

GOVERNMENT STATUS REPORT, SWEDEN

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SWEDISH ROAD SAFETY ORGANISATION

The Ministry of Enterprise, Energy and Communications is responsible for road traffic safety in Sweden. The ministry is limited in size and the Swedish Transport Administration handles much of the practical and operational work. The administration is responsible for the planning, building and operation of roads and railroads. The Swedish Transport Administration also has the overarching role to develop long term plans for all modes of transport. The Transport Administration holds responsibility for research within the fields of mobility, environment and traffic safety. It is also performing in depth studies of fatal crashes within the road traffic system. When co-operation with other actors in society is necessary to effectively achieve its goals the Administration may work together with these actors.

From 2009 the Swedish Transport Agency has overall responsibility for regulations within air, sea, rail road and road traffic. Within the Swedish Transport Agency the Road Traffic Department formulates regulations, examines and grants permits, as well as exercising supervision within the field of road transport over e.g. road traffic, vehicles, driving licences and commercial transport. The agency also conducts analyses of road traffic and supply information about injuries and accidents within the road transport system. Swedish Transport Agency is also holding vehicle and driver licence registers.

The Swedish Transport Administration and the Swedish Transport Agency are both responsible to work towards the transport policy goals set up by the parliament.

In Sweden the main other bodies active in road traffic safety efforts are the police and the local authorities. Other important parties are the National Society for Road Safety (NTF), with its member organisations, and transport industry organisations. The Group for National Road Safety Co-operation (GNS) is a central body that co-ordinates co-operation between the Swedish Transport

Administration and Agency, the local authorities the authority for occupational health and safety and the police. The NTF is an additional member of this group, as well as some partners from the private sector.

The Ministry of Enterprise, Energy and Communications sets the agenda for traffic safety operation. Important initiatives from the Swedish government in the field of traffic safety the latest years are among others:

- A new system for speed limits, building on the “Safe System” approach
- A mandatory risk education for everyone taking a drivers licence
- Improved regulation for safer moped driving
- Stringent safety and environmental demands on cars used by the government and the authorities
- The introduction of a permanent alco-lock program.

FATALITIES

The Swedish overall long-term safety objective within the road transport system was settled in 1997, when the Swedish parliament voted for the “Vision Zero”. This vision states that ultimately no one should be killed or seriously injured in the road transport system. The design and function of the system should be adapted to the conditions required to meet this goal.

Sweden has a long tradition in setting quantitative road traffic safety targets. The recent target was set in 2009 by the government. This target is set at a 50% reduction of fatalities between 2007 and 2020 and a reduction of 25% of severe injuries during the same period. Sweden as member of the European Union was part of the union’s target of a 50% reduction of fatalities between 2001 and 2010. For Sweden that target meant a maximum 271 fatalities year 2010.

In the year 2010 the number of fatalities in Sweden was 287 (preliminary estimate). This number includes suicides. The suicides have historically been included in the Swedish statistic. From 2010 these will be reported separately and excluded from the general statistics of road traffic fatalities. This is in line with international practice (United Nations et al. 2009). The road toll in Sweden then is re-

duced by 20 suicides to 267 thus reaching the 50% EU target for 2010. With around 270 fatalities per year Sweden is one of the safest countries when it comes to road traffic, with a level of 2.8 fatalities per 100.000 inhabitants. This is less than half of the European Union risk average (6.9 fatalities per 100 000 inhabitants year 2009).

