In addition, at present we cannot assess how great the potential for injury reduction is, even if it is probably large. Reduced speed also has a large effect on reducing injuries in all types of accidents, and the effect is therefore assessed as at least 15 lives per year.

No technical defects apply to those accidents where decisive technical defects existed on the motorcycle or moped. Technical defects of decisive importance may be broken lights in accidents at night or faulty brakes. Tuning has been assessed to be of decisive importance in those cases where the cause for an accident or injuries occurring was such a high speed that it could not have been achieved without the moped having been tuned.

Only registered vehicles on the roads is a matter of unregistered motorcycles not being ridden in traffic. The effect of this is certain, although there is no known action that could effectively achieve this.

Visibility improvement from other vehicles has a potential in accidents in which the driver of the other vehicle in the accident has stated that the motorcycle was not visible since it was concealed by the other vehicle itself (such as the A-pillar) or by some other vehicle. This effect is considered to be somewhat uncertain, since it is impossible to guarantee that the accident could have been avoided if the visibility had been good.

Research and innovation

The prioritisations that are made shall be based on facts and scientific grounds. Encompassed in the strategy is the need for research and innovation to be highlighted. As mentioned several times in this document, knowledge about measures and their connection to road safety is lacking in many cases.

A few important highlighted areas are:

motorcycles:

- visibility and alertness
- speed support system
- extreme behaviour
- the right competence for motorcyclists - further training of
- criteria for how a side lateral area shall be designed in order to improve conditions for a motorcyclist who is exiting the road.

mopeds:

- the effects of full-body protective clothing
- the effects of different age limits for class I mopeds
- charting of the maximum design speed of the moped upon purchase and after being used for a certain amount of time.

Visibility and alertness

The area has great road safety potential. The current challenge is to define how the accidents are categorised into causes linked to visibility and alertness respectively, as well as to define the measures that have effect within respective areas. Factors to be taken into consideration are vehicles, the road environment and road users. Further research is needed that results in proposals for measures.

Speed support system

The system exists, but has not been completely developed for motorcycles. However, there are support and warning systems in GPS and similar. In general, all vehicle manufacturers are working with the issue of ITS (Intelligent Transportation Systems), and there are various technological solutions that can increase safety, including that of motorcyclists. This relates to different types of support systems that provide the driver with information, and systems that assist riding.

Extreme behaviour

Research is needed concerning the causes of and remedies for extreme behaviour. It represents a group that choose in many ways to break laws. The problematic of extreme behaviour relates to attitudes and norms among one or several subgroups of motorcyclists. They need to be identified and described so that it is then possible to formulate conceivable measures and strategies.

The right competence for motorcyclists - further training of motorcyclists

A number of further training schemes for motorcyclists are currently being run. Evaluations of the road safety effects among these riders demonstrate an amount of positive effects, but often negative road safety effects as well, that is, the rider actually has a higher risk for an accident than before the training. One explanation can be that the course participant is able to practice elements that are considered particularly difficult, for example, taking curves or braking. There is a risk that the rider's belief in their own abilities increases more than their actual abilities. A common way to counteract this effect is simply to avoid skills training in further training and concentrating on knowledge about risks, known as "risk education".

We suggest that a joint industry standard for further training of motorcyclists be developed, which can be recognised by all parties. It should be possible to develop the standard on the basis of ISO 39001, the "Road Traffic Safety Management System", which will be established in Autumn 2012. Over 40 countries are participating in the work in different ways, as well as several international organisations. It can be said that ISO 39001 is reminiscent of ISO 14001 which relates to the global Environmental Management System.

Criteria for how a side lateral area shall be designed in order to better accommodate a motorcyclist who is exiting the road.

At present, the criteria for a side lateral area are based on those who travel in passenger cars. However, criteria for motorcyclists is lacking. Development is required in this area, including monitoring trends. This relates to how a side lateral area can best be designed for a motorcycle and motorcyclist. It also concerns the ability of motorcycles and motorcyclists to cope with hitting safety guard rails.

