Improving the Traffic Safety in the Western Balkan Countries through Curriculum Innovation and Development of Undergraduate and Master Studies


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I. SPAIN

1. Analysis of established practices in Spain for traffic safety management

   The established practices in Spain are based on the Road Safety Strategy 2011-2020 published by Traffic General Directorate being a framework for action and an instrument which promotes, facilitates and coordinates the road safety initiatives of the political, economic and social agents at a national level, the attainment of shared objectives and the achievement of new challenges. The actions which are to be carried out in the framework of the strategy are based on the handling of eleven groups and key road safety topics from the perspective of education and training, raising awareness and communication, compliance with regulations, the infrastructure and the vehicle, the urban area, the company and professional transport, victims, as well as two areas of action which apply across the board, which are research and knowledge management, and coordination and participation.

1.1 The Safe System Approach

1.1.1 Traditional and Safe System approaches

   The path towards sustainable mobility is guided by five central themes: ecological mobility, safe mobility, universal mobility, competitive mobility and healthy mobility. The key factors of the institutional management of the strategy: Political leadership, An integrationist strategy, Interdepartmental coordination, Governmental involvement in the territory, Participation of public, private and social agents, Generation and transfer of knowledge.

   The vision: The citizens have the right to a Safe Mobility System in which everyone, citizens and agents involved, has a responsibility.

   The values: The strategy conceptual framework: objectives and indicators; Shared rights and duties; The users and designers of the system are its collaborators and voluntary workers; Sustainable mobility: Healthy for citizens and environmentally-friendly; Safe users: Educated, trained, informed, aware and responsible; Safe roads and environments Roads designed according to human and technological capabilities; Safe vehicle Protector of its users.
1.1.2 Safe System Principles

The priority of the strategy is to reduce the socio-economic impact of road traffic accidents through the following principles:

- To protect the most vulnerable users
  - Children: to provide safe school environments and journeys, to improve the efficient use of child retention systems, to promote road safety on the school curriculum.
  - Young people: to improve the capabilities and attitude of young drivers, to carry out active interventions at nightlife venues.
  - Elder: the monitoring of older people's driving ability improves, to provide the elder with safe areas for mobility, to improve knowledge about the accident rate amongst the elderly and their mobility.
  - Pedestrians: to promote walking as a cheap and healthy form of mobility, to provide safe areas for pedestrian mobility, to improve knowledge concerning the accident rate of pedestrians and their mobility.
  - Cyclists: to promote the use of the bicycle as an efficient mode of transport, to improve the skills and attitudes of cyclists and other users, to provide safe areas for bicycle mobility, to improve cyclists' knowledge.

- To promote safe mobility in urban areas: to provide safe urban public spaces and environments; to promote discipline in the urban environment.

- To improve the safety of motorcyclists: to ensure safer conduct from motorcyclists; to increase the safety of the roads for motorcyclists; to increase knowledge concerning the accident rate of motorcyclists and their mobility.

- To improve safety on single carriageway: to ensure safer conduct on single carriageways, to improve the safety of single carriageways by designing them especially to prevent vehicles from leaving the road or having head-on collisions.

- To improve safety on work-related trips. Road safety in Companies: to achieve the active intervention of companies in accidents on the way to and from work, to improve knowledge concerning accidents on the way to and from work; Professional transport: to ensure safer conduct from professional drivers; to improve the ability and competence of professional drivers.
To improve conduct related to alcohol and driving speed. Alcohol and drugs: to develop preventive actions to reduce the consumption of alcohol and drugs when driving; to consolidate the actions for monitoring the regulations. Speed: to achieve safer conduct in relation to speed; to promote safe road design in order to reduce dangerous situations due to speed: 30km/h areas, accesses to towns.

1.2 Traffic safety management functions

1.2.1 Result focus

The result focus is oriented to the following indicators:

- Lower rate of 37 deaths per million inhabitants
- Reduce the number of serious injuries by 35%
- Zero children killed without a child retention system
- 25% less drivers between the ages of 18 and 24 killed or seriously injured at the weekend
- 10% less drivers killed above the age of 64
- 30% less deaths due to being run over
- 1,000,000 more cyclists without their death rate going up
- Zero deaths in cars in urban areas
- 20% less deaths and serious injuries amongst motorcyclists
- 30% less deaths due to having come off a single carriageway
- 30% less deaths in accidents driving for work
- 1% reduction in those testing positive for alcohol in the blood in random preventive tests
- 50% reduction in the percentage of light vehicles which exceed the speed limit by more than 20km/h

1.2.2 Coordination

The lead agency in road safety is Chairs (Minister of Interior) the National Road Safety Council, a high level group of consultation. It elaborates Road Safety Strategies and Plans (now in force: Road Safety Strategy 2011-2020; Plan of Action 2012- 2016). It has direct responsibility for: traffic rules inside and outside urban areas; traffic management and enforcement outside urban areas; driving licensing; penalty point system; vehicle
registration; coordination of research on road safety; national registers of drivers, vehicles accidents, sanctions, penalty points.

1.2.3 Legislation

The intention of regulations and enforcement is to consolidate the change in road users’ behaviour by supervising observance of the regulations. The supervision and control of compliance with the regulations is, along with information and awareness, one of the most effective tools available for managing to increase road safety. The groups and key topics that are to be tackled by the strategy in the area of regulations and enforcement are children, young people, cyclists, motorcyclists, single carriageways, alcohol and drugs, and speed.

✓ Sphere of Intervention “Regulatory reform”: Regulate the use of saliva tests in drug controls; Establish action protocols for the detection of the presence of hash and cocaine in driving; Define the concept of repeated offenders and their monitoring from the penalty points license register; Vehicle confiscation.

✓ Sphere of Intervention “Enforcement”: Run enforcement campaigns to enforce the use of seat belts and child restraint systems; Run enforcement campaigns tackling speeding as a risk factor; Run enforcement campaigns targeting drink and drug driving; Draw up a comprehensive plan for the monitoring and control of drivers without a license; Run enforcement campaigns to enforce traffic laws on areas outside urban areas; Share the annual calendar of enforcement activities to all police forces; Run specific campaigns to monitor and control the correct signalling of roadworks; Run campaigns to monitor and control motorist compliance with the regulations, particularly on roads and sections with pseudo-sport driving; Run campaigns to monitor and control school transport.

✓ Sphere of Intervention “Law enforcement tools”: Promote the use of the new technologies in law enforcement; Improve police experience and training and hence increase the effectiveness of alcoholic drinks and drug controls; Study the possibility of introducing alcolock for certain groups; Review and update the Fixed and Mobile Radar Plan in accordance with national and international experience acquired.
1.2.4 Funding and resource allocation

The actions which are to be carried out in the framework of the strategy are based on the handling of eleven groups and key road safety topics from the perspective of education and training, raising awareness and communication, compliance with regulations, the infrastructure and the vehicle, the urban area, the company and professional transport, victims, as well as two areas of action which apply across the board, which are research and knowledge management, and coordination and participation. However, given the current environment, particularly where budgetary availability is concerned, the details of the projects to be undertaken and the economic budget will be set out in the action plans which are drawn up annually, and will be the working tool for achieving the established objectives.

1.2.5 Promotion

The communication plan of the Road Safety Strategy pursues the following objectives:

- To achieve the strategic objectives, which aligned with the best international practices and shared by all of the agents involved, constitute the road map for road safety policy for the coming years.
- To enrich the knowledge of the environment and the reality of the action plans on behalf of the groups affected and involved.
- To facilitate the elimination of possible resistance from the various agents whose action contributes towards the implementation and achievement of the strategy and promote the attainment of synergies on knowing the objectives that they are pursuing and sharing.

In order to achieve these objectives, the Strategy proposes the deployment of a line of internal communication, and, at the same time, an external line of communication will be developed at both a national and international level.

Internal communication plan

The internal communication of the strategy is aimed at Traffic Department staff, a distinction being made between the staff involved and the remaining personnel:

- The staff involved shall be informed of the launch, annual plans, follow-up reports and annual reports by means of a news summary.
- The remaining personnel can find out about the strategy through press releases which will be displayed on the intranet.
External communication plan

The external communication plan will have two target groups, the media, and citizens and social agents:

✓ The media will be informed of the launch, annual plans, follow-up reports and annual reports by means of press releases.
✓ Citizens and social agents will be informed of the strategy launch by means of an information campaign. The information concerning annual plans, follow-up reports and annual reports will reach them through press releases which will be published on the strategy web page.

1.2.6 Monitoring and evaluation

The monitoring model is a dynamic and continual process which should guarantee the feedback and adoption of corrective actions, related to the development and execution of the strategy.

This model is supported by the following process and procedures:
✓ • The activity indicators system.
✓ • The annual Action Plan.
✓ • The annual Report of Activities.
✓ • A revision of the Strategy on the mid-term.

1.2.7 Research and development and knowledge transfer

Research and knowledge management is based on “More and better information to ensure the efficient treatment of road safety issues”. More accurate knowledge of the cause of accidents and the effectiveness of measures taken, amongst other things, will make the actions more effective in this area.

✓ Sphere of Intervention “Road safety statistics and indicators”
  o Progress in the awareness of the safety level through observation studies to obtain road safety indicators.
  o Obtain risk exposure data.
  o Obtain cost-benefit indicators for the evaluation of measures.
  o Evaluate measures, policies and risk prediction analysis.
  o Set up Regional Road Safety Observatories.
  o Road Safety Statistical Plan.
✓ Sphere of Intervention “Research related to road safety”
o Carry out studies that enable accident rate profiles to be characterized for the priority groups in the Strategy and main risk factors.

o Selectively develop in-depth analysis and systemize the findings.

o Study speed as a risk factor and its impact in our country.

o Study the problem of “black spots” in the accident rate for different groups.

o Exchange knowledge on accident rates and road safety among the different social agents.

1.3 Traffic safety activities

1.3.1 Safe roads

Operational objectives are to “Improve the safety of single carriageway by designing them especially to prevent vehicles from leaving the road and having fatal collisions” and “Ensure safer conduct on single carriageway”. In this context, the following measures are specially designed for this collective:

- Run enforcement campaigns to enforce traffic laws on areas outside urban areas.
- Share the annual calendar of enforcement activities to all police forces.
- Gradually extend the application of the safety classification of infrastructures (European Directive on Road Structure Safety Management, Risk-maps, Eurorap…) to the Spanish Road Network so that road sections with greater potential for improvement and efficiency in safety investments in infrastructures can be classified.
- Extend the application of the criteria included in the Technical Manuals published by the Ministry for Public Works on vehicle safety barriers to Spanish roads so as to reduce the severity of accidents as a result of vehicles going off the road, particularly on single carriageways.
- Promote the construction of vehicle parking areas on single carriageways.
- Promote the development of technical criteria and the implementation of pilot sections on single carriageways to avoid the risk of frontal collisions.

1.3.2 Safe vehicles

Vehicle safety through “Vehicles equipped with more and improved safety elements”. The best knowledge of the current vehicles on the road and their safety conditions, promoting the incorporation of new active and passive safety systems, that
should be installed safely, and taking care of the maintenance will make a considerable contribution towards reducing the number of accidents and their severity. The groups and key topics that are to be tackled by the new strategy in the area of vehicle safety are motorcyclists.

Sphere of Intervention “Vehicle technical information”:
- Increase data in the National Vehicle Register so as to have more and better information.
- Draw up the Evolution Barometer of Safety Conditions of the Vehicle Fleet and environmental emissions.
- Provide citizens with vehicle records.
- Improve the MOT Register.
- Sphere of Intervention “Towards a more sustainable vehicle”.
- Promote the clean and efficient vehicle.
- Promote sustainable and safe fleets in the Public Authorities.
- Sphere of Intervention “Towards a safer vehicle”.
- Promote demand for the incorporation of active and passive safety features in vehicles.
- Promote the renewal of the vehicle fleet in accordance with road safety criteria.
- Develop vehicle-vehicle and vehicle-infrastructure interaction systems.
- Run campaigns to raise awareness of the importance of preventative vehicle maintenance from the point of view of road safety.
- Promote the installation and use of speed limiters in vehicles.
- Promote the gradual incorporation of braking distribution systems in the fleet of motorcycles.

