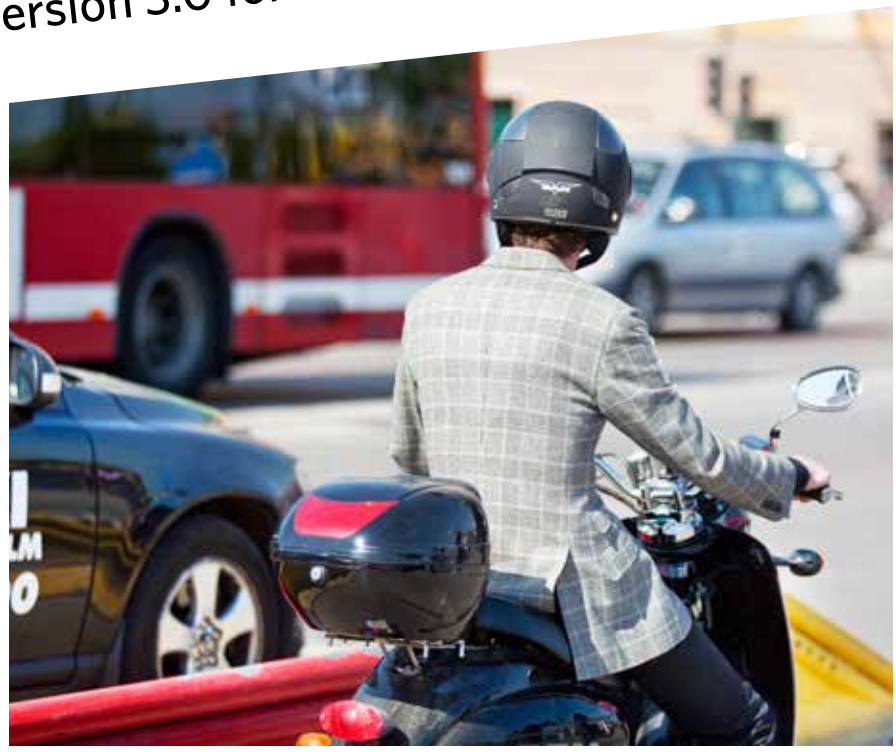
TRAFIKVERKET

Increased safety on motorcycles and mopeds

Combined strategy version 3.0 for the years 2016-2020



MOPED- och MOTORCYKEL BRANSCHENS RIKSFÖRBUND

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CYKEL MOTOR OCH SPORT-FACKHANDLARNA

Polisen

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Foreword

The number of unprotected road-users who are killed in traffic is projected to increase up to 2020, primarily due to the continuing increase in the number of those killed in cars. It is more likely that unprotected road-users will be killed in traffic than will protected road-users within several years. This implies that we must focus on unprotected road-users even more, including motorcycle and moped users.

The most recent combined motorcycle and moped strategy from 2012 has been developed, with its basis in new knowledge, measures taken by participants in this field, and developments concerning the accidents that have occurred.

The goal for this strategy is to demonstrate how the number of motocycle and moped users killed in traffic can be reduced by half, and how the number of seriously injured can be reduced during the period from 2010 to 2020 based upon the situation in 2015.

The strategy indentifies prioritised areas where efforts have been made that are important to work with currently, while it also notes lack of knowledge that requires correction in the aim to develop the basis for effective solutions in the future.

The strategy is an aid in the operational planning for authorities, municipalities, organisations and other participants within the field. It presupposes that all participants within their own areas of responsibility, independently or in cooperation with others, take measures on a local, regional, national and international level. The participants contribute foremost by orienting themselves to the prioritised efforts in their operations.

Something new that can be challenging from this point, is the motorised bicycle that has been implemented in Swedish law from 2016. In Sweden, the motorised bicycle is classified as a class 2 moped, a development which in turn can increase interest in mopeds. Thereby, the number of injured and killed moped users may increase.

We do not stand before a simple task. However, if everyone contributes well, it is still possible to reach our goal!

We stand behind the direction of this strategy and our own organisations' contributions to it.

January 2016

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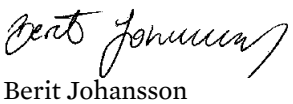

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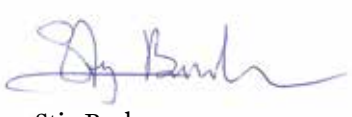

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Summary

The goal of this strategy is to show how the number of motorcycle and moped users killed in traffic can be reduced by half and how the number of very seriously injured can be reduced by the year 2020. The goal is based upon levels in 2010. The number of motorcyle and moped users who have been killed or injured in traffic has declined in recent years. However, on the motorcycle side, there remain great challenges in order to reach the goal. The goal of this combined strategy is to systematise safety work and thereby increase safety on motorcycles and mopeds.
This is accomplished primarily because the strategy:

- points out prioritised areas of effort
- identifies lack of knowledge
- clarifies participating organisations' ambitions to contribute with their own efforts
- clarifies the need for research and innovation
- clarifies how follow-up is to take place

COOPERATION and PRIORITIES
The strategy is to be an aid in operational planning for authorities, municipalities, organisations and other participants within the field. The strategy is limited primarily to include two-wheel motorcycles and mopeds that are used on the road. The strategy presupposes that all participants within their own areas of responsibility, independently or in cooperation, carry out their measures locally, regionally, nationally or internationally. The participants contribute, predominantly, through orienting themselves towards the prioritised efforts in their operations.

SAFE MOTORCYCLE TRAFFIC
The most important feature for increasing motorcycle traffic safety is to take measures to prevent accidents, but also, importantly, to mitigate the consequences of an accident if one should occur inspite of all these efforts.
Prioritised areas for increased motorcycle safety are:

- increasing the percentage of motorcyclists who keep the speed limit
- reducing extreme behaviour on a motorcycle
- safer motorcycles
- safer streets and roads
- increasing focus on visibility and awareness

SAFE MOPED TRAFFIC
The most important feature for safe moped traffic is limiting the consequences of accidents that happen.
Prioritised areas of effort for increased moped safety are:

- reduced augmentation of mopeds and fewer technical deficiencies
- correct and increased helmet use
- safer streets and roads

FOLLOW UP
In order to reach national traffic safety goals, so-called goal-steering of traffic safety work is applied. This means that there are goals to follow-up for a number of indicators. It also means that traffic safety development and the reaching of goals is evaluated with precision at annual result conferences. Motorcycle and moped safety are included as a part of this work. In conjunction with Sweden's moped and motorcycle board, there is also an annual check-up of the participants' operations based on the ambitions that are described within the prioritised areas of effort.

REGULAR DEVELOPMENT OF THE STRATEGY
The strategy shall regularly be audited based upon the outcome of the number of injured and killed, the activities that the participants have carried out as well as new knowledge. The next strategy review is planned for 2018. The Swedish Transport Administration will be taking the initiative for this review.

Contents

Motorcycles and mopeds in transport policies

Vision Zero

In the autumn of 1997, the Swedish parliament (Riksdag) decided that the long-term goal for traffic safety would be that no one should be killed or seriously injured as a result of traffic accidents within the road transport system. Vision Zero The responsibility lies in part with those who shape and maintain the system, and in part with the road-users who are responsible for following the rules. The responsibility reverts to those who design the system if road-users are not able to follow the rules.

The starting point for Vision Zero is that human error in traffic should not lead to serious injury.

For a motorcycle user, the risk for death or injury in an accident is very high, even at relatively slow speeds. The primary direction for those who design the system therefore becomes taking measures that support drivers in avoiding accidents. Naturally, it is also important to mitigate the consequences of accidents when possible. The most important feature for safe moped traffic is to limit the consequences of accidents that do happen. A moped user who wears a helmet properly has a fair chance of surviving an accident if the speed is 45 km/hour at the most, and good chances of surviving an accident if the speed is 30 km/hour at the most.

Transport policy goals

The overall goal for Swedish transport policies is to secure a socio-economically efficient and long-term sustainable provision of transport for citizens and commerce in the entire nation.

The overall goal is supported by a functional goal that impacts the accessibility of travel or transport, and a discretionary goal that deals with safety, environment and health. The goal is a starting point for all the nation's measures within the transport area, for example, what authorities should prioritise among various needs and desires when they carry out their tasks. The goal should also be of support for regional and municiple planning. The goals include all types of traffic, which means that they also pertain to transport and travel that is made by motorcycles and mopeds.

Functional goal accessibility

The functional goal means that: "The transport system's form, function and use should contribute to providing everyone basic accessibility of high quality and usability as well as contribute to developmental forces in the entire country. The transport system should be equally accessible and equally good for the transport needs of both women and men."

Travelling by motorcycle or moped instead of by automobile can reduce congestion and, in that way, increase accessibility in our cities.

A journey by motorcycle or moped can have many aims, for instance pleasure, business travel, or a workplace commute. Accessibility is different for motorcycles and mopeds, since they often are used in different traffic environments and are driven at different speeds. A trip by motorcycle is similar in accessibility to a trip by automobile, while a trip by moped, especially a class 2 moped, is more comparable to the accessibility that a cyclist would have. Many people need mopeds or motorcycles in order to function in daily life or in order to enjoy an increase in quality of life during leisure time.

Discretionary goals of safety, environment and health

Discretionary goals mean that the "transport system's design, function, and use shall be adapted so that no one shall be killed or seriously injured. In addition, it shall contribute to the achievement of environmental quality goals as well as to increased health."

This means that all travel takes place in a safe manner and that it does not contribute to a worsened environment or to negative health effects. Transport safety measures can, however, even create positive effects upon the environment. Reduced speeds lead, for example, to better air quality, less emission of greenhouse gases, and a lower noise level. These improvements can also be assumed to have positive effects upon health.

Today, moped users have no natural place in the traffic system. Mixing mopeds with pedestrians creates insecurity and disruptions, predominantly for children, the elderly and the disabled. It is important to create a safe and secure place for both moped users and pedestrians.

Increased focus on unprotected road-users

The number of unprotected road-users killed in traffic is falling, but not at the same rate as those who are protected in a car. Within a few years, it is likely that there will be more deaths of unprotected road-users than of protected road-users. This entails that we must focus even more on unprotected road-users and this includes motorcycle and moped users.

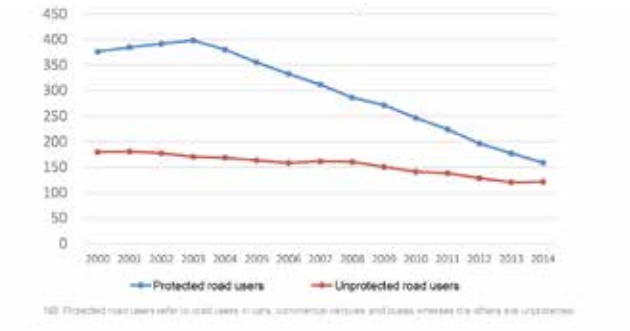

Figure 1: Numbers of deaths of protected and unprotected road-users.

Systems for increased safety

Aim

The aim of the combined strategy is to systematise safety work and thereby increase safety on motorcycles and mopeds. This is accomplished predominantly because this strategy:

- points out prioritised areas of effort
- identifies lack of knowledge
- clarifies the participating organisations' ambitions in contributing with their own initiatives
- clarifies the need for research and innovation efforts
- clarifies how follow-up shall take place

The strategy is intended to be an aid in operational planning for authorities, municipalities, organisations, and other participants within the field.

Delimitation

The strategy is limited primarily to include two-wheel motorcycles and mopeds that are used on the road.

Goals

The goal of this strategy is to show how the number of motorcycle and moped users who are killed in traffic can be reduced by half, and how the number of very seriously injured can be reduced during 2010 - 2020, based upon the situation in 2015.

The quantified goal is to by 2020 reduce the number of people killed in traffic to a maximum of 21 motorcycle users and a maximum of 5 moped users per year. The number of seriously injured shall be reduced to a maximum of 180 motorcycle users and a maximum of 190 moped users by 2020.

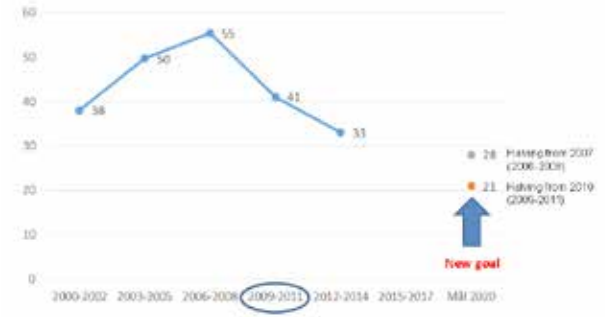

Figure 2: The number of persons killed on a two-wheel motorcycle (3-year average) 200-2014, as well as goals for 2020

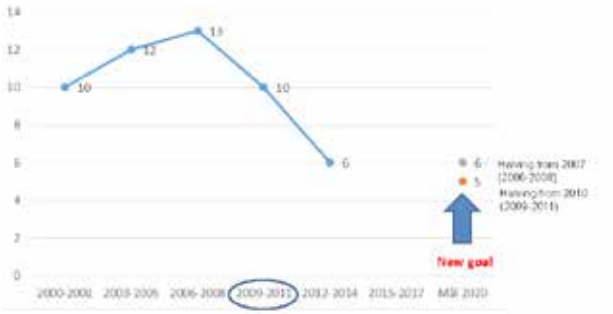

Figure 3: The number of persons killed on a moped (3-year average) 2000-2014, as well as goals for 2020

Phase goal 2020

Swedish traffic safety work is based upon Vision Zero and phase goal 2020. The phase goal that is valid now was determined by the Swedish parliament in 2009 and was formulated so that the number of people killed in road traffic was to be reduced by half between 2007 and 2020. This means that the number of deaths in 2020 could not exceed 220. This decision also means that the number of seriously injured people in road traffic was to be reduced by one fourth during the same period of time.
Since the review of the phase goal in 2012, there is a suggestion to adjust the goal in order to allign with the phase goal for road safety that was adopted within the

EU. The EU goal is to reduce the number of deaths in traffic by half between 2010 and 2020. This would mean a goal of a maximum number of 133 deaths in road traffic by 2020, which is significantly less than the number that was established for the phase goal of 2020. The government has not yet expressly accepted this goal. This strategy is built upon both the EU's goal and that motorcycles and mopeds contribute to a reduction of the number of deaths and serious injuries by half.

In order to avoid the outcome from one individual year, the goal is not taken from 2010, but from the period 2009 - 2011 and to the period 2019 - 2021, instead of 2020. Swedish accident statistics show that, on average, 41 motorcycle users and 10 moped users died each year during the period 2009 - 2011. During the same period of time, on average, 359 motorcycle users and 381 moped users were seriously injured each year.

Cooperation and priorities

The strategy presupposes that all participants within their own areas of responsibility, independently or in cooperation, take measures on a local, regional, national and international level. The participants contribute primarily through orienting themselves toward the prioritised areas of effort in their own operations. These areas should, to the extent possible, be based upon research and experience, and should be the areas where it is possible to reach the greatest, measurable effects.

Follow-up

In order to reach traffic safety goals, the so-called goal-steering of traffic safety work is applied. This means that there are goals to follow up for a number of indicators, and that traffic safety development and goal achievement is evaluated with precision in annual result conferences. The indicators will be updated during 2016.

The following indicators are followed-up currently:

- observance of speed limits (national and municiple network of roads)
- sober traffic
- seatbelt usage
- helmet usage (cycle and moped)
- automobile safety
- motorcycle safety (Anti-lock braking systems)
- safe national roads
- safe pedestian, bicycle, and moped pathways in densely populated areas
- maintenance of pedestrian and bicycle pathways.

All indicators pertain to the combined strategy, except the indicator seatbelt usage.
In conjunction with Sweden's moped and motorcycle board, there is also an annual check-up of the participants' operations based on the ambitions that are described within the prioritised areas of effort.

