GOVERNMENT STATUS REPORT OF JAPAN

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TRENDS OF THE ROAD TRAFFIC ACCIDENTS IN JAPAN

The number of fatalities (those who died within 24 hours) resulting from traffic accidents in 2014 was 4,113. This represents the fourteenth consecutive year that the number of fatalities has been decreasing. This number was about one-fourth the 16,765 fatalities in 1970, which was the year in which the number of fatalities reached a peak. In addition, the number of accidents resulting in injury or death and the number of injured persons decreased for the tenth consecutive year in a row since 2004, when the numbers were at their worst.

However, the number of fatalities and injured persons and the number of accidents resulting in injury remained high in 2014, as there were approximately 710,000 fatalities and injured persons, and approximately 570,000 accidents resulting in injury or death.

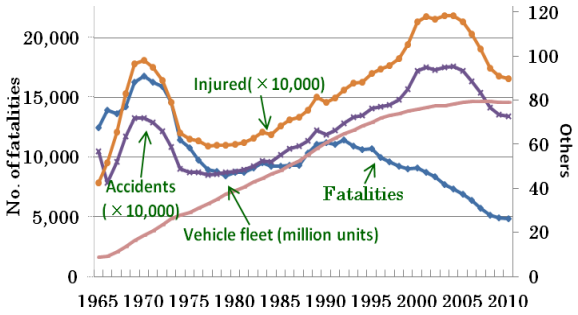

Figure 1. Trends of the road traffic accidents in Japan

New targets were established: to reduce the number of fatalities to below 3,000 (those who died within 24 hours) and to below around 3,500 (those who died within 30 days) by 2015 in the Ninth Fundamental Traffic Safety Program for 2011–2015.

The road transport environment is beginning to change greatly due to the change in types of traffic accident victims reflecting the aging society and the introduction of new technologies including electric vehicles for a low carbon society.

Therefore, on 1 June 2011 the Working Group on Technology and Vehicle Safety of the Council for Transport Policy of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) reported a new target for 2020 to reduce the number of fatalities by implementing vehicle safety measures and evaluating their effect, and setting the policy for reaching the new target.

Future direction of safety measures includes the following:

1) Correspondence to declining birthrate and a growing proportion of elderly people
2) Reduction of traffic accident victims for pedestrian and bicycle crew's
3) Correspondence to new mobility such as EV, micro mobility
4) Measures against grievous accident in which heavy duty vehicles are involved

FUTURE RESEARCH IN FINDING SOLUTIONS TO THE SAFETY PROBLEMS IDENTIFIED

To reduce the number of traffic accidents, approaches will be made towards the following measures upon speculating future changes in social structures, such as future developments in IT and the progression of declining birthrates and an aging society.

- Promotion of safety measures for pedestrians;

- Promotion of neck injury prevention measures;
- Introduction of standards on crash compatibility;
- Research on advanced technologies, etc.

Concrete approaches regarding each of the measures are introduced below.

1. Promotion of safety measures for pedestrians

With regard to accidents involving pedestrians, which account for a high percentage of the number of fatalities caused by traffic accidents in Japan, it is necessary to implement popularization and promotion of pedestrian protection performance standards. As a result, with regard to measures for pedestrians, pedestrian head protection standards were introduced in 2004, and were also adopted pedestrian leg protection standards in January 2015. At the same time, a global technical regulation for pedestrian leg protection has been discussed at GRSP under WP.29 and Japan continues actively contributing to those activities.

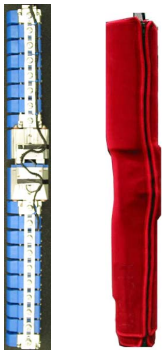

Figure 2. FLEX-PLI

According to rapidly spreading of hybrid cars, Japan judged that measures are needed to address the quietness of hybrid cars. And then the MLIT set up a study committee to investigate the problem of quietness.

In 2010, this committee reported to the MLIT on a future direction and specifically recommended that these vehicles should emit a sound. Based on these results, the MLIT published a guideline on Acoustic Vehicle Alarting Systems (AVAS) for short, which are designed to solve the quietness of HVs and similar vehicles.

WP.29 established a guideline in March 2011 based on Japan's guideline and now expects to develop it as a global technical regulation (gtr).

Figure 2. Demonstration of sound devices that could equip "silent cars"

2. Promotion of neck injury prevention measures (standardization of dummies)

Accidents involving neck injury account for more than half of the total number of accidents, and as there is an increasing trend in the number of such accidents in recent years, the enhancement of standards for headrests, etc. is being promoted as measures for neck injuries.

At the same time, with regard to assessments of whiplash injuries, which 80% of occupants in rear-end collisions suffer, the mechanism behind the occurrence of whiplash is complex, and as a result, there is not enough scientific clarification and it is also unclear as to which dummies should be used and what items to assess.

In particular, with regard to dummies, there are concerns regarding the consistency of assessments due to differences in structures, etc. of the dummies, and it is necessary for dummies to be standardized by having the research institutions, etc. of each country make approaches by contributing to efforts to elucidate the mechanism behind the occurrence of whiplash injuries and decide on assessment standards and indicators.

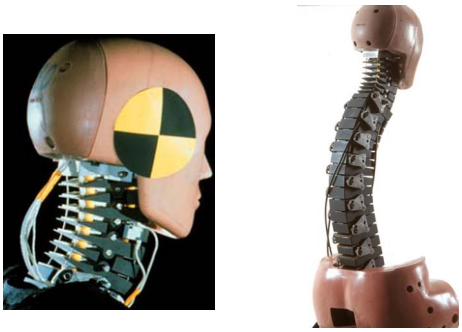

Figure 3. Standardization of dummies

3. Introduction of standards on crash compatibility, etc.

In addition to the above, crash compatibility measures for accidents involving frontal collision are also one of the passive damage mitigation measures for which approaches should be made. Japan considers measures for mini vehicles as being necessary. For the short-term, reviews are currently being conducted on the installation height of structural members so that the structural members interlock when there is a frontal collision.

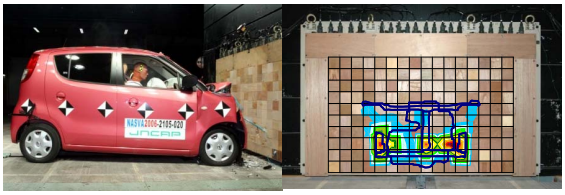

Figure 4. Crash Compatibility

Standards relating to performance for protecting occupants from electric shock after the collision of an electric vehicle or hybrid vehicle were introduced in 2007, and based on these regulations, UNECE regulations were established at WP.29 in 2010. Currently, a global technical regulation for electric vehicles is now being discussed at GRSP under WP.29 and Japan continues actively contributing to those activities.

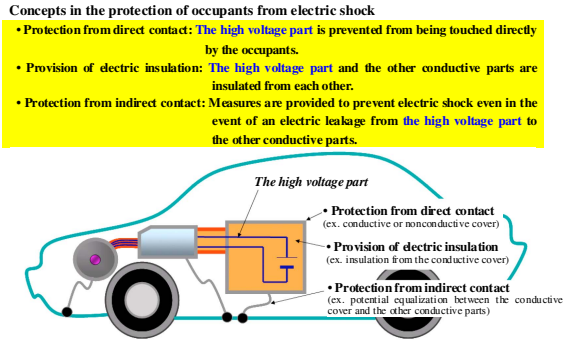

Figure 5. Concepts in the protection of occupants from electric shock

4. Research on advanced technologies

In order to effectively reduce traffic accidents, the MLIT began in FY 1991 a project on vehicles equipped with advanced safety technologies (Advanced Safety Vehicle, or ASV), and has been promoting the deployment of ASVs for more than 20 years. ASV technologies such as the Advanced Emergency Braking System (AEBS), Adaptive Cruise Control (ACC) and Lane Keep Assistance System (LKAS) were put into practice as a result. Phase 5 of the project, which began in FY 2011, aims to reduce traffic accidents even further. The project promotes the development of ASV technologies and next-generation communication-based systems such as vehicle-to-vehicle (V2V) and vehicle-to-pedestrian (V2P), as well as driver assistance systems in case of emergency.

In addition to the ASV project, the MLIT has been working on the development and promotion of automated driving technologies through various activities. One example is the Cross-ministerial Strategic Innovation Promotion Programme (SIP), which was established based on the Japan Revitalization Strategy (JRS, cabinet approval on June 14, 2013) and Comprehensive Strategy on Science, Technology and Innovation (cabinet approval on June 7, 2013). The SIP aims to encourage innovation by promoting research and development at all stages by enhancing cross-ministerial cooperation. The Council for Science, Technology and Innovation designates research themes based on their expected impact

on solving societal issues and enhancing economic growth. Among the ten SIP programmes is the Innovation of Automated Driving for Universal Services. Automated driving is thus being discussed in line with the road map drawn up by the JRS.

Under WP.29, the ITS Informal Working Group had been the group to discuss various technical issues regarding the vehicle part of Intelligent Transport System (ITS). The group has so far developed common understandings relating to automated driving technologies such as the definition of automated driving technology, Guidelines on establishing requirements for high-priority warning signals, and Design Principles for Control Systems of Advanced Driver Assistance Systems (ADAS). Meanwhile, the Working Party on Brakes and Running Gear (GRRF) under WP.29 has developed UN Regulations for advanced technologies, such as R130 on lane departure warning systems (LDWS) and R131 on AEBS.

IDEAS FOR POTENTIAL COLLABORATIVE RESERCH INTER NATIONALLY

In addition to above mentioned, Japan would like to collaborate internationally to establish regulation against head restraint because accidents involving neck injury account for a high percentage of the number of fatalities in Japan as mentioned above. And also global technical regulations on new technologies like QRTV, RESS, AEBS and ITS in general could be established and in order to do so it would be needed to collaborate internationally by doing so, we could surely promote smooth diffusion of safe and convenient vehicles with equipments utilizing above mentioned advanced automotive technologies.

CONCLUSION

Measures that are being taken in Japan have been described above, but in order to promote international harmonization in the aspects of further advancing safe and environmentally friendly vehicles in the future, it is perceived that approaches made in coordination with the ESV Conference, WP.29, ITS World Congress, etc. will become increasingly important.

The written U.S. Government Status Report will be made available to the public after the 24th ESV Conference.
The oral report will be presented on Monday, June 8, 2015 by
Mr. Nathaniel Beuse
Associate Administrator for Vehicle Safety Research
National Highway Traffic Safety Administration
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GOVERNMENT STATUS REPORT, SWEDEN 2015

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SWEDISH ROAD SAFETY ORGANISATION

The Ministry of Enterprise and Innovation is responsible for road traffic safety in Sweden. But due to the decentralised structure in Sweden, the Ministry works with budget, goals, and policy related issues while the operations are managed by the **Swedish Transport Administration** based on the directions from the ministry. The administration is responsible for the planning of the entire transport system with all modes of transport. It is also responsible for the building and maintenance of roads and railroads. The Swedish Transport Administration, also has an overarching role in the development of long term strategies and plans for all modes of transport in the transport system, contributing to the goals set up by the government for the transport sector. 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. If co-operation with other actors in society is necessary to effectively achieve its goals the Administration may work together with these actors.

The other authority in the sector is the **Swedish Transport Agency** which has overall responsibility for regulations within air, sea, rail road and road traffic. Within the Swedish Transport Agency the Road and Railway Department formulates regulations, examines and grants permits, as well as exercise 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 maintains vehicle and driver licence registers.

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

In Sweden the main other bodies active in road traffic safety efforts are the police and the local authorities. Other important parties are the NGOs for example 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 the 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 other key partners from the traffic safety sector.

ROAD TRAFFIC FATALITIES

The Swedish overarching 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 (Johansson, 2009). The design and function of the system should be adapted to the conditions required to meet this goal.

Since Sweden introduced a visionary goal in the middle of the 1990s several jurisdictions have taken the same approach. In some jurisdictions the name has been changed to Safe Systems Approach to avoid the strong focus on the number zero (OECD, 2008).

The Commission of the European Communities has in its White Paper on transports set out the goal "By 2050, move close to zero fatalities in road transport. In line with this goal, the EU aims at halving road casualties by between 2010 and 2020. Make sure that the EU is a world leader in safety and security of transport in all modes of transport" (EC, 2011. Page 10).

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 266. The road toll in Sweden thus did reach the 50% EU target for 2010. Great progress was also made in other countries in the EU. Latvia, Estonia, Lithuania, Spain, Luxembourg, Sweden, France and Slovenia all reached the EU 2010 target. Portugal very nearly made it with a reduction of 49.4%.

With significantly less than 300 fatalities per year Sweden is one of the safest countries when it comes to road traffic, with a level of 2.7 fatalities per 100.000 inhabitants in 2013. This is about half of the European Union risk average (5.2 fatalities per 100 000 inhabitants year 2013). In Sweden fatalities related to distance travelled is 3.6 fatalities per billon vehicles-kilometres (2013) which can be compared with the 7.1 fatalities per billion –vehicle kilometres (2013) in USA (IRTAD 2014).

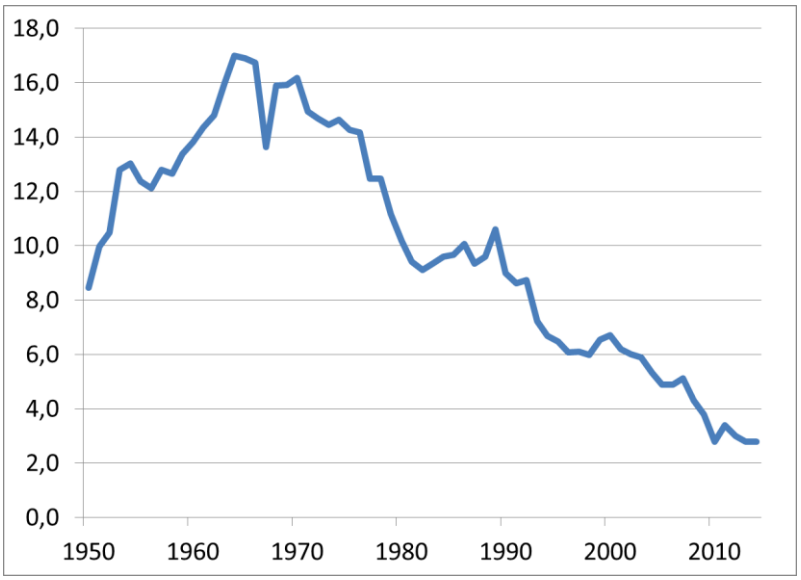

Figure 1. Road fatalities per 100 000 inhabitants in Sweden 1950-2014

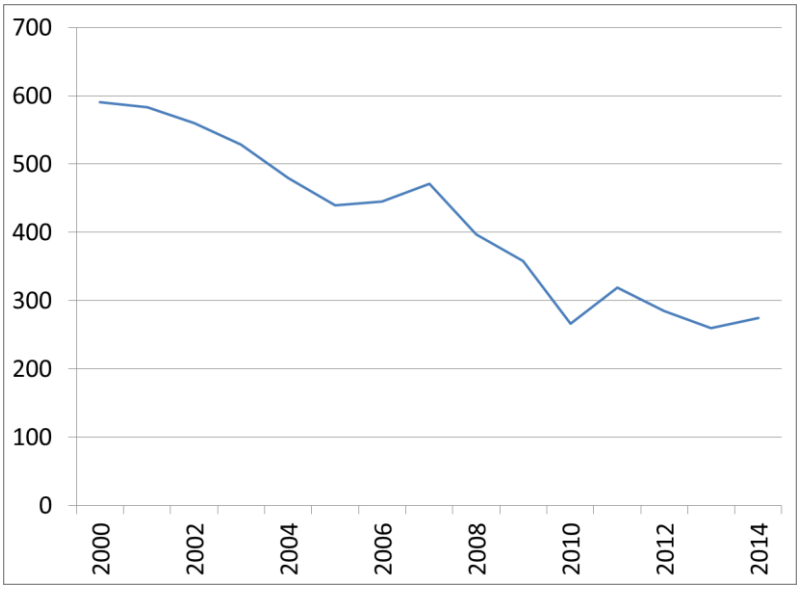

Figure 2. Road fatalities in Sweden 2000 to 2014

INTERIM TRAFFIC SAFETY TARGET FOR 2020

Sweden has a long tradition in setting quantitative road traffic safety targets. In 2009 the Swedish government stated a target of 50% reduction of fatalities and 25 % reduction of severe injuries from 2007 to 2020. This target would demand Sweden to be at a maximum of 220 fatalities in the year 2020. This interim target towards the Vision Zero is a part of an updated continuing road safety operation in collaboration with other stakeholders (The Group for National Road Safety Co-operation, GNS).

After Sweden decided on a target for 2020 the European Union has decided on a 50% fatality reduction between 2010 and 2020. For Sweden this would mean a maximum of 133 fatalities in the year 2020 (because of the good safety performance in 2010). This new European ambition is significantly higher than the Swedish target. Thus, Sweden so far has not committed to the EU target.

The partners of GNS have made an analysis on whether the 133 goal could be achieved and what status a set of Safety Performance Indicators (SPI) would have to be at to support the goal. From this analysis it seems that the goal is achievable.

In 2012 the new interim road safety target for 2020 was proposed to the Swedish Government by the Swedish Transport Administration (STA, 2012). One important element in the revision was to predict the benefits of future interventions for road safety in order to facilitate the prioritisation of road safety measures. One way of doing that is to evaluate safety technology with retrospective analysis of crashes. However, by using retro-spective data there is the risk of adapting safety innovations to scenarios irrelevant in the future. Also, challenges arise as safety interventions do not act alone but are rather interacting components in a complex road transport system. Therefore a new method to consider possible impact of safety interventions was developed (Strandroth, 2014).

The key point was to project the chain of events leading to a crash today into the crashes for a given time in the future. Assumptions on implementation on safety technologies were made and these assumptions were applied on the crashes of today. It was estimated which crashes would be prevented and the residual was analysed to identify the characteristics of future crashes. The Swedish Transport Administration's in-depth studies of fatal crashes and hospital admission data translated into risk of permanent medical impairment were used in the calculations.

It was estimated that the number of road fatalities would be reduced with approximately 40 percent from 2010 to 2020 with the current planned interventions for this period. The main part of the reduction originated from the gradual replacement of the vehicle fleet. The analysis also suggested that it would be possible to strengthen the targets to a reduction of the number of fatalities by 50 percent to 133 fatalities between 2010 and 2020. But that would require measures above and beyond those that are included in the prediction. Through this new method not only quantitative estimations were made but also valuable information regarding the characteristics of future crashes was found. The current Swedish road safety operation is based on a system of management by objectives. This system is based on cooperation between stakeholders, targets on 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 together with the other stakeholders.

The road SPI:s that are monitored is speed compliance, sober driving, seat belt use, helmet use, safe vehicles, ABS on motorcycles, safe national roads, safe municipal streets and maintenance standard on municipal streets. These indicators each have a target for 2020 which makes possible to prioritize between measures easier for stakeholders.

DEVELOPMENT TOWARDS THE GOAL 2020

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 and in the near future.

The development towards the target is annually evaluated at a result conference in April. So far there have been six conferences making it possible for all stakeholders to meet and discuss further work towards the interim target and Vision Zero.

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 Organization for Standardization (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 standard was delivered in 2012 as ISO 39001 Road traffic safety (RTS) management systems - Requirements with guidance for use.

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. A study of fatal crashes in Sweden has shown that ESC is reducing fatal loss-of-control crashes with 74% (Lie. 2012). As these crashes constitute about 36% of all fatal crashes for cars without ESC, the overall effect is around 27% risk reduction. This is higher than previous estimates based on crashes with a lower severity level.

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 2014, all new passenger cars were equipped with ESC. Even with this rapid introduction of ESC predictions show that it will be year 2017 before 90% of the traffic will be performed in cars with ESC.
Sweden has actively 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). A Swedish study shows the relation between Euro NCAP pedestrian score and real life impairment risks for pedestrians and bicyclists (Strandroth et al. 2014). Results show that the injury severity for pedestrians and bicyclists hit by cars with three and four star pedestrian protection compared to cars with just one star was significantly reduced (24-56%) for all body regions. Regarding injuries of higher severity the reduction was most evident for head injuries. The injury reduction grows with higher levels of medical impairment and in lower impact speeds.
In December 2014 99% of the new car sales had a seat belt reminder according to Euro NCAP specification for the driver. 98% had a reminder for the passenger and 78% 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 seat belt reminders living up to Euro NCAP’s specification is increasing seat belt use in fatal crashes with 80%. (Lie, 2012). 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 140 fatalities in cars every year, the exchange of slightly fewer than 7% of the vehicle fleet results in around 7 “saved” lives in 2014. Out of these about two

thirds comes from the better crash protection and one third from the ESC systems.

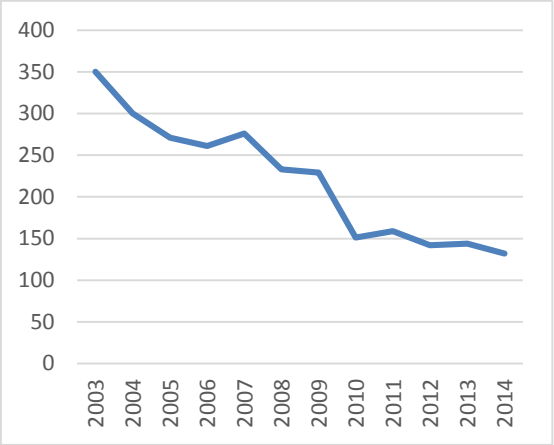

Figure 3. Road fatalities in passenger vehicles Sweden 2003 to 2014

ABS ON MOTORCYCLES

Anti-lock Brakes (ABS) has been proved by several studies to significantly reduce motorcycle crashes by some 20-50% depending on injury severity (Teoh, 2011; HLDI, 2009; Rizzi et al., 2009). A study on US insurance data (HLDI, 2014) also shows that the benefit with ABS was even higher in combination with Combined Brake System (CBS). As technology evolves more advanced ABS-system is expected and in 2013 Bosch introduced Motorcycle Stability Control (MSC) with enables full braking in a cornering manoeuvre. In 2014 two motorcycle models with MSC was available in the Swedish market.

Earlier studies have focused primarily on heavier motorcycle models. In 2014 a new study was therefore performed in order to confirm if the results applies to lighter motorcycles, i.e. scooters, as well (Rizzi et al., 2014). The study involved crashes from Sweden but also from Italy and Spain, i.e. countries in southern Europe were motorcycles are often used for transportation. An induced exposure approach was used and the material includes more than 10,000 casualty crashes with motorcycles. Results show that the effectiveness of motorcycle ABS in reducing injury crashes ranged from 24% in Italy to 29% in Spain, and 34% in Sweden. The reductions in severe and fatal crashes were even greater, at 34% in Spain and 42% in Sweden. The overall reductions of crashes involving ABS-equipped scooters (at least 250 cc) were 27% in Italy and 22% in Spain.

It was concluded that at this stage, there is more than sufficient scientific-based evidence to support the implementation of ABS on all motorcycles, even light ones.

Many stakeholders have been encouraging the fitment of ABS on new motorcycles (STA, 2012). In Sweden the fitment rate has increased from approximately 15% in 2008 to 85 % in 2014. According to Bosch Corporation (2012) the installation rate in Europe for ABS in production on motorcycles with engine size larger than 250 cc has increased from 27% in 2007 to 36% in 2010. Since the European Parliament also has voted for a legislation which makes ABS mandatory for all new motorcycles over 125cc from 2016, the fitment rate is likely to increase even more in the years to come.

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 together with the industry have initiated a long-term partnership within FFI – Strategic Vehicle Research and Innovation (R&D). Sweden has a long and positive experience of such co-operation between authorities, the industry and academia. 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 four industrial partners: Volvo, FKG (Scandinavian Automotive Suppliers), 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. In order to keep the focus and to strive for the goals, the members in collaboration have developed a road map defining safety concepts and mile posts for the years 2020, 2025 and 2030.

The road maps will be updated as progress is achieved.