1.3.3 Safe road use

It is based on education and training to “Promote civic, responsible and safe behaviour amongst road users”. Education and training are the tools which make it possible to modify road user conduct in the medium-long term so that they voluntarily develop safe conduct, following the traffic regulations and proceeding with caution on their trips. The groups identified in the new strategy that are the focus of the education and training area are children, young people, newly qualified drivers, cyclists and motorcyclists.
Sphere of Intervention “In the educational environment”: Draw up and disseminate didactic material based on the promotion of safe values for compulsory training in Road Safety for Primary and Secondary Education: Promote road safety in compulsory education; Train teachers in road safety; Promote the “safe school route”; Run educational programmes for children as users of bicycles.

Sphere of Intervention “In access to driving”: Introduce accompanied driving; Homogenise the novice driver concept; Promote classroom road safety training at driving schools; Promote road safety contents and efficient driving in the theory part of driving tests; Incorporate the role of road training teacher in regulated vocational training.

Sphere of Intervention “In updating knowledge”: Promote safe driving courses for motorists; Promote safe and efficient driving courses; Improve training for reckless drivers.

Alcohol and drugs - Operational objectives: “Develop preventive actions to reduce the consumption of alcohol and drugs when driving” and “Consolidate the actions for monitoring the observance of regulations”. In this context, the following measures are specially designed for this collective:

- Conduct information and awareness campaigns about the risks of alcohol and toxic drugs on driving, and promoting these campaigns at European level.
- Promote the involvement of society in initiatives related to the risks of alcoholic drinks and driving; Consolidate the role of alternative driver and passive drinker; Regulate the use of saliva tests in drug controls; Establish action protocols for the detection of the presence of hash and cocaine in driving; Define the concept of repeated offenders and their monitoring from the penalty points license register; Run enforcement campaigns targeting drink and drug driving. Improve police experience and training and hence increase the effectiveness of alcoholic drinks and drug controls. Study the possibility of introducing alcolock for certain groups; Create a rehabilitation programme for repeated offenders in alcoholic drinks and drug sanctions. Raise awareness of health professionals so that they have greater involvement in preventing the effects caused by alcoholic drinks and drugs while driving.

Speed - Operational objectives “Achieve safer conduct where speed is concerned” and “Promote safe road design in order to reduce dangerous situations due to speed: 30km/h areas, accesses to towns”. In this context, the following measures are specially
designed for this collective: Run information and awareness campaigns on speed as a risk factor; Run enforcement campaigns tackling speeding as a risk factor; Review and update the Fixed and Mobile Radar Plan in accordance with national and international experience acquired. Gradually introduce section control in accordance with road safety criteria; Promote the installation and use of speed limiters in vehicles; Review speed limit signalling criteria on single carriageways. Divisions into sections of homogenous characteristics will be necessary in order to facilitate signalling and its enforcement; Draw up the instruction on safety distance signalling and proceed to its selective implementation; Review crossing and entering villages so as to adapt speed to road safety demands; Appease traffic through the extension of pedestrian zones, 30 zones and meeting zones; Study speed as a risk factor and its impact in our country.

1.3.4 Post-Accidents Care

It is to support those affected by traffic accidents since road traffic accidents result in a high number of victims every year, the lives of whom can be seriously affected by the consequences. This requires the protection and support of the people affected, both direct victims and relatives.

Sphere of Intervention “Assistance at the scene of the accident”
✓ Improve response times in traffic accidents.
✓ Organize meetings on emergency assistance in traffic accidents for the exchange of good practices.
✓ Implement the e-call system to report emergencies.
✓ Sphere of Intervention “After the accident”:
✓ Calculate the socio-economic cost of accidents.
✓ Draw up the new scale of compensation.
✓ Integrate victims of traffic accidents and provide legal and psychological assistance at the Victims’ Offices.
✓ Develop the function of the Public Prosecutor’s Office as a guarantee of victims’ rights.

Sphere of Intervention “Victims associations”:
✓ Promote the celebration of the Worldwide Day of Traffic Accident Victims.
✓ Promoter and cooperate with associations of victims in their road safety preventive programmes.
Promote the presence of associations of victims in social networks to transmit positive messages regarding road safety.
2. Introduction with traffic safety innovative practices in Spain

An example is collaboration of Mobileye and Spain’s Road Safety Authority DGT (Directorate-General of Traffic) to Enhance Road Safety and Prepare for an Autonomous Future seeking to enable Spanish cities to become autonomous ready through ADAS Adoption, Mapping Data Generation and Policy Framework Development. Mobileye-Bus will promote the benefits of the adoption of advanced driver assistance systems for municipal and private fleets to support improved road safety across Spain. The development of vision and data analysis for advanced driver assistance systems (ADAS) and autonomous driving, and Spain’s Directorate General of Traffic (DGT) is intended to reduce road accidents and prepare Spain’s infrastructure ecosystem and regulatory policy for the driving of autonomous vehicles. Furthering the Vision Zero objective, the DGT will also promote the development and adoption of autonomous driving. The DGT is working toward the regulation of autonomous vehicles and will lead the required cross-industry alliances to position Spain as an integrated Autonomous Ready™ country.

In addition to assisting to prevent accidents by providing drivers with real-time visual and audio alerts, the system collects actionable and dynamic data on city streets, such as infrastructure deficiencies, accident hotspots, parking usage, environment conditions and other road hazards. Data collected will be analyzed by the DGT and other government authorities to prepare Spanish roads for semi- and fully autonomous vehicles, while also contributing to and enhancing the development of RoadBook, powered by the crowdsourced REM Road Experience Management mapping technology. Additionally, data obtained will be utilized in other research and development projects to explore new ways to improve road safety.

Mobileye and Spain’s DGT will also collaborate on defining the regulatory roadmap required for an autonomous future. Together they will seek to develop a policy framework for efficiently validating the safety of an autonomous vehicle, incorporating Mobileye’s Responsibility Sensitive Safety (RSS) model, which provides specific and measurable parameters to ensure that a self-driving vehicle operates in a responsible manner and does not cause accidents for which it can be blamed. The landmark collaboration is the
latest example of Spain’s efforts to become a world leader in road safety through technological innovation.
3. Discussion

Spain is one of the EU countries with a lower traffic fatality rate per million population and ranks fifth in the list of countries with the lowest fatality rates and with better figures than Germany, France, Italy or Finland. In 2016 the population was 46.4 million inhabitants in Spain, the vehicle fleet was 33.6 million vehicles and there were 26.5 million registered drivers; in 2016 Spain welcomed 75.3 million tourists, a 9% increase as compared with the previous year. The factors that play an important role in our fatality rate are increased mobility, ageing of the vehicle fleet, inappropriate speed, driving under the influence of alcohol and drugs, failure to wear safety belts and child restraint systems, and distractions, especially those related to the use of mobile devices.
II. HUNGARY

1. Analysis of established practices in Hungary for traffic safety management

Maintaining and increasing road safety is a fundamental objective of transport policy. The road safety activity is extremely complex, closely related to many other areas. Since at the heart of all road safety efforts is the physical and spiritual integrity of human. Traffic safety is therefore also a health issue.

Additionally, road accidents cause huge losses to the national economy. However, investments in the creation and maintenance of high-performance, safe and environmentally friendly transport systems will create jobs, promote business creation and regional infrastructure.

Finally, on the one hand traffic safety is an important part of general security of life and living conditions. On the other hand; in this sense, it is also an environmental issue.

1.1 The Safe System Approach

1.1.1 Traditional and Safe System approaches

Maintaining and increasing road safety is primarily the responsibility of the state. Efforts in this area can only be successful with a broad social partnership.

The basic question of road safety is whether we assume the responsibility of others in everyday road traffic, as we expect from others. Behavior in road transport is a form of social behavior that we shape ourselves on the one hand and traffic rules on the other. Even if compliance with the regulations is indispensable, the safety of transport cannot be ordered or enforced. Therefore, in addition to the regulations and their enforcement, the responsibility of the road users must be emphasized. Traffic safety is consequently also a social issue.

1.1.2 Safe System Principles

Efforts to increase the level of traffic safety can be grouped around three fundamental factors according to one division:

✓ human,
✓ vehicle,
✓ road and environment.
Although each of these three areas is important, education, training, experience and propaganda strongly influence the behaviour of road users. As a result, it must be placed at the centre of road safety.

Another division classifies the main areas of road safety activity by help of the “Three E” rule:

- Education (education, education, training, propaganda),
- Enforcement (enforcement of traffic rules by checking and sanctioning non-compliance),
- Engineering (an engineering activity that includes not only the vehicle but also the road-related technical tasks).

1.2 Traffic safety management functions

1.2.1 Result focus

The goals of a road safety programs are:
- improving the behavior of road users by better understanding and mediating the rules and providing basic and further training,
- safer vehicles using technical developments (primarily by using electronic equipment, intelligent vehicles),
- improving the infrastructure of the road by disseminating the best solutions,
- standardizing the control of violations,
- highlighting hazardous locations,
- uniform collection of accident and incident data,
- ultimately halving the number of road fatalities

1.2.2 Coordination

The responsibility of the state is to deal with the following areas to improve road safety by:
- enforcing the use of the seat belt,
- introducing the system of periodic technical inspection of the vehicles,
- enhance roadside controls,
- speed limits,
- specifications for vehicle dimensions and weight,
- unification of driving license and training programs to gain more experience,
- technical harmonization of vehicle standards,
safety requirements for the road network, taking into account technical progress,

health and general consumer protection.

1.2.3 Legislation
The diverse nature of the road transport structure and its social impact make it necessary to regulate the technical, traffic, economic and legal aspects as well. On the one hand, the Minister responsible for the sector of transport and subordinate institutions play an important role the development of the regulation of road transport. Furthermore, regarding additional legal and governmental regulations

✓ the Minister of the Interior is directly responsible for the operation of road traffic, road safety, vehicle registration and the related administration and information system and indirect responsibility for the operation of the municipal road network through the municipal operational supervision competence,

✓ the Minister of Finance, who, in addition to his overall financial responsibility, is also responsible for the adequacy of the funding conditions for the national public road network and the public bus service under the exclusive state ownership,

✓ and the Minister for the Environment, one of the most important and difficult tasks of which is to reduce, as far as possible, the environmental impact of road transport and mitigate its consequences.

Road transport is also affected by a number of international regulations.

The scope of the Roads Act and its Implementing Regulation covers - regardless of nationality - road users, vehicles, roads and their surroundings, as well as road transport facilities in Hungary.

Road transport is controlled by a very important and widely known law in Hungary, the Ministerial Order on Road Traffic (1/1975 KPM-BM Decree, amended several times).

1.2.4 Funding and resource allocation
Road accidents represent a significant cost to the state budget.

The improvement of road safety is financed by the national economy.

1.2.5 Promotion
According to the National Road Safety Program, an action program should be developed annually to maximize road safety. The Government must report annually on the development of traffic safety. Public tasks to improve road safety are emerging in the field of road transport. This includes:

- professional support, education and promotion of school education regarding safety road use,
- work on collecting, evaluating and researching the data needed for the planning, development and regulation of road transport.

Within the above categories, the annual action programs, together with the available financial resources, record the specific actions to be taken.

1.2.6 Monitoring and evaluation

Traffic accident – in statistical sense - is an unexpected, unintentionally induced traffic event that has resulted either death or personal injury or material damage. A traffic accident can cause:

- material damage and/or
- personal injury.

The scope of traffic accident statistics only covers the latter one.

A road accident involving personal injury is any traffic event that has occurred on the road or from a road, and in which at least one moving vehicle or an animal that can be used to drive is involved and at least one person died or was injured. The classification of personal injuries by outcome in Hungary is divided into three group as follows:

- personal death means (at least) a person died as a result of an accident at the scene of the accident or within 30 days of the accident,
- severe injuries include injuries, fractures, cracks, shocks, internal injuries, general medical treatment, general injury, or any injury that requires hospital care,
- light injuries, fractures that heal within 8 days.