Regular development of the strategy

The strategy shall develop from the outcome of the number of injured and killed, the activities that the participants have undertaken and new knowledge. The next strategy review shall be started, as planned, during 2018. The Swedish Transport Administration will take the initiative for this review.

Tillsammans för Nollvisionen

Developments based on motorcycle accidents that have occurred

During 2015, 43 motorcycle users died in traffic on two-wheel motorcycles. In 2014, 29 two-wheel motorcycle users were killed, and approximately 330 were counted as seriously injured, while 55 were very seriously injured on motorcycles. Seriously injured persons are said to be people who are determined to have a medical disability as a result of their traffic injury. Of those who were killed on a motorcycle, 9 out of 10 were male drivers.

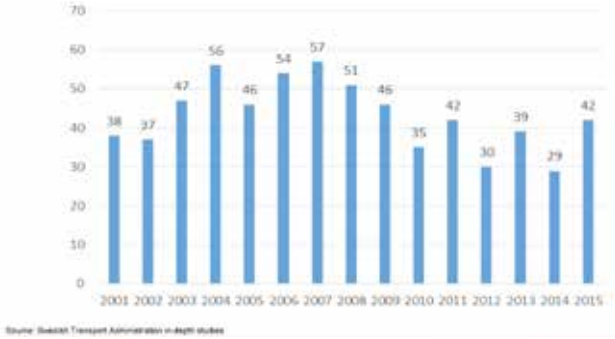

Figure 4: The share of those who were killed on two-wheel motorcycles, 2001-2015

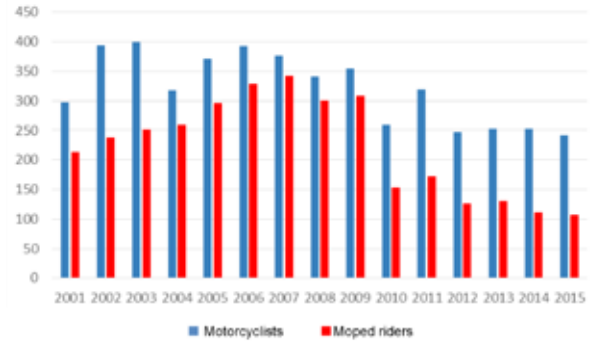

Figure 5: The share of those who were seriously injured on motorcycles and mopeds, 2001-2015

Despite the fact that the number of motorcycles in traffic has increased since the beginning of the 2000's, the number of police reports concerning seriously injured motorcycle users has declined. One explanation for the significant reduction in the number of seriously injured since 2012 can be the reduction of motorcycle travel. It should also be noted that the police reporting of traffic injuries during 2014 was tied to a greater decline than in other years. In June 2015, there were 313 000 motorcycles in traffic.

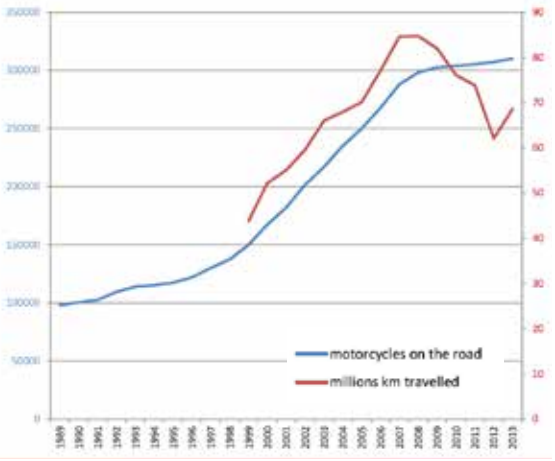

Figure 6: development of the share of motorcycles in traffic and within total traffic from 1989-2014

Information from the insurance industry shows that the number of insurance policies/annual risks has declined. This can be interpreted to mean that people do not use their motorcycles to the same extent any longer, and only insure them for a few months per year. Another interpretation can be that motorcycle owners choose to drive their motorcycles uninsured. Since the risk of being killed or severly injured declines with increasing age and experience, another explanation for the reduction in the number of deaths and injuries can be that the median age of motorcycle owners has almost doubled during a 25 year period, up to 53 years of age currently.

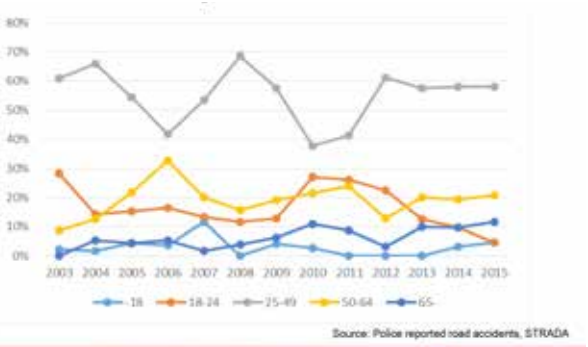

Figure 7: Number of motorcyclists killed, distributed by age, 2003-2015

Single accidents are the single most common type of accident where motorcycle users are killed or injured
Of these single accidents, approximately 70 percent take place in a curve, 20 percent take place on straight stretches of road and the rest take place at a crossing.

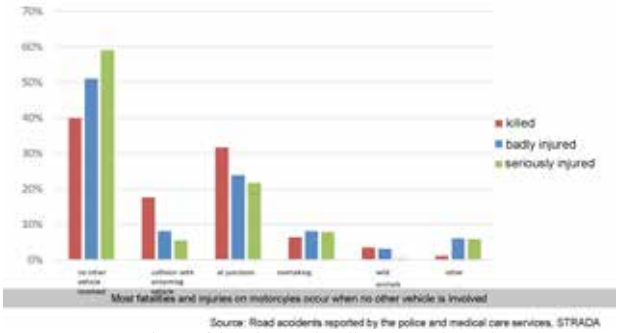

Figure 8: Number of fatalities, badly injured, and very seriously injured on motorcycles according to type of accident 2005-2013

The next most common type of accident where motorcycle users are killed or injured is in crossing accidents. In almost all crossing accidents, an automobile driver has turned or driven in front of a motorcycle user. One 2009 study indicates that automobile drivers are the cause of 64% of insurance errands where more than one vehicle is involved. Factors to take into consideration in order to prevent crossing accidents are vehicle types, the road environment in the form of crossing design, and visibility conditions as well as users. Research in the field shows that it is crucial to work with both increasing the visibility of motorcycle users and to increase awareness among other road users in order to reduce the number of collisions. Conversion of regular crossings in densely populated areas to traffic roundabouts is said to prevent the majority of fatal accidents, except those which occur at very high speeds. One condition is, however, that roundabout ornamentation is not designed in such a way as to cause increased risk of injury in case of collision.
In addition, another important factor is the motorcycle user's speed, since it can be rather difficult for an automobile driver to make the proper choice at a crossing if the motorcycle user drives significantly faster than the posted speed. In 7 out of 10 accidents, the motorcycle driver is said to have driven 10 km/hour faster

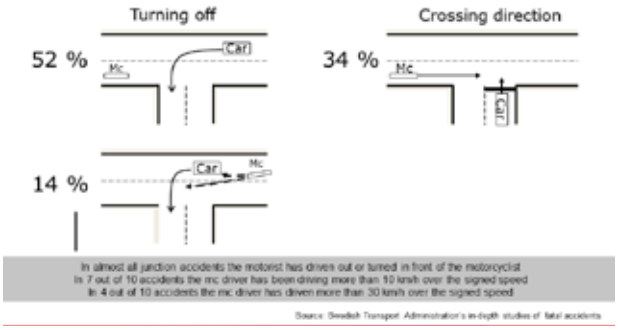

Figure 9: Sequence of events in crossing-related fatal accidents with motorcycles 2005-2013 (108 accidents)

than the posted speed, and in 4 of 10 accidents, the motorcycle driver is said to have driven more that 30 km/hour faster than the posted speed. Source: The Swedish Transport Administration's in-depth studies

Motorcyclists in a supersport are accident prone.
4 out of 10 of those motorcycles that were involved in fatal accidents between the years of 2005 and 2013 were of the supersport variety. This type of motorcycle accounts for less than 10 percent of all motorcycles in traffic. Of those who were killed within three years of having obtained a driving license, 2 out of 3 were driving a supersport vehicle. Of those who owned a motorcycle for a period of time of less than three years and then were killed, 2 out of 3 were driving a supersport vehicle. Only 1 in 10 of those who were killed who were driving a motorcycle of the supersport variety, were said to have kept the speed limit.

Figure 10: Fatalities on motorcycles according to motorcycle type, 2006-2015

Prioritised areas of effort for motorcycles

The most important factor in increasing safety for motorcycle traffic is to take measures that prevent accidents. But it is also important to mitigate the consequences of an accident that occurs, despite all efforts to prevent it.

The areas of effort that are prioritised are:

- increasing the number of motorcycle users who keep the speed limit
- minimising extreme behaviour on motorcycles
- safer motorcycles
- safer roads and streets
- increasing focus on visibility and awareness

Increase the number of motorcycle users who keep the speed limit

Increasing the number of motorcycle users who keep the speed limit is our most crucial and most significant traffic safety challenge for increased safety on a motorcycle.

Exceeding speed limits can be both the cause of an accident as well as the cause of a worsened injury as a result of the accident. All measures that result in a reduction in the number of speed limit infractions have an immediately positive effect and therefore, strongly contribute to reaching the 2020 goal.

The potential, given the 2012-2014 starting position, is more than 10 fewer motorcycle fatalities. This is probably an undervalued estimate of real effects, since this estimate only takes into consideration a smaller number of accidents (not a decrease in injuries).

Speed measurements
During 2012, 2016 and 2020, comprehensive speed inspections for automobiles, heavy traffic and motorcycles were/are to be conducted. Between these measurements, smaller annual measurements are conducted with the aim of being able to estimate changes. The index measurement of 2015 shows that the number of speed infractions among motorcycle users have decreased by 2.4 percent since 2012.

The goal level for the indicator "speed observance" implies that at least 80 percent of total traffic, among which are also motorcycle users, shall keep pertinent speed limits by the year 2020. Only approximately 45 percent of total traffic follow posted speed limits. This is at the same low level that is was 10 years ago. Automobile users are better than motorcycle users at keeping pertinent speed limits, 47 percent compared with 38 percent among motorcycle users. Source: The Swedish Transport Administration's speed investigation during 2012.

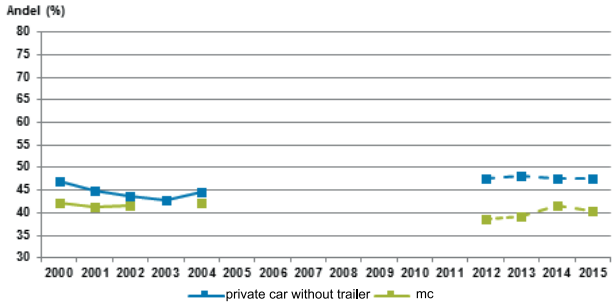

Figure 11: The share of total traffic within allowed speeds for the years 2000-2004 as well as 2012. The estimates for 2013-2015 pertain to heavily trafficked motorcycle roadways as well as the entire national roadway network for personal automobiles without trailers, from May - September.

The share of those who drive more than 30 km/hour over the pertinent speed limit, is three times higher among motorcycle users as compared with automobile drivers.

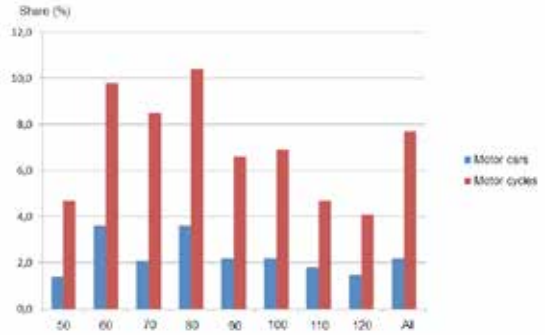

Figure 12: The share of total traffic that drove at speeds more than 30 km/hour over the allowed speed limit among personal automobiles and motorcycles within various speed classes, national roadway network 2012.
Source: The Swedish Transport Administration's speed investigation 2012.

In-depth studies of fatal accidents
The reports that serve as the basis for these in-depth studies indicate that in seven out of ten cases, the motorcycle user is said to drive more than 10 km/hour too fast and in four cases out of ten, more than 30 km/hour too fast. Today, there is no basis for assessing whether these circumstances impact the sequence of events or consequences, other than that reaction time, braking distance, and impact severity generally are increased with an increase in speed.

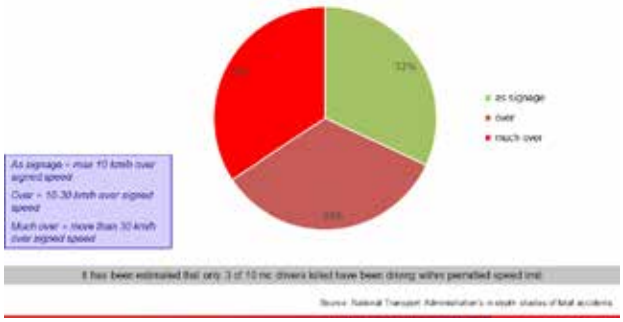

Figure 13: Estimated speed in fatal accidents with motorcycles 2005-2013 (114 fatalities)

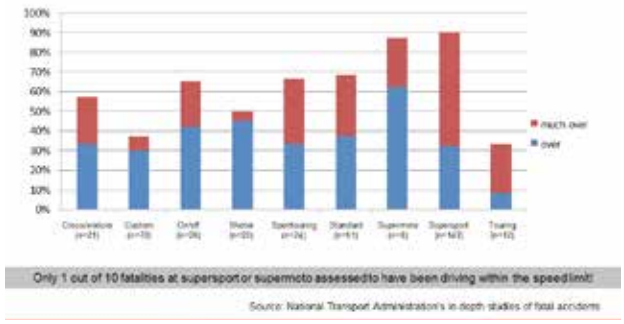

Figure 14: Fatal accidents distributed according to estimated speeds over or significantly over the posted speed, within respective motorcycle type, 2005-2013 (256 fatalities)

Motorcycle users' approach to speed limits
Sweden Motorcyclists and the Swedish National Road and Transport Research Institute conducted a recent survey during 2013 about motorcyclists' views on speed. The study showed that the surveyed people do not see reduced speeds as one of the five most important safety measures. Fewer than half accept posted speeds. The motorcycle users' speeds adapt more to risk factors than to choice of motorcycle, driving in a group, driving with passengers, driving in rain, warning signs, and crossings.

An investigation of what influenced newly licensed drivers to drive at the speed of 90 km/hour on a road where a 70 km/hour speed limit was posted was made with the the help of another survey, the Swedish National Road and Transport Research Institute's 720 report from 2011. The result showed that what influenced their intention to drive too quickly was primarily the feeling that they had the situation under control. In these cases, it had to do with external circumstances such as the road was dry, the road was of a high quality standard, that the motorcycle in use was high performance, and that there was little traffic. Attitude also played a major role. If the driver considered high speed to be a feature that increased a sense of well-being and freedom concurrent with a sense that the risk for an accident or detection by authorities was small, the inclination to drive too quickly increased. Additionally, the intention was impacted by the fact that their friends also would drive quickly and would accept this behaviour.

Based on these and similar results, it has been found that a significant percentage of those who commit speed infractions are well aware that they are breaking the rules. For these reasons, these behaviours are classified as conscious wrongdoings, as opposed to other wrongdoings that are rather caused by mistakes or routine errors. It has also come to light that conscious wrongdoings constitute the main cause of traffic accidents, rather than mistakes or mishaps. In order to change these behaviours, it is necessary to focus upon the underlying motives behind the actions rather than increase knowledge.

Surveillance
Traffic safety cameras have become all the more common in Sweden, and upon those routes where cameras are found, speed observance has increased. In Sweden, driver responsibility is employed, which means that it is difficult to identify motorcycle users who are registered for speed infractions unless the driver is stopped. This means that it is very difficult with these methods to prosecute a motorcyclist. This can also account for the fact that the share of registered motorcyclists relative to total traffic registered by Automatic Traffic Safety Controls (ATK) is greater than it is for automobile drivers.