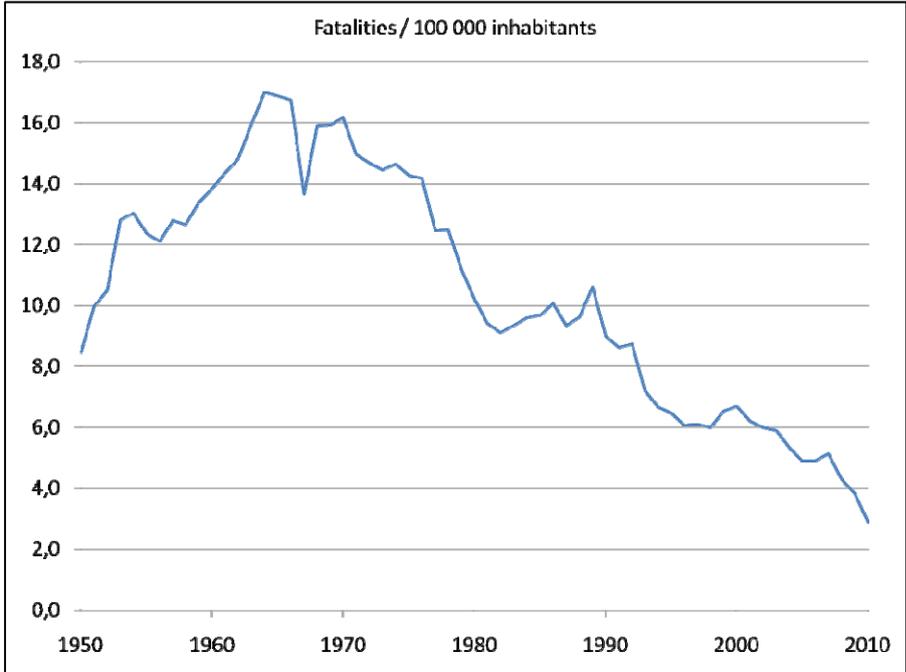


Figure 1. Road fatalities per 100 000 inhabitants in Sweden 1950-2010

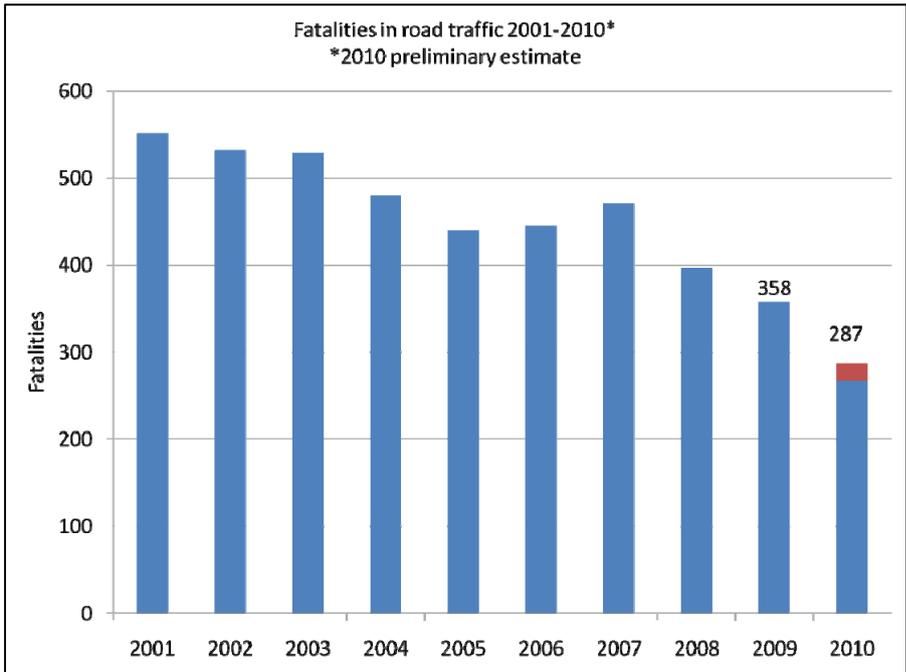


Figure 2. Road fatalities in Sweden 2000 to 2010

INTERIM TRAFFIC SAFETY TARGET FOR 2020

In 2009 the Swedish parliament stated a target of 50% reduction of fatalities and 25 % reduction of severe injuries from 2007 to 2020. This interim target towards the Vision Zero is a part of an updated continuing road safety operation in collaboration with other stakeholders. The previous interim target for 2007 was set without prior consultation with or commitments from parties and the target was not met until 2010.

The current Swedish road safety operation is based on a system of management by objectives where cooperation between stakeholders, targets on Safety Performance Indicators (SPI:s), and annual result conferences where road safety developments and targets are followed up. The aim is to create long-term and systematic road safety operation.