The level of road safety is measured by the absolute or relative number of deaths caused in the given traffic environment (country, county, city, road network, etc.). Relative numbers (specific accident data or accident indicators) are derived from absolute data by comparing them with other road traffic characteristics (so-called background data such as traffic size, vehicle stock, etc.).
The most important of these is the relative accident indicator and the accident density.

These indicators are primarily suitable for comparing the road safety standards of different road networks, road sections and road categories, although the relative accident indicator is also advantageous for international comparison. An important quality measure of the road safety situation is the so-called. Severity Indicator, which refers to the number of deaths per 100 injuries on average per road accident.

Comparisons are usually territorial

1.2.7 Research and development and knowledge transfer

Most of the issues of road transport development are raised by networked infrastructure. The infrastructure consists of a large number of elements, a wide variety of technical and institutional components.

The development of the road network can be investigated by interaction with the maintenance and operation possibilities, integrated into the complex transport system, and the development and implementation of a coordinated development, maintenance and operation strategy for roads.

An important part is the implementation of IT developments, as IT becomes an increasingly important element of transport systems. There are several areas of IT application that support other activities, such as: administrative and administrative automation, general communications, process control, database creation and use, etc. However, in the field of transport there is also a wide range of IT applications, from which the electronization of telecommunication and insurance equipment, the implementation of telematics investments, the establishment of traffic management and organization systems (transport management, reservation, passenger information, etc.) are emphasized.

The use of telematics, electronic data interchange (EDI), geographic positioning (GPS) is of particular importance in road transport. The implementation of telematics developments is also important for our European integration. Coordinated application at local, micro-regional, regional, national, and international levels will result intelligent transport systems that are embedded in data collection and processing:

- collective information, information and traffic flow systems with point, line or network operation,
individual information and traffic control systems that provide information before or during travel,
systems providing up-to-date traffic information to drivers.

Telematics systems also have an important traffic safety impact (vehicle tracking systems) besides their information significance. Connecting a wide range of applications, creating a unified database, and exchanging data is also used for business communication, making it easier to engage internationally and apply advanced organizational methods.

1.3 Traffic safety activities

In case of traffic safety regulation, the necessary activities should cover all aspects of the transport system, including human, vehicle, track and other equipment. Accident statistics, technical research results, and advanced security products that have been developed must be taken into consideration.

Improving road safety is a key issue for the EU's common transport policy. In this regard, four well-defined areas can be highlighted by fitting to the system elements:

- design, construction and maintenance of road infrastructure (including track and other facilities),
- development of vehicles (by increasing passive and active safety),
- traffic management and control,
- influencing driver behavior.

1.3.1 Safe roads

In case of tracks and other facilities, the implementation of safety requirements and the prevention of potential conflict situations should be considered even at the construction stage. Thus, e.g. the spatial segregation of different types of traffic (goods - person, local - long distance, motor - cyclists - pedestrians) is justified, in order to reduce the number of accident centres; eliminating level crossings and modernizing existing insurance systems.

The safety impact of road network development is not negligible. For that reason, activities are needed as well:

- high-speed road network development,
- use of European design standards for all roads, use of appropriate signal equipment for operation and maintenance work, and the improvement of pavement quality, including drainage capacity,
- develop a system for social reviews of developments,
in the case of non-residential roads, great attention should be paid to the development of junctions and level crossings, to the enhancement of the safety of railroad crossings by modern safety devices, to the reduction of the interference of road barriers (advertisements, columns, lines, vegetation),

in case of roads within the built-up area it is important to force the actual speed reduction (e.g. at the introductory stages of the settlement).

1.3.2 Safe vehicles

In terms of vehicles, construction and technical condition are also a safety factor. Safety aspects of technical development are significant. Improvement of active and passive safety systems is a key question.

Active safety aims accident prevention and contains:

- braking systems,
- steering equipment,
- light and sound signalling equipment, etc.

Passive safety is to reduce the consequences of accidents that have already occurred and consists of:

- better quality of the materials used,
- design of the chassis and bodywork based on scientific studies,
- high-performance bumpers
  - which absorb a high amount of collision energy by deformation,
- airbags and the seat belts, etc.

In addition, the comfort equipment taking into consideration ergonomic requirements not only reduces physical but also nervous fatigue which results an improved level of road safety.

Furthermore, when a new device is set up in a vehicle, the former, periodic (continuous) inspection has to be renewed in order to justify the conformity, suitability and the safety operation. An example for that issue is remodelling a gasoline engine vehicle into a gas-powered one.

1.3.3 Safe road use

In order to improve road safety, the development of good transport behavior has been identified as a priority. Its main tools are:
strengthening road safety propaganda (TV and radio campaigns, billboards, etc.), coordinated with police controls,
improvement of the content and methodology of driving schools, education, differential practice programs of different age groups, regularization, encouragement and improvement of the prestige of teachers' trainings, professional special trainings,
modernizing, harmonizing the system of driver training, examination and post-training, and preparing the introduction of a driving license for the trial period.

For enforcing good traffic behaviour, the following actions are made:
increasing the frequency of police controls
  o increasing the number of police staff,
  o enhancing police qualifications and technical equipment (measuring instruments, laboratories),
introduction of central computerized record of traffic offenses
  o point system,
  o history of previously committed traffic violence.

Particular attention should be paid to the requirement to install child restraint equipment (seat, seat belt, etc.).

1.3.4 Post-Accidents Care
Drivers involved in a traffic accident have a legal opportunity to take the necessary measures to settle claims at the site of a road accident that causes only material damage. (Acceptance of liability for an accident is not mandatory on the spot.)

Since it aims to eliminate the consequences of accidents that have already occurred, technical rescue as an indispensable action, is usually counter-productive process if it is needed.

Scene investigation is a procedural act in which, while adhering to strict formalities, the aim is to record the condition, situation, circumstances found on the site, track traces, alterations, and their relationships in such a way that the results of the inspection provide data for the investigation, facts before the court prove and present reality.

In the case of road traffic accidents, on-the-spot inspections are mostly carried out as an urgent investigation action.

Based on the data collected, the traffic accident is aimed to be investigated and reconstructed in a detailed form.
2. Introduction with traffic safety innovative practices in Hungary

The main determinant factor of traffic safety is the human, since the vast majority of accidents are due to human reasons. In the transport process the participation can be:

- active player as a driver or other service provider,
- passive person as a passenger,
- participates as an individual passenger in variable quality (driver, passenger, pedestrian).

Therefore, in order to increase traffic safety, the primary objective is to reduce the potential for human error.

There are several options to train those people who already have driving licence. One is taking part in driving technique trainings. The drivers can gain more experience on driving tracks, where special traffic situations can be met (see Figure 1.). Several driving schools and institutions provide these types of trainings. The other opportunity is using driving simulators.

![Figure 1. Driving trainings with special effects](image)

Improving the level of education and enhancing the knowledge is a key moral issue. For that propose, a number of posters can be seen around the roads of Hungary. The aim is to draw attention to the risks of speeding and fatigue, increase seat belt use, etc.

In addition, special programs are organised for children and adults as well, to get closer to the questions of road safety as a participant of traffic (driver, cyclist, pedestrian, etc.).

There is "To see and to be seen" campaign in every autumn, to give the opportunity to the drivers to let the lightning equipment of the vehicle checked by experts to reduce the number of accidents caused in the dark.
Furthermore, to increase visibility of the traffic signs, an option is to mark them with fluor based background, especially when the usual traffic order is changed on the given part of the track (see Figure 2.).

![Figure 2. Traffic sign with fluor background](image)

Determining accidental center points is a key question. A suitable solution for separating the oncoming traffic is the double barrage line that might furtherly be extended by deflectors as well.

![Figure 3. Double barrage lines with deflectors](image)

Finally, in critical crossroads and on roads with high traffic camera systems are set up. On the one hand, by help of their records, sanctioning of committed traffic violence is easier. Additionally, when an accident is occurred, more visual data is provided from the situation before the incident and the circumstances around it.
3. Discussion

The objective evaluation of road safety is unthinkable without professional international comparison. This comparison can, of course, only be done using specific accident data, as the distortions resulting from the comparison of the different conditions in each country can only be eliminated if they are not always fully. Comparison is made difficult by many problems.

In Hungary, nearly 98% of road accidents can be traced back to human causes. Within this, drivers were faulty in 87.5% of accidents and in 10.8% pedestrians. Although in recent years, the rate of drink-induced accidents has decreased, but the rate is still very high (12%). An increasing proportion of accidents occur in populated areas, which is more than 72%. Among the causes of the accident following are the most common:

✓ incorrect speed,
✓ change of direction and turning,
✓ not giving priority,
✓ overtaking.

Besides raising the level of education and moral factors, which play a major role in the improvement of the accident situation, the activities of social organizations and civil organizations are also of great importance in addition to the official bodies (transport policy, traffic authority, legislation). With the initiatives and propaganda activities of the National Accident Prevention Committee, bringing together both circles, it has a major role to play in improving road safety.

In Hungary, in the past decades primarily as a result of the consistent series of road safety measures, the number of road traffic accidents and the number of victims of personal injury significantly decreased. Only the severity index of accidents has not been significantly reduced, therefore in the future the traffic safety activity should be focused more on the prevention of fatal and serious injuries, especially outside the populated area.

Active police presence and scientifically-based, intense awareness-raising activities are key to achieving and "preserving" the benefits of the measures.

The international comparison of road safety should not ignore the difference between the motor level of the countries under investigation; As motorization levels increase, specific accident data show a decreasing trend.

By using the experience of advanced motorized countries, we can somewhat shorten the "motorized" path assigned to us, avoiding
III. POLAND

1. Analysis of established practices in Poland for traffic safety management

The subject is too wide to discuss it in an accurate and comprehensive way. This document will present the data in a synthetic and general way. The information was taken from the program "National Road Safety Program 2013-2020" (hereinafter "Safety Program") and "The final report from the mid-term evaluation study of the National Program of Road Safety in the years 2013-2010".

1.1 The Safe System Approach

1.1.1 Traditional and Safe System approaches

In Poland, there is an organization structure that allows modeling and security management - it aims to provide a comprehensive approach to the issue of road safety. The main and coordinating organization is the National Road Safety Council (Krajowa Rada Bezpieczeństwa Ruchu Drogowego - KRBRD), the infrastructure is supervised by the General Directorate of National Roads and Motorways (national high-class roads), and organizations operating within the administrative division of the country (voivodship, municipality, city).

Strategic documents have been adopted, setting out the directions of activities in the field of road safety:

- GAMBIT 2005-2013 security strategy,

1.1.2 Safe System Principles

There were identified the main problems of road safety in Poland:

- Protection of pedestrians.
- A safe speed shaping.
- Shape a safe behaviors of road traffic participants.
- Adaptation of road infrastructure to the basic standards of road safety.
- Promotion and operation of safe vehicles.
- Development of the roads rescue system.
- Development of traffic safety management system as a base for effective solution of problems identified above.
1.2 Traffic safety management functions

1.2.1 Result focus

The objectives of the actions formulated in the strategy of the action focused on the above-mentioned problems. He assumes that the effect to achieve is not only to minimize the number of accidents, but to ensure that when an accident occurs, its effects will not be fatal. This vision is a realization of the far-reaching goal of the European Union, which, as a world leader in security in all modes of transport, would like the number of deaths to approach zero in 2050. As a step towards the implementation of the multiannual vision, the two main goals to be achieved by 2020 were adopted:

- Limit the annual number of deaths by at least 50% by 2020 - this means no more than 2,000 killed in 2020
- Limit the annual number of seriously injured by at least 40% by 2020 - this means no more than 6,900 seriously injured in 2020

The national security strategy lists four main areas of action:

- Safe user,
- Safe vehicles,
- Safe roads,
- Safe speed,
- Post-accidents care.

1.2.2 Coordination

The leading and supervising institution is the National Road Safety Council (KRBRD). It is an interministerial advisory and auxiliary body of the Council of Ministers in matters of road safety. The chairman is the Minister of Transport, his deputies are: secretary or undersecretary of state in the Ministry of Interior and secretary or undersecretary of state in the Ministry of Transport.