During 2014, motorcycles constitued just over 6% of the total number of infractions registered, while total traffic by motorcycle is approximately 1-2 percent on an annual basis. During the summer months of 2014 - 2015, motorcycles were registered at 15 percent. Motorcyclists who were registered by Automatic Traffic Safety Controls could not be prosecuted since identifying the driver was required.

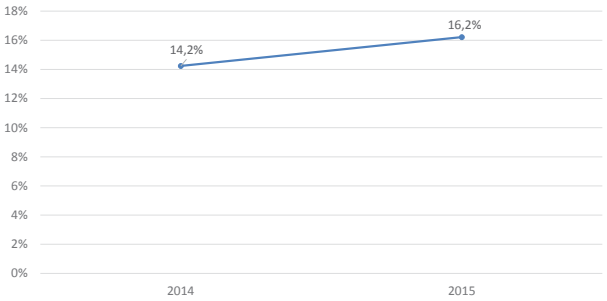

Figure 15: The share of two-wheel motorcycles photographed by Automatic Traffic Safety Controls, April - September
Source: The Swedish Police

In addition to speed control cameras, there are other crime prevention measures that the police can put into operation. Crime prevention in general is divided into the groups primary, secondary, and tertiary. Speed controls, as have been previously named, are examples of primary prevention within traffic. The aim of primary prevention is that the subjective risk of detection shall increase, which, in turn, can cause the number of infractions to decline. Secondary prevention can mean that police are on the spot, outside a location when it is time for guests to drive home.

An example of tertiary prevention is when a driving license is suspended for a driver that has driven while intoxicated. A number of different studies have shown that a combination of primary, secondary, and tertiary prevention yield the best results.
A further measure that can increase the effects of traffic surveillance is that these preventive measures are repeated over a longer period of time, and that they are tied to information that aims at increasing the experienced risks. Experienced risk means both the risk of getting into an accident as well being discovered by the police.

Education
From 1 November 2009, an obligatory risk education program was inaugurated for the qualifications of A and A1. The educational program is offered at two different times and is both theoretical and practical. A short time after the introductions of this educational program, an evaluation was conducted. The results of this before and after study showed some smaller differences in attitudes, norms and intentions. The differences that were revealed often showed progress in the ″right″ direction, in other words, an increased understanding for various risks. The negative changes that could be seen pertained predominantly to the youngest group (16-20 years old). The conclusion was, therefore, that there is a need for another pedagogical form directed to just that target group. The effect of continued education has been discussed, and according to a meta-analysis, it was found that these seldom demonstrate a positive effect. In certain cases, it was even possible to see an increase rather than a decrease in accidents. The problem with this analysis, conducted in 2003, is that later educational programs are not included.

During recent years, a number of studies have been emphasized that point to how an educational program is conducted as the problem, rather than the concepts that are taught. Björnskau and others, TÖI 2010, confirm earlier studies that voluntary continuing education tends rather to lead to increased risk of accident, as long as the educational focus is on the training of skills and not on driver strategy/risk analysis.

It was also established that the basic training for a driving license was thought to reduce the risk by 6 - 10%. Against the background of the aforementioned, continuing education focuses more on avoiding risks and increasing risk awareness. This view is also somthing that Sweden Motorcyclists adopted in the design of their continuing education programs. In an educational program oriented toward the ″sporting bike driver″, the aim is to provide an insight into increased risk, which also means a reduced focus on pure skills training.

Another example is an educational program that was carried out during the years 2012 - 2014 in the Netherlands. This course was voluntary for those who had driving licenses, and after it was carried out, the course participants were able to receive a reduced insurance premium. The result of the evaluation showed that the educational program had had a positive effect on the motorcyclists' driving behaviours. An important conclusion was that good results were tied to instructors who both were very competent and enthusiastic. 2014 " This is a remarkable result, because until now no studies were found that scientifically establish positive effects of an advanced rider training course."(Ref) Sweden Motorcyclists has arranged continuing education for motorcyclists according to the Dutch model. Sweden Motorcyclists has invited the Dutch educators here to Sweden and has translated the educational materials into Swedish.

This is how we proceed:

The Swedish Police

- Continue the work of reporting drivers who exceed the speed limit by 6 - 9 km/hour over the prevailing speed limit.

National Moped and Motorcycle Trade Association

- Follow ACEM's policy concerning marketing motorised two-wheelers, which means that in advertising, they should be presented in a responsible manner and that valid traffic rules should be followed, not the least of which concern speed.

The Swedish Transport Administration

- Conduct further speed measurements. Greater basic framework measurements take place 2016 and 2020. Between basic framework measurements, smaller index measurements take place.
  - During 2016, allow an analysis to be made of international experiences with motorcycles, speed, surveillance, and culture.
- During 2016, develop a impact severity curve that clarifies the meaning of speed.

The Swedish Transport Agency

- During 2016–2017, evaluate risk education programs for motorcycles, and thereafter survey the content of the risk education program.

Sweden Motorcyclists

- Increase members' acceptance of speed limit observance.
- Measure speed acceptance 2017, via continuing the earlier attitude investigation about speed limit observance, for example.
- Use membership panel to investigate attitudes about speed.
- Inform all Sweden Motorcyclists' channels of information about the meaning of speed to accident risk and specifically about the places where the greatest number of accidents take place (curves and crossings).
- Sweden Motorcyclists' SCHOOL shall continue to connect the consequences of speed in the pedagogy of their continuing education.
- Sweden Motorcyclists' SPORT shall continue to work towards getting the risk group off of the nation's roads and into motorcycle sports, that is to say away from traffic.
- Collect and share knowledge from our international cooperative efforts.

The Swedish National Association of Driving Schools

- Work towards motorcycle and risk educators receiving continuing education concerning the advantages of anti-lock braking systems and other technical systems as well as the effects of the connection between motorcycles and speed.
- Further clarify the effects of the connection between motorcycles and speed in The Swedish National Association of Driving Schools' educational materials.
- Work towards increasing the integration of basic training and risk education through internal education.
- Work towards establishing a new curriculum for motorcycles for the 2017 season (digital and print).

The National Society for Road Safety

- Through the channels of The National Society for Road Safety, draw attention to groups of motorcycle users who drive legally, keep the speed limit, etc.

Reduce extreme behaviour on motorcycles.

The majority of motorcycle users are road users who are aware of traffic safety. There is however, one type of road user who repeatedly appears in fatal accidents among motorcyclists. These motorcycle users demonstrate something that can be described as extreme behaviour.

This group is difficult to reach since they often to not consider that they constitute any danger for themselves or for others. Drivers believe that they can master situations and that the chances for an accident are nearly nonexistent. This means that traditional traffic safety measures which focus on the driver driving safely are unsucessful, since this group already experiences that they drive in a safe manner.

From the starting situation in 2012-2014, the potential is a total of 17 fewer motorcyclist fatalities.

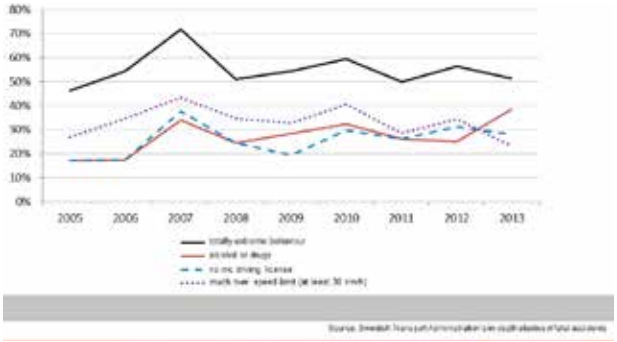

Figure 16: The share of motorcyclists killed with extreme behaviours, 2005 - 2013 (n=385)

Extreme behaviour in this context is defined as:

1. Very high speeds: The driver keeps a speed that exceeds the limit for driving license suspension, that is to say 30 km/hour or more too fast.
2. Unlawful driving: The driver has no authorization to drive a motorcycle.
3. Driving under the influence: The driver is influenced by alcohol, narcotics and/or medications that negatively influence driving.
4. Aggressive driving: The driver drives in an aggressive manner relative to the other people in traffic. This can mean, for example, negligent rear-wheel driving and passing at extreme speeds.

Sweden Motorcyclists does not share the working group's definition of aggressive driving or very high speeds in this context, rather considers that aggressive driving as well as very high speeds shall be connected to punishable negligence in conjunction with the Traffic Crimes Law (1951:649) in order to fulfill the criteria of extreme behaviour.

Very high speeds
Very high speeds means that the driver keeps a speed that exceeds the limit for driving license suspension, that is to say 30 km/hour or more too fast. This group's share is 34 percent of all fatalities during 2005-2013. The goal group is the group that regularly breaks the speed limit. See also the area of special efforts called, "Increase the share of motorcyclists who keep the speed limit."

Surveillance
As has been discussed earlier, police speed controls and Automatic Traffic Safety Control surveillance is not particularly effective. However, a driver can be convicted of gross negligence in traffic if the speed violation is seen to be serious and in an environment dangerous to traffic. In addition to these measures which are described as primary prevention, this group could also be reached with the aid of secondary and tertiary methods, see speed.

Insurance and compensation
Insurance companies have introduced measures to reduce this behaviour. These are tied to compensation, and in cases that are determined as gross negligence in traffic, traffic damage compensation is reduced. Another measure is that vehicular damage insurance can be reduced or completely eliminated in cases of extreme behaviour such as high speeds.

Information
It has been previously determined that traditional methods for increasing traffic safety do not function especially well for this group, however one must not abandon these efforts just for this reason. All information needs to be directed to the target group and this is something which, to the greatest degree possible, pertains to this group of drivers who behaves in an extreme manner in traffic. In order to persuade the driver that this behaviour needs to change, four different conditions need to be fulfilled:

1) dissatisfaction
2) understanding
3) credibility
4) attractiveness

Dissatisfaction can be created through presenting information that conflicts with earlier held ideas. Increased understanding can be reached if the message is relevant and if it can be tied to something that is already known. Credibility is increased, if, the message is based upon knowledge and if the alternative is possible to carry out. An attractive message is experienced as engaging if we succeed in persuading the individual that the new, in a better way than the old, fulfills a desired function.

This manner of attack is also supported by various investigations and meta analyses that show that the dissemination of information has a greater possibility of being successful if it is directed to a specific target group, but also if it deals with one, well-defined subject. It is also important that the message is based on comprehensive research and relevant theoretical models, that can be helpful in identifying the most important explanations for the problem behaviour. With the help of social marketing, these features should be integrated in a broader strategy for influencing the behaviour of road users.

Unlawful driving
Unlawful driving means that the driver lacks the authorization to drive a motorcycle. The driver has either never gone through a driving license training program and therefore does not have the knowledge that is necessary to drive a motorcycle, or the driving license is suspended. Studies have also shown that those who drive unlawfully are more likely than others to drive at very high speeds, in intoxicated conditions and aggressively. Within this group are also people with a criminal background and who relapse into criminality. In terms of criminal persons who often relapse into crime, two studies directed to the police show that this can cause the police to "lose their spark" since their reports rarely lead to prosecution.

This group's share is approximately 30 percent of all fatalities 2010-2013. Among the fatalities who lacked driving licenses and who had known driving license histories, 50% had a suspended driving license.

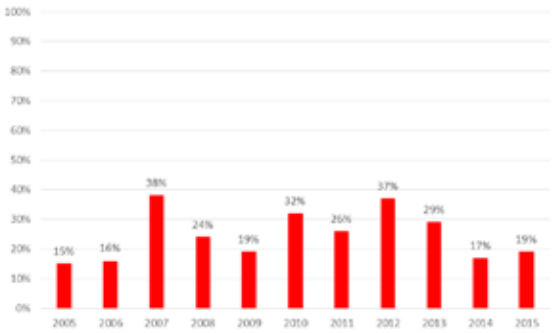

Figure 17: The share of motorcycle drivers in fatal accidents (2-wheel motorcycles) without valid driving licenses, 2005-2013

Driving under the influence
Driving under the influence means that a person who drives a motorised vehicle either has;

- at least 0,2 parts per thousand alcohol in the blood (0,1 mg/l in the breath) or
- a narcotic substance in the blood (does not pertain if the substance is used according to a doctor or other prescriber's prescription)
- has been so influenced by alcohol or other substances so that the person cannot drive in a safe manner.

Almost 1 in 3 motorcycle driver fatalities were alcohol or drug influenced during the period, 2005 - 2013. Intoxicated driving or driving under the influence co-varies with other traffic safety problems, such as,

for example, high speeds, lack of helmet, or unlawful driving. In terms of unlawful driving, close to 60 percent of fatalities were among those who also were under the influence.

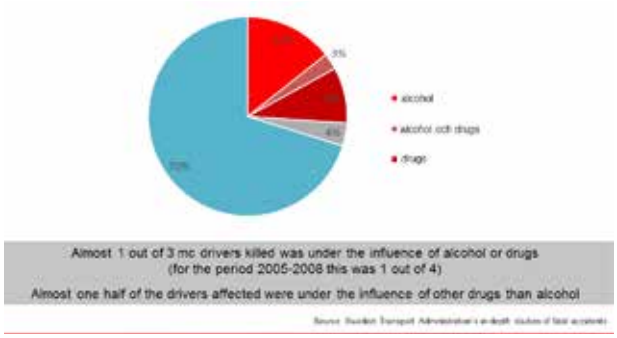

Figure 18: The share of alcohol and drugs in fatal accidents with motorcycles 2005-2013 (376 fatalities)

The indicator sober traffic follows the share of alcohol influenced drivers in traffic. The series of measurements shall, predominantly, be seen as a measure of alcoholic drunk driving development and not as the factual level. The goal for year 2020 is 99,9 percent sober drivers. 2014's measurements show that the share of sober drivers was at 99,78 percent which means that the indicator is not in line with necessary development. At the present, there is no indicator for the presence of narcotics in traffic. The development in terms of narcotics related fatalities in road traffic is currently followed via The Swedish Transport Administration's in-depth studies.

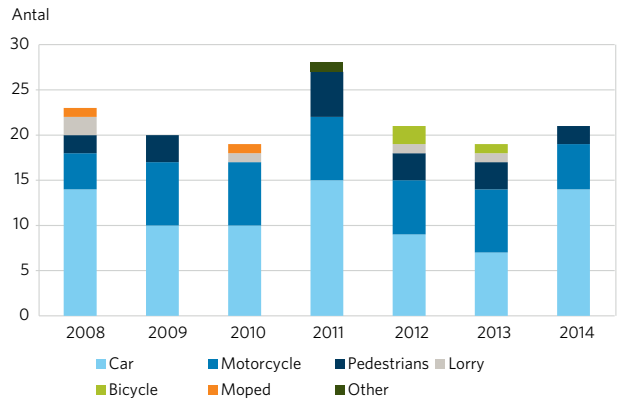

Figure 19: The number of persons killed in drug-related fatal accidents, according to mode of transport. Source: The Swedish Transport Administration's in-depth studies. *Excluding suicide, from 2010 and on.

One strategy for the reduced share of alcohol and narcotics in traffic was compiled in 2015 in conjunction with other participants under the leadership of The Swedish Transport Administration. The aim for the strategy is that it shall contribute to more sober traffic. It presumes that all participants who, on their own, can influence, will carry out measures within their own areas of responsibility and/or by cooperative efforts. Prioritised areas of effort that are said to have great potential are, for example;

- continued development of sobriety supporting techniques
- high number of alcohol breath tests
- development of knowledge about the existence of narcotic substances in traffic and their risks.
- mapping of unprotected road users
- requirement of treatment or supportive measures after drunken driving.

With technical systems in all vehicles, one can effectively prohibit alcohol-related traffic accidents among motor vehicle drivers. It is very likely that such technology will be possible in the long-term for personal automobiles and heavy vehicles, primarily. Parallel with the development of systems that detect alcohol via breath tests, there is continuing development of more general systems that aim at following a driver's behaviour and taking appropriate measures (driver monitoring). These systems can also become meaningful in terms of alcohol or narcotics influenced drivers.