FFI funds for projects are divided so that two thirds of the money is allocated to climate and environment while one third to safety. An FFI board is responsible for setting a balance between targeted projects and more long-term efforts which can deliver ground breaking 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 "traffic safety and automated vehicles". 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 where a vehicle is involved. 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 are related to impaired driving. In Sweden 2011, 18% of killed vehicle drivers had illegal levels of alcohol on their bodies (Swedish Transport Administration 2012). As many other countries Sweden has an alcolock programme for offenders. There is also some 85000 alcolocks used in Sweden in trucks, buses and taxis on a voluntary basis. There are even some installations made in trams, ferries and locomotives. These alcolocks are used on an emerging market for safe transports. Both buyers of transports and suppliers have found these alcolocks attractive to ensure sober drivers. There is an ongoing technology development both in terms of new basic technologies for alcolocks and forms for a reliable and non-intrusive sobriety support systems.

Alcohol consumption is not the only reason for impaired driving. Often fatigue, distraction, legal and illegal drugs are also lumped into the term impaired driving. Vehicle systems that detect distraction and fatigue are out on the market. These systems are using signals from the vehicle to analyse 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 feed back 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 guide lines 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.

As traffic is developing into a more automated mode of transport the need for close co-operation between all actors in the field is becoming urgent. Automation in traffic demands co-operation.

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 or as it is called in Sweden, "road safety cameras" have been put up the last years. The aim of the camera system in Sweden is to support drivers in making a safe speed choice and, through a change in speed behaviour among a large proportion of the traffic create a new social norm with respect to what is an appropriate speed (Belin et al 2010). 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 navigations systems. Some vehicle manufacturers are also using cameras to read speed signs. As an effect of the marker development the consumer crash test program Euro NCAP has developed a protocol to assess Speed Assistance Systems (SAS) and is using the protocol since January 2013. A better compliance with speed

limits will give significant environmental benefits through lower fuels consumption.
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 define 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.

Although the road traffic injuries is a very complex problem a comprehensive knowledge have been developed over the years about the magnitude of the road safety problem, knowledge about important risk factors and both theoretical knowledge and practice experience about effective road safety strategies and measures . However, we are still lacking systematic knowledge about the way different public authorities, private organizations in different time periods try to tackle this major public health problem. We do not seem to have an adequate understanding and interpretation of the dynamics of the process aimed at formulating and implementing road safety polices and how sound road safety interventions are diffused in the society. Improving road safety requires knowledge about implementation processes, measures known to be effective and how and where in other sectors of society road safety aspects can be mainstreamed and partnerships built. It also requires the ability to choose the strategies and approaches that best fit the specific conditions of different countries Racioppi 2004, Belin 2012).

The safety development for car users is impressive over the last decade. We have in Sweden seen a drop of in car fatalities with more than 50 %. But there is still a need to further improve.
For other road users the same positive development isn't seen. The fatalities in the group of vulnerable road users is proportionally growing. When looking at impairing injuries, pedestrians together with bicyclists have as many injuries as car users. This will impact traffic safety work in the future, both from the road design and the vehicle perspective.

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 where vehicle industry in its role as system designer partner can support the road user. 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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STATUS REPORT, FEDERAL REPUBLIC OF GERMANY

President and Professor
Stefan Strick
Federal Highway Research Institute
Germany

24th ESV-Conference

Gothenburg, Sweden, June 8-11, 2015

1 STATUS AND TRENDS

1.1 Road accidents in Germany

The total number of police registered road accidents has stagnated for the last 10 years – between 2.2 and 2.4 million road accidents. There were slight increases in single years such as 2004, 2007 or 2010, but as well slight decreases in 2002 or 2011. On the long run, there is an increase since 2000 by 2.7 percent in 2013. The forecast for 2014 thus indicates a decrease in accident figures by roundabout 2 percent (2013: 2.41 million road accidents).
The number of road accidents with personal injury has decreased by 24 % since 2000, resulting in 291,105 road accidents with personal injury in 2013. For 2014 a slight increase of almost 2.5 percent to approximately 298,000 injury accidents is expected.
Casualty figures have also decreased, with lower reductions for slight injuries and higher reductions for severe injuries and fatalities. The total number of casualties has decreased by more than 26 percent from 511,577 in 2000 to 377,481 in 2013. For 2014 the increased number of injury accidents will lead also to an increased number of casualties of approximately 2.5 percent compared to 2013 – to about 387,000 casualties in 2014.
Since 2000, the number of severe injuries has been reduced by nearly 37 percent to 64,057 seriously injured road users in 2013 and the number of slight injuries has been reduced by nearly 23 percent to 310,085 slightly injured road users. Fatalities have decreased by 55 percent from 7,503 fatalities in 2000 to 3,339 fatalities in 2013. A slight increase to approximately 3,360 fatalities has been predicted for 2014.
According to the positive development on the long term, the year 2013 showed the lowest number of fatalities since introduction of accident statistics. And also for the number of injury crashes and casualties the year 2013 was the second best after 2010, when accident figures were even lower than 2013.
But the forecast for 2014 with stagnating or even increasing numbers shows, that the positive development cannot be taken for granted. While many factors concerning e.g. safety behavior or vehicle and infrastructure safety play an important role for the long term development of fatality and crash figures, short-term increases result mainly from changes in mobility and traffic behavior due to different and extreme weather conditions. The year 2014 was characterized by an early and mild spring, resulting in high accident and fatality figures concerning mainly motorized and non-motorized two-wheelers.

1.2 Socio-economic costs due to road traffic accidents in Germany

The Federal Highway Research Institute (BASt) calculates the costs of road accidents on an annual basis. The costs of road traffic accidents to Germany's national economy include personal injuries and damage to goods.
The calculated costs include direct costs (e.g. for medical treatment, vehicle repair/replacement), indirect costs (for police services, the legal system, insurance administration, replacement of employees), lost potential growth (including the shadow economy), lost added value of housework and voluntary work, humanitarian costs, costs of monetised travel time losses due to accidents on motorways. Using the developed calculation model an analysis of very severe injuries and the effect of underreporting on total accident costs could be accomplished.
The calculated total accident costs for 2012 amounted to approximately 32.11 billion Euro.
Furthermore, personal injuries amounted to 13.54 billion Euro. Costs of about 18.57 billion Euro were caused by damage to goods.

The costs per person add up to 1.62 million Euro for a fatality, 116,151 Euro for a severely injured person and 4,829 Euro for a slightly injured person.

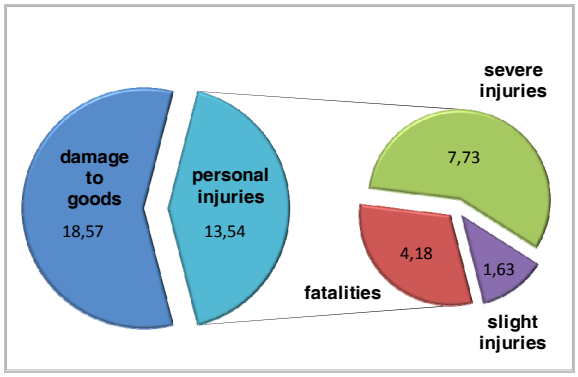

Figure 1: Costs due to road traffic accidents in 2012 (billion Euro)

1.3 German Road Safety Programme

The German Road Safety Program was launched in autumn 2011 and will be running for ten years until 2020. The principal aim of the program is to enable safe, ecologically sensitive and sustainable mobility for all road users in Germany. It comprises a wide range of road safety measures addressing road users, vehicles and the road infrastructure.
The program addresses new challenges (e.g. demographic change and mobility of elderly) and aims at safeguarding the efficiency of the road network. At the same time, it reflects recent technological developments in vehicles such as driver assistance systems, cooperative vehicle systems or new engine concepts. In these latter areas, the main focus lies on ensuring that the development of vehicle technology induces safety gains rather than safety risks. Activities also focus on rural roads and on reducing not only the number of fatalities, but also the number of serious injuries.
For the first time, a quantitative target of -40% for fatalities by the year 2020 was set. The target was defined on the basis of scientific research regarding the expected development of road safety until the year 2020 (R. Maier et al., 2012 a). The monitoring and assessment of road safety measures and the development towards the target is done by the Road Accident Prevention Report, which is prepared every two years and submitted to the German Bundestag. In 2015, a Midterm Report will be launched, taking stock of the first half of the road safety program. Until 2013 the number of fatalities has been reduced by 16,7 % since 2011. On condition of a prolongation of this trend into the coming years Germany is well on its way to achieve the reduction of 40 % by 2020.

2 RESEARCH

2.1 Finished projects

2.1.1 AsPeCSS

The ASPECSS project (Assessment methodologies for forward looking integrated pedestrian and further extension to cyclists safety systems) focused on passenger cars' forward looking safety systems that are designed to address pedestrian and cyclist accidents. The project's aim was to deliver harmonised test procedures as input for further regulatory and consumer rating activities as well as to develop a methodology to assess the integrated safety systems (benefit of the linkage from both vehicle's active and passive safety systems). Other initiatives that contributed to the definition of test and rating procedures were the AEB (Autonomous Emergency Braking) group and the vFSS (vorausschauende Frontschutzsysteme / advanced forward looking safety systems) group. Final test procedures had been discussed and defined within Euro NCAP, based on input of all of these initiatives. The four final test cases for pedestrian AEB systems had then undergone extensive validation and verification testing by various test labs, and as a result, the test procedure has proven to be able to compare the performance of different types of pedestrian AEB systems.
In parallel to the work done by ASPECSS, AEB group and vFSS, specifications for a propulsion system as well

as for the pedestrian dummy had been defined. A proper combination of propulsion system and dummy is now available for testing. It is expected that testing within Euro NCAP will start as announced by beginning of 2016.

Figure 2: Testing of pedestrian AEB system.

2.1.2 InteractIVe

After almost four years of work, the integrated project interactIVe has reached its completion, marking major progress towards the realisation of advanced safety systems for Intelligent Vehicles.
The main achievement is the creation and evaluation of integrated ADAS (Advanced Driver Assistance Systems), characterised by outstanding capabilities for supporting the driver in varied traffic scenarios, and specifically for avoiding hazardous situations. Several new safety functions have been implemented in six passenger cars and one truck, based on the following pillar concepts: continuous driver support, collision avoidance, and collision mitigation. These vehicles have granted a comprehensive validation in a large set of field trials, in some cases combined with driving simulator experiments. Special attention has been given to low cost solutions for all the vehicle segments.
Multiple integrated functions were developed for continuous driver support, but also for executing active interventions for collision avoidance and collision mitigation purposes are served by an integrated perception layer. The primary objective was to extend the ADAS scenarios range and usability by introducing a unique access point, the so-called perception layer, where not only different fusion approaches will fit into the same concept, but also all applications have an access to sensor-, digital maps- and communication data through a common interface: the Perception Horizon.
Different types of sensors were used ranging from radars, cameras and lidars to GPS receivers for the extraction of the electronic horizon.
In parallel to this, work was also initiated by the development of detailed use-cases. The use-cases describe how the functions in the different demonstrator vehicles should resolve so called target (accident) scenarios. This work led to Information, Warning and Intervention (IWI) strategies. The IWI strategies should be applicable both to the specific demonstrator vehicles in the interactIVe project as well as to ADAS beyond the project.
The general IWI strategies can be seen as Human Factors guidelines or general functional requirements for ADAS. The development of IWI strategies was carried out iteratively. The use-cases and initial requirements from the vertical sub-projects served as a starting point in order to define the functions. Strategies were evaluated in different simulator and test track experiments and updated based on the outcome of the experiments.
The analysis of legal aspects for broad exploitation of the interactIVe applications was carried out. This work clearly identified the current steering system regulation UN-R 79 as being the most relevant hurdle for the introduction of new, more automated ADAS technologies.

2.1.3 Global technical regulation on pedestrian safety

An Informal Working Group on GTR9 Phase 2 chaired by Germany and with intensive contributions of BASt has prepared both, a second phase for a global technical regulation on pedestrian safety as well as the 01 series of amendments of UN regulation 127, both introducing a new flexible pedestrian impactor (FlexPLI), better reflecting the human response and kinematic behaviour of a pedestrian in case of an impact. In the meantime, UN-R 127.01 has been adopted by WP.29 and is being applied by the contracting parties since January 2015.

In parallel, a Task Force of the IWG redefined the bumper area being subjected to tests with the FlexPLI. A proposal of the Task Force, in principle stating the hard structure under the bumper fascia to define the width of the test area, has been already endorsed by GRSP at its December 2014 session.

2.1.4 Pedestrian safety

Within the Euro NCAP consortium, a technical working group updated the pedestrian test and assessment protocols. Amongst other things, the FlexPLI has been introduced and is being assessed against injury criteria and performance limits proposed by BASt. The new upper legform test is now focusing on the injured body region pelvis and femur rather than on the injury causing part. A new test with the child headform impactor against the bonnet leading edge was proposed by BASt and was introduced in 2015 as monitoring test for defined vehicle heights.

2.1.5 Cyclist safety

Cyclists as the second group of vulnerable road users are currently not addressed by provisions of passive safety. Therefore, BASt initiated the development of a test and assessment procedure for passive cyclist safety, revising, where necessary, the pedestrian test procedures by addressing the particularities of vehicle to cyclist accidents in terms of boundary conditions, following real world accident data and impact kinematics.

2.1.6 Motorcycle helmets

The numbers of accidents involving motorcycles with severe or fatal injuries are still on a very high level compared to other traffic participants. Motorcycle helmets are a substantial part of the protection devices in accidents. Requirements for motorcycle helmets are specified in the UN-R 22 with regard to visibility, shock absorption and others.
In order to reduce this high number of seriously injured or killed motorcycle riders a research project was conducted to establish recommendations for an improvement of the UN-R 22 concerning the type of test, test equipment, test criteria and limits.
Therefore, national and in-depth accident data (GIDAS) were analyzed and supplementary computer based FEM simulations were performed to better understand the injury mechanism and injury pattern of helm protected head injuries. In addition, different new head injury criteria and head finite element models were discussed.
The statistics from national accident data have shown that in 2013, 641 riders were killed and 12,034 were seriously injured in a total number of 42,427 PTW (powered-two-weheeler) accidents. The analysis of motorcycle accidents in GIDAS was based on a subgroup of motorcycle drivers with MAIS 3+ injuries (n=199). In most cases, a protective helmet had been used. In 18%, the main injuries were located in the region of the head; in 48%, the victims had no head injuries but serious to critical or fatal injuries to the body. About 10% of the motorcycle riders had no helmet at all or used an absolutely unsuitable helmet.
Recommendations with regard to the type of testing, test velocities, test temperature and test criteria have been made.

2.1.7 Rear Underrun Protection

UN-R 58 governs the design and installation of rear underrun protection devices on vehicles of categories N2, N3, O3 and O4. Nevertheless, rear end collisions – especially those involving vehicles of category M1 – with the aforementioned categories of commercial vehicles are characterized by a high level of accident severity. Germany thus submitted a proposal to the UNECE suggesting that the regulation be amended. This would include, inter alia, increasing test forces and reducing ground clearance. Using an injury risk model based on German national accident statistics, it is estimated that these measures could reduce the number of fatalities by 53 to 78 % and the number of seriously injured casualties by 27 to 49 % in such accident constellations, which is equivalent to 20 fatalities and 95 seriously injured casualties per year. In monetary terms, the benefit would be 35.7 million euros. The costs for the goods vehicles and trailers affected each year would be between 5 and 20 million euros, depending on how the costs are estimated. Thus, the benefit-cost ratio for the proposed measures is between 1.78 and 7.
Related to relevant accidents at EU 27 level based on a CARE database analysis, the benefit is estimated to be higher than in Germany by at least a factor of 9, whereas fleet-dependent costs would only exhibit a factor of 4. Thus, for the European commercial vehicle fleet and the accidents in which they are involved, it can be estimated that the effectiveness at EU 27 level would be at least as high as in Germany.
Against the background of the problems associated with HGV rear underrunning, the question arises as to whether passenger car emergency braking systems can, in the near future, represent an effective and efficient alternative for improving the situation of rear underrun accidents. For Germany the benefit from introducing an

ideal emergency braking system for all passenger cars would be around 842 million euros per year, while the costs for 3 million newly registered vehicles per year in Germany would be between 489 and 917 million euros. This produces a benefit-cost ratio of 0.9 to 1.7. By comparison, improving the Rear Underrun Protection Regulation would prevent 38 % (20 of 53) of the fatalities theoretically addressed by an emergency braking system but would only cause 2 % of the costs of passenger car emergency braking systems.

2.1.8 Impact of age related changes on injury biomechanics and test tools/procedures

The demographic change results in a higher participation of older people in traffic which leads to increased risk of accidents and injury of this particularly vulnerable group. The passive vehicle safety still shows potential for improvement to address this increasing challenge. BASt is supporting this in particular by contribution to research towards the optimization of test tools and procedures for passive vehicle safety in regulation and consumer testing. To enable this, BASt has been involved in a variety of research projects and regulatory activities in particular addressing to age-related conditions of road users.
E.g. as part of the revision of the UN-R 94 for frontal impact of cars the injury criteria of the Hybrid III dummies were adjusted to take into account the injury tolerance of older car occupants. Further a research project addressing injury biomechanics of elderly was funded by BASt, which was completed in 2014. The aim of this project was to identify age-related anthropometric differences of the bony thorax based on medical imaging methods (Figure 4). The results allow the adaptation of a numerical human model to represents an older vehicle occupant. This model can be used for further simulation-based investigations to improve the passive vehicle safety for elderly occupants.

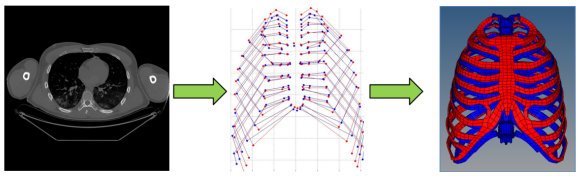

Figure 3: Age-related anthropometric differences of the human bony thorax

On February 12, 2014 the symposium "Trauma biomechanics of older road user - Challenges of Demographic Change" was held at BASt with around 70 participants. The event focused on biomechanical age-related changes of older road users, which may have an effect on accident risk and road safety in general of elderly road users. During the symposium, studies were presented based on current accident data indicating the priorities of the injuries of older road users. In addition, recent biomechanical research results were presented. Furthermore possible technical solutions of vehicle safety systems to take into account biomechanical differences of elderly car occupants were discussed.
BASt will continue to investigate the impact of demographic change on a necessary adaptation of testing and evaluation methods of passive vehicle safety. Specifically, this means a further contribution towards an optimization of wheelchair restraint systems as well as in the development of frontal impact test methods and the frontal impact dummy THOR with corresponding age-related injury criteria. This will be supported by increased use of numerical simulation models of human body.
Some of these research activities including further work on the THOR dummy will take place in the EU funded research project SENIORS (Safety-Enhancing Innovations for Older Road Users). The project will start in June 2015 with a duration of about 3 years under the coordination of BASt. It is based on an integrated approach to improve the safe mobility of older road users in the context of demographic change. All relevant modes of transport are taken into account in the road with a focus on vehicle occupants as well as pedestrians and cyclists.

2.1.9 Child restraint systems

The work of the UNECE/GRSP Informal Group “Child Safety” deals with the new regulation UNECE R129 for child restraint systems (CRS). A step by step approach is implemented. The Phase 1 dealing with with ISOFix Integral “Universal” CRS (“i-Size”) is finalized. The new regulation includes side impact testing, an updated test bench and the use of the Q-dummies. The weight group system has changed to a standing height based system which is easier to understand by users. Up to an age of 15 month an “i-size” CRS has to be rearward facing. The new regulation gives the possibility to have universal rearward facing CRS with ISOFix anchorages. The use of CRS homologated according to the UNECE R129 is implemented in the German regulation. To support the use of the CRS and explain the new regulation a brochure “Kindersicherheit im Auto” will be published by BASt. The brochure will be also available for download in English (“Child Safety in Cars”).

2.1.10 Smoke and toxicity in bus fires

Bus fires occur frequently but are usually not accompanied with severely injured persons. In most of the cases the fire starts in the engine compartment and does not affect any passengers because they can leave the bus in time. However single accidents, in which the fire enters the passenger compartment, resulted in a high number of fatalities. More dangerous than the fire itself is the toxicity of smoke gases due to burning interior parts made of plastic materials.
BASt therefore initiated a research project with regard to the fire safety performance of buses including smoke development and its toxicity. The study was elaborated by BAM (Bundesanstalt für Materialforschung und -prüfung, Federal Institute for Materials Research and Testing, Germany) and was published recently. Burning behaviour tests were carried out with small specimen of bus interior material, with complete seats and using whole buses in order to examine possibilities to further increase bus fire safety and to determine how far it is possible to transfer and adapt existing rail requirements to buses.
Some of the outcome of the experiments is already incorporated into international legislation. Especially UN-R 107 and 118 cover bus fire safety performance. E. g. fire detection systems in the engine compartment and smoke detection systems in separate interior compartments which turned out to be very useful are already required. Also testing of certain properties of insulation materials to repel fuel or lubricant as well as testing vertical burning rates for vertically mounted parts is specified in the UN regulations.
The most important results of the work concern smoke development and toxicity of smoke gas components which are still not covered by legislation. As demonstrated in the experiments, in case of a fire the air in a passenger compartment of a bus is quickly filled with large amounts of opaque smoke that impair visibility. Requirements limiting smoke density and toxic smoke gas concentrations would help to increase the time of escape for passengers in case of a bus fire so that they are not exposed to the toxic components that are produced when bus parts are burning. It is not sufficient to limit all components together by a weighted sum as in the current rail standard since single gases might be lethal although the sum limit is not exceeded. It is rather recommended to limit concentrations for each single component. The study further recommends that the concept to use fire suppression systems in the engine compartment should be persued further.
The transposition of the recommendations of this study into UN regulations is currently discussed on national level. The report is available for download: http://www.bast.de/DE/FB-F/Publikationen/Download-Publikationen/Downloads/F1-busFireProject.pdf.

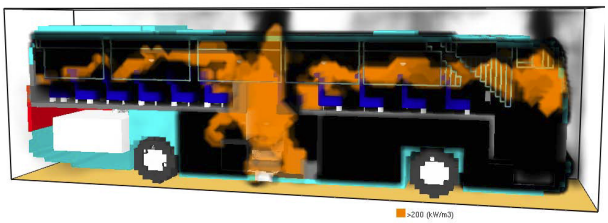

Figure 4: Bus fire simulation (source: BAM)

2.1.11 Periodic Roadworthiness Tests

The current Directive 2009/40/EC includes minimum standards for the periodic roadworthiness tests of motor vehicles (regular vehicle checks required by law) and will be replaced by the Directive 2014/45/EC. The current Directive 2009/40/EC is repealed with effect from 20 May 2018.
The current Directive applies to passenger cars, buses, coaches, light and heavy goods vehicles and their trailers (with more than 3,5 tons maximum authorized mass), but not to scooters, motorbikes, tractors and other smaller trailers.
In the Directive 2014/45/EC (Official journal of the European Union / L127 / 29th of April 2014, Volume 57) the scope of vehicles to be tested is extended to two- or three-wheel vehicles from 1. January 2022 (vehicle categories L3e, L4e, L5e and L7e, with an engine displacement of more than 125 cm) and wheeled tractors of category T5. These two categories of vehicles are currently not compulsory under EU law. Also vehicles of historic interest have now been more precisely defined. Other aspects such as the minimum training of inspectors and the common data exchange are also part of the Directive. The still outstanding implementing acts will cover the verification of the electronic vehicle safety systems, such as Adaptive Cruise Control and the exchange of data between the Member States.
The European Commission contracted a consortium led by CITA including BASt to undertake a project to develop and evaluate roadworthiness inspection methods for the inspection of the functionality and performance of Electronically Controlled Safety Systems (ECSS) and perform a cost benefit analysis for their potential introduction into European legislation.