The road safety performance indicators that are monitored is speed compliance, sober driving, seat belt use, helmet use, safe vehicles, safe heavy vehicles, safe national roads, safe municipal streets, rested drivers, rapid rescue and valuation of road safety. These indicators each have a target for 2020 which makes prioritising between measures easier for stakeholders.

DEVELOPMENT TOWARDS THE GOAL 2020

Even though fatality figures in Sweden is at an all time low the status for the SPI:s shows that there are still a lot of work to be done in order to make the reduction sustainable over time.

One of the most challenging indicator targets are the one for speed compliance, were the percentage of traffic driving within speed limits has to increase from around 50 % in 2004 to 80 % by 2020. Reduced speeds have major safety potentials. So far the development has been good (due to a large introduction of speed cameras for example) but the gap between the current situation and the ultimate 2020 target is still vast. The development for seat belt use and bicycle helmet use has not been satisfactory so far. The development of the safe national roads has so far been most successful. This is due to a continued increase of roads with separation from head on collisions and a reduction of the speed limits from 90 km/h to 80 km/h on a large part of the roads with risk of head on collisions.

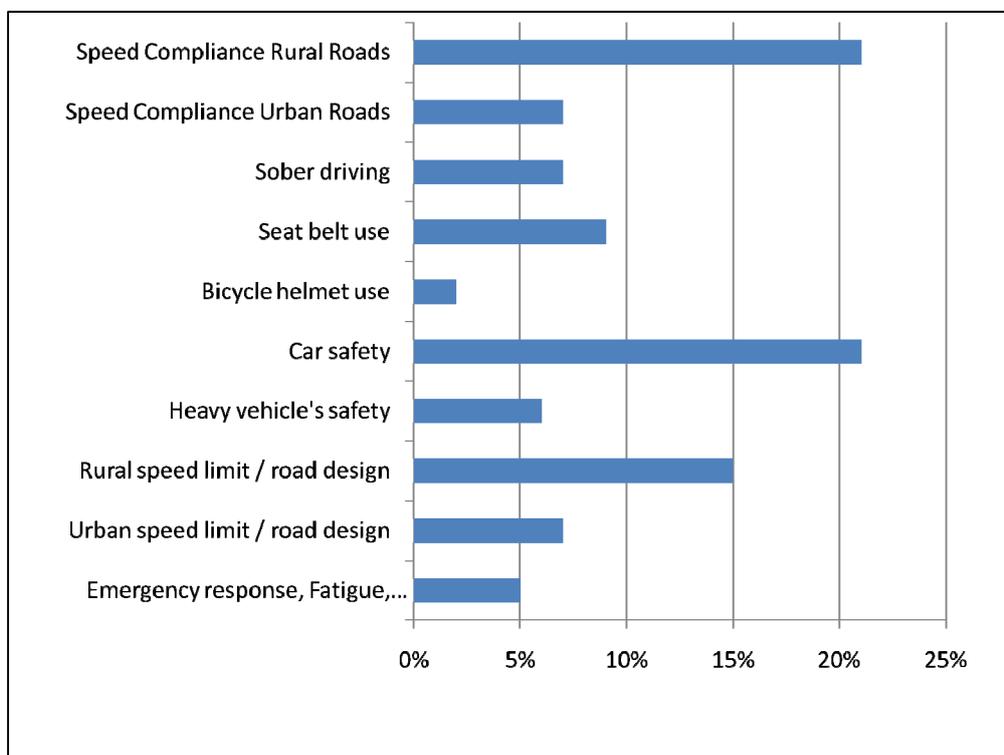


Figure 3. Calculated contribution to 2020 target from different focus areas

The role of the vehicles to contribute to the target is further discussed later in this paper. However, it is worth noticing that the replacement of the car fleet gave the biggest contribution to the results 2010. The development towards the target is annually evaluated at a result conference in April. So far there have been two conferences making it possible for all stakeholders to meet and discuss further work towards the interim target and Vision Zero. The indicator set-up and the targets are to be revised in 2012, making it possible to adjust targets level etc. to the current situation and to focus safety activities and investments.