The police have a continuing role of importance through their surveillance and control operations involving breath tests. The breath tests that the Customs Office and the Coast Guard conduct are also important in capturing alcohol or narcotics influenced drivers.

It is important to obtain increased knowledge about how it is possible to break the trend that many unprotected road-users die in alcohol and narcotics related accidents. It is also important to uncover the extent to which narcotic substances are found among drivers in road traffic and the subsequent risks, in order to effectively work at reducing the influence of narcotics on drivers.

Aggressive driving
Aggressive driving means that the driver drives in an aggressive manner in relation to other road-users. This deals with, for example, negligent rear-wheel driving or passing at extreme speeds.

The group's share is 2-3 percent of all fatalities but it correlates strongly with the group that drives at very high speeds. As with high speeds, a driver who drives in an agressive way can be prosecuted for gross negligence in traffic.

This is how we proceed:

The Swedish Police

- Continue the work of reporting drivers that behave in an extreme manner
- Initiate a united manner of working with SMADIT (Cooperation against alcohol and drugs in traffic) among police.
- Develop a new traffic strategy with guidelines for regions where the local problem prevails.

The Swedish National Association of Driving Schools

- Further clarify negative driving behaviour and potential risks of motorcycle driving in The Swedish National Association of Driving Schools' educational material

Sweden Motorcyclists

- Continue to inform members, motorcyclists and media of the problem.
- Make visible the degree of the problem and the accidents that extreme behaviours cause.
- Change the direction of all involved parties concerning the importance of having a valid driving license and of driving sober/drug-free in a lawful vehicle.
- Change the significance of the concept of extreme behaviour to the following: Very high speeds in combination with negligence in traffic, aggressive driving, unlawful driving, and driving under the influence.
- Make driving license ownership a measure that is part of milestone work.
- continue to offer Sweden Motorcyclists' districts, clubs, meetings arrangers, course arrangers, Sweden Motorcyclists Sport, et. al. the loan of alcohol breath testers.

Swedish Motor Insurers

- Upon gross negligence, traffic damage compensation can be reduced. Even damage to motorcycles (vehicle damage insurance) can be reduced or completely eliminated due to extreme behaviour such as high speeds or if the driver is not sober.

Miscellaneous:

- Research and Innovation, the effect connection needs to be developed.
- Further measures to reduce extreme behaviour in traffic need to be developed.
- See also measures pertaining to speed

Safer Motorcycles

It is important to foster and encourage the notion that new motorcycles need to be equipped with various traffic safety enhancement systems, but also to invest in continued technological development. The work of introducing anti-lock braking systems on motorcycles has been a successful area of effort in earlier strategies. In this version, we want to broaden the area of effort to include more technological support systems. Some examples have clarified the effect connection to increased traffic safety, but others, currently, lack such a connection and therefore need to be developed.

Example of vehicle technology development

Anti-lock braking systems

Anti-lock braking systems on motorcycles reduce the risk of being killed or seriously injured in an accident by approximately 50 percent. For just crossing accidents, the risk is reduced by approximately 70 percent. The potential from the starting situation in 2012-2014 is a total of 14 fewer motorcyclist fatalities and 4 fewer fatalities by 2020.

The goal for the milestone indicator of "safer motorcycles" is that at least 70 percent of the total motorcycle traffic by 2020 shall be by motorcycles that are equipped with anti-lock brakes (ABS).

Very few older motorcycles are scrapped since owners often keep them as a hobby or for pleasure rides. This means that the opportunity of increasing the share of total traffic with anti-lock braking systems is predominantly found in the addition of new motorcycles with anti-lock brakes.

The share of new motorcycles with anti-lock brakes was approximately 85 percent during 2014, compared with approximately 15 percent in 2008 and 78 percent in 2013. This resulted in a share of total traffic of 39 percent for 2014. The rapid increase in new sales of motorcycles equipped with anti-lock braking systems also results in a growing share of total traffic with anti-lock braking systems. The share is expected to increase by approximately 5 percent per year, and thereby the increase is in line with necessary developments for reaching the goal of 70 percent by 2020.

Currently, anti-lock braking systems are standard or are an upgrade on basically all types of motorcycles, except smaller offroad-motorcycles, which was not the case just a few years ago. The share of anti-lock braking systems in new sales will continue to increase in coming years since the EU introduced legal requirements for anti-lock brakes on all new motorcycles over 125 cubic centimeters from 2016. It is, however, important that even motorcycles under 125 cubic centimeters are equipped with anti-lock brakes since they often are used by young, inexperienced motorcycle users.

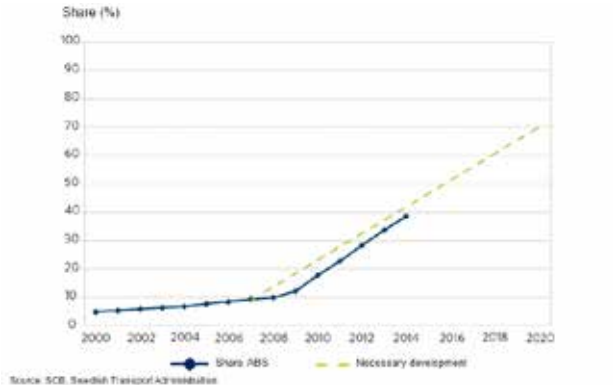

Figure 20. The share of total traffic with motorcycles equipped with anti-lock braking systems (ABS) 2000-2014, as well as necessary development to 2020. Source(s): Statistics Sweden, The Swedish Transport Administration

"Curve Anti-lock Braking Systems"

The latest generation of anti-lock brakes even takes into consideration the tilt angle and centrifugal angle, which are very important factors for continued development of anti-lock braking systems. The system causes the motorcycle to stay under control even during braking maneuvers at a high speeds and with a tilting motorcycle, for example in a curve.

Protection against leg injuries

Earlier research has shown that 70 percent of motorcyclists sustain some form of leg injury in an accident (Otte 1998). Other studies have reported that leg injuries account for approximately 50 percent of all serious injuries among motorcyclists (MAIDS 2004; NTHSA 2008).

In a study by Rizzi et. al. (2015) motorcycles where the motor sticks out in front of the driver's leg (so-called boxer motor) were compared with similar anti-lock braking system motorcycles with narrower motors. Approximately 180 medical reports from 2003-2014 were analysed in-depth and the risk of permanent injury was compared for various parts of the body as well as for the whole body. Results showed that for anti-lock brake motorcycles with boxer motors, the risk for leg injuries that resulted in lasting difficulties was reduced by half, presuming that all else was the same. Results also showed that injuries to the torso did not increase with the boxer motor.

Combined Braking System CBS
A combined braking system is a system that links together the rear and front brakes, so that braking power is distributed between the rear and front brakes.

Adaptation of the motor effect
On several motorcycle models, there is now the possibility to adapt the motor effect to prevailing circumstances. It is possible, for example, to choose street, sport, rain, and off-road depending upon the character of the ground underneath. On a number of models, shock absorber function can be adjusted depending upon the type of motor that is chosen.

Anti-spin
Anti-spin contributes to stability and road-holding ability by the rear wheel avoiding losing its grip. This function reduces gas starting so that grip is restored.

Slip clutch
The slip clutch is relatively new and prohibits the rear wheel from bouncing when shifting down.

Roll-over protection
A small and light motorcycle with good brakes is benefitted by roll-over protection, since it prohibits the motorcycle from being overturned frontward.

Air bag
From 2007, Honda Goldwing has an air bag that deploys in an accident where, for instance, a motorcycle drives into the side of a car, and the driver is prevented from hitting the side of the car. In terms of studies about damage reducing effects, nothing has been proven.

Protective systems for the driver, integrated with the motorcycle
Two established manufacturers of protective equipment have developed various types of jackets with air bags that even can be integrated with factory-mounted sensors on a specific motorcycle model. No evaluations from actual accidents exist yet, but tests indicate major reductions of force in a collision, when compared with conventional protection.

Lights
Adaptive xenon curve lights and "LED cornering lights" are two types of curve lights that function in different ways.

Tyre pressure controls
In order to increase the motorcycle's stability, there are now tyre pressure controls on certain models that warn if tyre pressure is too low. If there is incorrect air pressure in the tyre, it can impact stability in a negative manner, which in turn causes the motorcycle to be difficult to control. Tyre pressure control is possible to mount after the fact.

Electronic suspension
Electronic suspension can be found on all the more motorcycle models, which provides opportunity for adjustment depending upon how the motorcycle is loaded. This is positive, as seen from the standpoint of traffic safety, since the load impacts a motorcycle's road characteristics to a significant extent.

This is how we proceed:

National Moped and Motorcycle Trade Association

- Follow and present the development in the number of motorcycles with anti-lock braking systems, with particular attention to smaller motorcycles of up to 125 cubic centimeters.
- Follow and present other technological developments which contribute to increased traffic safety on motorcycles and mopeds.

Sweden Motorcyclists

- Inform members via the membership newsletter about developments in the field.
- Participate in tests of motorcycles with new technology.
- Collect and spread knowledge obtained in our international cooperation.

The Swedish National Association of Driving Schools

- Work towards assuring that motorcycles at traffic schools connected to The Swedish National Association of Driving Schools are equipped with anti-lock braking systems.
- Work to encourage that all motorcycles used in risk training 2 are equipped with anti-lock braking systems and that the benefits of anti-lock braking systems are demonstrated during all educational programs.
- Further clarify the advantages of anti-lock brakes in The Swedish National Association of Driving Schools' educational materials.

The National Society for Road Safety

- As a consumer organistion, draw attention to safe motorcycles, for example those with anti-lock braking systems, good ISA, etc.

Swedish Motor Insurers

- Insurance companies adjust their customers' premiums through, for example, discounts on insurance premiums if the motorcycle has safety systems such as anti-lock brakes.

Miscellaneous:

- Research and innovation effect connections need to be developed for several new systems.

Safer roads and streets

The Swedish Transport Administration's analyses of fatal accidents (2005-2013) show that 2 out of 3 motorcyclists who die or who are seriously injured were driving on the national road network, and that 1 in 3 were driving on the municipal road network.

The potential of the starting situation for 2012-2014 is three fewer motorcyclist fatalities for a barrier guard, four fewer for a side area, and five fewer for the crossing on a public highway. Clean, whole, and even roadways have a potential of 1-2 fewer fatalities.

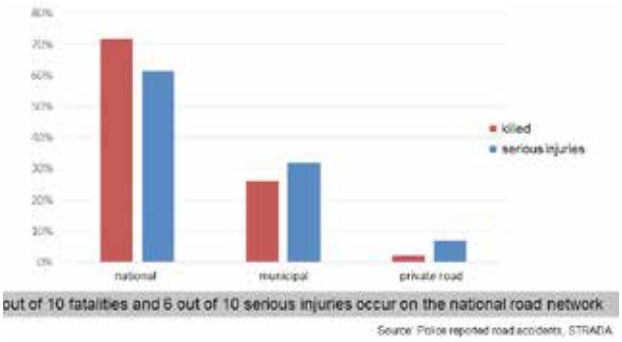

Figure 21: The share of fatalities and serious injuries of motorcyclists per road maintenance provider, 2005-2013

Motorcyclists are killed and inured most frequently on roads with speed limits up to 80 km/hr.
In one out of 10 fatal accidents, it has been shown that deficiencies in the roadway have significant meaning.

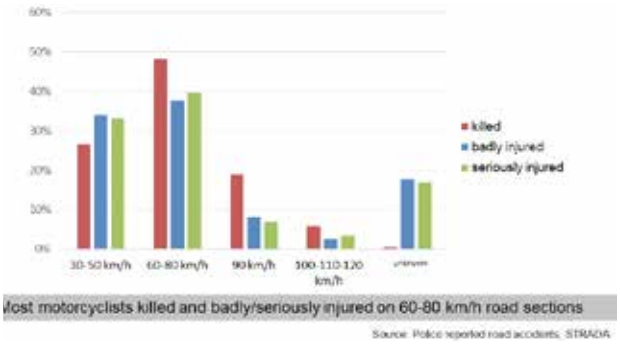

Figure 22: The share of fatalities, seriously injured, and badly injured on motorcycles according to speed limit, 2005-2013

Primarily, this has to do with formation of grooves, but also with lacking friction. The deficiencies are distributed correspondingly on both the national and municipal road network.

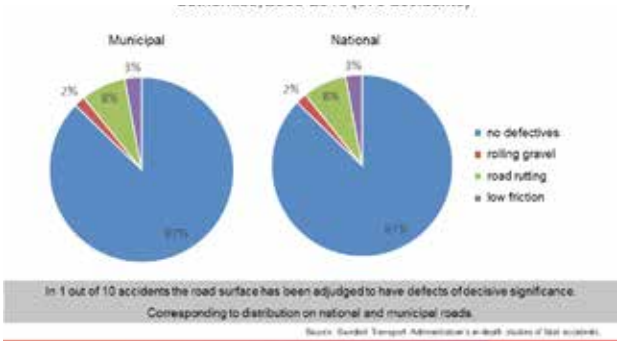

Figure 23: Deficiencies in the roadway in fatal accidents with motorcycles, distributed according to national/ municipal road maintenance respectively, 2005-2013 (376 accidents)

Motorcycles and barrier guards

The barrier guards save approximately 80 road users' (motorists') lives per year. Strandroth J (2015). The barrier guards constitute, however, a fixed object in the traffic environment which causes a risk that the road user could drive into it. Approximately four motorcyclists and just as many motorists are killed per

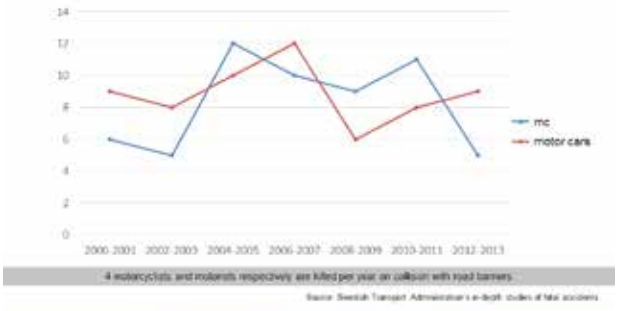

Figure 24: The share of fatalities on motorcycles and personal automobiles in collisions with all types of roadway barrier guards, 2000-2013

year in collision with a guard barrier.
Single accidents are the single most common type of accident where motorcyclists are killed or injured seriously (4 out of 10 accidents).
In three of ten single accidents, the motorcyclist is

killed upon collision with a road barrier (which correlates to one in ten of the total number of motorcyclists killed in traffic.) In only one of five cases, it was determined that the motorcyclist had kept the speed ilmit, which causes an extra significant challenge for those who maintain roads.

Middle barrier guards and side barrier guards
The middle barrier guard improves safety for all road-users on the road. The safety gain that the middle barrier guard provides a motorcyclist can partially be explained by stating that the motorcycle driver avoids unexpected meetings or oncoming traffic in their own driving lane. But, in addition, the motorcyclist is prohibited from passing and risking collision with an oncoming vehicle (in 8 of 10 fatal meeting accidents, the motorcycle drove over into the driving lane of oncoming traffic.)

The effect of today's side barrier guard for the motorcyclist is not equally favourable as for the middle barrier guard, since the side barrier guard often worsens safety for the motorcyclist. This is because the same barrier guard that, in a good way, captures the kinetic energy of a personal automobile that drives off the road, can comprise a dangerous object for the motorcyclist. This does not involve any obvious safety benefit for motorcyclists if they are protected from dangerous objects on the side of the road by the side barrier guard, if the side barrier guard in and of itself is dangerous to drive into. However, if the side barrier guard is flexible, smooth, and equipped with protection for driving under it, it can be a protective alternative for motorcyclists as well.