For this purpose 2,654 tests on electronic systems were performed during field tests. The stored error messages of the tested vehicles cannot be associated with existing defects or are only relating to a low voltage of the vehicle. Therefore those error messages of the electronic systems are not suitable for the purpose of Periodic Technical Inspection at this time. In addition, it has been found, that the reference value method is a suitable additionally method to assess the deceleration and the brake force distribution. The final report was transmitted in July 2014 to the Directorate General MOVE of the European Commission: http://www.cita-vehicleinspection.org/Home/Studies/ECSS/tabid/560/Default.aspx.

Figure 5: scan tool used in ECSS

2.1.12 EVERSAFE

The objective for EVERSAFE was to provide safety requirements for electrically propelled vehicles, thus answering the current need for standardization within the area. This was achieved through the investigation of potential safety issues of electric vehicles and further complemented with a study of user safety concerns. This allowed for the identification of real and perceived safety risks which were needed to be addressed by the developed safety requirements. Under the scope of the EVERSAFE project, safety issues were categorized in two groups:

• Active/Primary Safety: Under this topic vehicle stability was addressed under fault conditions which would not arise in a conventional vehicle, i.e. failures in wheel hub motors, faulty regenerative braking systems.

• Passive/Secondary Safety: Within this area, the focus was set on the fields of crash compatibility (conventional fleet meets electric fleet) and Energy Storage Systems behaviour under and after crash loads (focusing on Li-ion batteries). Major results were recommendations for the safe testing of electric vehicles and/or their main components in regulations and standards as well as an updated safe handling procedure for rescue services to be considered in case of a severely damaged electric vehicle in crash.

To mitigate the safety issues identified by EVERSAFE, the delivered safety recommendations also revealed needs for further research efforts and comprised suggestions for standardization to be implemented by both industry and legislation.

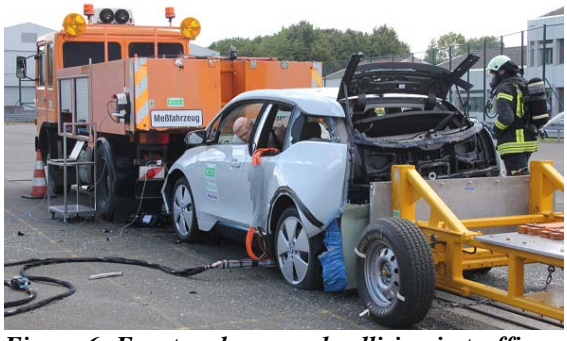

Figure 6: Front and rear-end collision in traffic congestion scenario

2.2 Ongoing research

2.2.1 Turning Assist Systems for trucks

Accidents between right turning trucks and straight riding cyclists often show massive consequences. Accident severity is much higher than in other accidents. The situation is critical especially due to the fact that, in spite of the mirrors that are mandatory for ensuring the field of view for the truck drivers, cyclists in some situations

cannot be seen or are not seen by the driver. Either the cyclist is overlooked or is in a blind spot area that results from the turning manoeuvre of the truck and its articulation if it is a truck trailer or truck semitrailer combination.
At present driver assistance systems are discussed that can support the driver in the turning situation by giving a warning when cyclists are riding parallel to the truck just before or in the turning manoeuvre. Such systems would generally bear a high potential to avoid accidents of right turning trucks and cyclists no matter if they ride on the road or on a parallel bicycle path. However, performance requirements for such turning assist systems or even test procedures do not exist yet.
BASt therefore carries out a research project in order to develop a testing method and elaborate requirements for turning assist systems for trucks. In-depth accident data was evaluated case by case in order to find out which are representative critical situations. These findings served to determine characteristic parameters (e.g. boundary conditions, trajectories of truck and cyclist, speeds during the critical situation, impact points). Based on these parameters and technical feasibility by current sensor and actuator technology, representative test scenarios and pass/fail-criteria are defined.
After having fixed the set of test cases and parameters a validation phase has to follow. For that purpose trucks equipped with turning assist system will be used. It will be examined if the system is able to inform the driver when necessary and how far it is still annoying due to possibly given false warnings.
It can be expected that a turning assist system that fulfils the requirements and tests elaborated in this study will have a very positive influence on accident figures concerning right turning trucks and cyclists. The test procedure is meant to be the basis for an international discussion on introducing turning assist systems in vehicle regulations at UNECE level.

2.2.2. Study on Camera-Monitor-Systems

Within the automotive context camera monitor systems (CMS) can be used to present views of the traffic situation behind the vehicle to the driver via a monitor mounted inside the cabin. This offers the opportunity to replace classical outside and inside rear-view mirrors and therefore to implement new design concepts, aerodynamically optimized vehicle shapes and to reduce the width of the vehicle. Further, the use of a CMS offers the potential to implement functionalities like warnings or situation-adaptive fields of view that are not feasible with conventional rear-view mirrors. Despite these potential advantages, it is important to consider the possible technical constraints of this technology and its effect on driver perception and behavior. On the technical side besides the field of view and the robustness of the system, aspects as its functionality at day and night as well as under varying weather conditions were object to a scientific investigation conducted by BASt. Concerning human machine interaction the perception of velocities and distances of approaching vehicles were considered as they might be different for CMS as compared to conventional rear-view mirrors. Potential influencing factors as the position of the display or drivers' age were taken into account. Within the BASt study CMS was tested under controlled conditions as well as in real traffic for passenger cars and heavy goods vehicles.
In general, it was shown that it is possible to display the indirect rear view sufficiently for the driver, both for cars and trucks, using CMS which meet specific quality criteria. Depending on the design, it is even possible to receive more information about the rear space from a CMS than is possible with mirror systems. It was also shown that the change from mirrors to CMS requires a certain period of familiarisation. However, this period is relatively short and does not necessarily result in safety-critical situations.
Currently the UN-R 46 (Devices for indirect vision) is under revision by an informal group on Camera-Monitor Systems, in which above mentioned results are considered.

2.2.3 Study on winter tyres

Winter tyre use for passenger cars is mandatory in Germany if there is snow or ice on the road. Commercial vehicles are required to have tyres with winter characteristics only fitted to their driven axles, and no specific limits for tyre wear and age are set for any vehicles' winter tyres.
Since wear and age of tyres might have a considerable effect on their friction coefficients, BASt was asked to perform an extensive study on winterly road surfaces to identify reasonable limits. In general, passenger car tyre properties decrease substantially with profile depths below 4 mm, but not with age. This effect had not been found with commercial vehicle tyres.
Theoretical considerations suggest that specific winter tyres on trailer and steering axles might contribute to better braking behavior of commercial vehicles. The steering axle has a large influence on empty truck-and-trailer combinations, while the trailer axles have a high effect on fully loaden vehicles. The current regulation on tyres UN-R 117 does not define any tests or winter requirements for steering axle or trailer tyres, so no robust estimation on the improvement of traffic safety can be done.

It seems that a situational requirement to fit belt chains to driven axles could improve the climbing ability of commercial vehicles in specific situations. Since a large amount of traffic jams on German highways in winterly conditions is due to trucks being stuck, this could in fact improve winterly traffic flow.

2.2.4 Accessibility in long distance buses

In order to deregulate passenger transport, German long-distance bus operators are now allowed to compete against one another and against rail transport. To meet the requirements of all passenger groups in the light of inclusion, their buses will have to provide two wheelchair spaces by 2020 (by 2016 for vehicles first registrations). These requirements build not only towards the German wide aspiration to reduce accessibility barriers, but also towards the goal to avoid barriers systematically in the future. So far, it is not clear if other specifications for equipment going beyond those accessibility requirements in long-distance buses are needed to ensure an appropriate degree of accessibility. For that purpose BASt initiated a research project carried out by Human Factors Consult, Berlin. After having defined accessibility in this context, the main goal of the research project is to derive recommendations for measures to be taken when designing and building accessible long distance buses as a basis for international discussion on harmonised regulations. The project therefore includes two subordinate tasks: first to gather stakeholder requirements and define accessibility which is both done using questionnaires and workshops and second to compose recommendations for respective measures. Different kinds and degrees of disabilities have to be regarded. The measures shall focus on the vehicle itself, the operation of the long-distance buses and on operation personnel. Road infrastructure issues shall be demonstrated using examples for best practice. Deriving measures shall also take into account the state of the art technology for barrier free access and examples coming from the rail sector. In the end also costs, feasibility (technical limits) and practicability have to be considered when assessing the measures proposed.
First intermediate and preliminary results show that for the technical requirements for the bus UN-R 107 Annex 8 can serve as a good basis which might be amended. It turned out and should be paid attention to that accessibility in the view of disabled people often can be reached by the use of support addressing at least two sensory channels. It seems equally important to consider needs and requirements of different user groups (individuals differently challenged and unchallenged in kind and degree (of impairment), senior citizens, children, parents, etc.) in a design for everyone and to focus not only on the accessibility of the vehicles but equally on a barrier-free travel chain as a whole.
The project is planned to be finished in the course of the year 2015.

2.2.5 GTR on head restraints

For several years, work is in progress with regard to develop an improved regulatory dynamic test procedure for head restraints with the aim of mitigation of neck injuries. The dynamic test option in the current GTR No. 7 on head restraints foresees the use of a Hybrid III dummy using the test pulse as described in FMVSS 202a. According to several studies like those from EEVC, the Hybrid III is lacking biofidelity under rear impact conditions and is not humanlike enough for seat or head restraint testing. In consumer test programs like Euro NCAP or IIHS, the BioRID is used for many years for the dynamic assessment of seat performance under rear impact conditions. However, several concerns have been raised about the repeatability and reproducibility of the BioRID. As the anthropometric test device (ATD) is the crucial factor in a dynamic test a suitable dummy needs to be defined for use in regulation. Several studies have shown that out of the available dummies (Hybrid III, THOR, RID3D, BioRID) the BioRID seems to be the best dummy for low speed rear impact seat testing.
Within the framework of the Informal Working Group on a GTR No. 7 on head restraints phase 2 a BioRID Technical Evaluation Group (TEG) has been given the task to improve the BioRID and to develop the necessary specifications and documentation for regulatory purposes. The BioRID TEG started its work in January 2010 and most of the meetings are hold as WebEx meetings with some joint face to face meetings with the GTR No. 7 group. The BioRID TEG is chaired by BASt. The TEG has made significant progress and quite a lot of issues have been discussed, investigated further and addressed in the meantime e.g. by technical bulletins released by the dummy manufacturer (Humanetics). A drawing package is now available on the UNECE website as well as an improved certification procedure; a built level check list has been published as well as a PADI (Procedures for Assembly, Disassembly and Inspection). Work is ongoing with the aim of reducing the response corridors during certification and refining the certification procedure. A new certification test (GEN-X test) has been developed and some further refinements are ongoing. The improvements developed and proposed by the TEG and the new certification procedures are indented to be used by Euro NCAP and IIHS, too. The aim is a worldwide harmonized BioRID for testing under rear impact conditions for regulatory purposes as well as consumer testing. A really challenging task of the GTR No. 7 group and the BioRID TEG is the development of validated injury or seat performance criteria addressing the risk of cervical spine distorsions. In September 2014 a special GTR No. 7 / BioRID TEG Group of Experts Whiplash Injury Criteria Meeting was chaired by BASt.

The group recommended a set of potential injury criteria for regulatory purposes. However, those injury criteria are still under discussion and further research.

2.2.6 Child restraint systems

BASt is further supporting the work of the UNECE/GRSP Informal Group "Child Safety" in the development of Phase 2 of the new regulation UN-R 129. This phase deals with the implementation of universal booster seats (with and without backrest), were the child is secured by the vehicle 3-point belt, in the regulation. This will also include the stature based system and will be connected to the standing height of the child. After finalization of Phase 2, the group will work on other CRS types in a third phase.
In addition BASt is participating in the "Chest and Abdomen Injury Criteria Task Force", dealing with the Q-dummies. This work includes the reconstruction of accidents with children involved as car occupants The Task Force will give input for the UNECE/GRSP Informal Group "Child Safety" and the Euro NCAP Child Safety Working Group.
After the implementation of the CRS-car interface compatibility assessment protocol, Euro NCAP now works on the replacement of the dummies representing smaller children by dummies representing older children in the dynamic test. BASt is involved in the development of the new protocol which will include the Q6 and the Q10 dummies as rear seat occupants in dynamic ODB and side impact tests. The aim is to improve the protection of larger children respectively small adults on rear seats.

2.2.7 Urban Space: User oriented assistance systems and network management

Together with 30 partners including automobile and electronics manufacturers, suppliers, communication technology and software companies as well as research institutes and cities BASt has joined the national project UR:BAN[1] which started in 2012 running for a four-years-term until April 2016. The project is funded by the Federal Ministry of Economics and Technology. UR:BAN focuses on the development of advanced driver assistance and traffic management systems for cities and pays special attention to the human being in all aspects of mobility and traffic.
UR:BAN also covers the evaluation and prediction of vulnerable road users´ (pedestrians and cyclists) behaviour and movements. With regard to the complexity of urban traffic UR:BAN aims at supporting the driver in performing maneuvers such as driving in narrow or obstructed streets, resolving conflicts with opposing traffic and performing lane changes. By means of novel panoramic sensing and prediction capabilities collisions can be avoided by automatic braking and/or swerving. BASt is involved here with legal expertise since the legal implications of the functions developed in UR:BAN – such as functions performing automated swerving manoeuvres in critical traffic situations – have to be identified and examined.
Furthermore, UR:BAN takes the human being into account by incorporating adaptive support into the design of vehicle controls and displays. BASt is involved in the examination of the aspect of controllability of new driver assistance systems with psychological and legal expertise.

2.2.8 AdaptIVe

Automated driving systems as defined in the EU-project AdaptIVe accomplish surplus operations compared to Advanced Driver Assistance Systems currently in use. They automatically take over operational manoeuvres and "drive" the vehicle longitudinally and cross-ways. Depending on level of automation they differ in terms of tasks still allocated to the driver.
AdaptIVe has the vision of a widespread application of automated driving to improve road safety and address inefficiency in traffic flow. The project approved by the European commission involves 29 research institutes, suppliers and industrial partners. The project develops new and integrated automated functions to improve traffic safety by minimizing the effects of human errors. The general objective of AdaptIVe is to develop new functionalities provided by partially-automated and highly-automated vehicles. Major AdaptIVe-functions are foreseen for different settings, namely highways, urban traffic, and specific close-range manoeuvres. Continuously automated systems like Adaptive Cruise Control and/or Lane-keeping Systems are well established in the market for Driver Assistance Systems today. In combination of these systems, for example the motorway chauffeur, the driver would additionally not required to constantly monitor the "drive" by the function any longer. In legal terms the question is being raised whether legislation is keeping pace with these technological advancements.
Therefore, in addition to the technological aspects, AdaptIVe will address important legal issues that might have impact on the market introduction of automated systems. It will identify the legal implications for manufacturers and drivers and identify boundaries lying in current regulation. Today's legal framework was developed based

[1] www.urban-online.org

on the concept that safe driving is a task of the driver only. Consequently it is likewise a basic legal assumption as well as requirement that the driver must be able to control his vehicle at all times. With a move to automated driving, the driver might temporarily, under certain conditions no longer be needed permanently in this role. Contradictions of such a development with the current legal situation need to be identified.
The main goal of this project is to collect and summarise the important aspects from legislation for different EU-member states on this technology. The secondary objective, from a legal perspective, is to foster mutual understanding and identify the possibly necessary harmonization within the EU member states. This objective shall be achieved by a comprehensive review of the current legal framework regarding automated systems. The review shall cover regulatory law (e.g. national road traffic law), the Vienna Convention on Road Traffic and road traffic liability (of the driver/ vehicle owner). If possible, corresponding aspects of criminal law (specific for the field of road traffic) and administrative offences can be investigated.
Another contribution of BASt is to provide input on impact analysis methology with focus on accident data from the CARE and GIDAS database.

2.2.9 KO-HAF

In 2015 a new research project concerning cooperative, highly automated driving (Ko-HAF) starts. BASt joins a national consortium with automobile and electronics manufacturers, suppliers, communication technology and software companies, research institutes and road administrations. The project aims on development of cooperative, highly automated driving on motorways, i.e. for high speed ranges on well constructed road infrastructure. This includes a significant improvement of forecasts for environmental detection in addition to the automation of the longitudinal and lateral control of vehicles.
The driver can not be taken entirely out of the loop during highly automated driving. Therefore, the readmission of the driving task by the human within a certain lead time will be researched in Ko-HAF as well. Several test vehicles will be constructed for testing and demonstration of highly automated driving under normal conditions and in case of system failure. The new vehicle operation will take place on test tracks and on public roads.
Key activities of BASt – in an academic part – are the evaluation of usability of external data for the highly automated driving, the design of data exchange with third parties and the evaluation of data protection issues.
In a practical part, BASt will conduct driving tests to determine the effect of different levels of automation on the driver's fatigue by EEG (electroencephalography) brain wave measurement and test the effectiveness of possible countermeasures in a second step.

2.2.10 aFAS

The project "aFAS" is funded by the Federal Ministry of Economics and Technology. Following the successful introduction of assisted driving funktions (up to level 2 of the BASt definitions) the next major step will be the integration of innovative driving functions in high and full automated levels. Against this background, the project „aFAS" was built by a consortium of eight partners. The name stands for a driverless mobile warning truck in case of temporary road works. Temporary road works present a danger for employees of road maintenance services. Accidents often occur because motor vehicles crash into the contruction site. The focus is therefore to build a driverless fully automated truck to improve safety for the employees of road maintenance services. The prototype of "aFAS" will be tested on the hard shoulder of the freeway in real traffic. A particular challenge in this project is to meet the requirements of functional sefety and quality of the steering system and the brake system. Also the sensor system has strict quality standards. BASt is involved with legal expertise in respect to driverless automation. Furthermore, BASt is involved in the application for a special license needed for the driverless vehicle. The limited speeds required for road maintenance provide ideal conditions for the first technical realization of driverless driving.

2.2.11 Frontal Impact

With regard to impact direction the frontal impact is still the most relevant one in terms of injury causation for passenger vehicles. Accident data has shown that the stability of passenger compartments has been improved substantially in recent years, even for lighter vehicles. However, the performance of the restraint system becomes now even more important because vehicles are getting stiffer which is leading to a higher deceleration pulse. Additionally, in real-world car-to-car impacts the lighter of the two vehicles has to withstand higher loadings than the heavier vehicle due to the principle of linear momentum.
Therefore, a research project is ongoing to investigate different types of frontal impact test procedures. The objectives are focused on restraint system tests and include tests with a mobile deformable barrier as well. Different anthropomorphic test devices are used to evaluate the protection capability of occupant restraint systems in particular with regard to the prevention of thoracic injuries.

Furthermore, the benefit of different frontal test procedures will be estimated based on real world accident data.

Figure 7: Comparison of two full width frontal impact tests.

2.3 Perspective

As the finished studies show, vehicle safety research is an international issue. Therefore BASt participated in applying for calls of the European framework research programme “Horizon 2020”. In addition national projects complement the work addressing specific research topics. BASt was successful with regard to the projects mentioned below.

2.3.1 SENIORS

Given the demographical change today’s society is facing, a european funded research project named SENIORS (Safety-ENhancing Innovations for Older Road userS) under the HORIZON 2020 framework programme will investigate the safety need for combining different transport modes being used by the elderly as the most vulnerable road users. The consortium consists of a governmental entity, Euro NCAP laboratories, research institutes, dummy manufacturers, OEMs and vehicle suppliers. The project with kick-off on 1 June 2015 has a running time of 36 months. BASt acts as project coordinator.

2.3.2 PROSPECT

Several vehicles that are currently on the market feature automatic emergency braking (AEB) systems either as standard or optional fitment. Assessment procedures for these systems are under development or already available. Their expected positive effect on accident figures is taken into account in consumer testing.
However, current systems suffer from a few limitations. Their intervention in critical driving situations occurs shortly before this event - at a time when the vehicle driver has almost no chance to avoid the accident by itself. As a consequence, this late reaction time makes it difficult for the AEB system to avoid (e.g. vehicle comes to a full stop just in front of the threat), in particular in high speed scenarios and scenarios with obscured pedestrians. If the braking intervention would start too early, there would be plenty of false activations in regular traffic, even in perfectly normal situations - which is not acceptable for traffic flow, from a safety perspective, and last but not least for the driver. Also, current systems only have access to vehicle braking systems. There's no automatic steering system in production (some prototypes are available).
Proactive safety systems especially for pedestrians and cyclists can be more effective, if they tune their intervention timing better to the traffic situation and driver fatigue, and if they use steering intervention additionally to braking intervention.
This is where the PROSPECT (Proactive Safety for Pedestrians and Cyclists) project comes in: PROSPECT will develop advanced Human-Machine Interfaces (HMI) as well as advanced vehicle control strategies for combined steering and braking. The advanced HMI will monitor the driver's directional attention and for instance intervene earlier in cases where the threat is out of the driver's focus. The control systems will make use

of a tremendously increased radial sensor range to find the optimal combination of steering and braking, and advanced sensor interpretation systems will allow to better judge the intention of pedestrians along the vehicle route with respect to their direction of movement.
To estimate the benefit for these new functions, advanced testing and validation methods need to be developed. Current validation of automatic brake systems is carried out on a test track, without irritating objects, road clutter, road signs or lines; thus, in rather artificial surroundings. PROSPECT will not only introduce novel realistic surrogate targets, but also perform testing in realistic surroundings including other moved objects, infrastructural facilities, clutter and the like.
Final output of PROSPECT will be three vehicle demonstrators, to be tested in detail using state-of-the art surrogate targets for pedestrians and newly developed surrogate targets for bicycles and their riders.

2.3.3 CODECS

The deployment preparation of Cooperative Intelligent Transport Systems (C-ITS) involves many stakeholders, including the automotive industry, National Road Authorities and road operators (including their suppliers), automobile clubs and organisations promoting ITS as a tool to safer, smarter and more environmental friendly mobility. COoperative ITS DEployment Coordination Support is a 36 month support action (kick off 1 June 2015) where core stakeholders support the deployment coordination activities on European scale (Amsterdam Group, EC C-ITS Deployment Platform). Beyond elements of aligning deployment roadmaps and of strategy coordination one important planned output will consist in the profiling of standards which are relevant for C-ITS services with infrastructure involvement. This technically important output for ensuring interoperability represents the focus of the BASt involvement in the CODECS support action.

GOVERNMENT STATUS REPORT

Vehicle Safety Standards Branch

Department of Infrastructure and Regional Development

AUSTRALIA

INTRODUCTION

Australia is in the fourth year of a co-ordinated national strategy on road safety, and continues a downward trend in road crash fatalities. However, the trend is not consistent across all road user categories, leaving a number of areas for continued improvement.

Figure 1 **- National Fatality Rates and Road User Type**

THE NATIONAL ROAD SAFETY STRATEGY 2011-2020

The National Road Safety Strategy 2011–2020 was released on 20 May 2011 and presents a 10-year plan to reduce the annual numbers of both deaths and serious injuries on Australian roads by at least 30 per cent. Figure 2 shows the target in conjunction with current fatality rates.

Figure 2 **- National Road Safety Strategy**

The strategy outlines broad directions for the future of Australian road safety, planned initiatives for the first three years and a range of options for further consideration as the strategy progresses. The initiatives and options are set out in four key areas—Safe Roads, Safe Speeds, Safe Vehicles and Safe People.

The strategy included a requirement for a thorough review to be carried out after three years. The review was conducted by Austroads in 2014 under Terms of Reference approved by Australian Commonwealth, State and Territory Transport Ministers. These called for:

An assessment of progress made during the first three years of the NRSS (2011–2013)

A review of the ongoing suitability of the 'high level' content of the NRSS

Identification of implementation priorities and key actions for the next three years.

The review was largely informed by an independent study commissioned from the Centre for Automotive Safety Research(CASR) at the University of Adelaide.

The main findings of the review were:

Good statistical progress was made in the first three years of the NRSS, as measured by overall changes in annual road fatality counts. The number of deaths in 2013 represented a 16.5% reduction relative to the strategy baseline period (2008–2010).

Fatality trends were less positive for certain sub-groups of road users, particularly cyclists, motorcyclists and older drivers.