Effects of full-body protective clothing for moped riders

Head injuries account for the greatest proportion of serious injuries (48%), which means that the correct usage of helmets has great potential to reduce the number of serious injuries. Arms and legs combined, however, account for 30% of serious injuries, and 52% of all serious injuries. The development of protective equipment that is usable and effective for the reduction of arm and leg injuries can therefore have great safety potential. Further research is necessary here for clarifying the potential of such protective equipment.

The effects of different age limits for class I mopeds

The European Driving License Directive provides member countries the opportunity to determine the age limit of riders within a range of 14-18 for class I mopeds. An age limit of 15 was determined in Sweden, while Denmark has an age limit of 18 and France 14. An evaluation of the effects of the various age limits between EU countries should provide the basis for a review of age limits for mopeds in the future.

Charting of the maximum design speed of the moped upon purchase and after being used for a certain amount of time.

Knowledge is lacking about the actual potential speeds of mopeds after a certain amount of usage without any amendments having been made.

Motorcycles and mopeds as part of transport policy

Vision Zero

The Swedish Parliament decided in the autumn of 1997 that the long-term road safety objective should be that no one should be killed or seriously injured as a result of road accidents in the road transport system – Vision Zero. Responsibility for this vision lies partly with those who design and maintain the system, and partly with road users who are responsible for following the rules. If road users do not have the ability to follow the rules, the responsibility returns to the designers of the system. The point of departure for Vision Zero is that human errors in traffic should not have to lead to serious personal injuries. For a motorcyclist, the risk of being killed or injured in an accident is extremely high, even at a relatively low speed. The primary emphasis for the system designers therefore is the implementation of measures that support the riders in avoiding accidents. But mitigating the consequences of accidents when possible is also a natural part of this. The most important factor for safe moped traffic is to limit the consequences of accidents that occur. A moped rider who uses a helmet in the right manner has reasonable chances of surviving an accident if the speed is a maximum of 45 km/h, and good chances of survival if the speed is a maximum of 30 km/h.

Transport policy objectives

The overall objective of Swedish transport policy is to ensure the provision of transport for people and businesses throughout the country in a manner that is economically efficient and sustainable in the long term (13).

This objective is supported by two main objectives: a functional objective that concerns the accessibility of the journey or transport, and an impact objective that concerns safety, the environment and health. The objectives represent the point of departure for all measures adopted by the Government in the field of transport. For example, how the authorities shall prioritise different objectives and needs when they perform their tasks. The objectives should also serve as support for regional and municipal planning. The objectives comprise all modes of traffic, which means that they also concern transport and journeys made by motorcycle and moped.

The Functional Goal - accessibility

The word accessibility concerns the opportunity to minimise and overcome geographical distances in order to create contact possibilities and proximity to services and community functions. Motorcycles and mopeds may be an alternative to cars in cities where congestion is a problem.

A journey by motorcycle or moped can have many purposes including pleasure, a business trip or commuting. Accessibility varies for motorcycles and mopeds since they are most often used in different traffic environments and are ridden at different speeds. A journey by motorcycle has accessibility similar to that of car traffic, while a journey by moped, especially class II, has accessibility which is more like that experienced by a cyclist. Many people need mopeds or motorcycles for a functioning everyday life or to gain increased quality in their recreational life.

The Consideration Objective - safety, environment and health

It is important that all travel occurs in a safe manner and does not contribute to a deteriorating environment or negative effects on health. Road safety measures can also have good effects on the environment. Reduced speeds, for example, result in better air quality, reduced emissions of greenhouse gases and lower noise levels. These improvements can also be presumed to have good effects on health.

Mopeds do not have a natural place in the traffic system at present. To mix mopeds and pedestrians creates insecurity and interference, especially for children, the elderly and the disabled. It is important to create a safe and secure place for both mopeds and pedestrians.

Motorcyclists and moped riders are viewed as unprotected road users since 19 December 2010, when the Road Safety Act (SFS 2010:1362 and TSFS 2010:183) came into effect.