The KRBRD members are representatives of the Minister of National Defense, the Minister of Justice and ministers for public administration, budget, public finances, economy, spatial and housing management, education and upbringing, environment, transport, internal work, and Police Commander-in-Chief, Commander-in-Chief of the Fire Brigade, General Director of National Roads and Highways and voivods indicated by the Prime Minister.

Tasks of the KRBRD - defines the directions and coordinates the activities of the government administration in matters of road safety:
✓ proposing state policy directions, developing road safety improvement programs,
✓ commissioning scientific research,
✓ initiating and giving opinions on legal acts in the field of road safety,
✓ initiating foreign cooperation as well as educational and informational activities,
✓ cooperation with social organizations and non-governmental institutions,
✓ analyzing and evaluating the actions taken
✓ expand the expert base,
✓ play a leading role in the promotion of Program communication and activities in the field of education and social campaigns,
✓ take care of appropriate and stable financing for the road safety system

As part of the road safety management structure, distinguished local organizations:
✓ Provincial Road Traffic Safety Council
✓ Poviat Road Traffic Safety Council
✓ Municipal and Municipal Traffic Safety Centers

1.2.3 Legislation
The basic document in the field of road safety is the Road Traffic Law. There are also many other laws that are directly or indirectly related to the system. Unfortunately, the current records are scattered, imprecise or unadjusted to changing external conditions. The strategy of the security program aims at a statutory indication of the road safety system as an important social problem, by introducing one act that will cover it in a holistic way.

1.2.4 Funding and resource allocation
The model and the shape of the financing system in this field assumes that an undetermined part of inflow from the speed supervision system, a tax included in the price of fuel, is reinvested in road safety. This is the current weakness of the road safety management system in Poland (is insufficient and unstable). The method of linking the amount of mandatory insurance premiums for vehicle users to the financing of road safety is considered.

At all levels of administration and among people and entities involved in road safety, public awareness is necessary in this public opinion comprehensive social costs of road accidents and their impact on health. Thus, expenditure on corrective, preventive and
preventive actions in the field of road safety should be treated as investments that will bring measurable benefits.

1.2.5 Promotion

The basic tools for implementing the Program are implementation programs, sectoral, voivodship and poviats programs. All programs are developed taking into account the overriding objective of implementing the objectives of the National Program.

Implementation programs - programs designed for one or two years, which include:

✓ detailed action plans for the coming year for one-year programs,
✓ detailed action plans for the first year and an outline of the activities for the second year in the case two-year programs.

Each implementation program includes a set of actions implementing priorities and directions defined in the National Road Safety Program, as well as the date of performance of individual tasks, leaders responsible for their implementation and set indicators showing the degree of implementation of the measure and its impact on traffic safety road.

Sector programs - internal programs of individual ministries and administration institutions governmental (road management, police, fire brigade, etc.).

Provincial programs - apart from the national program, the basis for creating programs voivodship should be records in provincial documents - development strategy and plan zoning. Provincial programs, like the national program, should consist of a diagnosis that guarantees an objective view of the actual state of traffic safety a strategy with a clearly defined goal with the main directions of action. Their complement should be operational programs specifying the tasks to be performed by institutions and organizations at the provincial level.

Local programs - these are programs implemented by local governments. These programs have been developed with a high degree of detail should indicate specific solutions in the field infrastructure, supervision, education and rescue (eg improvement of a particular intersection, equipping a specific unit with equipment, indicating the exact place of automatic supervision e.t.c.).

1.2.6 Monitoring and evaluation

The monitoring tools of the security program are:

✓ Annual reports on the state of road traffic safety in Poland containing mainly:
  o facts regarding accidents in the previous year,
specific performance indicators included in implementation programs for a year preceding.

✓ Periodic reports on the implementation of program, including an assessment of effectiveness solutions applied, correlated with milestone goals

The National Council is responsible for both types of reports (officially published) of Road Traffic Safety. On the basis of annual reports, another is formulated implementation program. On the basis of periodic reports, a periodic correction is made Program. The use of both mechanisms is to lead to an increase in the effectiveness of activities for the benefit of road safety, and consequently to achieving the goals set in program. Analogous monitoring mechanisms - annual reports and periodic reports, should be introduced at the level of implementation of voivodship and local programs. The main measure of the implementation of the Safety Program as well as the state of road traffic safety is the actual decrease in the number of dead and seriously injured.

Since 2013, the Road Traffic Observatory has been operating in Poland. The main goal of the Polish Road Safety Observatory (POBR) is to contribute to reducing the number of road accident victims in Poland. POBR provides data on threats on Polish roads and disseminates knowledge about road safety.

1.2.7 Research and development and knowledge transfer

Research is carried out in two main areas:

✓ Long-term research aimed at learning about basic mechanisms and dependencies affecting the state of road safety;

✓ Research aimed at solving basic and current security problems road traffic in Poland and determining the effectiveness of the improvement measures applied.

Research organizations in Poland are: the Motor Transport Institute, the Automotive Industry Institute, Road and Bridge Research Institute, and also Universities.

1.3 Traffic safety activities

1.3.1 Safe user

Two priorities were adopted:

✓ Priority 1 - Shaping safe behaviors of road users,

✓ Priority 2 - Protection of road traffic participants
Shaping safe behaviors of road traffic participants is aimed at education. A conscious and cultural participant of the traffic, respecting and respecting the rights of others. This goal will be achieved mainly through the directions of activities related to education and supervision over traffic. It should be emphasized that in this priority, supervision over participants’ behavior road traffic is a preventive measure, that is, disincentives to dangerous behaviors (e.g., awareness of the inevitability of punishment). Both categories of activities are aimed at changing the behavior of all road users:

✓ pedestrians (including children and the elderly),
✓ drivers of vehicles and their passengers,
✓ cyclists,
✓ motorcyclists and motorists.

Protection of road users is aimed at carrying out activities of a nature security. In contrast to activities aimed at changing the behavior of participants traffic, it is necessary to ensure their safety through systems that they themselves do not they control and sometimes are not even aware of their existence. These activities are mainly: engineering activities (shaping safe roads and their surroundings), modern development technologies (safety systems in vehicles), control-monitoring and information activities.

**Legislative activities**

✓ Amending legal acts related to the issue of shaping safe behaviors road users, including:
  
  o ensuring the safety of unprotected road users (including through introduction of a uniform communication education system in schools),
  o reducing the risk of accidents involving young drivers through introduction of new regulations,
  o reducing the risk of accidents involving older people by introducing new regulations,
  o reducing the risk of accidents caused by chronically ill people, by introducing new regulations (e.g., by means of periodic medical examinations),
  o organizing the competences of institutions that supervise behavior road users.

✓ Amending legal acts in the field of protection of road traffic participants, including:
o strengthening the protection of unprotected road users (including verification of rules priority at pedestrian crossings),

o restricting the participation of people under the influence of alcohol in road traffic,

o introduction to the practice of spatial planning the so-called "Good practices" in the field road safety.

Research and exchange of experience

✔ Monitoring trends of changes in behavior of pedestrians, cyclists, motorcyclists and drivers, and impact on the safety of these groups of road users (speed, belts, helmets, entry at red light).

✔ Assessing the effectiveness of actions and measures used to achieve conservation objectives individual groups of road users.

✔ Construction of a data collection system on traffic behavior.

In the Safe User the basic indicators - referring to persons killed and people seriously injured in road accidents - illustrating the achievement of a satisfactory road safety level and allowing to monitor the degree of implementation of measures aimed at achieving the goals are:

✔ number of pedestrians as victims of road accidents, counted by victims in a given year;

✔ number of cyclists as victims of road accidents, counted by victims in a given year;

✔ number of motorists and motorcyclists as victims of road accidents, counted by victims in a given year;

✔ the number of victims in accidents caused by road users under the influence of alcohol, counted by victims in a given year.

1.3.2 Safe vehicles

Two priorities were adopted:

✔ Priority 1 - Improvement of activities related to the inspection of technical condition of vehicles,

✔ Priority 2 - Improvement of safety systems in vehicles.

Improvement of activities related to the inspection of the technical condition of vehicles is aimed primarily at all reduce the risk of accidents caused by poor technical condition vehicles and reduce their gravity. The improvement of vehicle safety systems is
aimed at introducing such solutions construction, so that the vehicle protects those who drive it or other road users, prevents the driver from making mistakes and minimizes the risks if they are committed.

**Legislative activities:**

- Development of the concept of a modernized national vehicle technical testing system.
- Preparation of regulations in the field of professional supervision over the condition of station equipment vehicle inspection and monitoring of their work.
- Development of technical requirements that will guarantee unambiguous and objective research technical vehicles.
- Development of a legal basis for the implementation of the supervision system (certification, approval) placing on the market of trade and the use of car parts and fluids in vehicles consumables.

**Research and exchange of experience:**

- Introduction to common use technology of objective operational tests vehicles with devices enabling precise and fast operational measurements.
- Conducting in-depth investigations of road accidents including state influence analysis technical vehicles for accidents.
- Conducting development works related to specific product groups in the field of advanced manufacturing technologies.
- Research, development and implementation of pilot intelligent transport systems in the field cooperation between devices equipped with roads and vehicles.
- International cooperation regarding the improvement of legal regulations in the field of systems testing and evaluation of spare parts, fluids and participation in international research on the pilot implementation of modern active safety solutions and passive.

In the Safe vehicle, the basic indicator - referring to persons injured and people seriously injured in road accidents - illustrating achievement of the road safety level and allowing to monitor the level of implementation of actions aimed at achieving goals is the number of victims in road accidents with the share of inefficient vehicles, counted by victims in a year.

**1.3.3 Safe roads**
Two priorities were adopted:

- **Priority 1** - Implementation of traffic safety standards eliminating the largest dangers in road traffic,
- **Priority 2** - Development of the road infrastructure safety management system.

Implementation of road safety standards eliminating the greatest threats in road traffic aims to reduce the number and consequences of accidents caused by shortcomings of road infrastructure, in particular:

- accidents with pedestrians and cyclists,
- frontal collisions,
- falling out of the way,
- side and rear collisions,
- accidents at night.

These standards should be implemented already at the stage of planning and designing roads and their surroundings, and during operation and monitoring. The development of the road infrastructure safety management system is aimed at elimination threats to traffic safety during the operation of road infrastructure. This goal it will be achieved by building appropriate tools and developing enabling procedures implementation of individual elements of the infrastructure security management system:

- assessment of the road's impact on road safety,
- road safety audit of project documentation,
- classification of dangerous sections,
- control of road infrastructure in terms of road safety.

In addition, it will be important to implement modern traffic safety management measures on the road network, using intelligent transport systems.

**Legislative activities**

- Assessment and implementation of changes in the law regarding road infrastructure planning and preparing land development plans to remove imperfections current regulations and the introduction of contemporary criteria and requirements traffic safety.
- Assessment and implementation of changes in the law regarding road construction and reconstruction as well as management movement to remove
the imperfections of the existing rules, including their structure and introduction of contemporary traffic safety criteria and requirements.

☑ Development and implementation of road safety standards that they must correspond to the appropriate road classes, including roads to be resurfaced and others modernization treatments.

**Research and exchange of experience**

☑ Permanent assessment of the effectiveness of typical and unusual infrastructure improvement measures traffic safety along with formulating recommendations for planning and design practices.

☑ Research on the impact of various elements of road infrastructure on traffic safety together with the development of models for forecasting this security.

☑ Detailed diagnoses of threats to various types of accidents (pedestrians, frontal collisions, falling out of roadways, side and rear events) with an assessment of the effectiveness of various measures improving safety.

☑ Research on the impact of using intelligent transport systems on traffic safety road traffic under national conditions together with practical recommendations and assessment of effectiveness measures and integration of the use of solutions in this field with planning practice and design.

☑ Construction of an integrated database on accidents, roads, traffic and data collection supplementary to current traffic safety monitoring and research scientific.

In the Safe roads the basic indicators - referring to persons who are injured and people seriously injured in road accidents - illustrating the achievement of a road safety level that satisfies the situation and allowing monitoring the level of implementation of actions aimed at achieving goals are:

☑ number of victims in frontal collisions (victims / year);

☑ the number of casualties in side and rear collisions (victims / year);

☑ the number of victims in accidents with vehicles falling out of the way (victims / year);

☑ the number of victims at intersections and nodes (victims / year);

☑ the number of victims on horizontal curves (victims / year);

☑ number of victims at night (victims / year).