Progress in reducing serious injury numbers was difficult to determine because of the lack of reliable, nationally consistent, non-fatal crash data. Available hospital data provided some evidence that serious injury levels had not declined in concert with the general downward trend in deaths.

The review found that progress in implementing the 59 'first steps' actions in the NRSS was varied, though there was evidence that most had been actively progressed to some extent and that there had been a number of clear achievements. Progress had been particularly strong in the vehicle safety area.

The review concluded that the 'high-level' content of the NRSS – its guiding vision, targets, key directions and Safe System principles – remain valid and appropriate for the 10-year strategy.

The review identified a range of 'priority areas' where road safety progress appears to have been lagging or where there is opportunity to make significant future gains. These areas included a mix of high-risk road user groups, countermeasure priorities and capacity building activities, and are discussed in some detail in the report prepared by CASR.

The review also concluded that the next phase of NRSS delivery should be guided by a more concise action plan than the initial 'first steps' agenda: it should focus on issues that clearly warrant national attention and that can be addressed through specific national actions.

Action Plan 2015–2017

The main outcome of the review is the three-year Action Plan described in this document.

In developing the content of the Action Plan, an over-arching principle was to focus on actions that will deliver or support significant long-term improvements in the safety of the road transport system – especially through strategic investment in infrastructure safety, vehicle safety and capacity building work.

This gives rise to some important qualifications about the content of the plan:

The Action Plan is not intended to directly target every higher-risk road user or community group identified in the NRSS review. By focusing on actions with system-wide impacts, it is expected that all groups will benefit from the plan.

The Action Plan is not intended to replace the content of the NRSS, but to ensure that national (or nationally-agreed)efforts are focused on strategically important initiatives. Many of the original 'first steps' actions in the NRSS remain important and will continue to be progressed at a jurisdictional level.

The Action Plan covers a number of broad categories:

Prioritizing our investments in infrastructure;

Improving the safety of Australia's vehicle fleet;

Encouraging safer road use; and

Advancing the safe system.

Improvements in the safety of vehicles on Australian roads are therefore fundamental to the Plan and particularly seek to implement priority vehicle safety standards (through the Australian Design Rules) and to accelerate the market uptake of vehicle technologies with significant safety potential.

The specific regulatory actions listed are to consider the mandating of:

Pole side impact occupant protection standards for new vehicles;

Antilock brake systems for new motorcycles; and

Electronic stability control for new heavy vehicles.

Targeted new technologies include Autonomous Emergency Braking, Lane Departure Warning and Intelligent Speed Advisory systems. These are to be promoted through collaboration between ANCAP (the Australasian New Car Assessment Program), individual jurisdictions (including the Commonwealth and States and Territories) and other stakeholders.

More detail on Australia's National Road Safety Strategy 2011-2020 and Action Plan 2015-2017 are available at https://www.infrastructure.gov.au/roads/safety/national_road_safety_strategy/index.aspx.

ANCAP

The Australian Government continues to be a member and major supporter of the Australasian New Car Assessment Program, with financial support being confirmed at least until 2015-16. ANCAP is currently in a period of transition, with testing and rating protocols to be aligned with those of Euro NCAP from 2018. ANCAP ratings remain significant in Australian consumer choice, with 81 percent of light vehicles sold carrying a 5-star rating (December 2014). In this period, an ANCAP rating was available for 92 percent of light vehicles sold.

REVIEW OF THE MOTOR VEHICLE STANDARDS ACT 1989

On 16 January 2014 the Assistant Minister for Infrastructure and Regional Development, the Hon Jamie Briggs MP, announced a comprehensive review of the Motor Vehicle Standards Act 1989, with a view to reducing regulatory costs to business and individuals and improving the safety and environmental performance of road motor vehicles.

The last major review of the *Act* was conducted in 1999. Since this time there has been significant change in the domestic and global environment of vehicle manufacturing, in vehicle technologies and in purchasing preferences of consumers. A public consultation process was conducted in late 2013 to seek feedback from interested parties on the need for a review and on the currency and operation of the legislation.

The review is currently in progress and has involved a public submission process along with consultations on possible future options for the Act. An Options Discussion paper was prepared and a number of public workshops were conducted in order to facilitate the process. The public submissions are being used to develop recommendations to Government and to prepare a Regulation Impact Statement for any proposed changes to vehicle regulation.

More detail on the review is available at
https://www.infrastructure.gov.au/roads/safety/national_road_safety_strategy/index.aspx.

HARMONISATION OF ADRS WITH INTERNATIONAL STANDARDS

Pending the outcome of the review, the Australian Government has accelerated harmonization of the Australian Design Rules (ADRs) with international standards, in particular by application of a further round of UN Regulations in anticipation of the advent of International Whole Vehicle Type Approval.

Application of UN Regulations means that in effect relevant ADRs are automatically updated when UN Regulations are updated, providing immediate access to the Australian market to vehicles featuring the latest safety technology.

Australia is committed to an international system for developing vehicle standards and is active participant of the UN World Forum for Harmonization of Vehicle Regulations.

REGULATORY DEVELOPMENTS

The ADR program works towards an agreed set of priorities in line with international regulations through UN WP29 activities and also Australia's National Road Safety Strategy 2011-20.

Brake Assist Systems (BAS)

In November 2013, Australia mandated BAS for light passenger vehicles and light commercial vehicles. Requirements will apply to new model vehicles from November 2015, to all new light passenger vehicles from November 2016 and all new light commercial vehicles from November 2017.

BAS has been shown to reduce the number and severity of crashes involving vulnerable road users, but can have broader application to other types of crashes where braking is a factor.

Electronic Stability Control (ESC)

In 2009Australia mandated ESC for light passenger vehicles. Requirements applied from November 2011 to new model vehicles and from November 2013 to all new vehicles.

In November 2013, Australia extended requirements for ESC to light commercial vehicles. As for BAS, these requirements will apply from November 2015 to new model vehicles and from November 2017 to all new vehicles.

Antilock Brake Systems (ABS) and the National Heavy Vehicle Braking Strategy (NHVBS)

Australia has diverse range of heavy vehicles and some heavy vehicle combinations that are not common in other countries. It is therefore important to ensure that braking technologies are compatible and suited to the combinations used in Australia, and the Australian road environment.

The NHVBS was released in 2008 and has been incorporated into the NRSS. Under Phase I of the NHVBS, Australia has mandated ABS for heavy trucks and buses and ABS or load proportioning brake systems for heavy trailers. Requirements have applied to new model vehicles from July 2014 and to new vehicles from January 2015. As part of these requirements:

- Trucks and buses equipped for towing must have facilities to power Electronic Braking Systems (EBS) (such as ABS/ESC) for the trailer, as well as provide the correct signaling for EBS operation where fitted.

Trailers with rear couplings must provide wiring suitable to transmit ABS/ESC/EBS functions to follow-on trailers.

There are expected to be significant safety benefits resulting from these changes.

Pole Side Impact

Vehicle occupant side impact fatalities account for around 20% of the road toll in a number of studied countries for example: Australia, Germany, the United Kingdom, the Republic of Korea and the United States).Australia proposed development of a Global Technical Regulation (GTR)on Pole Side Impact in 2010 and chaired the informal working group that developed the GTR.

GTR 14on Pole Side Impact was adopted by Working Party 29 on 13 November 2013. The GTR was subsequently transposed into a UN Regulation, which was adopted in November 2014.

EuroNCAPalso introduced test requirements based on the GTR on 1 January 2015, showing how regulatory and non-regulatory approaches can work effectively together.

Australia has commenced the domestic rulemaking process, in line with the NRSS and Action Plan 2015-2017. A Regulatory Impact Statement expected to be released shortly.

The performance requirements of the GTR (and UN Regulation) will reduce vehicle occupant injury risk (particularly head injury risk) in pole side impact crashes as well as vehicle-to-vehicle and other side impact crashes.

ABS for motorcycles

The case for mandating ABS for motorcycles is being considered, in line with the NRSS and Action Plan 2015-2017. Research on the real-world effectiveness of ABS in reducing road trauma is underway in conjunction with the Victorian Government in Australia. This research is expected to be finalized by mid- 2015.

ESC and the NHVBS

The case for mandating ESC for heavy vehicles is being considered, in line with Phase II of the NHVBS and the NRSS and Action Plan 2015-2017. Consultation is underway and the work is expected to be finalized by early 2016.

STATUS REPORT, EUROPEAN ENHANCED VEHICLE-SAFETY COMMITTEE (EEVC)

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INTRODUCTION

The European Enhanced Vehicle-Safety Committee (EEVC) was formed in February 1971 in Rome and has been active in participating in the ESV-programme since that time. EEVC comprised 8 members representing the administrations in charge of vehicle safety regulation from France, Germany, Italy, the Netherlands, Poland, Spain, Sweden and the United Kingdom.
During those four decades the environment of pre-regulatory research in the field of vehicle safety in Europe (and world-wide) has considerably evolved and it was necessary to realign EEVC to keep up with the future challenges. Therefore the EEVC Steering Committee agreed on new Transient Terms of Reference [1] which allow more flexibility and open EEVC to non-EEVC countries.

NEW TRANSIENT TERMS OF REFERENCE

EEVC, which has contributed to the former IHRA activities from the beginning, is convinced that pre-regulatory safety vehicle research has to be approached at a world-wide level; within that objective the Steering Committee of EEVC has confirmed that non-EEVC countries can participate at WG level to share their research.

The EEVC Steering Committee had an internal reflection on its future and how to determine future research directions and priorities.
As a result of the discussion new Transient Terms of References (TToR) were agreed.
According to the new TToR the objectives of EEVC are:

- to provide impartial scientific advice to support the development of European vehicle safety standards and legislation,
- to co-ordinate European research activities with regard to harmonised vehicle safety regulations,
- to support specific research, evaluate technical proposals and define scientific tools (such as biomechanical criteria, test dummies, test procedures) needed for further development of technical standards and legislation,
- to advise European governments, the United Nations Economic Commission for Europe (UNECE) World Forum for Harmonisation of Vehicle Regulations (WP29), and the European Commission including their groups of experts on vehicle safety, in the area of vehicle safety improvement,
- to organise, upon request, European representation to international research groups in the area of vehicle safety,
- to advise other groups if called upon, on issues related to vehicle safety,
- to promote enhanced vehicle safety by publishing research results

The government of any EU member state, which has sufficient scientific capacity to carry out practical research relevant to vehicle safety and is willing and able to contribute effectively to coordinated EEVC research programmes, may become a full member of EEVC.
Application for membership by the government administration in charge of vehicle safety regulation of an EU member state shall demonstrate that it has sufficient scientific capacity or is in a position effectively to contribute to EEVC research. Application shall be made to full members who shall agree to its membership unless one-third of the existing full members object.
At the end of each year, the secretary general shall ask all the full members to indicate to each other their volunteer to continue and to participate actively to the EEVC work for the year to come.
In case of negative answer of a full member, this full member shall be designated as “sleeping full member” and shall not be part of the steering committee for the year to come with no possibility to vote.
The full members of the year 2015 are France, Germany, Italy, the Netherlands, Poland, Spain and the United Kingdom. It is worthwhile to note that some of these members are members of Euro NCAP, too.

The EEVC Steering Committee has decided that the setting of the research agenda is the critical parameter in the further work of the EEVC, for both the scope of its activities and its priorities. It was agreed that short term and longer term research needed to be considered together.

NEW EEVC WEBSITE

The old EEVC website has been subject to major hacker attacks and was shut down for this reason. In 2014, the new EEVC website (www.eevc.org) has been launched. The web site serves as an information platform for all interested parties, both EEVC members and external, with a broad pool of documents/publications. Moreover, it is a useful tool for coordination and publication of the EEVC work, as well as for the internal data and information exchange. Each working group/task force has it is own member area with the opportunity to promote their work, share documents and make it available for the members before it will be published in the public area of the website.

ADVANCED ANTHROPOMETRIC CRASH DUMMIES (WG 12)

This working group is the longest active Working Group within EEVC. The scope of the Working Group includes adult as well as child crash dummies and corresponding injury criteria.

Child Dummies

The main work of EEVC WG12 during the last years was related to child safety. From a study completed in 2008 [2] it was concluded that the Q dummies offer a major step forward compared to the current P dummies used in UNECE Regulation 44. The Q family consists of a new born, a 9 month, a 1.5 year, a 3 year and a 6 year old dummy. The 10 year old version of the Q dummies was developed within the framework of the European project EPOCH [3].

The objective of the work of WG12 was to advise on the Q family for child safety in the new UNECE regulation 129 on “Enhanced child restraint systems”.

The main focus of the work was on the Q10 dummy. One report regarding the Q10 dummy was finalized so far "Q10 dummy Report - Advanced Child Dummies and Injury Criteria for Frontal Impact" [4]. The purpose of this report was to advise on an upper limit child dummy for frontal impact including advise on abdominal load sensing and injury criteria and corresponding tolerance.

Currently EEVC WG12 is working on a second report regarding the Q10 dummy, "Advice on the Q10 dummies for side impact testing". It will focus on the side impact biofidelity improvement of the Q10 dummy updated by a side impact kit. The dummy with this kit was evaluated in pendulum and Heidelberg type side impact sled tests and showed an improved biofidelity compared to the standard Q10.

WG12 will continue to work on a third deliverable "Advice on the use of the thoracic compression criteria balanced with possible abdominal pressure", which will be mainly based on review of the work conducted by a EEVC task group especially dedicated to this topic (see below).

Whiplash Dummies/Seat Performance Criteria

After completion in 2008 of an extensive evaluation of various crash dummies for low-speed rear impact, from which it was concluded that the BIORID is the most suitable dummy for this type of accident [5]; WG 12 has focused its activities on seat performance criteria (whiplash criteria). In Dec. 2010 an interim report on the analyses of real world (insurance) data was finalized. The main finding of this preliminary study was that the neck injury criterion NIC and upper neck shear force seem to be the best predictors for short and long term neck complaints following a rear-end impact.

The work on this topic continued using a larger insurance database and new seat tests with the BIORID dummy in order to verify and further elaborate on these initial findings. This EEVC WG12 report “Evaluation of Seat Performance Criteria for Future Rear-end Impact Testing” was provided to the UNECE GTR no. 7 informal group on head restraints and the BioRID Technical Evaluation Group (BioRID TEG) to serve as a basis for discussion [6] at a Group of Experts Whiplash Injury Criteria Meeting in September 2014 in Berlin in advance of the IRCOBI conference. However, the discussion on suitable injury criteria for whiplash associated disorders for regulatory purposes is still ongoing.

Further Work of WG12

In 2009 a status report concerning the 50th percentile adult male WorldSID dummy was completed [7] and in 2010 a status report concerning the 5th percentile female WorldSID dummy [8]. The development of the 5th percentile female WorldSID dummy has been carried out within the European R&D project APROSYS. An extensive international evaluation of this female dummy is still taking place and members of EEVC are participating in the Informal Working Group for Side Impact dummies that is considering the appropriateness of the 5th percentile female WorldSID for future regulations.

However, the 50th percentile adult male WorldSID dummy has been adopted as a regulatory tool for the GTR No. 14 on Pole Side Impact which was established in the Global Registry on 13th November 2013 [9].

Since the beginning of 2015 Euro NCAP is also using the 50th percentile adult male WorldSID dummy in its updated side [10] and pole test procedure [11].

Further work of EEVC WG12 during the last years includes advice on injury criteria for frontal impact dummies. Proposed injury criteria for the Hybrid-III 5% female to be used in an updated ECE R94 test procedure including a full width frontal test were revived. Furthermore the use of a proposed chest deflection criterion DEQ based on chest deflection measured in Hybrid III dummies and seat belt force was discussed within WG12.

SIDE IMPACT PROTECTION

The car side impact problem in Europe remains substantial and a frequent cause of fatal and serious injury. For this reason, the EEVC's Working Group 13 has been active over years in providing advice concerning measures to reduce the risk of injury to road vehicle occupants in the event of a side impact and issued a report in March 2010. In this latest period, the working group focussed on determining the accident and casualty profile of European side impact accidents, and considered the development of a modified barrier based, pole and interior headform test procedures. The societal benefits and associated costs of a series of potential options for the modification of UNECE Regulation 95 were also considered.

French, Swedish and UK national data were analysed and showed that around one quarter of car occupant casualties are injured as a result of a side impact. However, this rises to between 29% and 38% for those fatally injured, illustrating the more injurious nature of this type of collision. In side impacts 60% of casualties are 'struck side' (SS) occupants and 40% are 'non-struck side' (NSS). The proportion of fatal casualties in simple car to car or car to pole impacts is substantial, 50% and 67% for the United Kingdom and France, emphasising both the relevance and importance of the mobile deformable and pole impact tests.

An analysis to estimate the likely societal benefits for modifications to UNECE Regulation 95 was completed for Great Britain; this highlighted that there is still much benefit to be gained from the side impact safety measures in place today for Europe (i.e. UN-ECE Regulation 95 and Euro NCAP). However, the introduction of a regulatory pole test (to the current Euro NCAP specification with full dummy assessment) into the existing UN-ECE Regulation 95 would deliver significant benefits to society in terms of fatal and serious injuries.

Whilst the configuration of the current Regulation 95 barrier based test remains relevant, it is accepted that a more representative barrier is desirable and supportable from a safety perspective. Key characteristics of a revised test have been defined, though further work is needed to finalise the specification of the AE-MDB barrier Version 3 before it can be considered for use.

An analysis of National and in-depth data has been identified as the requisite first step towards better understanding of the injuries to non-struck side occupants, their associated mechanisms and determining the effectiveness of potential countermeasures.

Euro NCAP has taken the outcome of the AE-MDB research on board. An expert group of former WG13 and APROSYS members preceded the work after WG13 was formally put on hold.

Based on the recommendation of the expert group Euro NCAP focussed on the final stiffness corridor design followed by an accreditation process for the barrier manufacturers.

From 2015 onwards the AE-MDB replaces the ECE R95 barrier in Euro NCAP testing [10].

IMPROVEMENT OF CAR CRASH COMPATIBILITY AND FRONTAL IMPACT

The working group on compatibility was initiated in 1996 and worked with methods to test and evaluate compatibility in frontal impacts as well as improve frontal impact protection. Compatibility within the working group is understood as both partner and self protection as compatibility should not compromise existing safety levels.

Research activities included national research programs as well as European projects like the 5th Framework project VC-Compat and the FP7 Project FIMCAR. WG 15 conducted experimental tests, computer simulations,

and analyses of different databases to understand and describe the key issues in crash compatibility including structural interaction, global force levels, and compartment strength.
The results of the FIMCAR project identified the need for both full width and offset frontal impact tests in regulations. Test protocols, evaluation criteria, and benefit analyses were developed in the project and provided to the UNECE Informal Working Group on Frontal Impact. Although not all results for the FIMCAR project were accepted the incorporation of a full width rigid barrier test is under final review by the UNECE working party on passive safety (GRSP).

EEVC CURRENT ACTIVITIES

Restart of WG21

On its December 2014 meeting the EEVC Steering Committee decided to reactivate EEVC WG 21. It was the feeling of the Steering Committee that an independent look on the current accident data is needed with regard to detect research priorities on vehicle (and road) safety for the future. There might be still white spots but also a critical review of what has been reached in the last decade shall be undertaken.
The outcome of this research shall help to determine future research directions and priorities.

THOR Task Force

The main role on this work item of WG 12 was to advise on an advanced frontal dummy for regulatory use with appropriate injury risk functions. For this purpose WG 12 followed closely the international activities concerning the THOR dummy taking into account the recommendations formulated by EEVC in 2006 [12]. Specific to lower leg injuries, EEVC WG 12 published a study in March 2009 addressing the THOR-Lx Design and Performance [13].
Meanwhile the production version of the 50% percentile male THOR-M is available and the first THOR-M dummies have been delivered to Europe. There are also some older THOR upgraded with a special THOR ModKit. NHTSA is in the process of the federalization of the THOR.
Euro NCAP has recently published an updated roadmap [14] in which the use of the THOR in an advanced frontal impact test procedure is announced.
However, there are still a lot of open issues related to the use of the THOR for regulatory purposes and consumer testing. Therefore a new EEVC task force which is open to all interested parties willing to contribute shall work on those open questions.

Q Dummy Chest and Abdominal Injury Task Force

The CASPER project failed to develop injury risk functions for the Q-dummies' chest because there were only few valid accident cases available with AIS 3+ injuries for frontal impact and only 2 valid cases with AIS 3+ injuries for lateral impact. In addition in a number of accident reconstruction cases chest deflection measurement data was not available.
Abdominal injury risk functions were developed within the CASPER project for Q3 and Q6 only due to a lack of instrumented dummies of other sizes.
Accident reconstruction was outside the scope of the EPOCh project in developing the Q10.
This is why some interested parties (BASt, Britax, Dorel, Humanetics, IFSTTAR, LAB, TRL, TUB/VFSB, UTAC, VTI) started a Q Dummy Chest and Abdominal Injury Criteria Task Force in April 2013. No funding was available for the program at this status. All partners are contributing on a voluntary basis or are securing support by their own means. After the start of the Task Force other organizations joined (e.g. ADAC, BMW, PDB).
It was the feeling of some of the involved parties that a more formal structure or umbrella was needed to improve the support and speed up the work of the group. This is why EEVC has taken this task force under its wings. The task force is chaired by Dr. Heiko Johannsen.
Results shall be reported to UNECE GRSP for further consideration on regulation, EEVC WG12 and Euro NCAP.
The objective of the task force is to deliver a scientific basis for the definition of chest and abdomen performance criteria. The participants agreed to concentrate on the objectives and to collaborate openly in order to reach the objectives.
New partners that contribute resources to the work described above are welcome.

Further Work

Virtual testing / human body models

The possible use of virtual testing was discussed within WG12. This could be a future work item of a working group. Based on the results of the EC funded project IMVITER project the use of the virtual testing for the regulatory process was discussed. Based on the EU 371/2010 a flow chart was obtained within IMVITER. The developed methodology has been applied with 3 regulatory pilot tests. Both the Virtual Tests and the reference Tests are merged to obtain a response corridor where the model needs to be "included". As possible application of virtual testing in a regulatory context three options were identified, which could be further evaluated by the working group

- Use the Digital Human Body Models in current type approval process to provide supplementary information where dummies or experimental tools show limitations.
- Use of virtual testing as aid for the definition of test tool based procedures, improving experimental test tool, e.g. impactors or dummies
- Only virtual testing based approval including Digital Human Body Models.

Injury criteria for elderly

EEVC has signed a letter of support for the EC Horizon 2020 SENIORS project (Safety Enhanced Innovations for Older Road Users). The SENIORS project is expected to start in June 2015.

The efforts put the last years in road safety derived to a reduction of almost 48% of total fatalities in Europe, and the number of elderly fatalities due to road accidents has also decreased. However, among all the road fatalities, the proportion of elderly is steadily increasing. SENIORS aims at providing the needed knowledge and enable the suitable tools to reduce the number of elderly fatalities and serious injuries suffered in road traffic accidents in the near future. The increase of the level of protection for the elderly road users will be achieved by the in-depth understanding of the injury causation and mechanisms of this particular sub-group of VRU by enhancing the introduction of advanced safety systems through the implementation of assessment tools for elderly protection based on PMHS studies, volunteer testing and accident data (thus real-based).

The main goal of SENIORS project is to improve the safe mobility of the elderly, including obese, using an integrated approach and real-based knowledge that includes the main modes of transport as well as the particularities of this vulnerable road user group.

Thus, this project will investigate and assess the injury reduction that can be achieved through innovative tools and safety systems targeting the protection of the elderly as passenger car occupants, external road users (pedestrians, cyclists, e-bike riders) and while using other means of transport (such as public buses).

As such EEVC is looking forward to a good cooperation with SENIORS initiative. This is preferably to be established via joined meetings, active contribution in the course of the dissemination activities, next to the participation in Advisory Board meetings.

European part of the Student Safety Technology Design Competition

Three finalist teams from each region (Asia, Europe, North America) compete for top honors at this 24th ESV Conference in Gothenburg where their prototype devices/demonstrators will be on display in the exhibition hall.