No direct measures for reducing the environmental impact from motorcycles or mopeds are encompassed in the strategy. Older motorcycles and mopeds often lack catalytic converters and are estimated to account for 8 per cent of the hydrocarbon emissions of road traffic. A review is currently being performed within the EU of the framework directive for approval of models of two and three-wheeled vehicles. The review will result in exhaust standards improving significantly with the gradual introduction of EURO stages 3, 4 and 5. Exhaust components are regulated similarly to cars with regard to what is applicable. The introduction period for these three stages is roughly between 2014-2020, the exact times were being negotiated in the Council of Ministers at the time of writing, and are expected to result in methods for measuring the emission of carbon dioxide for motorcycles, as well as more stringent exhaust and noise pollution requirements. According to representatives from the motorcycle industry, motorcycles manufactured from 2015 onwards will meet the same emissions requirements as passenger cars.

New interim goals for 2020

In May 2009 the Swedish Parliament decided on new interim goals for road safety for the year 2020. The goal is to achieve a 50 per cent reduction in the number of fatalities by 2020 compared to the period 2006–2008. This means that the number of fatalities on the roads in 2020 will be a maximum of 220. The number of seriously injured persons is to be reduced by a quarter between 2007 and 2020, so that a maximum of 4000 persons will sustain serious injuries in 2020. The decision has been made that these interim goals shall undergo a review in 2012 and 2016 in order to remain as relevant as possible. The 2012 overview shows that it is possible to redefine the goals to a 50% reduction between 2010 and 2020. This ambition level would also be in line with the goal determined at the EU level. At the time of writing, the review had been submitted to the Government for further consideration. A prospective decision regarding reviewed interim goals can be expected to be made towards the end of 2012 at the earliest.

Towards Zero Together

Management by objectives for road safety
The Swedish Parliament has adopted Government Draft Bill 2008/09:93 as well as the Swedish Road Administration proposal for a system of management by objectives of road safety operations. The Government advocates, among other things, systematic annual follow-up of results as a tool for enabling continual follow-up of developments.

Management by objectives is based on measuring and following up the condition for a number of prioritised operational areas. Contributions by the stakeholders represent an important part of road safety operations. This also applies to the work on improving safety for motorcyclists and moped riders.

Monitoring: The core work of management by objectives involves monitoring the trend of road safety on the basis of the goals that were set. Each year begins with the production of an analysis report by a national analysis group. The group is comprised of analysts from different authorities. The analysis report gives an account of how many were killed and injured during the previous year as well as how the indicators appear in relation to the goals. On this basis the analysis group draws conclusions regarding whether the development is progressing at a sufficient pace or not.

The indicators are measurements of different traffic conditions that are relevant to follow from a road safety perspective. There is a goal for each indicator, and if the indicator goals are achieved this means that we are also achieving the goals for few fatalities and serious injuries. Monitoring of the stakeholders' measures in the motorcycle and moped area comprises the supporting information for the following review of strategy and planning of the next year's activities. The motorcycle and moped area performs an annual reconciliation prior to the updating of the strategy.

The indicators after the 2012 overview are the following:

- Compliance with speeds limits, national and municipal road networks (passenger car, heavy traffic, motorcycle)
- Sober road users
- Use of seat belts
- Use of helmets (bicycle and moped)
- Safe passenger cars
- Safe motorcycles (ABS)
- Safe state roads
- Safe pedestrian, cycle and moped passages (PCM passages)
- Maintained pedestrian, bicycle and moped lanes (PCM lanes)

Indicators that are particularly important for motorcycles and mopeds are compliance with speed limits, sober road users, moped helmet usage and safe motorcycles (ABS). The proportion of fatal accidents is also monitored in which a contributing factor was fatigue, distraction, lacking visibility, tuning or other technical moped defects.

The Results Conference: The results are presented at the conference and the stakeholders are given the opportunity to present the results that they have achieved during the previous year. The international expert panel presents their viewpoints on these occasions.

Joint standpoints regarding the focus: After the stakeholders have reported their results and they have been discussed at the results conference, the Group for National Collaboration (GNC) convenes. It is then established which areas should be concentrated on in the future in order to have the greatest chance of achieving the goals. These are compiled into a short document where the GNC member's reach an agreement regarding the focus that is most appropriate to have with the road safety work in the future. It acts as a tool for support, but is not binding for all of the stakeholders that want to collaborate on Vision Zero.