**1.3.4 Safe speed**
Two priorities were adopted:

- **Priority 1** - Shaping driver behavior in the field of driving at safe speed,
- **Priority 2** - Improve the speed management system.

Shaping driver behavior in the field of driving at safe speed is aimed at education of a conscious and cultural participant of the traffic, respecting and respecting the rights of other road users. This goal will be achieved mainly through the directions of activities related to education and supervision of traffic.

The improvement of speed management is aimed at maintaining the speed of vehicles compatible with speed allowed by regulations and road signs on roads of different categories.

Rational speed management consists of:

- establishing general and local speed limits that take into account various factors (shape of the road, design speed, road users, road surroundings),
- forcing drivers to comply with established speed limits through application:
  - supervision and restriction measures (automation of supervision of traffic),
  - planning and road resources (traffic calming, road hierarchy, separation different types of traffic).

This goal will be achieved mainly through the directions of activities related to engineering, supervision and Education

**Legislative activities**

- Amending legal acts relating to vehicle speed, including modification of the mode punish traffic violations related to excessive speed.

**Research and exchange of experience**

- Monitoring trends and behavior changes driving vehicles in conjunction with various means of influencing speed.
- Assessing the effectiveness of actions and measures used to achieve speed goals

In the Safe Speed, the basic indicator - referring to people killed and people seriously injured in road accidents - reflecting the achievement of a satisfactory level of road safety and allowing to monitor the implementation of actions aimed at achieving goals is the number of road accident victims caused by excessive speed, counted by victims in a year.

**1.3.5 Post-Accidents Care**

Two priorities were adopted:
Priority 1 - Integration and development of the National Rescue System,
Priority 2 - Improving the assistance system for victims of road accidents

Integration and development of the National Rescue System is aimed at creating one system rescue on roads, which should function in cooperation with rescue systems neighboring countries with Poland and rescue systems of other modes of transport (rail, air, water and sea), and this should translate into faster and more efficient assistance to victims of road accidents. Improvement of the assistance system for victims of road accidents is aimed at facilitating the victims to access information on forms of assistance and to obtain this assistance more efficiently. This objective will be implemented mainly through the directions of activities related to engineering and education.

**Legislative activities**

- Creating a basis for the construction of a uniform road rescue system.

**Research and exchange of experience:**

- An examination of the fate of road accident victims.
- Improving cooperation of emergency services and entities in the process of:
  - preparation of the entire infrastructure for rescue operations on roads,
  - organization of joint exercises for emergency services and entities,
  - notification and cooperation on the places of events (single, multiple and mass).
- Creation of a system for collecting precise statistics on the entire rescue process and post-accident care.
- Research on the type of threats and their location as well as elaboration of the method of selecting the service potential rescue to these threats. Other conditions
- Exchange of experience between national rescue systems and with other countries.

The system of integrated rescue is being developed - the uniform emergency number 112 has been introduced, the equipment database of local (volunteer) fire brigades is modernized, a network of Hospital Emergency Departments (SOR) has been created.

In the post-rescue and post-accident care, basic indicators - referring to people killed and people seriously injured in road accidents - that achieve satisfactory road safety level and monitor the level of implementation of actions aimed at achieving the goals are:
the number of victims of the deceased within 30 days of the accident, counted by the number of victims per year;

- the number of victims with permanent disability, calculated by the number of victims per year.

Introduction with traffic safety innovative practices in Poland

Due to the large area of road safety, this study will present only some of the practices used in Poland. The team developing this document decided to present the solutions described below.


Figure 1. Website www.krbrd.gov.pl

Figure 2. Website www.sewik.pl
✓ Nationwide social campaigns, e.g.
  o a social campaign regarding the use of seat belts
  o ways of trust - a program to protect life and health of people on national roads
    (https://www.youtube.com/watch?v=yrkFxTKPrJO)
  o a social campaign to improve the safety of vulnerable road users
  o campaign on the problem of driving under the influence of alcohol
  o campaign for transporting children in car seats
    (https://www.youtube.com/watch?v=KZjcSAErC1U)
  o a social campaign aimed at the problem of speeding by drivers of vehicles

Figure 3. Poster for a social campaign regarding the use of seat belts
✓ Reconstruction of the road network and application of solutions increasing the level of safety:
  - Expansion of the national and local road network
  - Road hierarchy
  - Reconstruction of dangerous road sections to the 2 + 1 standard
  - Separation of traffic flows
  - Forgiving roads
  - Self-explanatory roads
  - Traffic calming
  - Area speed measurement
  - Preselection stations for weighing vehicles in motion

Figure 4. Example road model 2 + 1 (source: https://www.motofakty.pl/artykul/drogi-2-1-tani-sposob-na-bezpieczne-wyprzedzanie.html)
Figure 5. Improvement of traffic safety by transforming a wide cross-section (source: “Kryterium bezpieczeństwa ruchu w projektowaniu dróg” Stanisław Gaca)

Figure 6. Segregation of the pedestrian stream (source: “Kryterium bezpieczeństwa ruchu w projektowaniu dróg” Stanisław Gaca)
**Figure 7.** Improving visibility within intersections (source: Kryterium bezpieczeństwa ruchu w projektowaniu dróg” Stanisław Gaca)

**Figure 8.** The entrance gate on the administrative border of the city of Puławy (source: METODY USPOKOJENIA RUCHU W OCENIE JEGO UŻYTKOWNIKÓW, Tadeusz CISOWSKI)
Figure 9. Elevated intersection along with the central island between traffic lanes (source: *METODY USPOKOJENIA RUCHU W OCENIE JEGO UŻYTKOWNIKÓW*, Tadeusz CISOWSKI)

Figure 10. System of preselection weighing and identification of vehicles (source: www.witd.szczecin.pl)

- Intelligent traffic control systems
Figure 11. Map of intersections covered by the Intelligent Traffic Management System in Lublin (source: www.zdm.lublin.eu)

Figure 12. Table of variable content Lublin, Al. Kraśnicka (source: www.zdm.lublin.eu)

- Education and training
  - Road traffic cities
  - Centers for improving driving techniques
  - Training for motorcyclists run by professional motorcyclists (sports competitors) and instructors
Figure 13. Road traffic city (source: www.lublin.eu)

Figure 14. Center for improving driving techniques in Lublin (source: www.odtj.lublin.pl)
Development of the medical rescue system: support for existing and construction of new hospital emergency departments, development of the Aviation Emergency Service (support and construction of new aerodromes and LPR bases), integration of the dispatching system through the construction of new medical dispatchers.

Introduction of new categories of driving licenses and running the state examination (significant limitations of vehicle power for young drivers)
Figure 14. Practical tasks on the state driving license for category A driving license (maneuvering area)

✓ Innovative activities of companies producing an element of road infrastructure

Police equipment with tools supporting accident operations: a laser measurement system, a 3D view generation system based on a point cloud, graphic programs.
IV. SLOVENIA

1. About road safety management (RSM)

Information about road safety management (RSM), development, key issues, components of road safety management plans etc. are needed also for developing master curricula for traffic safety in WB countries. According to work package 1.2 (WP 1.2) a partnership between UM and partners from EU is foreseen to increase knowledge about road safety management in WB countries.

In terms of road safety, there are countries, which have managed to make (large) progress in mitigating the number and severity of road accidents, but the situation in others countries is (still) alarming and even getting worse - see [1]. There are some attempts to do something, but it turns out in many cases that these undertakings are non-systematic, fragmented and not knowledge-based, resulting in ineffective actions. There are a lot of opinions from decision makers, based on their own beliefs of what should be done, so road safety work often ends up with information campaigns, showing that decision makers are doing something [67].

When it comes to road safety management (RSM), even if there is accumulated knowledge among road safety specialists on best practice and efficient countermeasures, the question is whether decision makers have the commitment to do something, and whether they are ready to engage in a systematic work and conscious of what such a systematic project should look like [67].
2. Road safety management: definition

In this chapter basic definitions about RSM and supplementary areas of interest are described. This chapter is prepared based on article of Andras Varhelyi: Road Safety Management – The Need for a Systematic Approach [67].

There are known many different definitions, approaches and descriptions about RSM (and RSM components), for example:

✓ The OECD [5] road safety report defines safety management as “a systematic process aimed at reducing the number and severity of road-related crashes” (p.97).

✓ Papadimitriou & Yannis [6] in their review of the literature, conclude that road safety management systems are complex, as they include various components (structures, plans, processes, outputs, tools, etc.) which make them difficult to describe in a standardised way. Nevertheless, effective organisation of RSM is seen as a prerequisite for achieving good road safety results.

✓ The OECD [5] report identifies five main steps of planning procedure for developing and implementing road safety programmes. These main steps are:
  o Road safety visions and targets;
  o Road safety plans and programmes;
  o Best practice road safety measures;
  o Organisational roles and co-ordination of activities; and
  o Monitoring and evaluation of the effects of road safety measures.

The report also refers to a number of tools available to support RSM.

✓ The WHO report [7] on road traffic injury prevention concludes with six principal recommendations for national road safety work:
  o Identify a lead agency to guide the national road safety effort;
  o Assess the problem, policies and institutional settings relating to road traffic injury and the capacity for road traffic injury prevention in the country;
  o Prepare a national road safety strategy and plan of action;
  o Allocate financial and human resources to address the problem;
  o Implement specific actions to prevent road crashes, minimize their consequences and evaluate the impact of these actions;
Support the development of national capacity and international cooperation.

An ETSC report [8] presents a methodological approach to the effective development and implementation of national road safety policies in EU member countries. A checklist is put forward in order to help decision makers and practitioners at a national level by enabling them to assess the current road safety situation and detect potential deficiencies. The checklist considers 22 items, such as:

- Political support and commitment;
- Public and private sector awareness and involvement;
- Road safety legislation;
- Traffic safety vision or philosophy;
- Strategy;
- Performance targets;
- Public health approach;
- Systemic perspective;
- Road safety action plan;
- Scientific choice of measures;
- Institutional roles and responsibilities;
- Allocation of responsibility for countermeasures;
- Funding;
- Monitoring and evaluation;
- Accident data;
- Safety performance indicators and exposure data;
- Research;
- Best practice exchange;
- Training;
- Enforcement;
- Emergency response;
- Holistic approach.

The report also stresses that the application of the ideas presented there requires taking the specific country’s features into account, but best practice visions and strategies adopted elsewhere could be adapted to the specific cultural, social and institutional
features of each country in question. The report also states that “no matter how technically well-founded it may be, no action can really be implemented without political will and commitment” (p.8).

✓ The SUPREME handbook [9] presents a large variety of best practice road safety measures in the EU member states as well as in Switzerland and Norway. RSM-relevant topics covered in the report are:
  o Institutional organisation of road safety and specifically road safety visions;
  o Road safety programmes and targets;
  o Efficiency analysis;
  o Resource allocation processes.

✓ An OECD report [10] gives a review of short-term and long-term measures to significantly improve road safety in OECD countries. It ensures that major road safety gains are possible through 8 enabling points, such as:
  o Improved data collection;
  o Setting robust interim targets;
  o Ambitious long term vision;
  o Adopting a Safe System approach;
  o Improving key institutional management functions;
  o Supporting research and development through knowledge transfer;
  o Establishing adequate funding for effective safety programmes;
  o Meeting management challenges, especially building political support.

The report recommends the “Safe System” approach to be adopted by all developed countries. This approach addresses all elements of the road transport system in an integrated way so as to ensure that road users are never subject to impact energy levels that can cause fatal or serious injury. It focuses on interventions to reduce crash risk and mitigate severity by managing the interfaces between the road user, the traffic infrastructure and the vehicle. It relies on adequate institutional management capacity to prioritise road safety, and requires shared responsibility and accountability between system designers and road users. Examples of the safe system approach are the “Sustainable Safety” vision in the Netherlands and “Vision Zero” in Sweden.