EEVC has taken over the responsibility for organizing the European part of the student competition ten teams from Europe submitted abstracts. A panel of five judges from Spain, Poland, Germany, France and Sweden reviewed and evaluated the abstracts.

Based on the evaluation some teams have been selected for the competition. In March/April 2015 a panel of judges – members of the EEVC Steering Committee - shall visit the selected teams' universities to evaluate the developed safety concept and functional design model. Based on the evaluation three teams have been selected for the competition.

The European Commission is sponsoring the European part of the student competition.

CONCLUSION

Since the start of EEVC in 1971 the environment of pre-regulatory research in the field of vehicle safety in Europe (and world-wide) has considerably evolved. EEVC has now realigned and agreed on new Transient Terms of Reference to keep up with the future challenges. The new TToR allow more flexibility and open EEVC to non-EEVC countries. Therefore EEVC is inviting non-EEVC countries to contribute to its activities like the new THOR and the Q dummy chest and abdominal injury task forces.

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KOREA GOVERNMENT STATUS REPORT

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Paper Number 15-0470

ABSTRACT

Korea has maintained its status as the world's fifth largest player in auto production. Development of both the domestic economy and the auto industry has led to quantitative growth of the auto market with the number of registered car exceeding 20 million. However, Korea still lags behind advanced countries in terms of reducing the number of road traffic accidents and fatalities. Under the circumstance, the Korean government set comprehensive measures to reduce traffic deaths and has put cross-ministry efforts to meet the challenge. In this context, the government is devoted to harmonizing domestic vehicle safety regulations with international regulations while improving the domestic regulations to better fit with the traffic environments of the country. In addition, the government is inducing vehicle manufacturers to produce safer vehicles by strengthening the New Car Assessment Program.

GENERAL STATUS OF KOREAN VEHICLES

Korea has managed to maintain its place as the fifth largest global player in vehicle manufacturing for a decade from 2005 to 2014 (see Figure1.). Such achievement has been possible thanks to the significant progress achieved by the domestic vehicle industry coupled with steady economic growth during the period.
After reaching 1 million in 1985, the number of registered vehicles in Korea had continuously increased and hit 20 million mark in 2014 while the ratio of citizens per vehicle has dropped to 2.5 (see Figure2.).

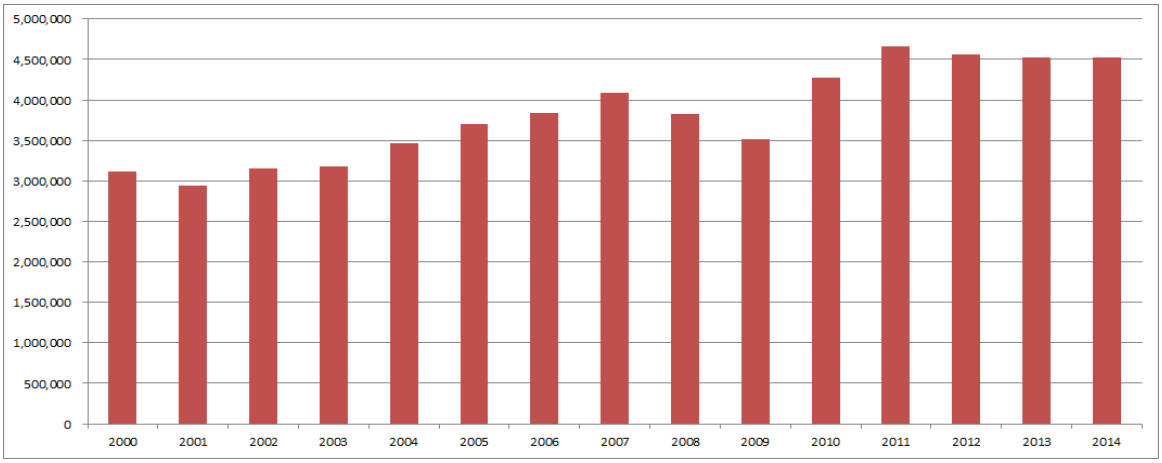


Figure1. Number of vehicles manufactured

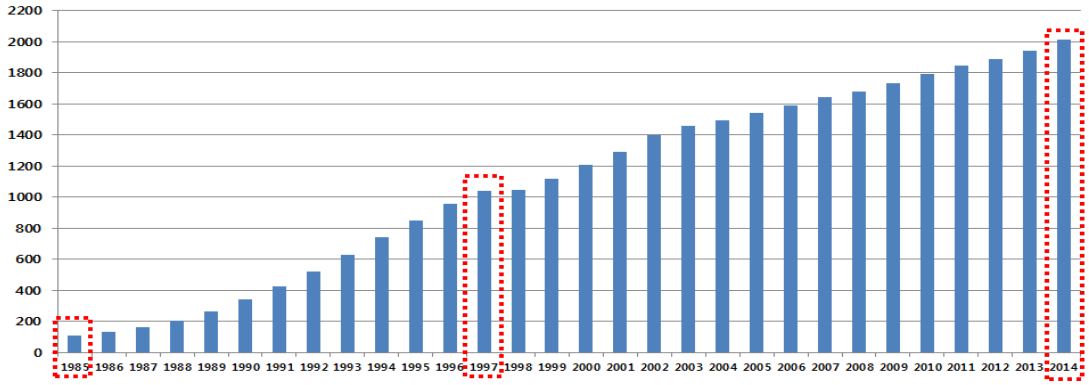


Figure2. Total number of registered vehicles

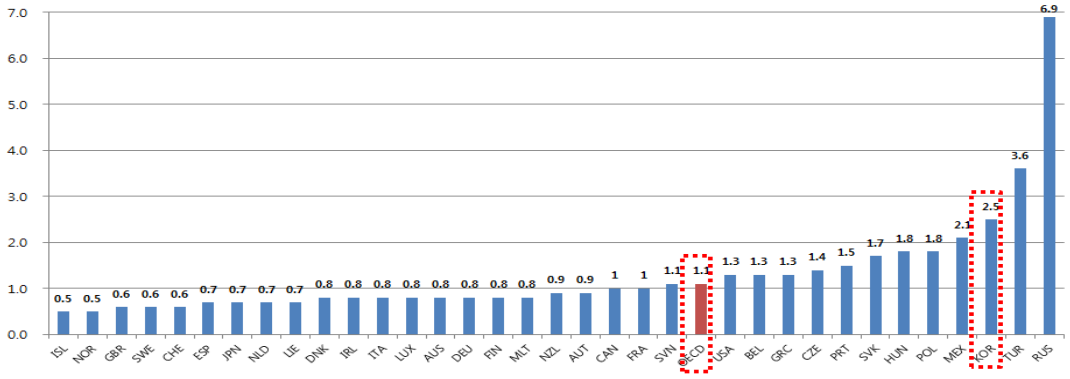


Figure3. Number of deaths from traffic accidents per 10,000 vehicles

Despite the growth of domestic auto market, the traffic fatality per every 10,000 vehicles is 2.5 persons as of the end of 2011, which is one of the lowest ranks among the OECD member countries (see Figure3.).
However, the number of deaths caused by road traffic accidents has decreased steadily since 2004 and recorded less than 5,000 for the first time in 2014 (see Figure 4.).

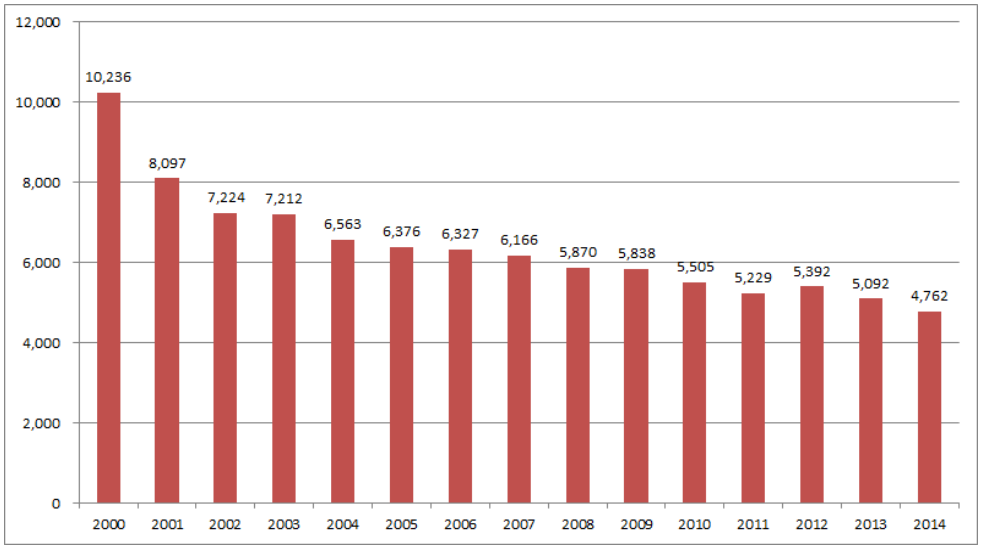


Figure4. Number of deaths from traffic accidents

The recent two years recorded the fastest decline in the traffic-related death rate in a decade. The average annual decline rate of road traffic deaths was 2.4% from 2004 to 2012 and 6.0% during the recent two years. The average annual road traffic death rate dropped by 2.4% from 2004 to 2012 and 6.0% during the recent two years. The road traffic fatality rate also went down from 2.41% in 2012 to 2.36% in 2013 and further declined to 2.1% in 2014. The government's efforts to reduce traffic accidents and fatalities played an important role in cutting the road traffic death rate. In particular, the Comprehensive Plan to Reduce Traffic Fatalities 2013-2017 was released in July 2013 and has been implemented to enhance vehicle safety, promote public awareness on traffic safety and improve road infrastructure.

With the goal of cutting road traffic fatality rate by 30% by 2017, five strategies were set under the Comprehensive Plan to Reduce Traffic Fatalities. Main action plans to achieve the strategies include obligating the use of safety belt for all vehicle passengers on expressways, conducting campaigns with active involvement of citizens and establishing institutional basis for Emergency Call System(e-call system) to further advance the accident response system.

Table1. Comprehensive plan to reduce traffic fatalities

Strategies & Action Plans
1. Creating the culture of valuing people the most to promote traffic safety - Advancing traffic regulations and applying stricter punishment for traffic violations - Advancing insurance systems and rooting out illegally registered cars under someone else's name - Strengthening education on traffic safety - Conducting traffic safety campaigns with the participation of citizens
2. Expanding infrastructure to promote safety - Eliminating causes of traffic accidents by securing safety infrastructure in the road environments - Realization of smarter and safer roads - Securing safety on the road for safer daily lives of pedestrians - Strengthening vehicle safety regulations and expanding the application of advanced safety devices
3. Establishing customized measures for relatively vulnerable groups in the transportation sector - Strengthening safety management to prevent accidents caused by senior citizens - Spreading customized safety education programs and creating culture of considering others - Strengthening traffic safety for children - Strengthening traffic safety for families with multi-cultural backgrounds and foreigners residing in Korea
4. Enhancing traffic safety for vehicles used for business purposes and advancing the accident response system - Strengthening safety management for vehicles used for business purposes - Tightening enforcement on traffic violations related to vehicles for business use and providing guidance to traffic offenders - Providing information on road safety and building up the capacity of professionals in the related fields - Introduction of the Emergency Call System and prevention of secondary accidents
5. Improving the system of traffic safety policies - Strengthening managing and adjusting functions of traffic safety policies - Enhancing local governments' capacity for traffic safety - Securing stable financial resources for traffic safety programs - Providing more support for traffic safety programs of local governments

The following is the recent legal development in vehicle regulations, in terms of their improvement and harmonization to international regulations and the New Car Assessment Program aimed at improving vehicle safety.

IMPROVEMENT IN VEHICLE REGULATIONS

Safety-belt reminder for unbuckled passengers

In the case of vehicle crash, whether a passenger fastens a seatbelt or not is a crucial determinant of how seriously the passenger is injured. It was found that the fatality and serious injury rates surged by more than nine times when seat belts were not worn by passengers on the rear seat in collision tests conducted by KATRI in 2010. Even though the use of seat belts by all vehicle passengers is mandatory on expressways, the rate of buckled rear seat passengers remains at 19%[1]. So, with the aim of promoting the use of seat-belts, the government plans to make audible warning devices that send alarms to unrestrained rear seat passengers as one of evaluation items of the new car assessment starting from 2015.
In addition, Korea proposed the mandatory installation of Safety-belt Reminders for rear seats at the WP.29 Working Party on Passive Safety in December 2014[2]. The rationale is the low safety-belt wearing rate for rear seats in nations such as Korea, which becomes all the more important for such nations where occupancy rate for rear seats is relatively higher.

Mandatory installment of a Daytime Running Lamp (DRL) for all vehicles

After the introduction of DRL in 2010, installment of DRL was initially optional and became mandatory in June 2014.
The mandatory use of DRL is based on results of studies that suggest the positive impact of DRL on ensuring the field of visions of drivers and road users under foggy, rainy, dusty and other adverse weather conditions during daytime as well as in the evening and at dawn. A study shows that mandatory installation of DRL would reduce the regional traffic accidents by 19% in average, suggesting an expectative traffic-accident prevention effect [3].

Strengthening safety regulations for vehicles used for commuting school children

The MOLIT enhanced vehicle safety regulations to prevent accidents involving backing school bus, traversing children after getting off the school bus or children accidentally stuck in the school bus. Major strategies to prevent accidents caused by those vehicles include installing automatic stop signal devices near the driving seat to catch the attention of other drivers who try to overtake the vehicle and installing Rear view camera and backup audible warning devices. In addition, wide-angle mirrors which are currently installed on the right side of the driver's seat will also be extended on the left to minimize blind spot areas for drivers [4].

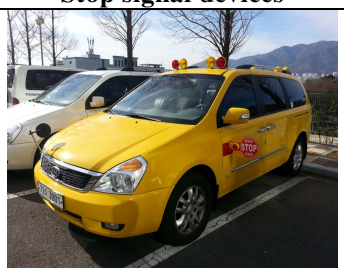
Stop signal devices	Wide-angle mirror	Rear view camera
		

Figure5. Commuting school children applied Strengthening safety regulations

Strengthening performance requirements for Endurance (Auxiliary) Braking System for the safety of vehicles used for commercial purposes

A series of road accidents has claimed many lives in Korea as large-sized passenger vehicles carrying groups of students deviated from steep and winding downhill roads in local areas or plunged off mountain roads. In this regard, given the geographical features of Korea, the government strengthened the endurance (auxiliary) braking regulation in June 2014. While Endurance (Auxiliary) Braking System is usually used to support service brakes, researchers suggest that Auxiliary Braking System can also be used to prevent brake fade on steep downhill roads.

In this regard, the use of high-performing Endurance (Auxiliary) Braking System is expected to contribute to enhanced braking performance on steep downhill roads.

HARMONIZATION OF VEHICLE REGULATIONS

As a member country of the 1958 Agreement and the 1998 Agreement, Korea has updated the domestic regulations in accordance with international regulations since 1996. As a result, 47 UN Regulations and 9 UN GTRs were reflected on domestic regulations. The table below shows the updates made in the domestic regulations.

Table2. Status of harmonization in Korea

Year	UN Regulations	UN GTRs
2006	- UN R13H : Passenger vehicle brake - UN R19 : Front fog lamp	- GTR No.1 : Door locks & Retention
2008	- UN R14 : Safety Belt Anchorages - UN R53 : Motorcycle Installation - UN R57 : Motorcycle Headlamps - UN R107 : Safety Inclination Angle - UN R39 : Speedometer - UN R95 : Side Collision - UN R123 : Semi-AFS	- GTR No.3 : Motorcycle Brake - GTR No.9 : Pedestrian Safety
2009	- UN R48 : Hazard Warning Signal - UN R73 : Lateral Protection	-
2010	- UN R6 : Side Direction Indicator - UN R10 : EMC - UN R13 : Spring Brake - UN R46 : Rear View Mirror - UN R79 : Steering Effort - UN R87 : DRL(Optional) - UN R112 : Asymmetric Headlamps - UN R123 : Full AFLS - UN R125 : Field of Vision	- GTR No.6 : Safety Glazing - GTR No.7 : Head Restraint - GTR No.8 : ESC
2011	- UN R64 : TPMS - UN R85 : Engine and Net Power - UN R42 : Bumper - UN R91 : Side Marker Lamp	-
2012	- UN R1,2,8,20,72,112,113 : Headlamps for Motorcycle - R53 : Light & Lighting devices for Motorcycle - UN R13 : Brake Assist System(BAS) - UN R107 : Minimum Turning Radius	- GTR No.4 : WHDC - GTR No.11 : Engine emissions for Non-Road Machinery
2014	- UN R30, 54 : Pneumatic Tyres - UN R100 : Electric Powertrain - UN R73 : Lateral Protection - UN R58 : Rear Underrun Protection - UN R55 : Coupling Components - UN R21 : Power-operation of windows - UN R119 : Cornering Lamps - UN R7 : Front & Rear position Lamps, Stop lamps and End-outline Marker Lamps - UN R3 : Retro-reflecting devices - UN R4 : Rear Registration plate lamps - UN R23 : Reversing lamps - UN R70 : Rear Marking plates	- GTR No.5 : ODB
Total	**47**	**9**

Researches on 14 items including brake lining, wheels and camera monitoring systems for replacing mirrors will be conducted in 2015 to harmonize domestic regulations with international ones. In addition, medium and long term plans (2016-2019) for researches on autonomous vehicles and related new technologies along with vehicle regulations are being developed.

STRENGTHEN NEW CAR ASSESSMENT PROGRAM (NCAP)

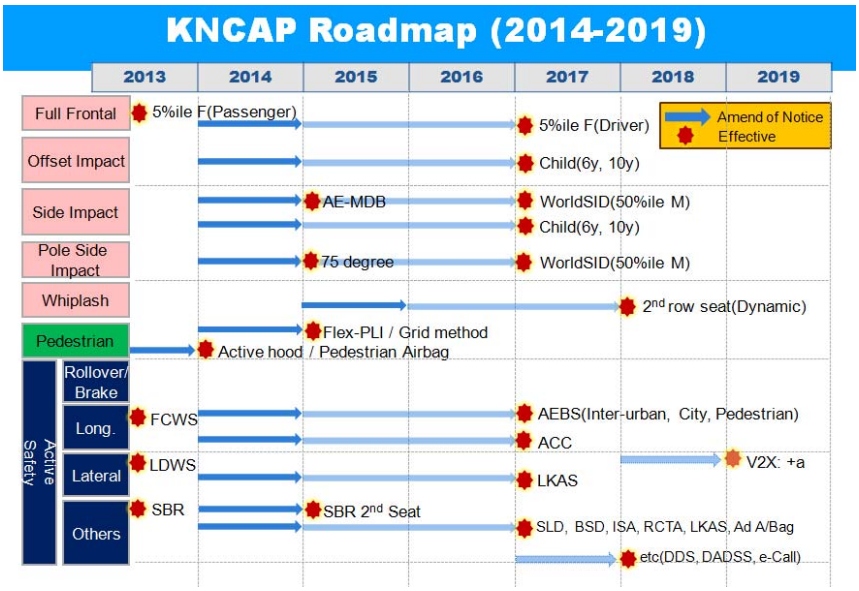
The Korean government is encouraging the production and sale of safer vehicles and is providing information about safety of vehicles by implementing New Car Assessment Program and disclosing its result. A total of 127 types of vehicles have been evaluated by 2014 since the New Car Assessment Program was introduced in 1999. The government has upgraded the assessment program by widening the pool of evaluated vehicle types ranging from compact cars to vans and trucks and by adding evaluation items. The Comprehensive Grading System was expanded as they are now in 2013 to help consumers to make more informed decisions. The applied percentage of evaluations items was also changed based on data about domestic traffic accidents. As a result, the percentage of pedestrian safety was set at 25% given the high fatalities of pedestrians (see Table3.).

Table3. Sample of the Comprehensive Grading System of KNCAP

Evaluated Fields		Crash worthiness [65%]					Pedestrian safety [25%]	Driving safety [10%]		Accident prevention safety [additional point 1.0]		
Evaluation items / Vehicle Type		Full frontal impact [16.0]	Offset impact [16.0]	Side impact [16.0]	Seat [10.0]	Pole side [+2.0]	Pedestrian safety [30]	Rollover resistance [5.0]	Braking [5.0]	Forward collision [0.4]	Lane departure [0.3]	Seat belt [0.3]
Small	**xxx**	15.9 (99.4%)	13.5 (84.4%)	16.0 (100.0%)	8.7 (87.0%)	2.0 (100.0%)	17.0 (56.7%)	4.4 (87.7%)	3.9 (78.0%)			

The mid-to-long term road map was established in 2014. The main strategies under the road map include the introduction of advanced airbags and an evaluation system for the relatively vulnerable groups in the transportation sector such as women and children. Enhancing assessment procedures in such areas as broadside collisions and adding six evaluation items including proactive safety devices are also expected to be included in the scheme (see Table4.).

Table4. The Roadmap of Korean New Car Assessment Program (KNCAP)



CONCLUSIONS

The Korean government is putting efforts to improve traffic safety by establishing “The Comprehensive Plan to Reduce Traffic Fatalities 2013-2017” following the “Reduce Traffic Fatality by Half". Improvement of vehicle regulations and the New Car Assessment Program to facilitate the production of safer vehicles provide a basis for such efforts. To that end, exchanging information and setting the right direction through international discussion are also as important as maintaining the potential of continuous improvement of vehicle safety by promoting the development and application of advanced technologies.

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GOVERNMENT STATUS REPORT - POLAND

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INTRODUCTION

The following report contains information on the progress achieved in Poland with regard to aspects of road traffic safety since the time of 22nd ESV Conference (Washington DC, 2011). This period was generally characterised as the intentional effort towards the traffic safety items within all its main system fields taking into account priorities drawn from analysis of domestic and international accident statistics. The current accident statistics for the last ten years are given on Figure 1, and Figure 2 and in Table 1.

In 2014 on Polish roads 34 970 road accidents occurred resulted in 3 202 fatalities and 42 545 injured persons which gives for the years between 2010 and 2014 as follows:

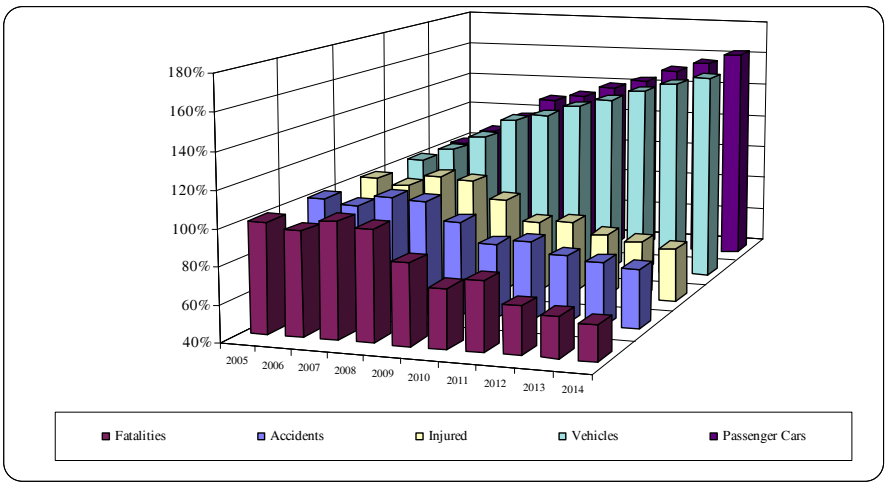
- 3 862 less road accidents (- 9.9%),
- 705 less fatalities (- 18%),
- 6 407 less injured (- 13,1%),

Even if the last four years on our roads were not that bed still Poland demonstrate the higher level of danger on the roads in comparison to other EU countries.

I. The diagnosis of Road Safety in Poland.

Over the past 10 years (2005÷2014) more than 45 thousand people died and approximately 532 thousand were injured (of which about 25% seriously injured) on Polish roads. During this decade, the number of accidents decreased by 27%, the number of fatalities by 41%, and the number of injured by 30%.