The Swedish Transport Administration has conducted a study (2011) with the aim of increasing knowledge about motorcycle accidents where the motorcyclist collides with a barrier guard. According to this study, approximately 5 motorcyclists per year are killed in barrier guard accidents (approximately 10 percent of all motorcyclists who are killed). The barrier guard accounts for most common impact severity in single accidents on a motorcycle. It was not possible to detect whether one type of barrier guard was more dangerous than any other type of the dominating types of barrier guard that were studied (wire barrier guards, W-beam, and Kohlswa beam). Concrete barrier guards are found in Sweden to a very small degree on the national road network, and the study did not include an accident with any of these either. Accidents with barrier guards equipped with protection for driving under were not studied either. The study's materials are too limited to distinguish between the various forms of barrier guards within the respective barrier guard categories. Other studies, however, have indicated that a motorcycle-friendly barrier guard shall have a smooth form without parts that stick out.

The study also showed that the accident's sequence of events at the barrier guard spread relatively evenly among the following types:

- fell off the motorcycle and slid into the barrier guard
- put upon the motorcycle in icy conditions and hit the barrier guard from above
- put upon the motorcycle in icy conditions, and fell over the barrier guard.

This is meaningful for assessment of the potential among various measures.

Protective guards for sliding under have been evaluated from a maintenance perspective 2012-2015
Protective guards for sliding under can be mounted upon road barrier guards to reduce the risk for motorcyclists to be injured in a collision with the barrier guard. The Swedish Transport Administration decided in 2012 to install and evaluate protective guards for sliding under on roadway barrier guards at four test locations during three winter seasons. The final report was completed in 2015. During the test period, barrier guards with protective guards for sliding under were studied for how they functioned practically, for example, how the protective device and barrier guard were impacted by snow clearing. Two important questions influenced how protective guards for sliding under lasted during snow clearing, and whether the protective devices influenced water runoff from the road. The results showed that the possibility to remove snow from the roadway was not negatively impacted by the protective guards for sliding under and drift formation did not increase either. Large amounts of snow did not seem to increase the amount of mechanical damage; snow banks that formed at the road

barrier guard protected against this type of damage. Therefore, a conclusion showed that the amount of mechanical damage to the roadway barrier guard and protective device could be minimised if the protective guards for sliding under did not stick out from the barrier guard's steel beam.

Protective guards for sliding under barrier guards are normally mounted so that there is only a small space between the guard's underside and the surface of the ground. With respect to the fact that a roadway barrier guard can sink somewhat over time, the protective device should be mounted in such a way as to reduce the risk for rubbish, gravel, and vegetation to block the space. With sufficient space between the surface of the ground and the protective device's lower edge, water run-off from the road functions well and decreases the risk for erosion damage. In order to assure water run-off over time, the space must regularly be kept clean from vegetation and other materials.

New requirements on design 2015
Experiences from follow-up have impacted the requirements that the Swedish Transport Administration places upon protective guards for sliding under, in the new edition of the Design of Roads and Streets (VGU). In order to assure good water run-off from roads, there are now requirements for the smallest distance between the protective devices and the surface of the ground. In order to avoid damage during snow clearance, the protective device may not stick out from the roadway barrier guard's steel beam. In cases of larger remodels and new construction, the barrier guard that meets the requirement for protection against sliding under is used in cases where a barrier guard is placed in an outer curve on the turnoff ramp as well as an outer curve on a two-lane road with a small radius.

The new 2015 edition of Designing Roads and Streets (VGU) also places requirements on "sleekness" (no parts that stick out) of the roadway barrier guard in conjunction with:

- connection to pedestrian and bicycle pathways,
- roads that are included in the so-called TEN-T road network,
- outer curves on turnoff ramps,
- other roads with significant motorcycle traffic (one hundred motorcycles or more per average 24 hour period during the summer season.)

Measures on the existing road network
The Swedish Transport Administration sees the need to also review existing road barrier guards. In conjunction with the exchange or repair of the barrier guard, the question needs to be asked, for example, about the extent to which the barrier guard shall be mounted again and in such a case, which type of barrier guard. Systematised measurements of motorcycle flow have been conducted since 2012, with the aim of producing a good planning foundation. Currently, there are flow measurements on half of the national road network. In 2017, 70 percent of the national road network is expected to be included. These, together with the remaining traffic measurements, constitute an important foundation for how barrier guards and side area measures can be prioritised.

Future development of barrier guards
Roadway barrier guards save many lives but are simultaneously obstacles in the road environment and thereby constitue a collision risk. Continued development of vehicles and barrier guards needs to take place. In the short term, the Swedish Transport Administration needs to continue developing functional requirements, so that the barrier guards correspond better to the needs of traffic as well as administration. Here, taking part in the development of testing methods and standards is included. Solutions that are adapted in other countries can also be introduced in Sweden, if they are determined to be effective. The direction for The Swedish Transport Administration's research and development in the long term means a clearer investment in a system view, in other words, how drivers, vehicles, and infrastructure cooperate for safety, environmental adaptation and effectiveness in the transport system.

One example that better designed motorcycles in combination with well-developed barrier guards can both reduce the risk for leg injuries in half and save lives, is available in two new studies from Folksam. The result of these studies builds upon real accidents as opposed to collision tests. The result shows that motorcycles with boxer motors in combination with a more sleek and softer barrier guard (with a protective guard for sliding under, as well as a prototype of a protective guard for sliding over) provided the mildest injury process. Studies point out therefore that there is great potential in increasing safety for motorcyclists through improving the design of both motorcycles and roadway barrier guards.[1]

1) Sweden Motorcyclists is of the view that the chapter about road barrier guards omits facts about the high risk for injury for motorcyclists who collide with the guard rails, as compared to those who travel in personal automobiles. In addition, they are of the opinion that it does not take heed to the analyses, conclusions and possibilities that are presented in conjunction with the combined literature study that Sweden Motorcyclists, the Swedish National Road and Transport Research Institute, and the Swedish Association for Road and Bridge Barrier Guards (SVBRF) conducted - "The definition of a safe barrier guard for motorcyclists", Fredriksson, Nordqvist, and Wenäll 2015.

Maintenance and upkeep

The Swedish Transport Administration has, in conjunctiion with Sweden Motorcyclists, compiled a description of motorcyclists' special needs, that should be observed in conjunction with planning, design, and building as well as maintenance, and operations. In conjunction with these, The Swedish Transport Administration has standards for operational and maintenance measures. In addition, road construction requirements have increased. This pertains primarily to the time that is needed for sweeping efforts after repairs are conducted. The requirements have increased in conjunction with new operational negotiations and are estimated to include all operational areas from 2016.

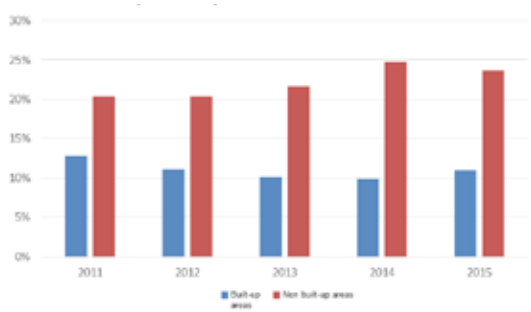

Figure 25: The share of accidents with loose gravel where motorcyclists were injured 2011-2015 (n=4671)

This is how we proceed:

The Swedish Transport Administration

- During 2016, create increased safety in observance of the current regulations of our operational contractors, through developing a new analytical system for following-up operational contractors during 2016.
- As one of several suggested measures in the "Orientation document for road and railway equipment 2016-2025", begin a preparational study in reference to demo routes for a more motorcycle adapted infrastructure, during 2016.
- During 2016, develop criteria for exchange of barrier guards on the existing road network.
- In conjunction with Sweden Motorcyclists, develop an app for deficiency reporting as well as warning for deficiencies.
- Carry out continued flow measurements The goal for 2017 is to cover 70 percent of the national road network.

The Swedish Transport Agency

- During 2016-2018, review the contents in the instructions for supervision of TEN-road network, as well as the development of The Swedish Transport Agency's regulations tied to the planning and construction ordinances.

Swedish Association of Local Authorities and Regions

- Support municipalities in their work with municipal traffic safety programs where motorcycles and mopeds will be emphasized.
- Distribute the booklet "Municipal Traffic Safety Program - tips and advice from municipalities that show the way" where motorcycles and mopeds are included.

Sweden Motorcyclists

- Develop reporting systems in the Sweden Motorcyclists app, version 2 that comment about deficiencies as well as warn about dangerous stretches of road, etc.
- Assist in the creation of a handbook/guidelines for safe road environments for motorcycles and mopeds.
- Assist with suggestions for measures on roads.
- Collect and spread knowledge from our international cooperation.

Increase focus on visibility and awareness

Research in the field shows that it is necessary to both work with increasing visibility for motorcyclists and with increasing awareness among other road users in order to reduce the number of collisions. Factors to take into consideration are vehicles, road environments in the form of crossing formations and visibility considerations, in addition to users
The question is whether the collision was due to an awareness problem or a visibility problem, in addition to which measures are relevant to each respective area. Another factor is also the speed of the vehicles involved, since it can be difficult for a motorist to make the correct choice in a crossing if the motorcycle's speed differs from the prevailing traffic rhythm.

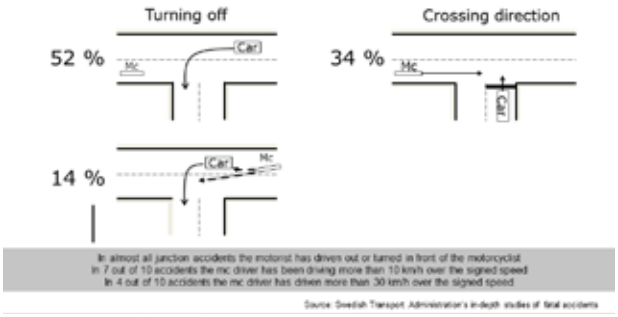

Figure 26: Sequence of events in crossing related fatal accidents with motorcycles 2005-2013 (108 accidents)

There are a significant number of international studies in this area, but it still uncertain which type of remedial measure is most effective. Therefore, we need to increase our knowledge about which effective measures are needed.
Currently, there is technology in automobiles that prohibits spin if there is oncoming traffic. This type of technology is promising and can reduce the number of crossing accidents with motorcycles.

A number of activities are completed within this area. Sweden Motorcyclists, for example, started a campaign in the autumn of 2009 called "See us", with press releases, meetings around the country, debate articles and a film. Concurrently, a website was created where knowledge about this area, measures that are taken in other countries, materials that can be used for both motorcycle users and other road-users, and research in this area are all published.

This is how we proceed:

Sweden Motorcyclists

- Inform members, media, and other parties about the problem.
- Inform about the remedial measures/research that exists and is used in other countries, in order to reduce the number of accidents where motorcyclists are killed and injured by other road-users.
- Call attention to the dangers for unprotected road users by distracted and inattentive drivers in traffic.
- The awareness campaign will be carried out in 2016.

Miscellaneous

- Further research is needed that can result in suggestions for effective measures.
- See also, measures for speed.

Development based on accidents that have occurred-moped

In recent years, the number of fatalities and injuries has declined. In 2015, five moped drivers were killed. In 2014, eight moped users were killed in traffic and approximately 290 moped users were estimated to be seriously injured, and slightly more than 30 were very seriously injured.

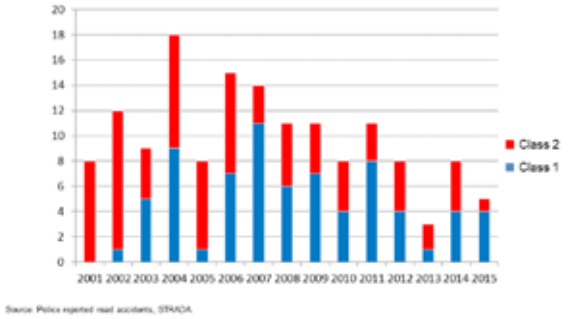

Figure 27: Development of the number of moped users who were killed, distributed by moped class, 2000-2015.

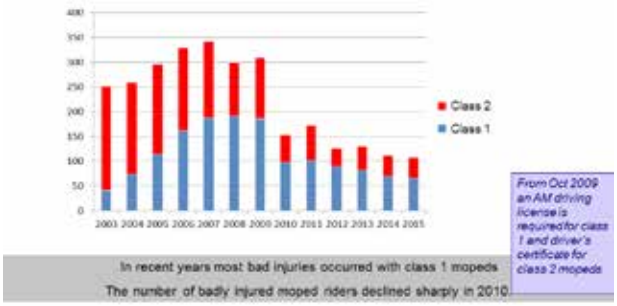

Figure 28: Development of the number of badly injured moped users distributed by moped class, 2003 - 2015

If one studies the distribution of moped user injuries according to the grade of medical disability and according to body part, it is shown that just as it is for cyclists, head injuries make for a significantly greater share of those who are injured very seriously than for those who are injured seriously. Almost 40 percent of all moped users who are injured very seriously have sustained a head injury while the corresponding share is only barely ten percent among the seriously injured.

After the introduction of the AM driving license for class 1, as well as the driving certificate for class 2 during the autumn of 2009, the number of badly injured 15 year olds has significantly decreased.

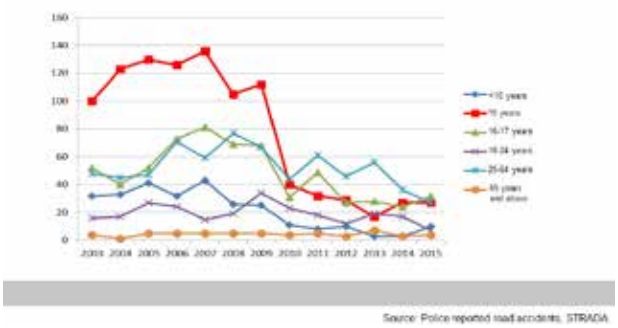

Figure 29: Age development for badly injured moped users, 2003-2015

Almost 8 out of 10 who were killed on a moped 2010-2014 were male drivers.

Among the fatalities in the age group 18-64, the share who were influenced by alcohol or drugs was greater than the share who were not under the influence. Among those who were younger than 18 years old, the share of those who were under the influence was very small.

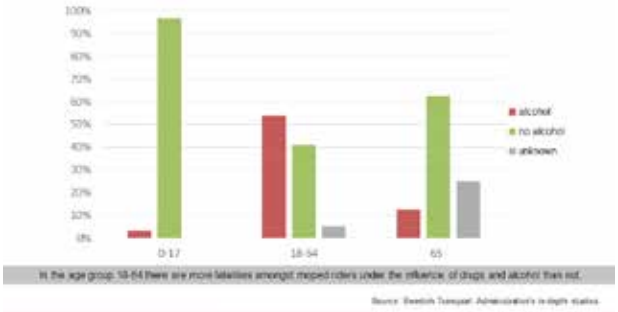

Figure 30: The share of alcohol and drugs in fatal accidents with mopeds 2005-2013 (77 fatalities)

Prioritised areas of effort for mopeds

The most important feature for safe moped traffic is to limit the consequences of accidents that occur. A moped user who uses a helmet in the proper way has a reasonable chance of surviving an accident if speed is no greater than 45 km/hour, and a good chance to survive if speed is 30 km/hr at the most.

The areas of effort to be prioritised are:

- reduced augmentation of mopeds and fewer technical deficiencies
- increased and proper helmet use
- safer roads and streets.

Less augmentation of mopeds and fewer technical deficiencies

There is significant potential for reducing the number of moped accidents that are caused by the augmentation of mopeds or by mopeds with technical deficiencies.

With the starting position in 2012-2014, there is potential for 4 fewer moped fatalities.

The Swedish Transport Administration's analyses of fatal accidents (2005-2013) demonstrate that only 3 out of 10 moped users who were involved in fatal accidents were without known technical deficiencies.