Planning: The vast majority of organisations have a planning process during the autumn prior to the upcoming year. All stakeholders are free to plan their own upcoming activities on the basis of the analysis report and the GNC joint standpoint regarding focus. In the Motorcycle and Moped Working Group, this joint strategy provides elaborated supporting information for planning.

Reporting planned activities: During the last GNC meeting of the year, all participating stakeholders are given the opportunity to report on the results of their planning processes. The plans for the following year are reconciled and summarised. The hope is that these plans were based on the analysis report and the GNC operational areas from earlier in the year, as well as from the joint strategy for the Motorcycle and Moped Working Group.

Motorcyclists and guard rails, the Swedish Transport Administration

Summary of the parts of the Swedish Transport Administration's Focus for guard rails and bridge rails (TRV 2010/98486)
Motorcyclists are a traffic group whose safety is not improved by the side guard rails along the edges of roads. Motorcyclists are overrepresented in accidents with guard rails that end in a fatality. There are alternative solutions to guard rails that have been developed with consideration of this group, but it is unclear how great the benefits for road safety would be of a large-scale implementation in relation to the costs. If the Swedish Transport Administration wants to have a high profile in the road safety work, it would be illogical to take a passive stance with regard specifically to motorcycles. The newly developed focus document for guard rails and bridge rails (8) is also concerned with the particular needs of motorcycle traffic.

In the document, it is suggested that the Swedish Transport Administration:

- introduce those effective solutions that are technologically and financially possible as soon as possible.
- undertake demonstration projects where the new solutions are established on a limited scale, including those with unclear effects, in order to amass experience and competence relating to the particular needs of motorcycle traffic.
- become engaged in short-term development work to promote the development of better functional requirements, preferably through European and international standardisation.
- initiate and participate in long-term development work in order to make new solutions possible in the future

Motorcycle accidents involving collision with guard rails

The Swedish Transport Administration has undertaken a study with the purpose of increasing knowledge about motorcycle accidents where the motorcyclist collided with a guard rail. According to this study, approximately 5 motorcyclists per year die in accidents involving guard rails (just over 10 per cent of all motorcycle fatalities). The guard rail represents the most common collision injury in single-vehicle motorcycle accidents. It is not possible to establish that one type of guard rail would be more dangerous than another of the dominant guard rail models that were studied (cable, W-beam and Kohlsva-beam barriers). Concrete barriers are used to an extremely small extent in Sweden on the national road network, and the study did not include any accidents involving this type of barrier. Nor have accidents involving collisions with guard rails that have protection from sliding underneath the guard rail been studied.

The study also demonstrates that the course of events during collisions with the guard rail are fairly evenly distributed among the following types:

- fell off the motorcycle and slid into the guard rail
- sat on the motorcycle upon impact and hit the guard rail from above
- sat on the motorcycle upon impact and fell over the guard rail

This is significant for the assessment of the potential for different measures.

Central barriers and side guard rails

The central barrier improves safety for all road users. The safety benefits for a motorcyclist provided by the central barrier can partly be explained by the motorcyclist being safe from unexpected oncoming traffic or traffic crossing their lane. But the central barrier is still dangerous to collide with, in the same ways as a side guard rail. Since we do not have traffic data for motorcycles, we do not know if the insecurity that motorcyclists feel on roads with central barriers and side guard rails results in them avoiding those roads.
Unfortunately, the side guard rail often results in reduced safety. This is because the same guard rail that serves the purpose of reducing the energy of motion for passenger cars that drive off the road can constitute a dangerous object for a motorcyclist. No safety benefit is gained for the motorcyclist from a side guard rail which protects against dangerous objects in side lateral areas if the side guard rail represents a danger upon collision.

Knowledge about motorcycle traffic

The newly developed focus document for guard rails and bridge rails (9) proposes that motorcycle traffic shall be included in the basic selection of traffic data, as well as that a definition and a threshold value for ”significant motorcycle traffic” are determined. The threshold value would indicate the smallest flow of motorcycle traffic necessary for it to be meaningful to consider measures that may provide a reasonable road safety effect for motorcyclists in relation to the cost. Only with such supporting information is it possible to be certain that measures are implemented where they provide the greatest benefits.