ISO-MANAGEMENT SYSTEM FOR ROAD TRAFFIC SAFETY

In the spirit of the Tylösand Declaration, Sweden has been an initiator to get a new work within International Standards Organisation (ISO). The work is aiming at developing a Road-Traffic Safety Management System standard. (ISO/TC 241 - Project Committee: Road-Traffic Safety Management System). Sweden is through the Swedish Standards Institute (SIS) holding the secretariat. The vision of the International Management Systems Standard is:

- Elimination of death and serious injury in the road transport system is the overarching goal.
- A voluntary and complimentary tool to legislation, addressing all organizations interacting with road traffic and driven by the needs of interested parties, including market forces.
- An approach to utilize and disseminate "best practice".
- Knowledge transfer from Traffic safety experts to the intended user community of the standard.

All requirements of the International Standard are generic and are intended to be applicable to all organizations regardless of type, size, products and services provided.

The project committee is planning to submit a draft international standard in the summer of 2011. The project has a timeframe up to 2012 to deliver and agree upon the proposed standard.

THE ROLE OF SAFER VEHICLES

The vehicles are of major importance when it comes to support the change of the road transport system. As can be seen above, the exchange and development of safer cars is an important pillar in the road safety work in Sweden.

It is becoming more and more evident that vehicle industry and road authorities must co-operate to define an interface where modern vehicle technology is given the right possibilities to work at its best. Strategies for speed signs are important for vehicle mounted cameras giving the driver information about the speed limit. Good and consistent lane markings are essential for modern lane departure assistance/warning systems. This need was confirmed by the European Council in their communication on traffic safety in December 2010. (European Commission 2010).

The Swedish Transport Administration has developed a co-operation with Volvo Cars to investigate areas of joint interest. The vehicle to road interface is one identified area. Another area of interest is setting boundary condition for safe speed. Some aspects of this co-operation are covered in a separate paper presented at ESV this year (Eugensson et al.).

PENETRATION OF SOME SAFETY SYSTEMS IN SWEDEN

Electronic Stability Control (ESC) has been proven to be very effective in reducing crashes related to loss of control (Erke, 2008, Ferguson, 2007, Lie et al. 2006).

The first studies of the effectiveness of ESC were published in the ESV conference 2003. Several studies followed in 2004 and 2005 establishing a scientific ground for declaring that ESC was effective.

The first mass market car with ESC was introduced late 1998. ESC was from then on gradually implemented on executive mid size and large cars and reached a 15 % new car sales penetration in mid 2003. Sweden has been world leading in getting a high degree of ESC penetration in new car sales. In December 2010, 99% of all new passenger cars were equipped with ESC. A special paper on this process was presented in the ESV-conference 2009 (Krafft et al. 2009).

Sweden has been part of Euro NCAP since the start of the organisation. Over the years since Euro NCAP started, the average scores have improved both for occupant protection as well as for pedestrian protection. Swedish Transport Administration has done an evaluation of the relation between Euro NCAP results and the risk of injury and fatality in real life crashes. The study shows a 70% fatality risk reduction between a Euro NCAP 2 star car and a 5 star car (Kullgren et al.

2010). At the ESV conference 2011 a Swedish study will be presented showing the relation between Euro NCAP pedestrian score and real life impairment risks (Strandroth et al. 2011). An approximate 20% reduction of injuries causing permanent medical impairment is estimated for two star pedestrian protection compared to one star cars. The injury reduction grows with higher levels of medical impairment and in lower impact speeds.

In December 2010 almost 95% of the new car sales had a seat belt reminder according to Euro NCAP specification for the driver. 75% had a reminder for the passenger and 35% a system to monitor seat belt use in the rear seat. Seat belt reminders are reducing the number of unbelted driver in city traffic with 80% in Europe (Lie et al. 2008). A Swedish study has shown that between 2005 and mid 2009 no one has died unbelted in a car with a seat belt reminder living up to Euro NCAP's specification (Swedish Transport Administration 2010). This is very promising.