✓ In its Global Status Report [11] the WHO recommends that national governments ensure that:
The responsible institutions for road safety actions have the necessary human and financial resources to act effectively;

- They develop and endorse a national strategy with realistic targets and earmarked funding for implementation;
- They promote multisectoral collaboration in road safety work;
- They promote collaboration between the different sectors involved in collecting data on road traffic injuries.

Bliss & Breen [1] in their Guidelines for RSM state that it is a country’s safety management capacity that sets the limits to improvements in road safety. They also state that an RSM system at the country level should address three inter-related elements: “institutional management functions, interventions and results, with prime importance being placed on institutional management functions, and more specifically the role of the lead agency” (p.xvi). Also, Bliss & Breen [1] promote the Safe System approach, and put forward seven institutional management functions providing the foundation for an effective national RSM system:

- Results focus – a strategic orientation that links all actual and potential interventions with results;
- Coordination;
- Legislation;
- Funding and resource allocation;
- Promotion;
- Monitoring and evaluation;
- Research, development and knowledge transfer.

The SafetyNet [12] report, after reviewing the literature, presents detailed recommendations on the most relevant issues in RSM. Many of those are based on the recommendations from two previous reports, i.e. [1, 10]. The report is a useful “manual”, compiling the recommendations from earlier reports, and it adopts the view of Bliss and Breen [1] on the RSM system having three levels, i.e.:

- Institutional management functions which produce
- Interventions, which in turn produce
- Results.
The institutional management functions comprise:

- Results focus, which is the overarching function;
- Coordination;
- Legislation;
- Funding and resource allocation;
- Promotion;
- Monitoring and evaluation;
- Research, development and knowledge transfer.

The important role of the lead agency is emphasized. Interventions consist of planning, design and operation of the road network for vehicles and road users, as well as the recovery and rehabilitation of crash victims. Results are expressed as quantitative long term goals and interim targets. The report describes these issues in detail and gives “good practice” examples for them.

- Johnston [13], exploring research on RSM, put forward the four well-known “C-s” as keys to best practice:
  - Constituency – unless the public demands action, appropriate resources will not be applied;
  - Commitment – without political will from the top, success will be limited;
  - Cooperation – RSM demands actions from a large number of stakeholders;
  - Coordination - is vital to integration and synergy across institutional efforts (p.1180).

- The Global Status Report on Road Safety [14] points out a number of areas that need to be addressed by governments. The recommendations outlined include:
  - Officially endorsed targets and indicators;
  - Improving the quality of data on fatalities, injuries and interim indicators;
  - Coordination of efforts by a well-resourced lead agency;
  - A multi-sectoral national strategy that includes specific targets;
  - Monitoring and evaluation of outputs and outcomes.

- Muhlrad [15] describes 6 components of road safety policies which are the outcome of policy formulation and policy adoption which will govern implementation:
  - A long-term vision - preferably to be decided by the parliament so that it becomes law;
- A medium-term strategy which creates the framework in which successive road safety intervention programmes will be designed and implemented;
- Short-to-medium term (four to five year) quantitative targets of injury reduction to be used for calibrating further efforts;
- A road safety programme coordinating all interventions planned to meet the targets;
- A funding mechanism ensuring annual financing of the action programme and support activities;
- Setting up implementation conditions to ensure that human, technical and financial resources are available when needed.

✓ The Road Safety Manual issued by PIARC [16] builds on best-practice experience and gives hands-on recommendations for RSM, where chapters of relevance are:
  - The road safety management system focusing on results and the importance of governmental and top management leadership and management capacity;
  - The Safe System approach;
  - Effective management and use of safety data;
  - Road safety targets, investment strategies, plans and projects;
  - Roles, responsibilities, policy development and programmes;
  - Intervention selection and prioritisation;
  - Monitoring and evaluation of road safety interventions.
3. Analysis of RSM Components

A number of studies analysed the impact of RSM components on road safety performance at the national level. Again, this chapter is prepared based on article of Andras Varhelyi: Road Safety Management – The Need for a Systematic Approach [67].

Wegman et al. [17] analysed the road safety situation of nine European countries representing three different regions with their different stages in road safety development and – based on their findings – put forward recommendations concerning the individual countries’ RSM systems. Some of the countries clearly missed some of the relevant functions for a functional RSM system, such as:

- Define clearly which of the ministries has the main responsibility for road safety;
- Consider the establishment of a central road safety agency with proper funding to coordinate/manage road safety activities;
- Set quantified road safety targets;
- Increase the resources for road safety improvement;
- Encourage stakeholders to be involved in road safety management processes;
- Establish an independent national road safety observatory for monitoring progress;
- Collect data on road safety performance indicators and on risk exposure in terms of kilometres travelled;
- Improve the procedures and data bases.

Muhlrad [18] – based on an overview of experience gathered in European, OECD and some low-and middle income countries on RSM practices – presented a diagnosis methodology, including a comprehensive checklist for data collection, for comparing road safety practices and needs in different countries. The book by Muhlrad [18] may serve as an introduction to RSM.

Elvik et al. [19] made an attempt to summarise and present information about the effects of RSM-relevant organisational measures and of quantified road safety targets and road safety programmes. Organisational measures included:

- Empowering public agencies to introduce road safety measures,
- Incentive systems for allocation of resources in the public sector,
- Formalising responsibility for introducing road safety measures,
Defining the extent of legal responsibility for the design and maintenance of public roads.

The authors arrived at the conclusion that “it is extremely difficult to judge the costs and benefits of organisational measures” (p.1017). It was also found difficult to assess the effects of quantified road safety targets and road safety programmes, partly because relatively few countries had adopted quantified road safety targets, but also because no effective safety programmes had been implemented, so the targets mostly had a symbolic function.

An ETSC report [20] overviewing European countries’ road safety performance, concluded that, for achieving long term effects, road safety policy should be reinforced with an effective institutional management.

Elvik [21] surveyed the use of 10 formal tools for RSM in 18 European countries by means of a questionnaire sent to national highway agencies, and made an attempt to determine whether a relationship existed between use of the tools and safety performance. These tools were:

- Accident modelling,
- “Black-spot” identification and analysis,
- In-depth accident studies,
- Monitoring of road user behaviour,
- Network screening,
- Road safety impact assessment,
- Road safety audit,
- Road safety inspection,
- Road protection scoring,
- Traffic conflict studies and
- Naturalistic driving studies.

Use of the management tools was found to vary. Elvik could not find clear support for the hypothesis that “the more extensive use a country made of the safety management tools, the better would be its safety performance” (p.1). However, Elvik recognised that the study had considerable limitations, mainly due to a small sample, and recommended that “the analyses should not be interpreted as supporting less use of safety management tools” and expected that a study with “a larger sample of countries could produce more meaningful findings” (p.6).
Papadimitriou & Yannis [6] argued that RSM could be described on the basis of three composite indicators, i.e.:

✓ Vision and strategy;
✓ Budget, evaluation and reporting; and
✓ Measurement of road user attitudes and behaviours.

They analysed the relationship between RSM and road safety performance at country level for 30 European countries based on the theoretical framework of the “SUNflower” pyramid, which describes RSM systems in terms of a five-level hierarchy:

✓ Structure and culture;
✓ Programmes and measures;
✓ Intermediate outcomes; i.e. Safety Performance Indicators (SPIs);
✓ Final outcomes, i.e. fatalities and injuries; and
✓ Social costs.

For each of the five levels of the hierarchy, a composite indicator was implemented. The results suggested that RSM indicators did not directly affect fatality outcomes. However, the existence of a dedicated budget for road safety, the systematic evaluation of the results of road safety programs and the regular measurement of road user attitudes and behaviour were positively associated with the operational level of road safety (SPIs) of a country. Surprisingly, the composite indicator: “Existence of a road safety vision and strategy”, was associated with a lower score on SPIs. As the authors commented, it may take several years for a road safety vision to show effects and the existence of a vision and strategy does not necessarily imply that effective measures are implemented at all. On the other hand, some of the best performing countries (e.g. UK, Netherlands, and France) were found not to have high scores on vision and strategy.

The DaCoTA EU-project [22] defined Policy-making as a cyclical series of tasks of:

✓ Agenda setting with recognition and definition of a significant public problem;
✓ Policy formulation with selection of objectives to reduce the problem;
✓ Policy adoption including appropriation by the stakeholders involved (agreement at the higher levels of decision making and consultations to ensure that the citizens accept and support the policy);
✓ Policy implementation, i.e. putting into use all the interventions planned in the policy;
✓ Policy evaluation, i.e. monitoring to check if is working according to plan and is likely to reach the objectives.

The DaCoTA project investigated the RSM framework in European countries to help promote “good practice” [23]. A RSM investigation model proposed by Muhlrad et al. [22] was used. The relationship between road safety management and road safety performance was analysed based on five “good practice” elements of management on the national level, such as:

✓ Institutional organisation, coordination and stakeholders’ involvement;
✓ Policy formulation and adoption;
✓ Policy implementation and funding;
✓ Monitoring and evaluation;
✓ Scientific support and information and capacity building.

It was concluded that it was not possible to identify a single “good practice” element and that “the establishment of a structure and process alone was not sufficient for effective road safety management” [24, p.5]. However, “road safety management systems based on strong departments of ministries, or using government agencies specifically established for this purpose, with a clear responsibility for the government’s road safety policy, are more effective” (p.5). The majority of the countries studied had adopted some kind of road safety vision, such as “Safe Systems”, “Sustainable Safety” or “Vision Zero”. Systematic consultations with regional authorities, NGOs, stakeholders and the public were found to largely affect the effectiveness of road safety management [24]. Elements that emerged as the most problematic “good practice” criteria were implementation, funding and monitoring of performance. Critical issues to keep the processes going were coordination and budget. Monitoring and evaluation mostly consisted of collecting information when a programme ended. National road safety observatories exist in most of the countries studied; however, there is great variation in their type, role and operation. Also, lack of information on implementation costs of countermeasures and lack of knowledge about appropriate methods to calculate these costs were pointed out. As Muhlrad et al. [24] formulated it, “Capacity building and training of road safety actors is seldom a systematic procedure with a dedicated budget” (p.7). It can be discussed if these five “good practice” elements are covering all and the only relevant issues in road safety management, as the outcome of the analyses showed that countries ranked as best in road safety management were not always the countries with the best road safety performance.
[24]. However, even if no direct relationship between RSM and the final accident outcome could be found, “road safety management was found to be associated with safety performance indicators (SPIs), reflecting the operational level of road safety in each country” [24, p. 5], which advocates the usefulness of SPIs as intermediate safety measures.

A subsequent analysis [25] concluded that it was impossible to identify single best working RSM structures at the national level; the individual countries could be compared when the RSM areas were considered separately. The countries were ranked into a number of groups, where the availability of individual RSM components reflected the level of RSM in the country in terms of its correspondence to the “good practice” criteria. A positive correlation between the higher level of the RSM system and better safety performance of the countries was found. Among the countries with a high availability level of individual RSM components, the presence of the “good practice” features, such as:

- A strong lead agency;
- A national medium-term road safety programme;
- Quantitative targets;
- NGOs or government agencies actively advocating for taking road safety action were common.

Weak points of the RSM systems were found in:

- Most policy implementation and funding components, such as the lack of a dedicated budget and insufficiency of human resources;
- Poor distribution and coordination of responsibilities between various management levels;
- Unavailability of sustainable and results-focused structures which would enable effective implementation, funding, monitoring and evaluation of the road safety activities.

Alfonsi et al. [26], based on the findings of the DaCoTA project, i.e. that “the weakest components of RSM systems in Europe are policy implementation and funding and the lack of knowledge-based road safety policy making” (p.2064), carried out a study on the relationship between funding and research models on the one hand and performance in RSM on the other. Their preliminary results show a positive correlation between funding and research models and performance in RSM. Countries were ranked on the basis of a composite index of three indicators (Number of published papers per population,
citations per paper and EC-funded road safety projects joined per population), where the highest rank was achieved by Sweden and Norway (countries with the lowest fatality rates per population).

Loo et al. [27] put forward a nine-component analytical framework for developing, comparing, and evaluating road safety strategies. The nine components are:

- vision;
- objectives;
- targets;
- action plan;
- evaluation and monitoring;
- research and development;
- quantitative modelling;
- institutional framework;
- funding.