Guiding document

During 2012, a new version of VGU (The Design of Roads and Streets) will be published. It will contain a more clear indication of motorcyclists as a traffic group whose needs are important to be considered. For example, the following requirements will be established:

Motorway exit slip roads and other exit ramps from roads with high speed limits, that have narrow or cramped radii of curvature, as well as a significant amount of motorcycle traffic, should be designed with (in order of preference):

1. exit ramps that have side lateral areas which are safe for driving off on to.
2. exit ramps that have guard rails on the outside curve with special protection against sliding under, designed to protect a motorcyclist who has fallen off from being injured by a guard rail post, see technical specification SIS-CEN/ TS 1317-8:2012. This specification includes the requirement for guard rails with special protection against sliding under are tested and verified that the crash safety for cars is not worsened.

The focus document for guard rails and bridge rails proposes the following:

1. Proposals for requirements and advice is produced for the design of the guard rails with consideration being made of motorcycle traffic’s needs. The contain requirements for more smoother design etc., which can be implemented today. Such guard rails are assessed as resulting in milder injuries, but are still dangerous to collide with for a motorcyclist. The proposed requirements and advice documents need to be established.
2. On the TEN-T road network and on roads with high speed limits (displayed speed 90-120 km/h), that also have a significant amount of motorcycle traffic, requirements and advice documents shall be applicable, in accordance with the above. This measure should correspond with the consideration made of unprotected road users that are required by the municipal street department on the TEN-T road network on the basis of requirements in the Road Safety Act and TSFS 2010:183.
3. On those sections of the low-trafficked road network, that have a significant amount of motorcycle traffic, the focus shall be on removing the guard rails and if necessary replacing them with improved side lateral areas. Improvement of side lateral areas also entails removing posts etc., that are dangerously located with consideration of the risk of driving off the road, especially in the exterior of narrow curves.

Demonstration project

A demonstration project is a working method for introducing technically functioning solutions, even if their effectiveness and different imaginable practical difficulties cannot be assessed. Guide rails that are specially designed for protecting a motorcyclist who has fallen off their motorcycle by having a shield under the guard rail’s central beam which stops the rider from sliding underneath, are an example of a solution that cannot be implemented on a large scale immediately. We know too little about the costs and the collective road safety effects. On the other hand, it is assessed as fairly certain that this solution can reduce the injuries resulting from an individual accident that occurs in this exact way. Through standardised testing it is also possible to verify acceptable safety for a car that collides with this type of guard rail. During 2012, the Swedish Transport Administration will conduct a demonstration project involving the installation of guard rails with protection against sliding under in order to gain experience from operation and maintenance, and to assess the costs.

Future development

In the short-term, the Swedish Transport Administration needs to develop its functional requirements so that the guard rails better satisfy the needs of road users and administrators. Part of this includes cooperating in the development of testing methods and standards. Solutions that are applied in other countries can also be introduced in Sweden if they are assessed as being effective. The focus for the Swedish Transport Administration's research and development in the long-run involves a clearer investment in a systemic approach, including how road users, vehicles and infrastructure interact with regard to safety, environmental modification and efficiency in the transport system. There are several imaginable solutions for the guard rails that concern physical "interaction and compatibility" between the guard rails, vehicles and road users. The combination of guard rail and passenger car, this approach has, along with the active contribution of the motor industry, led to the development work being perceives as more effective. To include the motorcycle industry as well is a logical continuation.

Annex 4

Compilation of ABS studies, Folksam

ABS studies

- **Sporner A, Kramlich T, Motorcycle Braking and its Influence on Severity of Injury, Proceedings of the 18th ESV Conference, Nagoya, Japan, paper number 03-0303, 2003.**

  Material: 610 fatal accidents 1990-1997, Germany

  Method: Reconstruction of traffic accidents with the aid of in-depth studies

  Results: 17 per cent reduction of personal injuries in accidents between passenger cars and motorcycles, not statistically significant.