Figure 1. Accident Data in Comparison with the Vehicle Stock in Poland in the Period 2005-2014



By: Anna Zielińska, Motor Transport Institute

Figure 2. Current trend in accident data and the car stock in Poland

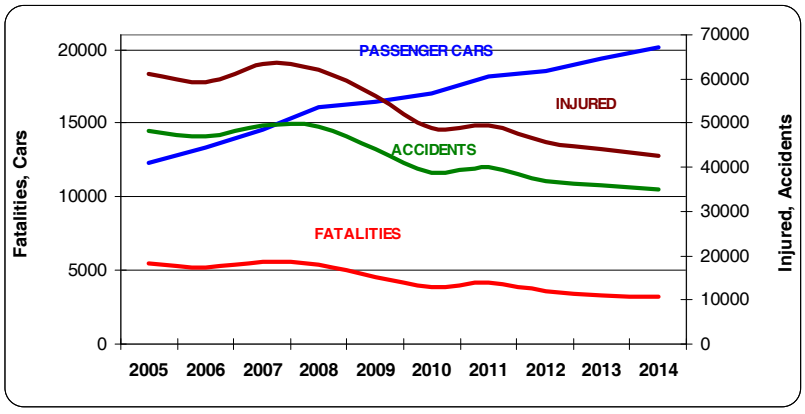


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Table 1. Accident Data in Comparison with the Vehicle Stock and Population in Poland in the Period of 2005÷2014

Year	No. of accidents	No. of fatalities	No. of injured	No. of vehicles (thousands)	No. of cars (thousands)	Polish population (thousands)	Fatality factor (No. of fatalities / 1 mln of inhabitants)	Accident severity (No. of deaths / 100 of accidents)	No. of cars / 1000 inhabitants
2005	48 100	5 444	61 191	16 816	12 339	38 157	143	11	323
2006	46 876	5 243	59 123	18 035	13 384	38 126	138	11	351
2007	49 536	5 583	63 224	19 472	14 589	38 116	146	11	383
2008	49 054	5 437	62 097	21 337	16 079	38 136	143	11	422
2009	44 196	4 572	56 046	22 025	16 495	38 167	120	10	432
2010	38 832	3 907	48 952	23 037	17 240	38 530	101	10	447
2011	40 069	4 189	49 506	23 853	17 872	38 538	109	10	464
2012	37 046	3 571	45 792	24 876	18 744	38 533	93	10	486
2013	35 847	3 357	44 059	25 684	19 389	38 496	87	9	504
2014	*34 970*	*3 202*	*42 545*	*26 455*	*20 164**	*38 484**	*83*	*9*	*524*

Preliminary data estimated as of March 2015 by Motor Transport Institute
* Central Statistical Office data as of June 30, 2014

By: Anna Zielińska Motor Transport Institute

II. The existing programme for road traffic safety and a bit of history

In **2005** the National Road Safety Programme GAMBIT 2005 was adopted by the government. In the programme it was established that:

1. The Polish far-reaching and ethically empowered vision of road safety will be the ZERO VISION.
2. The main objective to be attained by the year 2013 is a decrease in the number of fatalities by 50% over 10 years, i.e. the number of fatalities is to drop to 2800 in the year 2013.
3. In Poland, the high-risk groups most likely to be killed in a road accident include: vulnerable road users (pedestrians, cyclists, motorbike drivers, motorcyclists), children, and young drivers.
4. The main problems regarding road safety include:
   a) dangerous behavior of road users,
   b) poor quality of road infrastructure,
   c) lack of an effective system of road safety management.

In order to reach the main objective, 15 groups of priority actions and 144 tasks grouped into five detailed objectives were established:

1. Creation of a basis for conducting effective and far-reaching operations enhancing road traffic safety.
2. Shaping safe behaviors of road users.
3. Protection of pedestrians, children and cyclists.
4. Construction and maintenance of safe road infrastructure.
5. Reduction of the severity of accidents.

The assessment of the *GAMBIT 2005* Programme implementation, as per its status in the year 2014 indicates that:

1. In what concerns national roads, the set objective has not been attained - the objective was to reduce the number of fatalities down to 770 (the target value was exceeded by 82%).
2. As for the remaining road categories, the stage objectives were attained - the number of fatalities for these road categories is 4÷15% below predictions.
3. In relation to the base year (2003) a decrease of 19%÷40% in the number of fatalities occurred in all districts.
4. In three districts the objective for the year 2010 has been attained.

In the years 2008÷2010 a very encouraging decrease in the number of fatalities could be noticed. It was due to the actions undertaken in that period, as well as to the long-term effects of the changes and measures undertaken in preceding years.

During the period in which the *GAMBIT 2005* Programme was in force, many educational, preventive and infrastructural actions, in line with the programme directions, were undertaken at the national level. Unfortunately, only 84 out of 144 (58%) planned tasks were undertaken. At the same time, in many cases, political and administrative decisions were incompatible with the *GAMBIT 2005* Programme. In Poland, road accidents are still not perceived as a sufficiently important problem, and the poor effectiveness of actions at the institutional level is the result of the principle of shared collective responsibility for the problems with road safety management. Despite the problems mentioned above, a systematic decrease in the number of fatalities due to road accidents is taking place in Poland. An increased activity of Polish experts on the international arena may be observed, as well as a fairly extensive number of the undertaken actions for road traffic safety, within which the *GAMBIT 2005* Programme continues to play an essential role.

Conclusions related to GAMBIT

1. The strategy and action plans for road safety were properly developed under the GAMBIT programmes.
2. Trainings for road safety professionals increase the number of experts in this area at different levels. Poland participated in certain trainings conducted abroad (the Netherlands, France, Sweden) and is a well-informed member of the international community handling road safety issues.
3. One essential problem was the failure to implement actions *en masse* under the *GAMBIT 2005* Programme and the lack of assessment of their effectiveness. Unfortunately, sources of funding for these actions were also very limited. As a result, the scope of the undertaken actions was not extensive.
4. The existing regional GAMBIT programmes were properly developed, but the effective implementation of actions under such programmes requires the support from the central level, improvement of databases and performance assessment.
5. The identification of agencies leading in the governmental structures (leaders), performing the tasks regarding road safety indicated an insufficient political will behind the actions for road safety (lack of a political and operational leader, and the institutional problems in the area of cooperation).

III. Current situation

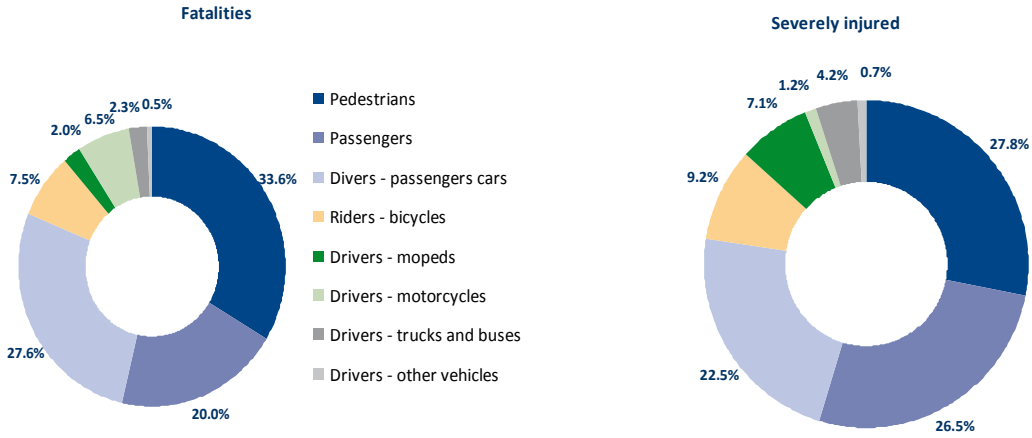
Scope and characteristics of the problem. Based on the available statistical data, it can be stated that per 100 accidents on Polish roads, there are approximately: 9 fatalities, 31 seriously injured persons, and 92 moderately and lightly injured persons.

Poland against the background of the European Union. Since 2007 Poland has been an inglorious leader among the European Union countries as regards the number of fatalities in road accidents. The share of Poland in the total number of fatalities amounts to 11%, although Polish population accounts for only around 7% of the total number of residents in the European Union. The risk of loss of life on Polish roads was twice as high as the European average in this respect, and over three times higher than in the countries leading in the area of road traffic safety, such as Great Britain, the Netherlands, or Sweden. The most frequently used rate for international comparisons is the mortality rate, which is the number of annual fatalities per 1 million inhabitants, and this rate for Poland amounted to 83 fatalities. Therefore, in 2014 Poland was one of leaders among all the countries of the European Union in this classification.

Types of accidents. For many years now, most people killed in road accidents (over 33% of the total number of fatalities) die in accidents connected with running over a pedestrian, which sets us apart negatively not only from Europe, but also from the world. These are the accidents connected with pedestrians moving on a street. Another group of accidents with a high mortality rate (15÷20%) are accidents caused by a head-on collision, the reason for which is often the lack of divided roads. There are frequent side collisions on intersections and entries/exits, which can also have fatal consequences. Equally dangerous are the accidents connected with driving into an obstacle (a tree or a post) located too close to the edge of the road.

Victims of road accidents - groups of high risk. From all the victims of road accidents, pedestrians represent the largest group (33.6% of fatalities and 27.8% of seriously injured) (Figure 3). Among drivers, the largest group of victims are the drivers of passenger cars (27.6% of fatalities and 22.5% of seriously injured). Cyclists should be taken into consideration, as they amount to approximately 7.5% of fatalities and 9.2% of seriously injured, while their share in the road traffic accounts for around 1%. The share of motorcyclists (2.3 % of fatalities and 4,2% of seriously injured) and moped drivers (2.0% of fatalities and 7.1% of seriously injured) in the number of road accidents victims is also increasing. The accidents in which pedestrians are the victims take place mainly in urban areas, while accidents in which drivers and passengers of vehicles are the victims take place mainly on country roads. However, a huge severity of the accidents with the participation of pedestrians (25% fatalities and 30% seriously injured in comparison to the total number of victims) takes place on the national roads.

Figure 3. Victims of road accidents - groups of high risk.



The age of the victims of accidents. The highest mortality rates (number of fatalities per 1 million of inhabitants) refer to young people (aged 15 to 24) and people over 65 years old.

The circumstances and causes of road accidents. The circumstances which lead to road accidents with fatalities most often include:

- the behavior of road users (maladjustment of speed, failure to give the right of way, incorrect overtaking, incorrect behavior towards a pedestrian, drunk driving and the lack of protection among road traffic users);
- external conditions (mainly: limited visibility and adverse weather conditions).

The geography of accidents and their victims. The largest number of fatalities is recorded in the Mazowieckie District, and then in the following districts: the Wielkopolskie, Śląskie, Łódzkie and Małopolskie Districts. The combined number of fatalities in these five districts accounts for over 50% of the all road accident fatalities in Poland. However, in relation to the number of inhabitants, the highest mortality rate in road accidents and, consequently, the highest risk (Figure 1.9) exists in the Świętokrzyskie and Mazowieckie Districts. It is also quite high in the Podlaskie, Łódzkie, Warmińsko-Mazurskie, Wielkopolskie, Lubelskie, Lubuskie and Kujawsko-Mazurskie Districts. It results, among others, from the low standard of the road network, high transit traffic in these districts, and inappropriate behaviors of road traffic users.

Socio-economic cost of road accidents. Since 2012 the cost of road accidents in Poland is estimated by a commission of the National Road Safety Council. The method of the valuation of the costs of road accidents is based on the generally accepted practice in transport economics and comprises of the following components: medical costs, cost of the lost productivity power (lost production), cost of damage to property and administrative costs. This method does not factor in the cost of human suffering resulting from road accidents. Additionally, the research conducted by the Road and Bridge Research Institute does not take account of the cost of collisions, i.e. accidents without any victims (estimated cost of 8 billion Polish zloty). In the future, this element should be included in the methodology of accident costs valuation. Latest estimation of total yearly road accidents costs for 2013 year amount to 49.1 billion Polish zloty (research of Road and Bridge Research Institute). According to the data from 2011, the greatest share of the annual accident cost in Poland is represented by the costs related to the injuries (57.3%). The costs related to fatalities account for 1/3 of the annual total (32.6%). The smallest share is represented by the cost of material losses (10.1%).

Unfavorable forecast. Forecasts regarding demography and motorization in Poland indicate that, in the years **2011÷2020**: the number of inhabitants may decrease by 1÷4%, the number of vehicles may increase by 15÷25%, i.e. reach the number of 30 million vehicles, and mobility of citizens (measured by transport performance) may increase by 30–35%. The stagnation or the limitation of preventive activities in the following years may halt the decreasing tendency in terms of the number of road accidents and the fatalities resulting from them. It is estimated that, in such a situation, over 40 thousand people may be killed and over half a million may be injured in road accidents by 2020. The value of both property and social loss of these road occurrences may reach 225 billion of Polish zloty. Therefore, it is necessary to take effective steps in order to protect the lives and health of road users.

Diagnostic conclusions. The research allowed for the identification of main problem areas in road safety in Poland:

1. Protection of pedestrians in road traffic.
2. Shaping the habits of driving with an allowed speed.
3. Shaping safe behaviors of road users.

4. Adaptation of road infrastructure to basic standards of road safety.
5. Promotion and use of safe vehicles.
6. Development of road rescue system.
7. Development of road safety management system as a basis for the effective solution of the aforementioned problems.

On the base of the diagnosis national programme was developed within the context of other existing, accepted and planned programmes and strategies - both international (UN and EU) and national documents.

IV NATIONAL PROGRAMME

Despite international documents the following national documents were taken into account to build Polish National Road Safety Programme 2013÷2020.

National Development Strategy 2020. In this document, it is stated that, due to high risk of road fatalities in Poland, programmes for the improvement of Road Safety are to be developed and implemented. Such programmes are to be in line with works on the improvement of infrastructure and information and education campaigns concerning traffic rules and the promotion of safe behavior of road users. Most important tasks include:

- construction and development of automatic traffic monitoring systems,
- development of an integrated system of accidents management,
- development of an integrated system of passenger service and goods transport,
- improvement of forms and channels of communication with society in terms of road traffic safety, Intelligent Transportation Systems,
- development of systems for financing investments within the scope of road traffic safety.

Transport Development Strategy until 2020. Apart from the general goals which take account of the new concepts of EU common transport policy and of the main guidelines of Polish transport policy developed recently, the document indicates strategic trends in the area of road traffic safety:

- safe behavior of road users,
- safe road infrastructure, safe vehicles,
- effective system of road rescue and medical assistance.

Efficient State Strategy 2020. The document underlines seven detailed objectives. Objective number seven: *Provision of a high standard of safety and public order*, determines the following directions for intervention associated with road traffic safety:

- counteracting road risks,
- road rescue and protection of the population (fire protection; preventive, rescue and firefighting actions),
- implementation and improvement of the rescue alert system,
- improvement of the functioning of the Medical Rescue Alert system.

The aforementioned intervention directions include several issues, such as the development of a national Road Safety programme, unification of the law, raising existing infrastructure standards, improvement of the functioning of structures and of the enforcement of procedures.

National Health Programme for the years 2007÷2015. Road accidents are considered a health related problem of the society. The third strategic goal of the National Health Programme is the reduction of the frequency of injuries resulting from road accidents and the limitation of their consequences. Reaching this goal calls for the reduction of the number of deaths resulting from road accident injuries. The need for preventive measures has also been identified.

National Programme for Prevention and Solving of Alcohol-Related Problems for the years 2011÷2015. The document determines plans for the following actions directed at limiting the number of vehicle drivers under the influence of alcohol:

- increase the number of sobriety tests carried out during standard road checks,
- development of a strategy concerning the problem of drunk driving, development and implementation of a unified programme for drivers detained for driving under the influence of alcohol,
- public education actions concerning the influence of alcohol on human body and the risk of damages arising as a result of driving vehicles under the influence of alcohol.

Programme structure. The Polish National Road Safety Programme 2013÷2020 and its structure of intervention is based on the following five pillars:

- safe behaviors of road traffic users,
- safe road infrastructure,
- safe speed,
- safe vehicles,
- rescue and medical assistance system.

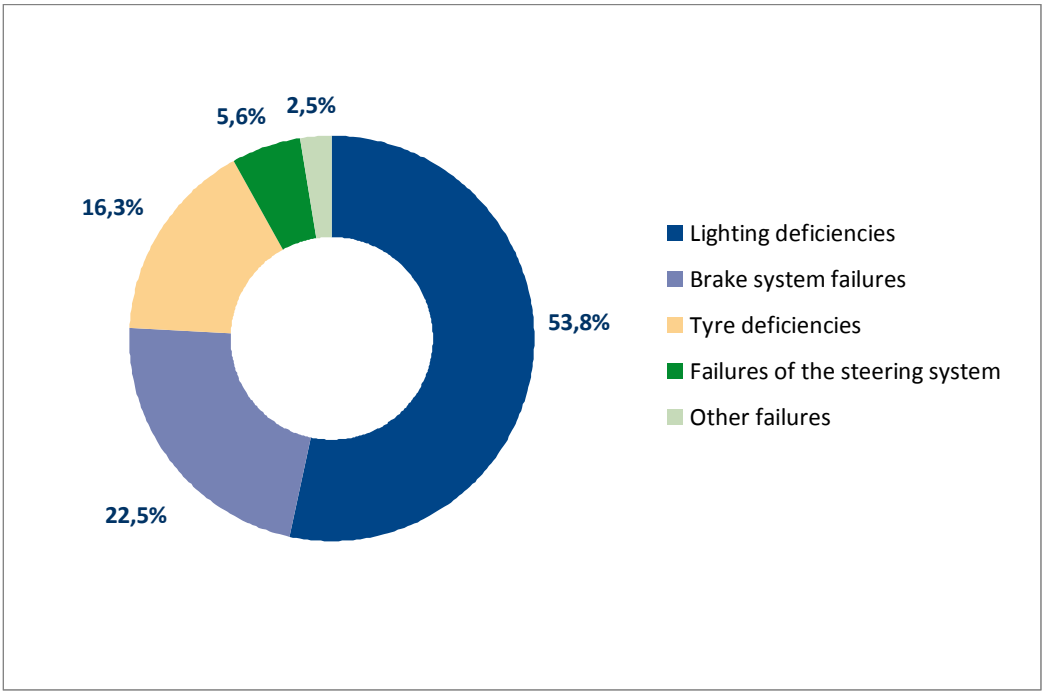
Effective implementation of activities within the above mentioned pillars is conditioned by the improvement of the management system for road safety. Therefore, the Programme indicates also the activities which are essential for planning, implementation, coordination and monitoring activities within its particular pillars. In every pillar, based on the diagnosis of the existing status of road safety, three priority directions (priorities) reflecting fundamental problems of road safety in Poland were distinguished, as well as conditions for their implementation. However, every priority accumulates activities covering:

- Engineering - understood as technical solutions for:
  — road network, which upgrade road safety and make roads "forgive" human errors,
  — vehicles, which protect drivers, passengers and other road users, as well as diminish possible damages of an accident.
- Supervision - understood as visible supervision and control aiming at the verification of existing regulations and prevention of non-compliance.
- Education - understood as enhancing awareness of road safety by identification and understanding the risk. The objective of education is to change attitudes and behaviors at the individual level, as well as at the level of certain communities or at the organizational level.

V. SAFE VEHICLES

Bearing in mind the very technological profile of ESV Conference I would like to give more information on road safety related to vehicle. According to the statistical data, vehicles are in Poland quite rarely the main cause of a road accident (less than 1% of total), but their technical condition more often assist to other causes and significantly influences the severity of accidents.

Figure 4. The main reasons of accidents attributable to technical failures in vehicles.



In addition estimations of the Motor Transport Institute indicate that in 2009, the average age of the vehicles in use in Poland was around 13 years. For comparison: the average age of vehicles at this time in Sweden was just under 10 years, in Finland - over 11 and in the USA - 11 years. Research shows that the average number of failures significant in terms of the safety of road traffic increases with the age of the vehicle. At the same time, it is noticeable that the older the car is the more failures posing a risk to road safety.

Risk factors

Vehicle safety directly influences the number of fatalities and the scale of consequences of accidents. For this reason, solutions in this area should be constantly sought and implemented, especially through equipping cars with elements supporting the driver (active safety) and elements protecting the persons participating in road occurrences (passive safety).

Technical condition of the vehicle. Pursuant to the law in force, the technical condition of vehicles is periodically revised by motor vehicle inspection stations (MVIS). However, an inspection carried out by the

Supreme Chamber of Control revealed that supervision over these inspection stations is insufficient. Nearly two thirds of obligatory devices of the MVIS is not certified. In Poland, the low technical culture is also a problem. It translates into neglect of the technical condition of vehicles, especially in what regards elements influencing the safety, such as brakes, lighting, shock-absorbers, steering system, tire pressure.

Lighting. Lighting deficiencies are among the most frequently listed failures (54%). This allows us to define the lighting issues as one of priorities in those actions for improvement of road safety which are linked with the technical condition of vehicles. Regulations regarding lighting-related technical requirements for vehicles are not in step with the technological progress and the low awareness of drivers is an additional factor, as they usually do not know that even formally proper lighting may not illuminate the way sufficiently.

Spare parts. Another problem is related to the spare parts used in vehicles. Technical requirements which should be met by parts and subassemblies used as replacement of original parts are not regulated by European laws. It has been estimated, based on examination of spare parts, that the quality of over 50% of parts currently on the market, as well as of various operating fluids (including brake fluid) poses a potential direct hazard to the safety of vehicle use.

Equipment - modern safety devices. Currently, all the newly manufactured vehicles in the European Union are equipped with basic safety systems, such as seat belts, ABS system or air bags for the driver. Additionally, thanks to advanced technologies, it is possible to equip cars with more systems supporting the driver in a risky situation on the road. This allows drivers to avoid collisions or to mitigate their consequences, both for the driver and for the passengers, as well as for other road users. Examples of such systems are: electronic traction control (which assists the driver in recovering from skids), camera systems limiting the so-called blind spot or e-Call (a system installed in the car, which automatically notifies rescue services about an accident). These solutions form part of the "e-Safety System". Vehicle producers subject their technical solutions to safety tests and strive to rank as high as possible in consumer rankings, such as Euro NCAP, which helps to popularize these solution and make them more readily available in new cars. Also cars driven in Poland, both imported as used vehicles (mostly from other EU states), are largely equipped with systems enhancing road traffic safety thanks to which a vehicle may limit the consequences of human-made errors and it technical shortcomings are rarely the cause of accidents.

Priorities and directions of actions (Table 2.).The diagnosis of the current state, as well as the experiences of model states of the European Union (in terms of road safety considerations), lead us to adopt two priorities under the Safe Vehicle pillar:

- Priority 1 - Enhancement of actions regarding vehicle technical condition inspections,
- Priority 2 - Improvement of safety systems in vehicles.

Enhancement of actions regarding vehicle technical condition inspections aims to, above all, reduce the risk of accidents caused by poor technical condition of vehicles and to limit their severity.

Improvement of safety systems in vehicles aims to implement such construction solutions so as to render the vehicle capable of protecting its driver and passenger, as well as other road users, to prevent human errors and to minimize the dangers when these errors are made.

Conditions for the performance of these actions. Basic conditions for the successful performance of the actions related to vehicle safety are legislative measures and support resulting from research and exchange of experiences.

Legislative measures aims for development of:

- a concept for a modernized national system for the inspection of the technical condition of all vehicles.
- provisions regarding the professional supervision over the equipment of motor vehicle inspection stations and monitoring their work.
- technical requirements unequivocally and objectively guaranteed by technical tests of vehicles.
- legal base for the implementation of a system (certification, homologation) to supervise the introduction into trade and use in cars of parts and operating fluids.