The framework was used for benchmarking road safety strategies in six selected countries. Some countries were found to be best according to some of the components and some other countries were found to be best in some other components.

Elvik [28] estimated that the implementation of a hypothetical complete Vision Zero program in Norway could reduce the number of traffic fatalities from about 300 per year to about 90 per year. He applied the statistical value of income loss from an additional death and found that “implementing the entire hypothetical Vision Zero programme would increase general mortality by about 1355” (p. 279), showing that efforts to eliminate a certain cause of death, in this case traffic accidents, may be so expensive that they may erode the available resources to eliminate other causes of death, which may lead to the increase in general mortality. Elvik concludes that “the possibility cannot be ruled out that a massive effort to eliminate traffic deaths would be counterproductive in terms of overall mortality” (p. 279). These findings generate a moral dilemma for the Vision Zero approach, asking whether injury prevention efforts can go too far.

Koornstra et al. [29] examined the underlying elements in the policies and programmes of three European countries with the lowest accident levels, i.e. Sweden, United Kingdom, and the Netherlands (labelled as the SUN countries). The main conclusions from the study were that safety activities were organised in a similar way in the three countries, with “each having a willingness to debate safety issues in Parliament,
a strong central co-ordinating ministry, good vertical co-ordination of safety activities from central to local groups, with supporting finance, and influential nongovernmental/non-profit organisations with a strong interest in safety” (p. 25). Also, road safety policies were based on quantified targets for the reduction of fatalities and serious injuries.

Elvik [30] analysed priority setting in RSM and found that strict and consistent cost-effective road safety policies could reduce the number of road fatalities by between 50 and 60% in both Norway and Sweden during a 10-years period (2002-2011) compared to current policies, which were assumed to prevent only about 10 to 15% of the fatalities during the same period. Elvik [30] also identified a number of sources of inefficiency in road safety policy, such as:

- lack of power, i.e. when a national government does not have the formal authority to introduce a certain road safety measure (the case of EU-countries);
- social dilemmas (e.g. cost-effective measures from a societal point of view are not cost-effective from the point of view of individual road users);
- priority given to other policy objectives, e.g. regional development.

Elvik [31], comparing the safety performance of Norwegian counties having quantified road safety targets with counties with only qualitative targets, found that “setting ambitious quantified road safety targets can help policy making by making it easier to implement effective countermeasures and set priorities effectively” (p.569). The OECD [32] report concludes that the existence of targets and targeted road safety programmes increases the prospect that safety policies will be implemented, and that they can lead to better integration of institutional efforts and can produce a more focused allocation of resources.

Wong et al. [33] evaluated the effectiveness of quantified road safety targets in 14 countries during the period 1981-1999. The findings showed that the majority of countries with quantified road safety targets experienced a reduction in road fatalities in the period studied. They concluded that “the setting of quantified road safety targets helps to raise concern about road safety in societies, encourages decision-makers to formulate effective road safety strategies, and ensures that sufficient resources are allocated to road safety programs” (p. 1004).

Wong & Sze [34] assessed the effectiveness of the quantified road safety targets set by a number of OECD countries over the long term. The results indicated that “target
setting in seven OECD countries was associated with a substantial positive effect on the time-series trend in road fatalities during the period in which the targets were in effect” (p.1187), which implies an increase in road safety improvement over time.

Elvik [35] analysed the Norwegian “management by objectives” system, and concluded that, while the system had a number of good features, it also had weak points. The system looked exemplary: the accident targets were clear and ambitious and the targets for road safety indicators covered all important road safety problems. However, some of the targets for road safety indicators referred to outcomes that could not be influenced by the Norwegian government, and there was a lack of support among politicians for quantified road safety targets.

Hakkert et al. [36] elaborated on the theory behind the development of Road Safety Performance Indicators (SPIs) and put forward SPIs in seven major areas, such as Alcohol and drug-use; Speeds; Protection systems; Daytime running lights; Vehicles; Roads; and Trauma management. These areas were considered as central to achieving significant improvements in road safety in the EU countries.

Wegman et al. [37] developed a comprehensive set of indicators – a Composite Road Safety Performance Index - to measure the road safety performance of a country. The index comprises three types of indicators:

- Road safety performance indicators, including a) final outcomes (numbers of killed and injured), b) intermediate outcomes (SPIs) and c) social costs;
- Policy performance indicator, consisting of the two components a) the quality of conditions (strategies, programs, resources, coordination, institutional settings, etc.) and b) the quality of action plans and individual countermeasures;
- Implementation performance indicators.

Wegman et al. [38] concluded that the composite index was realistic and meaningful as it gave a more enriched picture of road safety than a ranking based only on data on fatality rates. However, it was recommended that improvements in the index should be made by developing indicators for the implementation performance and improved procedures for availability of high quality national data.

Holló et al. [38], examining the explanatory value of SPIs, concluded that these cannot provide a full understanding of road safety trends, since – besides the established and often used SPIs – there are a number of other explanatory variables (e.g. demography,
technological development, etc.) for the safety outcome at the national level. Hence, they proposed that the various aspects of the complex socio-technical road safety system, organisational and structural factors should be included in the analysis of the road safety situation.

Gitelman et al. [39] developing a composite road safety indicator for benchmarking countries’ road safety performance considered four groups of basic safety indicators referring to:

- Policy performance (road safety programs);
- Final road safety outcomes (fatality and injury rates);
- Intermediate outcomes (rates of wearing seat belts, crashworthiness of vehicles, etc.);
- Background characteristics of countries (motorization level, population density).

The basic safety indicators with a clear contribution to the final composite safety indicator were:

- Fatality rates;
- Quality of national safety programmes;
- Rates of wearing safety belts; and
- Median age of cars.

These were concluded being a core set of basic indicators for assessing the safety performance of a country. It was found that ranking of countries based on the composite indicators was not necessarily similar to the ranking based on fatality rates only. The general conclusion was that the use of a composite road safety indicator provides a more nuanced picture of a country’s road safety situation than a ranking based only on fatality rates.

Bax et al. [40] elaborated a composite Road Safety Index (RSI) on the country level consisting of performances on three levels of the target hierarchy for road safety, i.e.:

- final outcomes (injuries and crashes);
- intermediate outcomes (SPIs) and
- policy output (safety measures and programs).

The method was found useful for comparing a country with the ‘best of class’, “making it clear which layer-index has to be improved in order to reach the performance level of the best performing countries” (p.146). It was pointed out that SPIs should be
revised periodically and be complemented with new, risk factors not recognised today that are found to have a strong relationship with road crashes and their severity.

Schulze and Kossmann [41] reviewed how a scientifically based RSM system, comprising strategic elements, tools and measures was applied in Germany. They concluded that such a RSM system includes a scientific research programme targeting the safety issues raised in the political road safety programme and – based on research results – the development and implementation of adequate road safety measures. The efficiency of the measures applied should be scientifically monitored. Schulze and Kossmann [41] concluded that, in order to ensure the efficiency of the proposed safety measures, they should be derived from research evidence. Also, research is needed to regularly monitor the impact of road safety management tools.

Elvik et al. [42], estimating the benefits to society of road safety research funded by some of the Swedish research boards during the period 1971-2004, concluded that, even if the study had several limitations, the various road safety measures originating from research efforts had very probably contributed to a major part of the reduction in road accident fatalities in Sweden. Hence, “the benefits of applied road safety research are likely to be greater than the costs of conducting this research and implementing road safety measures developed by research” (p.387).
4. RSM: Lessons learned

Summing up the findings in the literature reviewed (Chapter 3), it can be concluded that a number of important issues are pointed out by the different guidelines and recommendations. Even if these recommendations do not always overlap, and the individual documents do not cover all the aspects of importance, they together form a good base for a complete set of recommendations.

The recommendations are clear and straightforward and have been found to be working well in a few countries – where there has been a will to implement them! There is no doubt that following the steps of a systematic approach in RSM will lead to significant road safety improvements. The guidelines and recommendations for RSM may be exemplary; however, without political will and commitment they cannot be implemented successfully. As the OECD report [10] on ambitious road safety targets emphasises, “strong political commitment to a results focused approach to road safety management has a critical role in determining the achievement of a country’s road safety ambition and related targets” (p.17). Unfortunately, there is a huge barrier already at the very first steps of the systematic approach, and that is to get decisions makers to realise the burden of road casualties on the national socio-economy and gain their commitment to road safety work.
5. RSM: Proposed systematic approach

As could we conclude from previous chapters’ different approaches / components of RSM exist in various countries. In this chapter systematic approach in RSM is presented - as it is suggested in article [67].

To achieve significant improvements in road safety at the national level, there is a need for a systematic approach with clear responsibilities and accountability. The essential elements of such a systematic work are as follows:

- Define the burden and nature of road casualties
- Gain commitment and support from decision makers
- Establish Road Safety Policy
- Define institutional roles and responsibilities
- Identify road safety problems
- Set Road Safety Targets
- Formulate Strategy, Action plan
- Allocate responsibility for measures
- Ensure funding
- Apply measures with known effectiveness
- Monitor performance
- Stimulate research and capacity building

5.1 Define the burden and nature of road casualties

The first step is to define the burden of road casualties in the country. Part of defining the burden is the monetary valuation of the prevention of a fatality/injury accident. Such “values of statistical life” have been derived in a number of countries. However, there is a large variation among these. Interestingly, a negative correlation seems to exist between the monetary valuation of a statistical life and the road safety situation of a country, namely, countries with low “values of statistical life” have poor road safety situation and vice versa.

Monetary values of statistical life are also necessary in socio-economic assessments of infrastructure investments. The expected changes in accident costs (direct costs for damage, medical treatment, administration, loss of productive capacity, loss of welfare) are to be compared to other cost items (such as travel time savings/losses, environmental costs, etc.) that can be monetised. So, monetary values of statistical life are a necessary...
base for informed decisions on infrastructure investments. Still, these values are missing in many countries.

5.2 Gain commitment and support from decision makers

There is accumulated knowledge among road safety scientists on which strategies and measures are the most efficient, but without commitment from the decision makers, these will not be realized. Elvik [35], after analysing the Norwegian “management by objectives” system, concluded that RSM by objectives is an attractive idea, but successful road safety management by objectives requires a firm commitment from the top management. “In the absence of this support, the system becomes nothing more than a paper tiger” [35, p.1122]. The ETSC report [8] concluded that “no action can really be implemented without political will and commitment” (p.8). Also, the SUPREME handbook [9] states that: “If there is commitment and funding, a road safety vision directs road safety actions and forms the basis of road safety plans and programmes” (p.9).

Nevertheless, “where there’s a will there’s a way”; a good example to illustrate this is the case of France, having a poor safety performance among European countries until the President of the country “suddenly” became “... absolutely horrified that French roads are the most dangerous in Europe...” [45], and ordered tough road safety measures (automatic speed cameras programme, graduated driving licence system) resulting in unprecedented improvements in France’s road safety situation [46]. However, this effort still was not part of a systematic RSM project.

5.3 Establish Road Safety Policy

With the commitment of decision makers, a Road Safety Policy or Vision can be established. An example of such a policy is the Vision Zero in Sweden, whose parliament passed the Road Traffic Safety Bill in 1997, stating that “No one will be killed or seriously injured within the road transport system” [47]. It is important to emphasise that it was the parliament who made this decision on the vision, not the government, thereby not giving the succeeding government an opportunity to discard or change the road safety policy. Another example is the “Sustainable safety” policy in the Netherlands which states that “The transport system shall be adjusted to the limitations and possibilities of road users” [48]. The Safe System approach to be adopted, which means a results focused evidence based approach, building upon well-documented scientifically supported best
practices. Such policies constitute a good base to mandate the responsible body for road safety on the national level to develop a road safety strategy.

5.4 Define institutional roles and responsibilities

A crucial issue here is the existence of such a responsible body for road safety on the national level. This body could be a National Road Safety Committee/Commission, which should comprise the relevant departments (Transport, Police, Justice, Health, Planning, Education, Industry), and most importantly be chaired by a committed person respected by all parties. The solution for a responsible body for national road safety can be different in different countries depending on the way that state administration is organised. In Sweden, for example, where departments are small and government agencies have considerable power delegated to them, the responsible body for supervising road safety work is the Swedish Transport Agency with overall responsibility for producing regulations and ensuring compliance encompassing all modes of transport, i.e. roads, railways, aviation and shipping. Under the supervision of the Swedish Transport Agency it is the Transport Administration who is the responsible body for coordinating road safety work.