At the least, every fourth moped that was involved in a fatal accident was augmented. In fatal accidents, where the driver was under 18 years old, at least half of the mopeds were augmented. Augmented mopeds are not necessarily at the root of every accident that takes place, but they definitely influence the degree of seriousness of the resulting injuries, since speed increased when the accident takes place. Beside augmenting mopeds, there are also technical deficiencies, for example inadequate lighting and brakes, that are concurrent with fatal accidents. These deficiencies are also important to work with more. There is a need to develop methods that make more effective surveillance possible, since it places such a heavy demand on resources today.

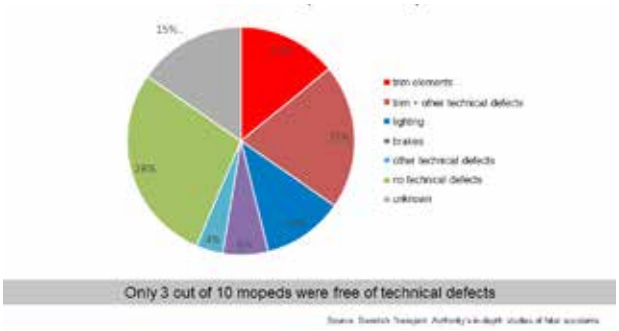

Figure 31: Technical deficiencies in fatal accidents with mopeds 2005 - 2013 (77 fatalities)

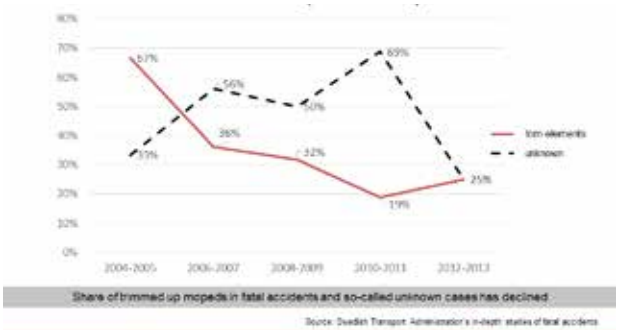

Figure 32: Development of the share of augmented mopeds in fatal accidents 2004 - 2013 (80 fatalities)

Moped users' attitudes towards augmenting their mopeds and speed infractions
The National Society for Road Safety's investigation of 2015 shows that over 25 percent of young moped users continue to drive too quickly, often or quite often (34 percent of young men and 17 percent of young women). Two thirds report that the moped will drive at over 51 km/hour and one third reports that it will drive at over 61 km/hour. One fifth of mopeds are reported to drive at over 71 km/hour. 28 percent admit that the moped is augmented and 10 percent do not know. It is most common that users have purchased an augmented moped (32 percent) or that users haved augmented them themselves (28 percent). 16 percent have been given help from a friend and 14 percent have been helpd by a parent. 5 percent have been assisted by a moped dealer. Over 80 percent of young people with an augmented moped answer that their parents know about it.

In a study conducted by the Swedish National Road and Transport Research Institute (report 762, 2012) the factors that explained speed infractions in traffic were analysed. The result showed that what influenced young people most to break the speed regulations was that it was fun. Another important factor involved being able to identify with another person who acted in this manner, and that this said person was someone who was liked/admired. In this context, young people could see that this type of behaviour had a certain status, and those who wanted to drive too quickly presumed that it would impress others.

In a later study, (the Swedish National Road and Transport Research Institute report 856, 2015) carried out an internet analysis where it was established that there are many places where speeds and moped driving are discussed. Here, it is quite common to discuss how best to augment a moped, how fast a moped has been driven, and how the police are deceived (either by driving away from the police or by claiming that one's own moped is not augmented). Posts about how quickly a moped has been driven, and in which situations the moped has been driven too quickly are often encouraged by other participants in the forum, in the form of terms such as ″Ass Cool″ and ″You are completely crazy!!!″, often followed by an emoticon, for example, that strengthens the sense that it is a positive comment - a compliment. Posts and comments can hereby be said to strengthen the norm of high speeds and speeding among moped users.

The role of parents
Earlier studies have shown that parents have an important role for young people's perceptions, attitudes, norms and behaviours in connection to moped driving.

Generally speaking, results from a study by the Swedish National Road and Transport Research Institute (Forward et al., 2015) showed that there was not espe-

cially much conversation about moped driving, which could be tied to the notion that parents were confident that the teenager already possessed sufficient knowledge and would do the right thing. Despite this, there was a certain difference between mothers and fathers. While mothers stated that they were more worried and that they more frequently talked with their children about the risks of high speeds, it was noted that fathers showed greater acceptance. According to earlier studies, legal guardians need more support since they do not always know how to act in order to reduce the risk that their teenager will get into an accident. This is not supported by the result of this study, since only 7 percent asked for increased support. However, people were positive towards police efforts, such as visits to schools to inspect mopeds, which can be seen as support to the legal guardians. That the moped could be confiscated if it was found to be augmented, was a less positively received measure.

Measures directed towards dealers and the insured
The National Moped and Motorcycle Trade Association has clearly taken a position against supplying parts for augmenting mopeds and also places demands upon its members to not supply parts needed for augmenting a moped.

The National Society for Road Safety cooperates with Sweden's national motorcycle dealers' association (SMR) and Bicycle, Motor and Sporting Goods Dealers (CMS) in order to counteract the augmentation of mopeds. A contract was established between the independent dealer and The National Society for Road Safety, where the dealer guarantees not to sell parts used for augmenting mopeds or to sell augmented mopeds, or to augment or in any other way help in augmenting a moped. In this way, the dealer actively takes a position against augmenting a moped. The National Moped and Motorcycle Trade Association has also participated in a cooperative effort about counteracting the sales of parts used to augment mopeds.

Suppliers and mechanics can question a guarantee if a moped has been augmented.
Insurance companies do not compensate mopeds where high speed components are on the moped. It has been shown that those who have an economic interest in the moped (parents) are more careful to see to it that the moped is not augmented.

Moped Education
Requirements on mandatory edcuation in order to drive a moped have been imposed, from October 2009. A new driving license qualification, AM, has been introduced for moped class 1, and requirements for driving certification have been introduced for moped class 2. A driving certification and a moped driving license can be suspended after an infraction involving augmentation.

Other measures
From 1 January 2016, it is not permitted to drive a class 1 moped at speeds greater than 45 km/hour. A class 1 moped shall be constructed for a speed of 45 km/hour at the most. Despite this, it is not entirely uncommon that a moped drives faster than this. One reason is that it is augmented, but also, it is possible for mopeds that are not augmented to go faster than the speeds that they were constructed for.
The new, special speed limit for a class 1moped is introduced in order to increase safety by decreasing the chance of driving faster than 45 km/hour.
The background for this is that many have been badly injured or have been killed on a moped in recent years, and that sometimes, it can be difficult for the police to verify if a moped has been augmented or not.
Now that the police can both control augmentation as well as report speeding over 45 km/hour, the possibility of controlling that mopeds do not drive faster than intended is increased.

This is how we proceed:

The Swedish Police

- Initiate preparatory work for reviewing new ways to prove that a moped is augmented. (This can pertain to a new control bank device that acts as evidence in a trial about a moped that has been augmented.)
- Develop a new traffic strategy with guidelines for regions where the local problem exists.

The Swedish Transport Agency

- Participate in international work for type approval and raise the question of interpreting regulations for speed-related limiters in mopeds.

The Swedish Transport Administration

- During 2015, begin to introduce new questions in the theoretical test (AM) that raise the consequences of infractions against the rules (augmentation/technical deficiencies/insurance/helmets) with the aim of increasing knowledge of the risks.

National Moped and Motorcycle Trade Association

- Continue to counteract the sale of augmentation parts for mopeds.
- Be positive to cooperation, as cooperation is needed with The National Society for Road Safety in various moped projects, with the goal of reducing augmentation of mopeds.

Swedish Motor Insurers

- Insurance companies do no compensate for mopeds that have speed increasing components. It has been demonstrated that the person who has economic interest in the moped (parents) are more careful to see to it that a moped has not been augmented.

The Swedish National Association of Driving Schools

- Work towards including more traffic schools in the invitation to cooperate with legal guardians in moped education.
- Word towards preparing the development of existing curriculum for mopeds, for the 2017 season (digitalisation including film and exercises.)

The National Society for Road Safety

- Develop and emphasize the work in media with a market survey of serious moped dealers that do not augment or sell augmentation parts.
- Work towards being able to investigate speed on new and used mopeds in cooperation with the National Moped and Motorcycle Trade Association.
- Develop "Traffic in School" with suggestions for pupil centered activities concerning traffic safety for secondary school pupils (assuming continued financing by Swedish Motor Insurers) and cooperation with the Swedish National Road and Transport Research Institute, for example.
- Survey investigation among moped-parents: what do they know about the risks/consequences?
- Work towards being able to carry out a pilot project where it is possible to meet and influence parents of young people who take an AM driving license through moped training and parent meetings.

Bicycle, Motor and Sporting Goods Dealers

- Continue and renew our work towards counteracting augmentation.
- Training: use the Swedish National Road and Transport Research Institute reports "Moped youths and their parents" as well as "Young moped users" in our moped education, as discussion materials and in order to attempt to get parents more engaged in the training.
- Follow the development of the motorised bicycle (L1e-A).

Increased and proper helmet use

Helmet use is a determining factor in the risk for being injured seriously. If moped users who have been killed are studied, it is possible to ascertain that during the years 2004-2014, 115 moped users were killed, and 53 percent of these were not wearing a helmet or had lost their helmet during the accident.

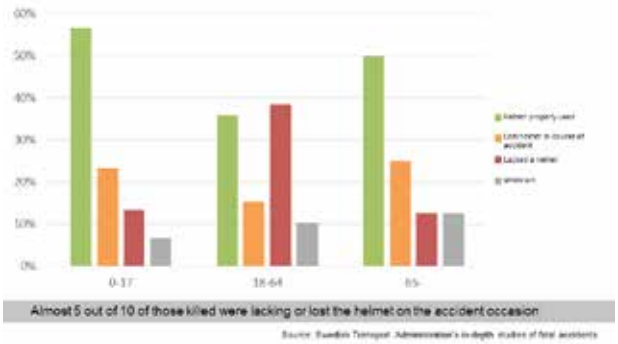

Figure 33: Helmet use in fatal accidents with mopeds 2005 - 2013 (77 fatalities)

The potential of the starting situation in 2012-2014, is two fewer moped users killed per year.

In 2014, eight moped users were killed in traffic, and approximately 290 moped users were estimated to have been seriously injured, with slightly more than 30 very seriously injured. If one studies the distribution of moped users' injuries according to the grade of medical disability and body part, it is demonstrated that just as for cyclists, head injuries comprise a significantly greater share of those who are very seriously injured than those who are seriously injured. Barely 40 percent of all moped users who are very seriously injured have received a head injury while the corresponding share is barely ten percent among the seriously injured. Increased helmet use among moped users has thereby the potential to primarily reduce the number of very seriously injured moped users. Calculations show that the use of helmets reduces the risk for serious injury by 17 percent and very serious injury by 47 percent.

From 2012, helmet use among moped users has been watched, in conjunction with the Swedish National Road and Transport Research Institute's cycle helmet measurements. The study was conducted in the same towns and at the same times as the cycle helmet observations, but at slightly fewer places in each respective town. Only those who are perceived to have their helmet properly fastened are counted as helmet users.

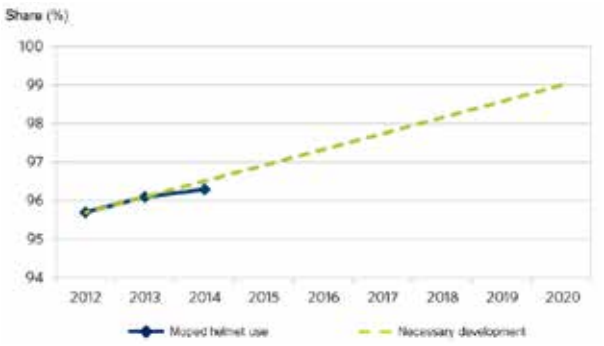

Figure 34: The share of watched moped users with moped helmets 2012-2014, as well as necessary develoment until year 2020. Source: The Swedish National Road and Transport Research Institute's observation measurements 2014.

Results show that observed moped helmet use was 96,3 percent in 2014, compared with 96,1 percent in 2013. 2012 was the starting year for measurements and there have not been any significant changes in moped helmet use between 2013 and 2014. The analysis group's evaluation was, therefore, that development is not progressing at the proper pace in order for us to reach the established goal level of 99 percent by 2020.

The National Society for Road Safety also carries out annual recurrent measurements of helmet use in all the nation's municipalities. The 2015 measurement shows that helmet use in the country is at 97%, with a certain variation between the regions, with the lowest percentage in the Kalmar region with 88%.

Education
Use of personal protective equipment is included in the mandatory training for moped drivers. The hope is that this training amounts to an increased awarness of the importance of using a helmet properly and that its use is increasing. Driving certification and the moped driving license can be suspended after an infraction of helmet regulations.

One problem can be that many people today do not understand that these infractions can lead to suspension of the driving license and driving certification. One idea is that if moped users become more aware of this, they will be better at following the rules. Information about legal consequences of traffic violations is therefore desirable. One channel could also be the raising of this issue in driver training.

This is how we proceed:

The Swedish Police

- Carry out continued controls.

The Swedish Transport Agency

- During 2016, review the content of the curriculum and the theoretical test for a driving certificate for class 2 mopeds, with the aim of drawing more attention to the risks of driving a moped.
- During 2016, review and develop information about the regulations and risks for mopeds.
- During 2015-2016, review and change the regulations and general advice about protective helmets from the former Traffic Safety Authority (TSVFS 1987:10).

The National Society for Road Safety

- Produce a market overview of moped and motorcycle helmets in cooperation with Sweden Motorcyclists and/or the National Moped and Motorcycle Trade Association.
- Work at continuing to have the opportunity to annually measure helmet use in all the nations' municipalities.

The Swedish Transport Administration

- Within the framework for milestone work, measure helmet use anually for moped users.
- During 2015, begin to introduce new questions in the theoretical test (AM) that raises the consequences of infractions against the rules (augmentation/technical deficiencies/insurance/helmet) in the aim of increasing understanding of risks.

Safer roads and streets

Most moped users are killed on the national roadway network. Among the badly injured, the majority of moped users were injured on the municipal roadway network.

The potential of the starting situation in 2012-2014 is 2 fewer moped users killed had there been a pedestrian, bicycle or moped pathway outside the densely populated area, and had it been used.

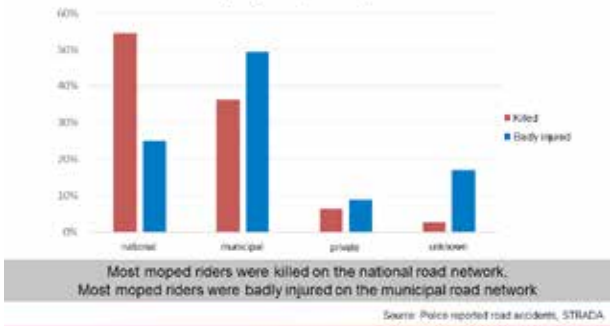

Figure 35: Road maintenance in accidents, with fatalities (77) and badly injured (2157) moped users, 2005 - 2013

Moped users currently do not have a natural place in the traffic system. Mixing mopeds and pedestrians creates insecurity and disruptions, primarily for children, the elderly and the disabled. It is important to create a safe and secure place for both moped users and pedestrians. It is important that deliberate decisions are made concerning where mopeds shall most appropriately drive. On certain stretches of road, it is desirable that even class 1 mopeds are permitted on bicycle paths. Well-functioning operations and maintenance on pedestrian, bicycle, and moped pathways in densely populated areas, as well as road design is essential for safety for unprotected road users. Mopeds

have, in a first step, been incorporated in The Swedish Transport Administration's "Requirements and advice for the design of roads and streets," earlier called VGU - road and street design. Swedish Association of Local Authorities and Regions and The Swedish Transport Administration have produced the "Pedestrian, Cycle and Moped Handbook," that have design of operations and maintenance in focus.