Research and exchange of experiences

- Introduction of the common practice of using the technologies of objective exploitation tests with the use of devices allowing for precise and quick exploitation measurements. Conducting in-depth research on road traffic accidents, including the analyses of the influence of the technical condition of vehicles for the occurrence of accidents. Conducting development works related to defined groups of advanced technology products. Research, development and pilot implementation of intelligent transport systems related to the cooperation of devices with which roads and vehicles are equipped.
- International cooperation regarding the improvement of legal regulations related to the systems of testing and assessment of spare parts, operating fluids and participation in international research regarding pilot implementation of modern solutions within the scope of active and passive safety.

Table 2. Priorities and directions of actions within the *Safe Vehicle* pillar

Priority	Direction of actions		
	Engineering	**Supervision**	**Education**
Enhancement of actions regarding vehicle technical condition inspections	Implementation of modern technologies and techniques at motor vehicle inspection stations; Improvement of technical homologation and use requirements regarding vehicle equipment;	Modernization of the system of supervision of motor vehicle inspection stations and monitoring their work; Modernization of the system for verification of equipment and parts in cars which affect their safety in road traffic; Certification of the obligatory equipment of motor vehicle inspection stations;	Education within a complex education system[I] regarding maintenance of the proper technical condition of vehicle and how it affects the safety of all road users; Running, within the system of promoting road traffic safety[II], information campaigns and campaigns to promote maintenance of the proper technical state of vehicles[III]; Periodic trainings for diagnosticians and supervisors of motor vehicle inspection stations[IV];
Improvement of safety systems in vehicles	Equipping the vehicles with modern safety devices[V]; The implementation of obligation of using devices blocking the vehicle start-up for professional drivers in cases when alcohol content in exhaled air exceeds	The implementation of supervision on proper use of obligatory safety devices installed in vehicle (e.g. child safety seats);	Popularization among the car owners of modern vehicle safety systems;

I. *System of education* included in whole within the *System of road safety management* (tab. 9.1)
II. *System of promotion* included in whole within the *System of road safety management* (tab. 9.1)
III. Including the popularization of the significance of lighting on the road safety and promotion of better quality lighting.
IV. *System of education* for road safety staff, included in whole within the *System of road safety management* (tab. 9.1)
V. Including systems to raise the safety of vulnerable road users, such as automated braking systems, external air bad.

Rescue service and post-crash response. Rescue service are the activities taken up under conditions of sudden or extraordinary danger to life and health, and also to property and environment, performed immediately. The main characteristics of rescue service are the suddenness of the incident preceding the action, for example, of the forces of nature or human, and the urgent course of reaction. Among numerous rescue fields, medical rescue service and post-crash care process are essential for the road safety, because they concern the health and lives of the injured, and, what is more, they require the involvement of many parties.

More detailed information on The Polish National Road Safety Programme 2013÷2020 are presented on website of the National Road Safety Council (http://www.krbrd.gov.pl/en/).
I am also glad to inform you that accordingly to the request from National Road Safety Council the Motor Transport Institute established Polish Road Safety Observatory and is its operator.

I would like to wish all of you a good co-operation and fruitful exchange of knowledge during this very important scientific international ESV conference being one of the important bases for improvement of everyday life - improvement of vehicle safety and thus road traffic safety.

Road Safety Vademecum

Road safety trends, statistics and challenges in the EU 2010-2013

March, 2014

European Commission
DG for Mobility and Transport
Unit C.4 – Road Safety

Contents

Summary of findings

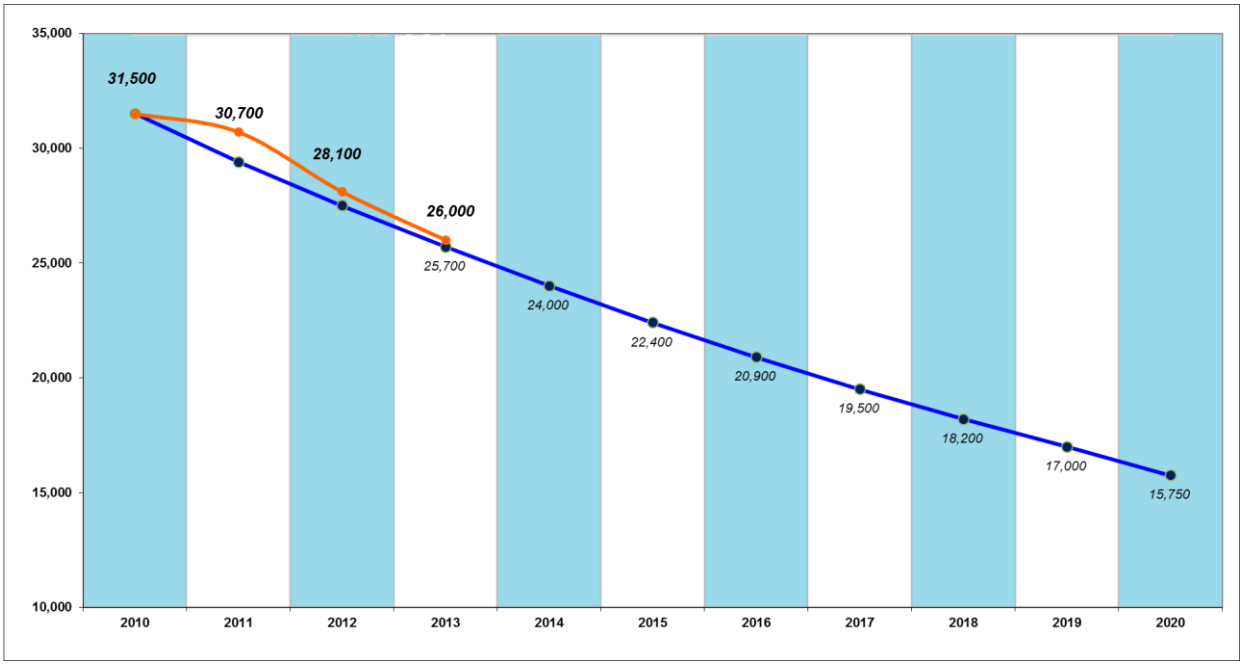
- In 2013, slightly more than **26,000** road fatalities were reported in the EU.
- This is a decrease of around **8%** compared to 2012.
- In total, there were **52 road deaths** per million inhabitants in 2013 in the EU.
- The top road safety performers (lowest number of road deaths per year and million inhabitants) in 2013 were **the UK, Sweden and Denmark**.
- The highest number of road fatalities in 2013 was found in **Romania, Latvia, Poland and Lithuania.**
- Over the period 2010-2012, the two main improvements are seen for **young road users** and for **car occupants**:
    - The number of young victims (aged 18-24) decreased by 19% to compare to the percentage reduction of elderly road users (above 65 years) of only 2% for the same period.
    - The number of car occupants killed decreased by 13% from 2010 to 2012, a stronger development than that for vulnerable road users.

1. Introduction

The Transport White Paper announced a strategic target for EU road safety for the period 2011-2020: to reduce the number of road deaths by half.

In 2010, some 31,500 people lost their lives on the roads in the 28 EU Member States. This figure is the baseline for the strategy objective and the target is to have less than 15,750 road deaths in 2020. If the target is achieved, more than 90,000 lives would have been saved in total during the decade.

Following a slow year in 2011, the number of road fatalities is now again substantially decreasing. The preliminary data for 2013 bring the EU development in line with the target curve.



Development over time: reduction of number of fatalities in the EU 2010-2020
(blue line = target, orange line = actual number of fatalities reported)

This text provides an overview of the latest road safety data and the main road safety developments in the EU. It presents the first provisional figures reported for 2013, where available, complemented with the final detailed data for 2012.

2. The road safety situation in the EU today

In 2013, a provisional total of 26,200 road fatalities were reported in the EU. This is a decrease of around 8% compared to 2012.

The EU average road fatality rate in 2013 is 52 people killed per million inhabitants, to compare to the baseline year 2010 with 62 dead per million inhabitants.

	Fatalities/million inhabitants	
Member State	**2010**	**2013**
Austria	66	54
Belgium	77	65
Bulgaria	105	82
Croatia	99	86
Cyprus	73	53
Czech Republic	77	63
Denmark	46	32
Estonia	59	61
Finland	51	48
France	62	50
Germany	45	41
Greece	112	81
Hungary	74	59
Ireland	47	42
Italy	70	58
Latvia	103	86
Lithuania	95	85
Luxembourg	64	87
Malta	36	54
Netherlands	32	-
Poland	102	87
Portugal	80	62
Romania	117	92
Slovakia	69	42
Slovenia	67	61
Spain	53	37
Sweden	28	28
United Kingdom	30	29
EU	**62**	**52**

The best road fatality rate is reported from the Sweden and UK, with 28 and 29 dead per million inhabitants respectively. Both countries have defended this top position since the start of the strategy period. They are followed by Denmark with 34 reported dead per million inhabitants.

Slovakia has made the most impressive improvement from 2012 to 2013 with 24% fewer road deaths, giving a new fatality rate of 42 dead per million inhabitants. This brings Slovakia from 10th to shared 7th position among Member States, overtaking Finland and Malta.

	Evolution of total number of fatalities	
Member State	**average percentage change/year 2000-2010**	**Percentage change 2012-2013**
Austria	-6%	-15%
Belgium	-6%	-7%
Bulgaria	-3%	0%
Croatia	-	-6%
Cyprus	-5%	-14%
Czech Republic	-5%	-12%
Denmark	-6%	8%
Estonia	-10%	-7%
Finland	-5%	3%
France	-8%	-11%
Germany	-7%	-7%
Greece	-4%	-12%
Hungary	-6%	-2%
Ireland	-7%	19%
Italy	-6%	-6%
Latvia	-10%	1%
Lithuania	-9%	-15%
Luxembourg	-8%	32%
Malta	-1%	100%
Netherlands	-7%	-
Poland	-4%	-6%
Portugal	-6%	-9%
Romania	0%	-9%
Slovakia	-5%	-24%
Slovenia	-7%	-4%
Spain	-9%	-10%
Sweden	-8%	-7%
United Kingdom	-7%	-1%
EU	**-6%**	**-8%**

The highest number of road fatalities per inhabitants is found in Romania, followed by Latvia and Lithuania. However, Lithuania has made a substantial improvement of -15% road fatalities since 2012, reporting the second best percentage change over the year after Slovakia, same as Austria.

Malta and Luxembourg reported large percentage increases from 2012 to 2013 but have few road deaths in total numbers so the percentage change over a single year is not statistically significant. Also Ireland (+19) and Denmark (+8%) report large negative developments since last year.

In sum, the year 2013 was a year of great diversity, with some Member States reporting large improvements and other reporting a worrying deterioration of the road safety situation.

3. The road users

Road user group	Change 2010-2012
Pedestrians	-8%
Cyclists	+6%
Moped riders	-15%
Motorcycle riders	-13%
Car occupants	-13%
Heavy goods vehicle drivers	-10%
All road deaths	**-11%**

Evolution over time: per road user group 2010-2012

During the years 2010-2012 pedestrian road deaths only decreased by 8%, three percentage points less than the total percentage improvement for all road deaths. The best improvement among pedestrians is seen for the age groups 50-64 years and 65 years and above.

For cyclists, the trend is even worse: the number of cyclists killed actually increased by 6% from 2010 to 2012. This is explained at least partly by an increased total number of cyclists on the roads. Among cyclists, the age factor is quite striking. While the number of young and children who die while biking decrease, the number of killed grown-up bicyclist is on the increase. Among those older than 50 years, the number of fatalities increased by alarming 10% from 2010-2012.

For car occupants and motorcyclists, the fatalities decreased more than average. This is commented further upon in the following chapter on vehicles.

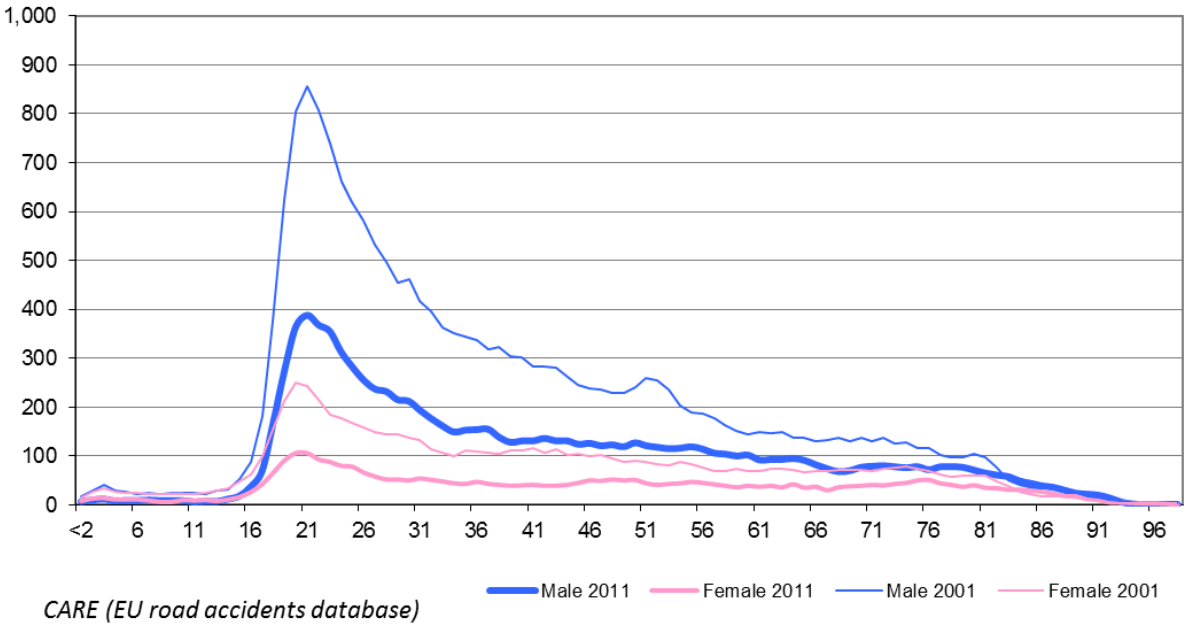
Risks per age groups
While the decade 2001-2010 could be called the decade of improved child safety with great improvements in safety for those younger than 15 years, the biggest improvement since 2010 is seen in the safety for people aged 18-24.

Age group	Change 2010-2012
< 15	-14%
15-17	-18%
18-24	-19%
25-49	-18%
50-64	-9%
>65	-2%
All road deaths	**-11%**

Evolution over time: per age group 2010-2012

On the other hand, the development for those older than 65 is less encouraging. This is partly linked to the demographic trend of an ageing society and the increase of the number of elderly in the EU over time.

The gender aspect
Male fatalities are still clearly over-represented in road traffic crashes. In 2012, 76% of all road fatalities were male and 24% were female. Among car driver fatalities, 82% were male.



Number of car occupant fatalities by gender and age.

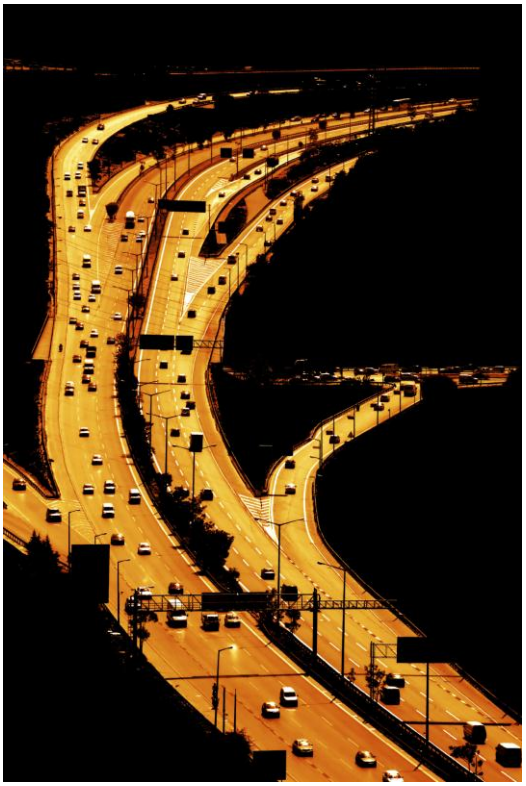
Women are more often than men involved in fatal road accidents as pedestrians, whereas men are more often than women involved in fatal road traffic crashes as car drivers.

4. The vehicles

Powered two-wheelers
Motorcycle fatalities have been an issue of great concern the last years, considering the large over-representation of motorcyclists among road fatalities. Most fatalities of motorcyclists and moped drivers occur on rural or urban roads.

To some degree, the trend has now turned and also the number of motorcyclist road deaths decreased more than average from 2010-2012, thanks to an increased focus on the safety of this road user group.

Countermeasures during the last years have included a legislative change in the EU driving licence directive to ensure a gradual access to the heaviest motorbikes for young people. Development and increased use of protective clothing and protective devices is another important action area, studied by an on-going EU-funded project. From 2016, the EU type approval requirements for motorcycles will include the more advanced braking systems such as ABS.



Cars
The road safety evolution for car drivers is stronger than for most other road user groups.

Cars are becoming safer, better equipped and more thoroughly tested for technical defects. Seat belt use is going up; the DaCoTA project reported that EU average seat belt use rates are around 85% in the front seat and 60% in the rear seat.

EuroNCAP, initiated as a study commissioned by the Commission Road Safety Unit, has led to a general fitting of airbags in cars. Technical developments for efficient enforcement of traffic rules in combination with better quality of driver training and road user education also have contributed to the positive development.

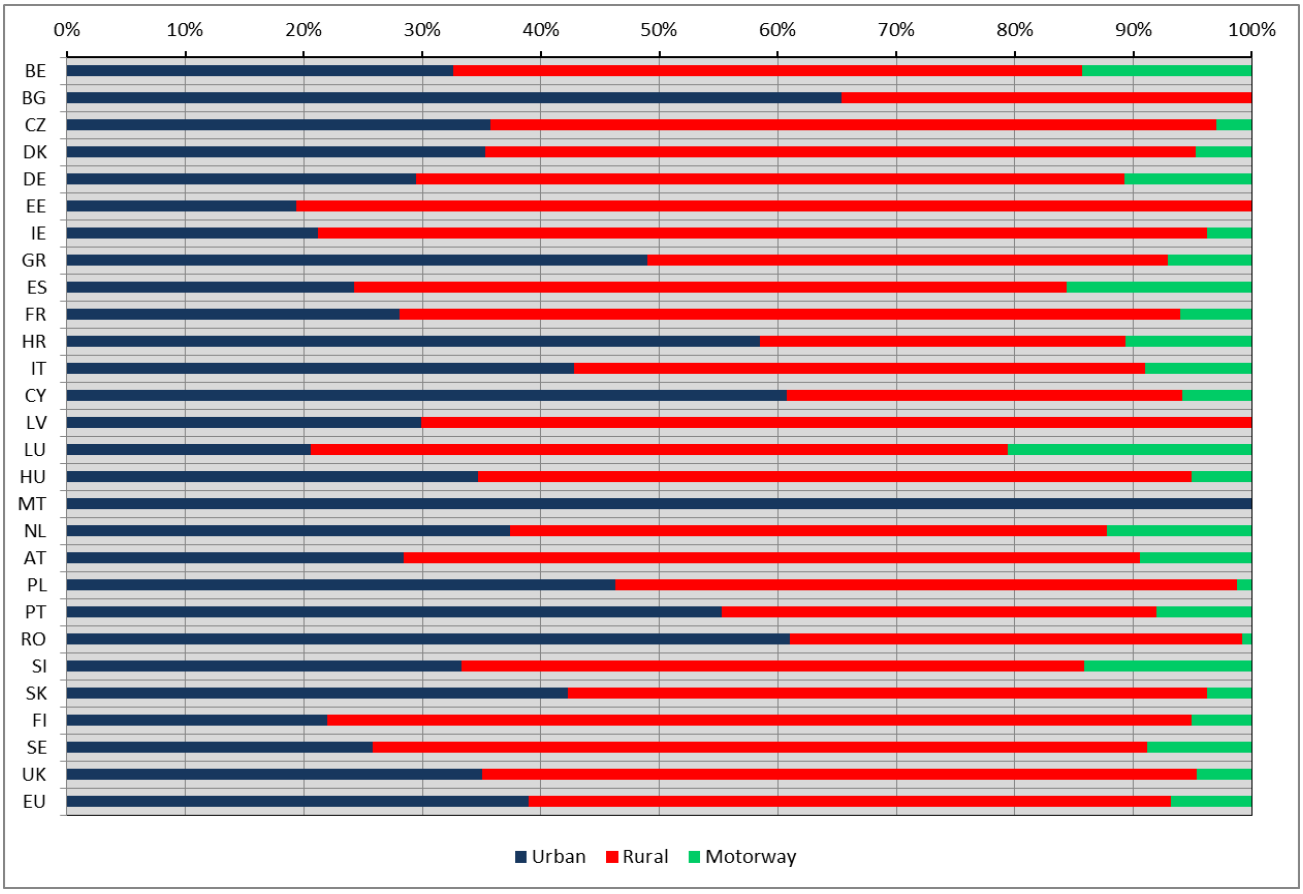
Heavy goods vehicles
The motorised vehicle category which defies the general trend is the heavy goods vehicles. The number of heavy goods vehicle driver fatalities decreased by only -7% 2010-2012, which is an even slower improvement than that of pedestrians. However, the total number of heavy goods vehicle drivers killed is also already quite low. Fatalities as consequences of crashes involving trucks or buses are more common on rural roads and motorways and less common inside the urban areas.

To further improve the situation, the Commission has initiated a review of the directive regulating minimum training and qualification requirements for professional drivers. The aim is to simplify and clarify the requirements and, where needed, to optimise the conditions for road safety training of professional drivers.

5. The infrastructure

Different types of accidents happen on different kinds of roads and the road fatalities are unevenly distributed on the different road types.

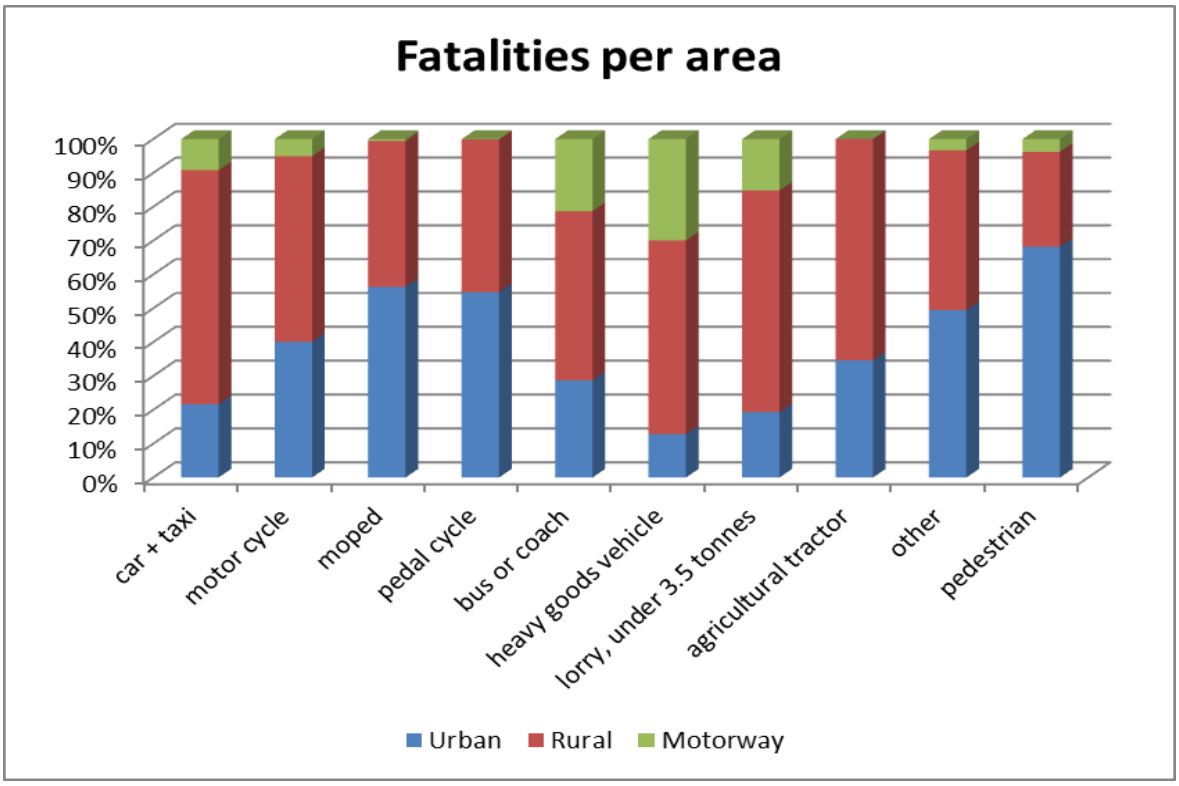
The situation also varies across the EU due to differences existing among Member States on traffic flows, population density and quality of road infrastructure. For example, in Romania, Cyprus, Croatia the highest share of fatalities occurred on urban roads while in Finland, Ireland, Luxembourg and Spain the majority of fatalities were on rural roads. Spain and Belgium reported the highest percentage of fatalities on the motorways.