  Comment: The first study that analysed the potential of ABS in actual accidents. The material cannot be representative. Results based on reconstructions of in-depth studies are possibly speculative.

- **Roll G, Hoffmann O, König J, Effectiveness Evaluation of Antilock Brake System (ABS) for Motorcycles in Real-world Accident Scenarios, Proceedings of the 21st ESV Conference, Stuttgart, Germany, paper number 09-0254, 2009.**

  Material: 51 serious and fatal accidents 1996-2007, Germany

  Method: Reconstruction of traffic accidents with the aid of in-depth studies

  Results: 53 per cent reduction of serious and fatal accidents involving braking, not statistically significant.

  Comment: Detailed reconstruction of in-depth studies, including an analysis of the interaction between ABS and other braking systems (CBS etc.). The material cannot be representative. Results based on reconstructions of in-depth studies are possibly speculative.

- **Rizzi M, Strandroth J, Tingvall C, The effectiveness of Antilock Brake Systems (ABS) on Motorcycles in Reducing real-life Crashes and Injuries, Traffic Injury Prevention, 10:479–487, 2009.**

  Material: Accidents with personal injuries 2003-2008, Sweden

  Method: Induced exposure

  Results: 38 per cent reduction of accidents with personal injuries; 48 per cent reduction of serious and fatal accidents, statistically significant

  Comment: The method is automatically compensated for confounders (unknown variables). The material is fairly small and is representative of Sweden, with is a country with specific weather conditions.

- **Moore M, Yan Y, Motorcycle Antilock Braking System (ABS), Highway Loss Data Institute, USA, 2009.**

  Material: Motorcycle insurance claims by model 2003-2008, USA

  Method: Regression analysis

  Results: 19 per cent reduction of total traffic accident costs (statistically significant); 21 per cent reduction of injury costs (driver, not statistically significant); 43 per cent reduction of injury costs (passenger, not statistically significant)

  Comment: Insurance data provides yet another dimension to the analysis. The first study that contains data involving supersport motorcycles with ABS. Difficult to compensate for all potential confounders. The material does not contain all models with ABS (BMW models are not analysed).

- **Teoh E R, Effectiveness of Antilock Braking Systems in Reducing Fatal Motorcycle Crashes, Insurance Institute for Highway Safety, USA, 2010**

  Material: Fatal accidents 2003-2008, USA

  Method: Exposure through number of registered vehicles

  Results: 37 per cent reduction of fatal accidents, statistically significant

  Comment: The study is consistent with an earlier study from 2008. Difficult to compensate for all potential confounders. The material does not contain all models with ABS (BMW models are not analysed).

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4. Investigation of the behaviour of motorcyclists and their attitude to road safety, Gregersen NP, Nordqvist M 2010
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6. Safer roads and streets for motorcyclists, The Swedish Transport Administration decision no. 100444
7. Standard description operation, the Swedish Transport Administration as well as the Swedish Transport Administration's requirements and advice (TRVT roads)
8. Focus document for road and bridge rails, The Swedish Transport Administration 2012
9. Interim reports of register study, Michael Fored, Karolinska Institutet
10. Vehicle data Traffic analysis 31 December 2011
11. The Swedish Transport Agency, the Road Traffic Registry
12. Monitoring of meeting-free roads, Arne Carlsson VTI 2009
13. Transport policy goals, Ministry of Enterprise, Energy and Communications

Organisations that have participated in working groups and/or steering groups

McRF , NTF, RPS, SKL, SMC, STR, Swedish Motor Insurers, The Swedish Transport Agency, The Swedish Transport Administration

Organisations that comprised the reference groups:

GNC (Group for National Collaboration):

The Swedish Work Environment Authority, Folksam, NTF, Ministry of Enterprise, Energy and Communications, RPS, SKL, Toyota Sweden AB, The Swedish Transport Agency, The Swedish Transport Administration

The motorcycle and moped area:

Folksam, SMC, NTF, CMS, RPS, FMCK, The Swedish Transport Administration, Insurance Sweden, VTI, McRF, MHF, The Swedish Transport Agency, SVEMO, SMR, STR

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