THE CONTRIBUTION OF NEW VEHICLES

With a rapid development of vehicles safety there has been of interest to calculate the yearly benefit of the exchange of the vehicle fleet. With about 230 fatalities in cars every year, the exchange of slightly fewer than 7% results in around 8 "saved" lives in 2010. Out of these about two thirds comes from the better crash protection and one third from the ESC systems.

ABS ON MOTORCYCLES

The Swedish Transport Administration has done a study on the effectiveness of ABS on motorcycles (Rizzi et al, 2009). The study set out to evaluate the effectiveness of antilock brake system (ABS) technology on motorcycles in reducing real life injury crashes and to mitigate injury severity. The study comprised an analysis of in-depth fatal crash data in Sweden during 2005–2008 to investigate the potential of ABS as well an estimate of the effectiveness of ABS in crash reduction in Sweden between 2003 and 2008 using induced exposure methods.

Induced exposure analysis showed that the overall effectiveness of ABS was 38 percent on all crashes with injuries and 48 percent on all severe and fatal crashes, with a minimum effectiveness of 11 and 17 percent, respectively. The study recommends the fitment of ABS on all new motorcycles as soon as

possible and that customers only should purchase motorcycles with ABS.

Since the launch of the result in June 2009 importers has taken initiative to increase the number of motorcycle models with ABS as standard and the share of new motorcycles with ABS has gone from 15% in 2009 to 60% in 2010. One insurance company has also decided to reduce the insurance costs with 15% for motorcycles with ABS.

FFI – STRATEGIC VEHICLE RESEARCH AND INNOVATION

Transport, mobility and accessibility are of major importance for quality of life and growth. If society is to continue its positive development, transport solutions must be safe and environmentally sustainable. Safe electric cars, smarter logistics and resource-efficient production technology are examples of the innovation and renewal which can help the Swedish automotive industry meet this challenge. To drive the development forwards, Sweden's government and industry are investing in a long-term partnership within FFI – Strategic Vehicle Research and Innovation.

FFI funds R&D that focuses on climate, environment and safety. The effort is ongoing and includes some €100 million per year, half of which comes from public funds through VINNOVA, the Swedish Transport Administration and the Swedish Energy Agency. An equivalent amount is invested by the five industrial partners: Volvo, FKG (Scandinavian Automotive Suppliers), Saab Automobile, Scania and Volvo Cars. This collaboration between public bodies, industry, educational establishments and research institutes is intended to provide high-quality results and contribute to positive social development.

FFI funds projects with two thirds of the money going to climate and environment and one third to safety. An FFI board is responsible for setting a balance between targeted projects and more long-term efforts which can deliver groundbreaking results. The board's duties also include promoting constructive cooperation between the various actors in the road traffic system.

The investments in FFI take place through various collaborative programmes. One is vehicle and traffic safety. Sweden is a world leader in traffic safety. The programme will contribute to the continued development of vehicles with active systems to prevent accidents as well as passive ones

to mitigate the consequences of those accidents which nevertheless occur. Initiatives have a systemic approach so as to get roads, vehicles and road- users to interact well.

IMPORTANT FIELDS FOR FURTHER RESEARCH

Many fatalities in Sweden as well as globally is related to impaired driving. In Sweden 2009 21% of killed vehicle drivers had illegal levels of alcohol on their bodies (Trafikanalys 2010). As many other countries Sweden has an alcolock programme for repeated offenders. There is also some 70 000 alcolocks used in Sweden in trucks, buses and taxis on a voluntary basis. These alcolocks are used on an emerging market for safe transports. Both buyers of transports and suppliers have found these locks attractive to ensure sober drivers. However there is a significant need for further technological development of reliable and non-intrusive alcolock system.