Safe Pedestrian, Cycle, and Moped Passages in Densely Populated Areas

A pedestrian, cycle, and moped passage (GCM-passage) is defined as safe if it is a separate lane or if 85-percent of motorists drive a maximum of 30 kr/hour. The latter is brought about most effectively by having some form of physical speed bump in connection to the crossing. At year end 2013, and the start of 2014, the share of safe passages was 19 percent, based upon information from slightly more than 40 municipalities. At year end 2014, and the start of 2015, this share was up to 25 percent, based upon 104 municipalities. Currently, no goal level for this indicator is stipulated. When the analysis group looks at what is required to contribute to the 2020 goal, an appropriate goal level is assessed at somewhere near 35 percent. This would amount to a share of seriously injured cyclists that decreased by almost 20 percent. This would also mean a significant decrease in the number of those who are seriously injured and killed on an annual basis.

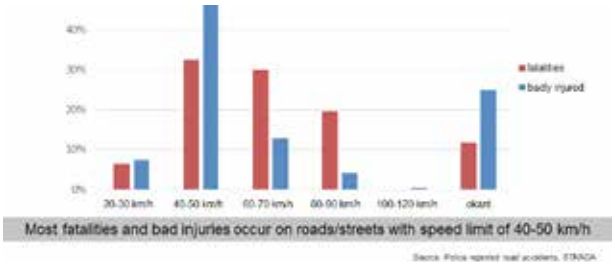

Figure 36: Speed limits in accidents, with fatalities (77) and badly injured (2157) moped users, 2005 - 2013

In order to follow the indicators, municipalities must have reported in the incidence type for Pedestrian, Cyclist, and Motor passages (GCM passages) and speed bumps in the national road database (NVDB), which are required so that indicators are able to be counted. At the end of the year 2014/2015, the number of reporting municipalities had grown to 104 and the number of safe passages to 25 percent. The share of passages with lesser quality was 21 percent and the remaining 54 percent was of low quality in 2014.

In order to improve this indicator, and thereby traffic safety in densely populated areas, municipalities must accept the challenge to make passages safe in terms of speed across the main network for motorised traffic in densely populated areas. This can be accomplished by constructing a separate lane of passage or introduce speed reducing measures in connection with crossings, such as bumps, raised passages, or narrowed passages. These, and several other measures, are described in the Swedish Association of Local Authorities and Regions' " Catalogue of measures for safer traffic in densely populated areas" (third edition, 2009). It is also possible to work toward better speed adaptation and lower speeds in densely populated areas, primarily through speed surveillance in the densely populated areas. According to most recent information (from year end 2011/2012) slightly more than 25 percent of municipalities have reviewed speed. It is very important that speed surveillance and speed adjustments continue in Sweden's municipalities. A working process towards this end is described in the Swedish Association of Local Authorities and Regions' handbook "Proper speeds in the town" (2008).

Maintenance of pedestrian and cycle pathways in densely populated areas

The indicator, maintenance of pedestrian and cycle pathways in densely populated areas, is new since the review of indicator set-up in 2012. The reason that it now is included in the national indicator set-up is that the result of the 2012 review showed that goal-steering work until now has not sufficiently focused on following up indicators that reduce the number of seriously injured. Approximately 80 percent of the cyclists who are seriously injured in traffic are injured in single accidents, and indicators are intended to catch a good measure of these. Higher standards for "cycle paths" are estimated to also benefit safety on mopeds.

The 21 municipalities that are assessed (within indicator work) as having lesser quality maintenance and operations on cycle paths, should have good opportunities to improve their work to the level that is required for good quality by 2020. A rough assessment is that an additional 15 municipalities, at least, that in this compilation are estimated as having low quality operations and maintenance of cycle paths, have the opportunity to increase quality to a level of good quality, with appropriate and directed measures up to the year 2020. In order for it to become possible for municipalities with low or lesser quality to raise their status to good quality, municipalities are required to review their manner of working and their standard demands.

More stringent quality assurance and more rigorous standard demands do not need to always be costly.

Generally, the improvement potential is greatest for gravel and leaf sweeping. More stringent demands on starting criteria and the timing of efforts within both winter road maintenance and dry ground maintenance is also important.

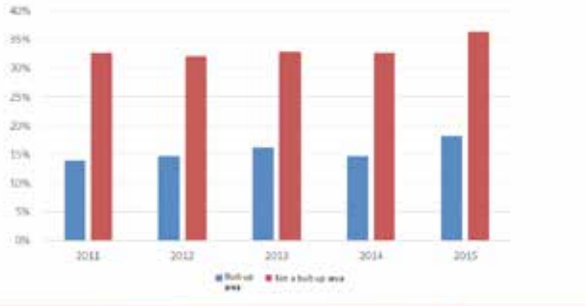

Figure 37: Share of accidents with loose gravel where moped users were injured 2011 - 2015 (n=6478)

This is how we proceed:

Swedish Association of Local Authorities and Regions

- Support municipalities in working with municipal traffic safety programs where motorcycles and mopeds are a part.
- Distribute the Swedish Association of Local Authorities and Regions' inspirational publication about municipal traffic safety programs and the traffic safe city, where motorcycles and mopeds are a part.
- During 2016, investigate cycle passages and the new incidence of bicycle overpasses -- where is it appropriate to erect these and how should they be designed?
- During 2017, develop a set of goals for Pedestrian, Cycle and Motor systems in cooperation with The Swedish Transport Administration, among others.

The Swedish Transport Administration

- During 2016, create increased security in our maintenance contractors' observance of existing regulations, by developing a new analysis system for following up maintenance contractors.

The Swedsh Transport Agency

- In future strategic work, take into consideration the separation of various types of vehicles on the road (for example, moped and electric bicycles).

Research and Innovation

The prioritisation that is made shall be based on facts and scientific foundations. Within the strategy, the need for research and innovation is emphasized. As is named at several places in the document, in many cases, knowledge about measures and their connection with traffic safety is missing.

Several important areas that are pointed out, are for:

motorcycle:

- visibility and awareness
- support systems speed
- extreme behaviour
- Proper competency motorcycle drivers-continuing education of motorcyclists
- criteria for how a side area shall be formed to be better for a motorcyclist who has driven off the road.

moped:

- effects of completely covering protective clothing
- effects of various age limits for class 1 moped
- further measures to reduce augmentation of mopeds and high speeds need to be developed

Visibility and awareness

This area has great traffic safety potential. The current challenge is to define how accidents are distributed among causes tied to visibility relative to awareness as well as to define which measures have effects within each respective area. Factors to consider are vehicles, road environments, and users. Further research that results in suggestions for measures are needed.

Support system speed

Systems are in existence but are not fully developed for motorcycles. However, support and warning systems in GPS et al. exist. On the whole, all vehicle manufacturers work with the issue of ITS (intelligent transport systems), and there are various technological solutions that can increase safety, even for motorcycles. This concerns various support systems which inform and systems which assist.

Effect connection, vehicle technology developments

Work with introducing anti-lock braking systems on motorcycles has been a successful area of effort in earlier strategies. In this version, we want to broaden the area of effort to include several technological support systems. Several examples have a clarified effect connection with traffic safety, but others do not have that today. Where effect connections are lacking, such connections need to be developed.

Extreme behaviour

Research is needed about causes for and measures against extreme behaviour in traffic. The whole problem with extreme behaviour involves attitudes and norms among one or several sub-groups of motorcyclists. This needs to be mapped and described in order to later be able to formulate conceivable strategies.

Proper competency motorcycle drivers-continuing education of motorcyclists

Knowledge of how effective continuing education shall be designed needs to be developed. Today, a number of continuing education programs for motorcyclists are carried out. Evaluations of the traffic safety effects of these educational programs demonstrate a number of positive effects, but often also negative traffic safety effects; that is to say, that after the training, the drivers actually have a higher accident risk than before the training. One explanation can be that course participants are able to practice the aspect that is viewed as particularly difficult, for example driving in a curve or braking. There is a risk that belief in one's own ability increases more than one's actual ability.

Criteria for how a road's side area shall be designed in order to better cope with a motorcyclist that has driven off the road

Today, there is criteria for the side of a road that is based upon those who travel in a personal automobile. Criteria is lacking, however, for motorcycle users.

Development is needed in this area, including surveillance of the surrounding world. This involves how a side area can best be designed for a motorcycle and a motorcyclist. It also involves a motorcycle's and a motorcyclist's ability to survive and cope with driving into a barrier guard.

Effects of completely covering protective clothing for moped users

Earlier studies have demonstrated that head injuries represent the greatest share of very serious injuries (48 percent), which means that a properly used helmet has great potential for reducing the share of very serious injuries. Arms and legs, however, together represent 30 percent of very serious injuries and 52 percent of all serious injuries. Developing protective gear that is useable and effective in reducing injuries to arms and legs, can therefore have significant safety potential. Further research that clarifies the potential and effects of such protective gear is needed.

Effects of various age limits for class 1 - moped

The European driving license directive gives member nations the opportunity to decide age limits for drivers within a range of 14 and 18 years old for class 1 - moped. In Sweden, a limit of 15 years old has been determined, but in Denmark, for example, the age limit is 18, while in France it is 14 years old. An evaluation of the effects of the various age limits among EU countries should be the basis for a future review of the age requirements for mopeds.

Further measures to reduce the augmentation of mopeds and reduce high speeds need to be developed.

Augmentation of mopeds has decreased but still constitutes a significant problem. Since motorised bicycles are classified as class 2 mopeds, augmentation of these should be prevented. Mopeds' constructive speeds at purchase and after a certain period of usage need to be clarified.

This is how we proceed:

The Swedish Transport Administration:

- During 2016, develop a more strategic Research and Innovation development in the field.
- During 2016, develop an impact severity curve that clarifies the importance of speed.
- During 2016, have an analysis made, among other things, of international experiences of motorcycle speeds, surveillance and culture.
- Support other actors through the 'signpost fund' and support non-profit organisations.

The Swedsh Transport Agency

- Combined Research and Innovation projects - safety upon usage - making demands on safety devices, will start during 2016. Among the questions that shall be answered/investigated are - which further demands shall be placed on barrier guards based upon various types of road user at various places, (pedestrian and cycle, moped, motorcycle, personal automobile, bus and lorry.)

Motor cycle and moped users

Motorcyclists

The most common motorcycle in Sweden is a custom-model, followed by standard and veteran motorcycles. The trend just now is that more and more choose so called naked motorcycles and adventure bikes. Average driving routes for a Swedish motorcycle is approximately 200 Swedish miles per year (Source: Traffic Analysis). The median age among motorcycle owners has increased to approximately 53 years old and has thereby almost doubled during a 25 year period of time. Approximately 70 percent of motorcycles are owned by men, approximately 10 percent by women and approximately 20 percent by legal persons.

Motorcycle driving license

Motorcyclists who have qualifications for driving a motorcycle in their driving licenses for personal automobiles, without a particular test (up until 1975, one could have A-qualifications when one obtained a B-driving license) represented 1 in 5 fatal accidents from 2009-2011. They were underrepresented, since almost half of the total traffic of motorcycles was carried out by drivers who have their qualifications in this way. Another group that sticks out is the group that does not have a valid driving license for a motorcycle. Their share is 30 percent of those who were killed during the period 2011-2014.

During 2012, many A-driving licenses were issued which likely is a result of new driving license rules in 2013. The number of driving license owners has been increasing each year since 2013. The share of women who obtain a motorcycle driving license has decreased since 2003. The average age among those who obtain an A-driving license is high.

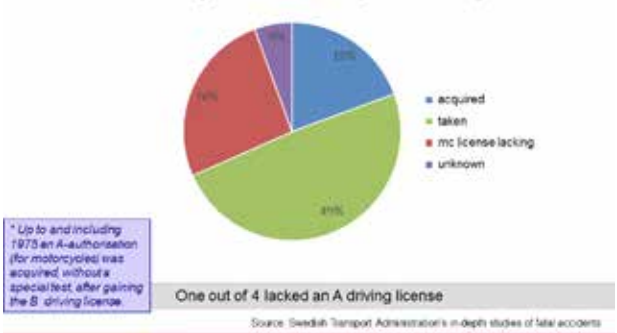

Figure 38: Driving license acquisition in fatal accidents with motorcycles 2005 - 2013 (376 fatalities)

Motorcycle driving license

- On November 1, 2009, an obligatory risk education was introduced in two parts for the person who will obtain a driving license for motorcycles.
- From the 19th of January, 2013, new regulations in the driving license area pertain. Among other things, the age limit was increased for A qualifications from 21 years old to 24 years old. The person who has had the A2 qualification for two years may obtain qualification A, however, at 20 years old.
- 1 May 2015, The Swedsh Transport Agency changed the regulations for the driving tests A, A1 and A2. The change means that one of the two maneuver tests at slower speeds was removed, in order to simplify and open up for a transferred focus in training and testing. The change in the test is expected to contribute to more time during training that can be used for exercises that have greater bearing on traffic safety. They are expected to also contribute to less importance placed on the driver's height and weight for test results.

Moped Users

The number of class 1 mopeds in traffic was slightly more than 104 000, in the year 2014 . Class 1 mopeds in traffic have decreased in number each year since 2009, when there were slightly more than 135 000.

The number of class 2 mopeds that are not required to be registered have also decreased. The insurance companies, during the summer of 2014, had approximately 53 000 class 2 mopeds insured, but estimated that there also are approximately 60 000 such mopeds.

The total number of mopeds in traffic during the summer of 2014 was thereby approximately 160 000.

Information from the vehicle registry shows that since 2012 there were more class 1 mopeds temporarily out of operation than there were mopeds in traffic, as of 30 June. In 2014, there were approximately 145 000 class 1 mopeds temporarily out of operation.

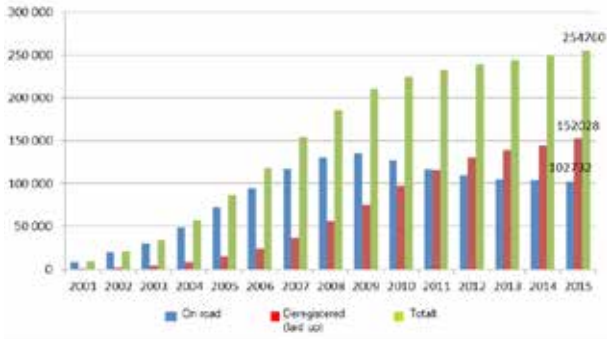

Figure 39: Number of registered in traffic mopeds respective to out of operation mopeds, class 1 as of 30 June 2001 - 2015

Estimates of total moped traffic show that total driving routes for mopeds were approximately 190 million kilometers during 2014 and that driving routes have decreased by approximately 1 percent between 2013 and 2014.

According to new EU provisions, a "motorised bicycle" shall be able to be type-approved within the EU from 1 January 2016. In Sweden, the motorised bicycle is classified as a moped class 2, which can again increase the interest in mopeds and thereby increase the number of fatalities and injuries on mopeds.

More 15 and 16 year olds, the upcoming years
The number of 15 and 16 year olds has decreased by 25 percent over the past 10 years, from approximately 260 000 in 2003, to 200 000 in 2013. Now, the number will increase again. In 2023, there will be approximately 230 000 15 and 16 year olds.

But today, it is not just 15 year olds who drive mopeds. Several groups have discovered that it is easy to get around on a moped in big city downtown areas, and that the moped is easy to park. In rural areas, the moped is a popular vehicle for predominantly young people, and it meets their need to be able to get where they need to go independently.

Driving license and driving certification for mopeds
In order to increase traffic safety, the rules for being allowed to drive class 1 and class 2 mopeds changed from October 1, 2009. A new driving license qualification, AM, was introduced and it is required in order to begin driving a class 1 moped. Concurrently, it became necessary to get a driving certification in order to begin driving a class 2 moped.