Fatalities per road type (2012)

Urban areas

The urban areas are characterised by frequent interaction between motorised vehicles and unprotected road users such as pedestrians and cyclists. However, the speed is also normally lower in the urban areas and the severity of road traffic crashes therefore somewhat lower. It is inside the urban areas that most of the less serious accidents occur. Of all fatal road traffic crashes however, only around 40% happen on urban roads. From 2010 to 2012, it was on the urban roads that the number of road fatalities decreased the most.



Type of fatality per road category

Rural roads

Rural roads normally have higher speeds than urban roads but lower speeds than motorways. The infrastructure standards are not as well regulated for rural roads as for motorways. It is on the rural roads that most of all fatal road traffic crashes take place: more than 50% of all the fatal crashes.

Motorways

Motorways and expressways are typically designed to accommodate long distance traffic travelling on a higher speed. In spite of the speed, only 5% of the total number of accidents took place on the motorways, but on the other hand, the consequences of each single crash are more serious and around 7% of all road fatalities occur on the motorways.

	Urban	**Rural**	**Motorway**
Accidents	68%	27%	5%
Fatal accidents	40%	53%	7%
Fatalities	39%	54%	7%
Injured	65%	29%	6%
Seriously injured	55%	39%	6%
Ratio victims(*)/accidents	1.2	1.4	1.5

(*) Victims includes both injured and fatalities

Infrastructure safety management: the legislative framework

Directive 2008/96/EC[1] provides the EU legislative framework for the safety management of road infrastructure. The directive establishes management procedures aimed to ensure that the road network is safe. It applies to the trans-European road network[2] but Member States are highly encouraged to apply the principles also on the secondary road network, notably where EU funding is provided to road infrastructure investments.

TEN-T Comprehensive Network (2013)		TEN-T Core Network (2013)	
	Length (km)		**Length (km)**
Completed	123.459	Completed	56.016
To Be Upgraded	43.723	To Be Upgraded	17.334
New Construction	13.247	New Construction	3.614

Trans-European road network: length of roads

For new roads, the directive provides that safety impact assessments and audits have to be carried out at different stages of planning and construction. For already existing roads, a periodic safety ranking to find the most dangerous sections (*blackspots*) and periodic safety inspections are mandatory. The results of these inspections should then be the starting point for targeting maintenance and improvements of the network.

The infrastructure safety management directive does not prescribe in detail what methods Member States should use to assess the safety of their roads. However, it lists a number of aspects that the assessments need to cover. Member States are also obliged to establish guidelines for the practical steps to be followed by national authorities or infrastructure managers in assessing the safety of roads.

A specific legislation is also currently in place for ensuring a minimum safety standard of tunnels[3]. Following the deadly accidents and fires of Mont Blanc, Tauern and St. Gotthard at the end of the 1990s and the early 2000s, systematic procedures and technical solutions have been established in EU legislation for tunnels longer than 500 meters.

[1] Directive 2008/96/EC of the European Parliament and of the Council of 19 November 2008 on road infrastructure safety management OJ L 319, 29.11.2008, p. 59–67

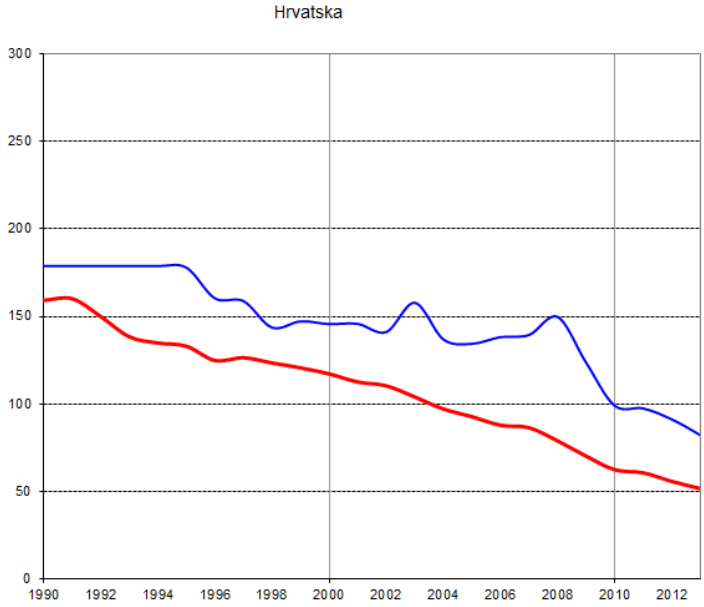
[2] Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU

[3] Directive 2004/54/EC of the European Parliament and of the Council of 29 April 2004 on minimum safety requirements for tunnels in the Trans-European Road Network, OJ L 167, 30.4.2004, p. 39-9

6. New Member State: Croatia

The newest EU Member State, Croatia, has taken on the challenge of reducing the number of road deaths by half until 2020. This strategic target is adopted in the *National road safety programme 2011 – 2020* which is closely aligned with the policy objectives of the European Commission.

Since around 2008, Croatia has succeeded in achieving a steep reduction of the number of road fatalities. In 2001, the number of dead per million inhabitants was 146; by 2013 this was down to 86 dead per million inhabitants compared to the EU average of 52.



Number of road deaths per million inhabitants 1990-2012 in Croatia.
Red line shows EU average.

The majority of road traffic crashes and fatalities in Croatia take place in urban areas: 80% of the accidents happen inside urban areas (EU average 68%) and 59% of fatalities (EU average 39%).

Croatia has only a partial zero tolerance policy on alcohol: a 0.0‰ limit for young drivers (16 to 24 years old) and professional drivers but for other drivers the 0.5‰ limit applies.

7. Concluding remarks

The main trends between 2010 and 2012 are *the safety of young road users* and *the safety of cars.*

The young car drivers are especially important since they have been largely over-represented among road fatalities and because their big share of the road safety problem means that a large percentage decrease gives substantial effect to the total numbers.

The reduction of car occupant fatalities can be linked both to driver education efforts, to enforcement campaigns and to the increased safety and improved equipment of vehicles today – not least with advanced driver assistance technology for road safety.

Future developments

For the coming years some additional focus on the unprotected road users seems to be called for. The low percentage improvements for pedestrians and cyclists indicate that more needs to be done. Among pedestrians, the increased use of smart phones and mobile phones as road user distractions is one risk factor to be further investigated. The Commission therefore launches a study on this during 2014.

The ageing Europe is mirrored also in the road safety statistics with the elderly making up an increasing share of the total number of road safety fatalities. Elderly pedestrians but also elderly car drivers face too high risks in road traffic today. To find solutions to the problem, the Commission initiates studies on road safety for elderly during the coming year.

The number of fatal motorway crashes no longer decreases at the same speed as other accidents. To investigate what more can be done to bring the improvement rate back on track, the Commission considers a review of the infrastructure safety management directive. A similar review is prepared for the professional driver training and qualifications directive, seeing that the number of heavy goods vehicle drivers killed is also decreasing less than average.

More information about these and many other planned and implemented road safety measures can be found on http://ec.europa.eu/roadsafety.

ESV CONFERENCE 2015 - ITALIAN GOVERNMENT STATUS REPORT

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ABSTRACT

This paper provides an overview of the main results achieved by Italy in the field of road safety during recent years. It focuses on the "National Plan on Road Safety" adopted in 1999, on its follow-up, in particular on its last edition titled "Horizon 2020".

After a general introduction of main road safety results, this paper describes the principal measures adopted during the last period, focusing on regulatory policies and enforcement.

A brief description of the research activities in the field of vehicle safety is given as well as a summary of the main recommended actions to improve road safety.

GENERAL

Road Safety in Italy

In the period 2001-2010 Italy has reduced its fatality rate from 125 fatalities/10^6 inhabitants to 68 fatalities/10^6 inhabitants which is about 46% reduction. Figure 1 shows the reduction of mortality rate recorded in the same period in the Europe Union [EU 27] Member States.

Between 2001 and 2013, Italy recorded a 52% reduction of fatalities (from 7,096 to 3,385) as well as 31% reduction of injured. It should be highlighted that the reduction of fatalities is more significant in the recent years since in the period 2001 – 2010 it was about 42%.

Looking at the percentage variation of number of deaths and injured between 2001 and 2013 by mode of transport, an inhomogeneous trend results for different categories of road users. In the case of mopeds there is a significant reduction in both the number of deaths and injured. Other categories, such as passenger cars and goods vehicles, show a modest reduction of the number of injured while reaching a significant reduction of the number of deaths (more than 50%). Cyclists and pedestrians, show a reduction of the number of deaths and an increase of the number of injured Finally, motorcycles show a slight decrease in the number of deaths (3%) and an increase in the number of injured (+ 19%).

In spite of the progress made, Italy remains a European country with high number of fatalities (3,385 in the year 2013); therefore further and continuous improvements are necessary.

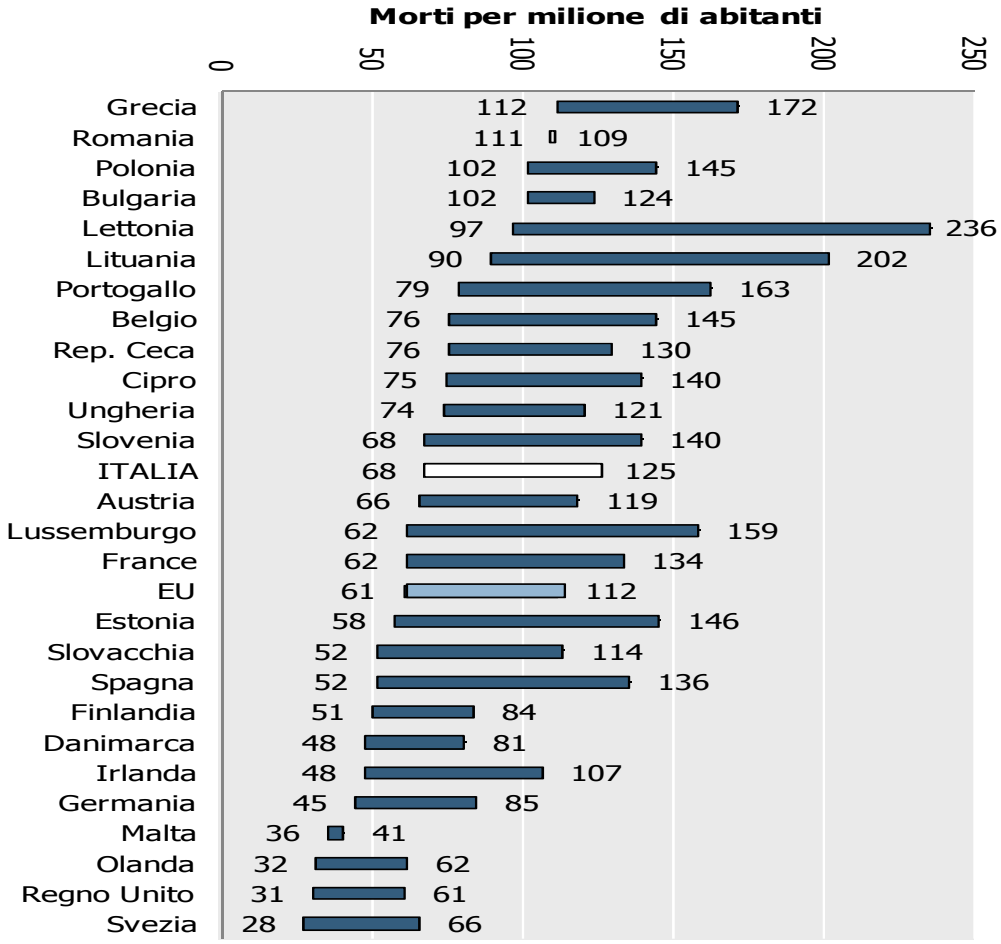

Figure 1 – Fatalities rate in EU 27 in period 2001-2010

THE MAIN ADOPTED MEASURES

The first National Plan on Road Safety covered the period 2001-2010 with the following strategic actions:

1. Regulatory policies

The main regulatory policies were represented by changes to the national highway code. In particular, the three major changes concerned:

- The introduction in 2003 of a penalty point system based driving license (Law No. 151/03). During the first two semesters of applications a reduction of 1,846 deaths was recorded as shown in figure 2.
- More empowerment to police agents and higher penalties, especially for "drink and drugs" drivers (Law No. 160/07).
- Zero tolerance for alcohol in case of young drivers (18-21 aged) and professional drivers.

2. Better enforcement

The main adopted enforcement actions were the following

- Increased number of checks on drink and driving. Between 2007 and 2012 the number of these checks increased by 220%
- The installation of automatic control systems (made by cameras and radars). The Italian automatic system to check average speed - so called "Tutor"- started to be implemented in 2004. In 2012 the system was in operation on about 3000 km of the highway network (the Italian highway road network is about 6700 km). In the period 2004-2011 a 48 % reduction of fatalities on highways was recorded.

3. Better road safety risk awareness

The adoption at national and local level of information campaigns has increased driver's awareness with regard to drink driving, speeding, use of helmets and safety belts. The main national campaigns are:

- "The guardian angel" campaign" which was conducted in the period 2003-2004.
- "On the good road" campaign which was conducted in the period 2009-2011.

The above campaigns resulted in an increase of the road risk awareness and in a behavioural change; this emerged by interviewing two samples of people (respectively 3000 and 5000 people).

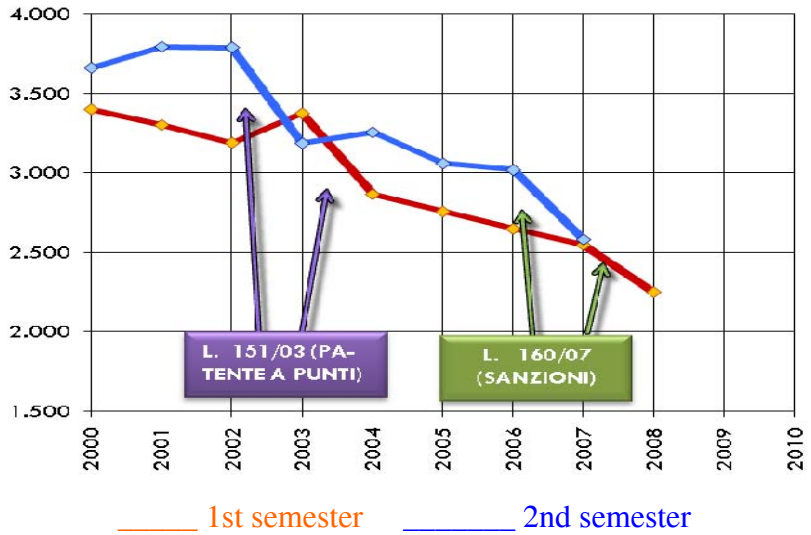

Figure 2 - The effect of introduction of a penalty point system based driving license

HORIZON 2020

The National Plan on Road Safety for 2001-2010 (hereinafter called NPRS 2001-2010) was developed in order to meet the goal fixed by the EU level of halving the number of fatalities in the EU.

Instead of a fixing a general target, the National Plan on Road Safety Horizon 2020 (briefly Horizon 2020) has set two levels of goals:

I. **General goals** concerning the level of safety of the whole road network where the final goal is the reduction of number of fatalities. The first target is to halve the number of fatalities by 2020 according to the European target. In terms of figure that means to reach a fatalities rate of 33 fatalities/10^6 inhabitants.

II. **Specific goals** defined according to the road user categories with higher level of risks. The categories which were identified are: pedestrians, cyclists, two-wheeler motor vehicle users and accidents of commuters. The result of a study shows the following:

- Pedestrians have an accident rate 6.7 time higher than car users;
- Cyclists have an accident rate 9,4 time higher than car users;
- Two-wheeler motor vehicle users have an accident rate 12,0 time higher than car users;
- The fatalities of commuters are about 6% of total road fatalities but they have risen by 52,1% between 2001 and 2010

Moreover, "Horizon 2020" adopted the principle of "no child dead on the road" aiming to involve all citizens to adopt a new culture of life.

WHAT TO BE CHECKED

The analysis of risk factors shows that the main factors triggering a road accident are the following.

- The high vehicle speed – both the absolute speed and relative speed between users – is the main factor causing about 30% of fatal accidents and is responsible for 17% of the accidents occurred in suburban area as recorded by police in 2012.
- The visibility is a main factor especially for vulnerable road users (pedestrian, cyclist and children).
- The "drink and drug" driving is a main factor especially for young drivers. According to a study conducted during 2008 and 2011 about 10% of drivers do not observe drink limit value.
- Use of safety protection systems. In the period 2009-2011, only 64% of front seats occupants used seat belt against a European average of about 78%. In the rear seat, the seat belt use rate is very low, around 10%. With regard the use of helmets it is estimated at about 90 %.
- The environmental factors are mainly related to the design and road maintenance. In 2012, 16% of deaths in road accidents occurred on wet or slippery road.
- Mass and shape of the vehicles is an important factor especially for vulnerable road users (cyclists, pedestrians and motorcyclists).
- Lack of experience leading to underestimation of risk and overestimation of their abilities are factors typically associated with young drivers and novice drivers. In Italy, 36% of young drivers aged up to 24 declare they over speed when driving, compared to a European average of 31%.
- Fatigue, stress and distractions while driving. It is estimated that drowsiness/fatigue is one of the causing factor in 10-20% of all road accidents, with an almost twice mortality rate compared to accidents due to other causes. The distraction is often linked to the use of mobile phones while driving. It is estimated that in Italy about 9% of people use a mobile phone when driving without a headset.

VEHICLE SAFETY RESEARCH

Research in the field of vehicle safety is mainly carried out in the framework of the activities of the European Enhanced Vehicle-safety Committee – EEVC of which Italy is member.

Researches conducted by EEVC are taken into account by the European Commission when preparing new legislation on road vehicle safety and by the UNECE which adopts technical regulations under the framework of the 1958 and 1998 Agreements.

The EEVC technical work is made by nine working groups, six of them dealing with passive safety, two with active safety and one with accidentology.

In the future, further progress in vehicle safety is mainly expected in the area of active safety rather than passive safety, but also in the field of integrated safety (combining passive and active safety for a more realistic performance evaluation). A key role is expected to be played by accidentology that will allow the definition of testing scenarios as well as real world assessment of active and passive systems.

Several are the ongoing actions.

With reference to accidentology and data collection Italy, through Florence University and FCA, is involved in the **IGLAD** (Initiative for the Global Harmonisation of Accident Data) **Consortium**. IGLAD was initiated in 2010 by European car manufacturers and is a consortium for harmonisation of global in-depth traffic accident data to improve road and vehicle safety. Main objectives of the consortium are the data collection and the recoding of data according to a standardized data scheme to enable comparison between datasets. At present, information on 75 variables regarding accidents, roads, participants (vehicles or VRU's), occupants and safety systems have been harmonized.

In the field of active safety, with more emphasis on the driver monitoring, a relevant Italian research project is **DRIVE IN^2** Project (DRIVEr Monitoring: Technologies, Methodologies and IN-vehicle INnovative systems for a safe and eco-compatible driving), which is coordinated by FCA Italy and involves several Universities.
The project received the Smart Communities award at SMAU (Salone Macchine, Attrezzature Ufficio, -exhibition of machinery and equipment for office) the most important Italian event dedicated to Information & Communication Technology- Naples, 2014. The objective is to develop advanced methodologies, technologies and systems for driver-vehicle interaction that help prevent accidents and reduce polluting emissions, with particular emphasis on the role of the driver. A key strength of the project is its multi-disciplinary approach, which includes:

- cognitive and behavioural analysis to identify factors having the greatest impact on the level and quality of driver awareness;
- monitoring of physical and psychological condition of drivers, including alcohol and/or drug use;
- application of data fusion and data mining techniques for an integrated analysis of vehicle variables;
- monitoring of driving style to determine maximum efficiency thresholds for key vehicle performance parameters.

One of the most interesting results from the project was the development of the SIM-Panda, the first prototype for safe road testing of driver monitoring systems. The vehicle enables realistic testing of systems that monitor the effects of fatigue, intoxication etc., without the dangers associated with real non-controlled driving conditions.

The Italian Ministry for Transport and Infrastructure recognized the DRIVE IN2 project as one of best practice, according to the National Action Plan for Intelligent Transport Systems (ITS), which was adopted by Ministerial Decree of 12 February 2014.

In the field of integrated safety, a relevant Italian project is **APPS4Safety** (Active Preventive Passive Solutions for Safety). The project is co-founded by Research Ministry and is included in the programs of DATTILO (the transport and logistic district), in the Campania Region. The project is coordinated by FCA (Italy), and is developed in collaboration with universities, several engineering firms and SAPA, an automotive parts supplier. APPS4Safety is focused on increasing the use of virtual engineering tools and methodologies in the automotive design and validation process to achieve a more integrated approach to safety challenges.

This multidisciplinary approach includes use of accidentology data, advanced components for non-conventional crashes (i.e., small overlap and pedestrian crash), new active and preventive safety technologies and systems, driving simulators, and new procedures for testing in the laboratory, on the vehicle or in a virtual environment.

With reference to ADAS evaluation Italy, is involved in the "Harmonization Group on Prospective Effectiveness Assessment for Road Safety (PEARS)". The objective of the group is to provide an open platform to discuss methodologies to evaluate the real-world effectiveness of advanced driver assistance systems in potentially hazardous traffic scenarios through virtual simulation. This cooperative research and development initiative involves major automakers, universities and automotive research institutes in Europe.

With reference to new test procedures Italy, is involved into the **CATS consortium** (Cyclist Autonomous emergency braking Testing System). The Consortium is working into the definition of a new testing procedure to assess Cyclist AEB (Autonomous Emergency Braking) systems and consumer tests of those systems.

Finally, Italy is involved in the field of tertiary safety on the work about new ISO 17840-1 for emergency rescue sheets.

ACTIONS TO BE TAKEN

Italy has been experiencing the greatest and most relevant amelioration process in the field of road safety during the last 30 years, which made it possible to re-align with the other EU countries.

A series of actions have been recommended by the transport administration and are being considered at political level.

First of all, in order to improve the effectiveness on road safety it is necessary to reinforce the action and ensuring a better coordination at central, regional and local level

In this respect, the Directorate General for Road Safety of the Ministry of Infrastructure and transport

plays a pivotal role. This organisation is linked to the corresponding regional offices which makes it possible to deal with road safety in a more systematic way.

Secondly, it is clear that the enforcement action is producing positive effects; therefore, we expect to continue to increase the number of controls on the roads with a better and dissuasive enforcement of traffic rules.

Another priority is the creation of a road safety culture, starting from school level with the aim of making the young population more aware of the need of careful and responsible driving. This priority should also concern administrations dealing with road safety in order to better train the existing human resources and prepare the new professionals to better deal with the subject.

The Road Safety National Plan has strongly recommended the adoption of a monitoring network based on local administrations and coordinated at national level. The aim of the monitoring is to have a better knowledge of the state and the evolution of road safety, the road safety measure adopted during the years and the results which have been achieved, to assess the effectiveness of the adopted measures.