Alcohol consumption is not the only reason for impaired driving. Often fatigue, distraction, legal and illegal drugs as well as alcohol are lumped into the term impaired driving. Vehicle systems are out on the market that detect distraction and fatigue. These systems are using signals from the vehicle to analyze the state and driving pattern for the driver. Already today the cars have an idea about when driving isn't up to standards. The systems as of today have weak feedback to the driver and uses signal lamps of haptic feedback. Not far away in time the vehicle will have a good estimate of the potential impairment of the driver. The question is how a vehicle, on its own, can restrict and guide the driver into a safe driving envelope. The most evident way is to limit the speed of the vehicle and putting safety systems into a more nervous mode. This makes a potential crash avoided and less harmful. There is an evident need in society to research this field and to develop guidelines for a safe shut down sequence.

The layout of infrastructure and the properties of it are becoming important for modern safety technologies. Already today lane departure warning systems are using lane markings as a critical component. In the near future crash avoidance by steering will need even better environmental awareness from lines and other road furniture. More and more cars are reading traffic signs and speed restriction signs are used to help drivers from speeding. As identified by the European Council,

there is an urgent need for better co-operation between vehicle manufacturers and suppliers, and road authorities. Rules, standards and strategies for line painting and road signs could be aligned with the properties of modern vehicle systems to better achieve good functionality and safety.

Speed management is a key element to achieve good safety. More and more countries are using speed cameras and section control to diminish illegal speeding. In Sweden more than 1000 speed cameras have been put up the last years. This has generated an emerging market demand for support systems helping users not to speed. Already many years ago nomadic SATNAVs indicated the speed limit. The same approach is now entering integrated navigation systems. Some vehicle manufacturers are also using cameras to read speed signs. As an effect of the market development the consumer crash test program Euro NCAP has decided to develop a protocol to assess Intelligent Speed Assistance systems (ISA). When the protocol is ready consumers will be able to get independent consumer information on key properties of ISA-systems. A better compliance with speed limits will give significant environmental benefits through lower fuel consumption.

Reducing energy in a crash is one of the most powerful ways to minimize injuries to road users (Krafft et al. 2009). At ESV 2009 two examples were shown, the Mercedes Benz Braking Bag (Danielson 2009) and the "Brake Stopping Distance Shortening System with Sticky Liquid" presented in the students competition by The University of Tokyo. These studies show that new technologies and approaches can be developed for brake with more than 1 g. The use of air brakes, down force from aerodynamic properties, track bite or other approaches could give significant benefits for better braking and steering in emergency situations. Better braking and steering makes a later decision on intervention possible and is giving more reliable actions.

Just like vehicle safety and road safety have been two to a large degree separate cultures, vehicle safety and ITS (Intelligent Transport System) have been driven by different groups in industry and society. There are high expectations from the ITS side to solve traffic safety problems. Further research is needed in which vehicle safety experts and ITS experts more clearly defines the areas of potential for improved safety. This should be done for the different stages of a driving process leading up to a potential crash. The connected vehicle is

probably more important to strategic decisions in the driving than for support in emergency situations. A reasonable balance must be achieved between safety from connectivity, active and passive safety. This balance should be further investigated and communicated.

CONCLUSIONS

When it comes to traffic Sweden is one of the safest countries in the world. The Vision Zero approach has further boosted a good safety culture.

The exchange of vehicles in combination with improved vehicle technology is a major contributor to achieve ambitious traffic safety targets. As more than 50% of new sales cars are sold to companies and other non private buyers, active strategies to convince large fleet buyers to choose best safety standard is of outmost importance.

Road users have a responsibility to operate within the safety limits of the road transport system. Vehicle technology can support this. Intelligent seat belt reminders, systems alerting drivers when speeding and alcohol starter interlocks are important systems to further develop and put on the market in large scale.

The ISO 39001 management system standard for traffic safety will give organisations a possibility to work focused with traffic safety.

Vehicle manufacturers and organisations responsible for infrastructure must develop better co-operations to ensure that the modern road offers a useful interface to modern vehicle technology such as lane departure warning and traffic sign recognition.

A safe system is achieved when user capabilities, vehicle safety, road design and speed limits all are in harmony. A holistic perspective on road safety is under development and is important when prioritizing research efforts.

More general information is available at the following pages

<http://www.trafikverket.se/eng>

<http://www.transportstyrelsen.se/en>

<http://www.vinnova.se/en/ffi/>

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