In conjunction with the introduction of the new qualifications in 2009, the number of AM driving licenses decreased dramatically. The curve has now reversed directions and turned upward again. The number of passing tests for an AM were 19 401 during 2012, 20 210 during 2013, and 22 371 during 2014.

New moped models from 2016
According to new EU regulations, a new ″motorised bicycle″ shall be able to be type approved within the EU from January 1, 2016. In Sweden, the motorised bicycle is classified as a class 2 moped.

A motorised bicycle shall be constructed to be operated with a pedal and crank system and may not provide additional power at speeds above 25 km/hour. The motor's net effect may not exceed 1 kilowatt. Electrical bicycles with a maximum of 250 watts will also be counted as bicycles henceforth.

For motorised bicycles, it is required, among other things, to

- have a driving license, tractor license, driving certification for moped class II, or that the driver has turned 15 years old before 1 oktober 2009
- wear a helmet (at least a bicycle helmet)
- carry traffic insurance
- be sober.

Environment

Automobiles have had exhaust requirements placed upon them for many years, but the first requirements for motorcycles were placed as late as 1999 through Euro 1. Since this time, the demands have gradually become more stringent year by year. Since 1 January 2007, only new motorcycles that meet the requirements of Euro 3 can be released on the market. Motorcycles that are already in use may, of course, continue to be used.

The most recently determined required steps, Euro 4 and Euro 5, involve not only the gradual intensification of exhaust demands but also sustainability requirements and limits that pertain to evaporation of fuel. Tied to exhaust treatment, there are also demands on diagnostics on board that control the exhaust treatment systems and inform the driver that something is wrong.

New for Euro 4 and Euro 5 are that demands even include measurements and reporting, but no limiting value, for fuel use and emission of carbon dioxide. Electrical motorcycles are also included in these requirements, but in these cases, electricity use and driving distance on electrical power are to be specified. There are also requirements on maximum allowable noise levels for motorcycles. This is important since noise is one of the most common environmental problems in terms of motorcycles, especially due to the fact that the original muffler has been replaced in some cases.

Euro 4 and Euro 5 will take effect from 2016 and 2020 respectively. In total, motorcycles and mopeds account for barely 9 percent of carbon dioxide emissions from the transport sector, but just slightly one percent of the total traffic.

Analysis of the potential of areas of effort

This strategy focuses upon safer motorcycle and moped traffic and describes the safety potential that various areas of effort have. The strategy shows that the combined potential within these areas are sufficient to reach a reduction by half in the number of fatalities. There is, however, no possibility today to break down the potential for all areas of effort in terms of the very seriously injured. There is, however, good reason to believe that these areas of effort have the potential of reducing by half the share of very serious injuries since the compilation of facts demonstrate that problem areas which pertain to fatalities and serious injuries often overlap one another. However, further development of analytical methods to uncover the potential for reducing the number of serious injuries is needed.

In the table below, the maximum potential of the areas of effort for motorcycle and moped users is shown. The potential is expressed partly as a reduction by percentage, parly as the number of saved lives based on a three year average from 2012-2014, concerning 34 who were killed by motorcycle and 6 who were killed by moped. The total potential is not calculated by totaling the potentials for all areas of effort, since these overlap with one another as they influence the same accidents. The analysis is based on facts from fatal accidents 2005 - 2008 when on average, 53 motorcyclists and 12 moped users were killed; but these are thought to be representative also of accidents during later periods of time since fact compilations show that these accidents are of a similar nature.

Examples of potential can be the potential of a whole, clean and even roadway. This is constituted from those cases where the roadway, in conjunction with The Swedish Transport Administration's crash investigation, was discovered to have deficiencies of decisive importance for the origin of the accident. This may involve cracks in the roadway or lacking friction, or alternatively rolling gravel from a support strip. During the period 2005 - 2008, two motorcycle users on average were killed each year for this reason; this represents approximately 4 percent for the 2012-2014 period, which is barely one person per year.

Effort area/measure	Potential motorcycle (%)	Share based upon means 2012-2014	Potential moped (%)	Share based upon means 2012-2014
Visibility/awareness				
Visibility/awareness other road-users	12	4	25	2
Right competency other road-users	4	1	8	<1
Awareness motorcycle driver/moped user	10	3	33	2
Safe roads and streets				
Visibility improvement road environment	12	4	33	2
Middle barrier	12	4	25	2
Safe crossing urban area	8	3	25	2
Safe crossing national road	15	5	33	2
Safe side areas	12	4	25	2
Motorcycle adapted middle and side barrier guards	10	3	8	1
Clean, whole, and even roadway	4	1	-	<1
Repair measures on the road	-	<1	-	<1
Moped, class 1, on cycle pathways (not urban area)	-	-	25	2
Safe use				
Speed observance	>30	>10		
Extreme behaviour	50	17	-	-
Right competency motorcycle and moped user	31	10	50	3
Right use helmet	8	3	25	2
Completely covering protective clothing	6	2	33	2
No lending	17	6	17	1
Medical requirements	13	5	17	1
Safe group driving	8	3	-	-
Rested drivers	6	2	-	-
Proper driving license qualification	25	9	75	5
Giving a lift	-	-	33	2
Safe vehicles				
Anti-lock braking systems	40	14	-	-
Theft protection	6	2	8	1
Alcohol safety interlock device/sobriety	15	5	33	2
E-call	8	3	-	<1
Traction control	10	3	-	-
Airbag	13	5	-	-
Support System Speed	>30	>10	-	-
No technical deficiencies	4	1	33	2
Mopeds that are not augmented	-	-	25	2
Visibility improvements other vehicles	6	2	-	-
Only registered vehicles on the road	6	2	-	-

Every area of effort is described in more detail below. In terms of those who are seriously injured, the accident data does not allow for the level of detail that is needed for analysis of the potential in each area of effort.

Visibility and awareness

Visibility and awareness among other road users have been assessed on the basis of the number of those killed in accidents where the critical event was that the counterpart did not see or notice the motorcycle or moped user. Accidents with only obscured visibility because of obstacles in the road environment have not been included. This effect is judged as certain. It is difficult, however, to distinguish visibility from awareness, that is to say, to distinguish between accidents where the collision was due to the fact that the counterpart really did not see the motorcyclist or moped user, and accidents where the counterpart focused attention on something else.

In terms of the awareness of the motorcycle or moped user, the effect is connected to those accidents where the awareness of the motorcycle or moped user was determined to be the critical factor that caused the accident. This evaluation can be considered to be quite certain, since accidents often have to do with the obvious connection between inattentiveness and the origin of the accident.

Proper competency among other road users is connected to the same cause of accidents as is the area, proper competency among motorcyclists. In terms of assessing the traffic situation, a few causes are added, however, for example mistaken assessment of speed and braking distance. In this case, the assessment is relatively certain.

Safer streets and roads

Visibility improvement in the road environment has the potential of limiting accidents where it is decidedly important that obstacles in the road environment have worsened visibility, for example in crossing intersections or in curves with limited visibility. The effect is, however, somewhat uncertain, since visibility improvements do not necessarily improve awareness, even if they are quite likely to increase the opportunity of detecting motorcyclists and moped users.

Mid-road dividers are determined to yeild an effect by preventing accidents upon meeting and passing. The accidents where motorcyclists have lost control and collided with oncoming traffic, have been excluded, since it is highly unlikely that a mid-road divider would have prevented the injury outcome. A Swedish study from 2009 showed that serious and fatal accidents have greatly decreased
on newly constructed roads with mid-road dividers, even with wire barrier guards. The effects, according to in-depth studies, are determined, however, to be somewhat uncertain, since it is not possible to exclude that fatal accidents could have occurred anyhow, even with a mid-road divider. If a barrier guard is used, the choice of barrier guard and its placement is also significant for the outcome of the accident, but its impact cannot be guaranteed.

The conversion of common crossings in densely populated areas to roundabouts, is estimated to be able to prevent the majority of fatal accidents, with the exception of those tied to very high speeds. It is, in certain cases, difficult to assess at which speeds accidents would be able to be prevented, and the effects therefore are somewhat uncertain. One pre-condition is, however, that roundabout ornamentation cannot be designed so that it results in an increased risk of injury upon collision.

Safe crossings on national roads have great potential, since many crossing accidents take place on national roads. Accidents at very high speeds have, however, been removed for the same reason as those for crossings in densely populated areas. The effects are uncertain, primarily because there is no completely safe design alternative that has been tested and evaluated with motorcyclists in mind.

Safe side areas mean that areas directly connected to the road are cleared of objects (for example, poles, trees and rocks) that can be dangerous to collide with. The effect of this pertains to single accidents, where the risk is reduced that someone could be killed as a result of a collision with objects in the side area. It is, however, difficult to determine if motorcyclists would have continued out into the terrain and collided with something else if the side area was cleared. Therefore, the effect is uncertain.

Side barrier guards are the most common collision object in fatal single accidents. International research shows that the risk of fatality is 15 - 80 times higher for a motorcycle user than for a motorist who collides with a barrier guard without some protection. The potential of a more motorcycle adapted side barrier guard has been determined to pertain to those accidents where a barrier guard represents the predominant impact severity. In those accidents where speed is very high, it is conceivable that the barrier guard's design is not significant to the possibility of survival. The effect is somewhat uncertain, since it is uncertain how many of those who collided with a barrier guard would have survived in a collision with a more motocycle adapted barrier guard.

A whole, clean and even roadway that has good friction is expected to prevent accidents where the roadway's condition is definitely significant to the cause of the accident. The same pertains to repair measures on the road. This effect assessment is certain. According to police reports, the friction factor is significant to the cause of the accident in ten percent of all motorcycle accidents.

Allowing class 1 mopeds on bicycle pathways today is not possible. Changes in regulations that would make this possible, where it is inappropriate for mopeds to drive on the road, for example 2 + 1 roads, would be able to increase safety for moped users. This effect is calculated based on the fact that bicycle pathways that are outside of densely populated areas would be allowed for class 1 mopeds. If more bicycle pathways were built, the effect would naturally be greater.

Safe usage

The potenial of preventing extreme behaviour has, in this context, been defined as preventing accidents where the crucial cause has either been very high speed, that the driver has driven without a driving license or with alcohol or other drugs in the body, or that the driver in another manner has driven very aggressively.

For speed observance, the potential is assumed from the third who have driven far above the posted speed limit at the time of the accident. The potential is likely higher, but is difficult to assess because no reliable connection between the speed of collision and risk of death has yet been produced.

The effect of a motorcycle driver and moped user with proper competency pertains to those accidents where the critical incidents are connected to assessment of the traffic situation, risky behaviour, or driving knowledge, such as braking technique or knowledge about how to take a curve. The effects are not certain, since in certain cases, it can be difficult to asses what really caused the accident. In many cases, there are clear ties between the aforementioned areas of effort, for example extreme behaviour and unlawful driving.

For helmet use, there is a certain effect in those cases where a person who was killed did not wear a helmet

and a doctor has determined that he/she would have survived if a helmet had been worn. The same pertains to protective clothing.

In approximately 25 percent of fatal accidents, the driver of the motorcycle is not actually the owner. Not loaning out a motorcycle or moped can therefore have an effect upon preventing these accidents, with the exception of those accidents where a motorcycle or moped has been stolen. The effect could be certain, since this measure limits access to motorcycles or mopeds in the same way that an alcohol lock or anti-theft device does. It is, however, uncertain since it sometimes is difficult to determine in in-depth studies when a motorcycle has been loaned out. In addition, this type of loaning in conjunction with fatal accidents is often combined with alcohol and the lack of protective gear. It can also be difficult to determine if the owner is the actual user of the motorcycle, the so-called semblance of insurance. This potential can be considered to be very uncertain.

It is also difficult to calculate the effects of medical claims. These measures are actually not connected to usage rather, more to the possibility of driving a motorcycle on the road. The effects are, however, important to draw attention to, as well as how significant they might be, based upon an assessment of the cases where illness is a possible cause of the accident. These assessments are also difficult to make, and therefore the effects are determined to be uncertain.

There is a potential to prevent those accidents that take place in connection with group driving, by carrying this out in a safer manner. The size of the effect is determined based upon those accidents that took place in connection with group driving, where the cause of the accident was a poor evaluation of the traffic situation by the motorcycle user. The effect is, however, uncertain since it is difficult to determine to what extent safer group driving would have prevented these accidents.

To determine whether tiredness has been the cause of an accident is generally difficult, and is especially difficult for motorcycle accidents. The effect of a rested driver becomes somewhat uncertain, therefore, even if there are a few cases per year where there is a suspicion that the driver fell asleep on the motorcycle.

The assessment of the effects of proper driving license qualifications builds upon accidents where the motorcycle or moped user has not had driving license qualifications. Hypothetically, the accident could have been avoided if the driver would have had the proper driving license qualification, and thereby better competency. The effects are, however, uncertain, since the group without a driving license more often than others, is killed drunk, and/or under the influence of drugs, without a helmet and/or on a vehicle that they themselves do not own. It is therefore difficult to judge if just driving license qualification in and of itself would have been enough to avoid the accident.

Raising the age limit for taking passengers to 18 years old could reduce the number of accidents where someone is killed on a moped in conjunction with taking a passenger/being a passenger. It is however uncertain if the taking of a passenger would have had a conclusive impact on the cause of an accident, and therefore the effect has been classified as uncertain.

Safe vehicles

The effect of anti-lock braking systems (ABS) is calculatedto be a 40 percent reduction in all types of accidents with personal injuries. The assessment is seen as certain, since several scientific studies have shows that anti-lock braking systems have approximately this effect. Here, a study with Swedish accident data is included.

Anti-theft devices eliminate the risk for accidents with stolen motorcycles and mopeds, and sober drivers and alcohol locks eliminate the risk for accidents where alcohol influenced motorcycle or moped users are killed because of their own mistakes. Both effects are seen as certain, since drivers in these accidents would not have been found on the roads if motorcycles would have had anti-theft devices or alcohol locks.

The alarm system, E-call, is determined to have an effect in single accidents where the person who is killed is found more than one hour after the accident, and where a doctor has detemined that the person would not have died directlly after the accident. The effect is, however, somewhat uncertain, since it is difficult to judge how many of these fatalities would have been avoided had the accident been discovered earlier.

Traction control (TC) has been determined to have an effect in those accidents where the critical event was rear wheel skid or rear wheel driving.

Airbags on motorcycles are determined to have an effect in those accidents where the motorcyclists are still sitting on the motorcycle at the time of the collision and where the speed does not exceed 70 km/hour. The effect has been determined as uncertain, since extremely few motorcycles are sold with airbags. There are therefore no estimates of this system on actual accidents.

Support systems for keeping speeds are not common on motorcycles. They have theoretically been determined to have a potential for preventing those accidents where speed has been a conclusive cause of the accident. This assessment is, however, uncertain, maybe even very uncertain, since no evaluation of these systems has been made on actual accidents. In addition, currently, we cannot determine how great the potential for injury reduction is, even if it is probably great. Reduced speeds also have a great injury reducing effect in all types of accidents, and therefore, the effect is determined to be at least 15 lives per year.

The area of effort, no technical deficiencies, pertains to those accidents where crucial technical deficiencies on motorcycles or mopeds have been found. Technical deficiencies of critical importance can, for instance, be broken lamps in darkness-related accidents or bad brakes. Augmentation has been determined to have critical importance in those cases where the cause of an accident or the outcome of an injury was such, that high moped speed could not have been achieved unless the moped had been augmented.

Only registered vehicles on the road are an issue, since non-registered motorcycles are not to be driven in traffic. These effects are certain, even if there are no known measures that can effectively achieve this.

Visibility improvements in other vehicles have a potential in those accidents where drivers of the other vehicle have explained that they did not see the motorcycle or moped because it was hidden or obscured by their own vehicle (for example, A-pillar) or some other vehicle. This effect is determined to be something uncertain, since it is not possible to guarantee that the accident could have been avoided with good visibility.

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