Institutional roles and responsibilities for important functions of road safety management to be defined, i.e. who should be the responsible for the accident data register, road maintenance, vehicle inspection, vehicle register, driver training, driver testing, driving-license register, enforcement of traffic rules, emergency assistance, traffic safety analyses, research and documentation services, training of professionals.

5.5 Identify road safety problems

As a basis for road safety actions and countermeasures, the road safety problems of the country should be identified in a systematic way. When presenting the road safety situation for a country or region, often used risk values build on the number of casualties related to some exposure measure. Some of these exposure measures (number of motor vehicles or motor vehicle kilometres) give a misleading picture of the situation as they neglect the existence of pedestrians and bicyclists, who in many countries carry the casualty burden of motorised traffic. Relating the number of casualties to the number of motor vehicles or motor vehicle kilometres may be misused to show a positive year-by-year development in the country with an increase of motorisation, showing a decreasing rate of casualties related to the number of motorised vehicles, and neglecting the fact that
it is the motorised vehicles which harm the vulnerable road users, whose presence in traffic is not included in this kind of exposure measure.

To illustrate the problem of using exposure measures based on the number of motor vehicles or motor vehicle kilometres, we can look at international comparative statistics on road accident fatalities, see [46]. When looking at road accident fatalities per billion vehicle kilometres, e.g. the USA is among countries with middle level road safety, but when we look at road accident fatalities related to the population of the country, the USA ends up among countries with the worst road safety record.

So, what exposure measure is to be used for risk assessment, where the risk is defined as “the number of persons killed related to some kind of exposure”? Among the often-used exposure measures, the “number of motor-vehicles” and “number of kilometres driven” are not good ones, as they relate the number of “victims” to the number of prevalence of “perpetrators”. To have a fair assessment of risk, the prevalence of all types of road users should be considered; hence, we need the measure “person-kilometres” per year of all types of road users (pedestrians, cyclists, passengers of public transport and users of individual motorized vehicles).

Access to exposure data for all types of road users allows us to perform the so called three-dimensional analysis of road safety problems. The dimensions “exposure” (person-kilometres per year), “risk” (number of injury accidents per person-kilometres per year) and “consequence” (number of killed per number of injury accidents per year), see Fig. (4), help us to get a good picture of the character of the road safety problems. Multiplying the units of the three axes (km*injured/km*killed/injured) gives the number of killed in road accidents in the country. This number itself does not reveal much of the road safety problems behind it. To illustrate the usefulness of the three-dimensional analysis, let’s take the examples in Fig. (4), where all three bodies (A, B, C) have the same volume, i.e. the number of fatalities are the same. Let us assume that the three groups A, B, C are different types of road user (but could also be different cities or regions). We can see that the major problem of group A is that it generates relatively many accidents, even if it does not have as much kilometre-age per year as group B. Group B, on the other hand, has a large amount of yearly kilometre-age, but it does not generate as many accidents per kilometre as group A, still the total number of fatalities is the same for both groups. Group C has smaller yearly kilometre-age than group B, and it does not generate as many accidents per kilometre as group A, but when an accident occurs, the outcome is more
severe than for those in the other two groups. Road safety countermeasures should be adapted to the specific problem of each group. To mitigate the problem of group A, countermeasures should be directed to reducing the risk of being involved in an accident (speed regulation, enforcement of compliance with regulations). To mitigate the problem of group B, countermeasures should be directed to reducing the exposure of this group (redirecting travel to modes of transport generating fewer accidents). To mitigate the problem of group C, countermeasures should be aimed at mitigating the consequences of an accident (protective devices). Examples of countermeasures acting on these three dimensions of road safety and directed to the infrastructure, the vehicle and the road are presented in Table 2.

However, even if this kind of approach provides a good tool for knowledge-based road safety work, several problems exist in only using accidents to analyse the road safety situation; the most obvious of them is that many accidents are never reported. The less the severity of the injury, the lower the reporting grade [19]. A study comparing police-registered injury accidents and traffic injuries registered at the regional hospital in Lund, Sweden, showed, that while the police register contained over 85% of injured car occupants, it only contained around 55% of injured cyclists and only around 22% of injured pedestrians [50]. The conclusion from this is that we have to combine the police register with the hospital register on traffic injuries. This is the case today in Sweden, where the STRADA database on traffic injuries combines the injury accident data of these two registers. Still, the coverage of the combined data base is far from satisfactory; Berntman & Modén [51] mapping the Police Records, Hospital Records and Hospital Discharge Register in the region of Skåne (southern Sweden) in 2004 found that Police Records and Hospital Records combined only contained 70% of the severely injured.

To analyse the traffic safety situation, we should also use non-accident-based Safety Performance Indicators (SPIs). SPIs are any measurements that are statistically related to accidents or injuries and are used in addition to accident or injury statistics in order to indicate safety performance or understand the process that leads to accidents. They also provide the link between the contributory factors to road accidents and the measures to affect them. SPIs are often referred to as “intermediate outcomes” since they fill the knowledge gap on causal relationships between interventions and accident outcomes. SPIs can give a more complete picture of the road safety situation, and hence are useful in developing countermeasures, even before the problems indicated by them result in
accidents or injuries. They can be quantitatively measured and they allow comparisons between countries concerning the safety situation as well as comparisons before and after certain actions are taken. SPIs can be developed within each field of activity of the road traffic system which can be directly related to safety. SPIs can help us to monitor how the road safety situation is developing and allow us to make interventions at an early stage if they show an undesirable development [24, 36, 52, 53].

Besides the well-established SPIs, the Composite Road Safety Performance Index, proposed by Wegman et al. [37] and further elaborated on by Holló et al. [38], Gitelman et al. [39] and Bax et al. [40] can be employed. However, its use needs some further development work. SPIs should be revised periodically and be complemented when new risk factors are revealed that have a strong relationship with road crashes and their severity [40].

A very good indication of the usefulness of (or the problem of not having) SPIs in Road Safety Management is the outcome of the Swedish Vision Zero policy during its first period. The long-term vision was “zero killed in 2020”. According to the vision, the number of killed should decrease by 50% from the year 1996 to year 2007, see Fig. (5). As seen in the figure, road safety development in Sweden during the first period of Vision Zero policy – but with no quantified sub-targets – was not successful. The vision was innovative, but there were no measurable safety indicators of the development and no regular follow-ups. Consequently, this first period of Vision Zero policy failed. A road safety vision without quantified targets will not be effective.

5.6 Set Road Safety Targets

To be able to set Road Safety Targets of relevance, the most salient road safety issues should be identified. Typical problems based on experience from countries where the road safety situation has been analysed, ranked according to the size of their contribution to fatalities and injuries, are: speeding, poor vehicle crashworthiness, high risk of unprotected road users, drinking and driving, insufficient medical and rescue services for accident victims and roadside obstacles [19]. In Sweden, e.g., the following major road safety problems were identified [55]:

- Speeding: Over 50% of drivers exceed the speed limits;
- Drinking and driving: 25% of motor vehicle occupants killed died in alcohol-related crashes;
Non-use of protective devices: 50 to 60% of killed car drivers were not wearing a safety belt in the collision;

Vulnerability of bicyclists: 21% of severely injured traffic victims were bicyclists;

Unsatisfactory crash protection in vehicles: 28% of all fatalities were from frontal collisions and 23% of all fatalities from single accidents;

Frontal collisions on rural roads constituted 28% of all fatalities in the country.

With knowledge of the pattern of road safety problems, Road Safety Targets can be formulated. They should be directed at the road users, the vehicles and the infrastructure in a balanced way and include complementary, non-accident based indicators of the road safety situation i.e. SPIs. The SPIs adopted should reflect the country’s road safety problem, but there should not be too many targets in view of the available policy instruments designated to realise them [35]. Following this principle for the second period of Vision Zero policy (from 2008 to 2020) in Sweden, both Accident Reduction targets and SPI targets were formulated. The SPI targets – besides the accident reduction target of a 50% decrease in the number of killed year 2020, are as follows [56]: 1) 80% of all vehicle-kilometres within the speed limit; 2) 99.9% of all vehicle-kilometres driven by sober drivers (below the 0.2 pro-mille limit); 3) 99% of car occupants use the safety belt; 4) 70% of cyclists use a helmet; 5) 99% of moped riders use the correct helmet; 6) 100% of new cars have the highest safety class according to Euro NCAP; 7) 70% of motorcycles are equipped with ABS; 8) 75% of all vehicle-kilometres, on roads with a speed limit over 80 km/h, are on roads with a central barrier. Each of these SPIs above answers an identified road safety problem in the earlier step of analysis of the situation in the country.

The SafetyNet report [52] on quantitative road safety targets gives guidelines and good practice examples of how to set institutional output targets, intermediate outcome targets and final outcome targets, how to avoid pitfalls in target setting and how to monitor target achievement.

Setting Road Safety Targets should have done in cooperation with all relevant stake holders (municipalities, the police, NGOs, vehicle providers, transport companies, road user organisations, etc.). Involving all relevant stake holders and interest organisations is very important so that they feel they are part of the process, and it makes them more committed to contribute to the achievement of the targets. The government should endorse the targets and make a firm commitment to their realisation [35]. These
principles have been followed under the ongoing second period of Vision Zero policy in Sweden (from 2008 to 2020), and consequently the outcome seems to be more favourable, see Fig. (5)

5.7 Formulate Strategy, Action plan

When the Road Safety Targets are in place, a Road Safety Strategy and Action Plan can be formulated. The action plan should [35]:

- be balanced (actions in all key areas);
- have challenging, yet in principle achievable targets;
- give priority to measures with known effectiveness;
- consider costs and expected benefits;
- be realistic (taking account of financial constraints);
- have a time table.

Elvik [57] carried out a broad survey of potentially effective measures, comprising 132 measures for Norway and 139 for Sweden. These measures were combined to form four different road safety strategies, ranging from no new measures to maximum implementation, i.e. the Swedish Vision Zero strategy. All the strategies except the “business as usual” strategy were assessed as resulting in significant fatality reductions.

The Road Safety Toolkit [58] - an internet-based collection of recommendations – provides free information on road safety plans. The Road Safety Toolkit is the result of collaboration between the International Road Assessment Programme (iRAP), the Global Transport Knowledge Partnership (gTKP) and the World Bank Global Road Safety Facility.

5.8 Allocate responsibility for measures

The responsibility for each of the indicators/actions, such as e.g. “Speed limit compliance”, “Wearing of safety belt” “Use of children’s seat”, “Share of vehicles having 5 stars on NCAP scale”, “Safe road infrastructure”, “Rescue services within X minutes of accident occurrence”, as well as monitoring of performance and outcome of all the above should be allocated to one respective responsible body. The responsible bodies should receive incentives to ensure their commitment to the targets, and they should be given the authority to decide on how best to realise the targets.

5.9 Ensure funding

Resource allocation is critical and it must be part of the road safety programme. The responsible bodies should be supplied with sufficient funding to implement cost-effective
road safety measures [35] and to achieve the maximum benefit from the funds; they should be linked to the specific goals of the programme [9]. It is also essential to follow up the effectiveness of the funded measures and thereby preventing misuse of resources [9].

To ensure funding of Road Safety Work, there are various possible sources, such as e.g. a fuel levy, insurance tax, fines for traffic offenses or a number plate fee. One example is the Belgian Road Safety Fund, where the fund receives money from fines paid for traffic offences and gives financial support to police services for road safety actions (enforcement) that focus on speeding, drink driving, seat belts, heavy goods transport, dangerous parking, and aggressive behaviour in traffic [59]. Another interesting example is the Swedish Number Plate Fund, financing road safety projects. It was established by the Swedish Road Administration (predecessor of the Transport Administration) in 1988. Money for the fund comes from fees for passenger car personalized number plates. Currently, there are about 14,000 personalized number plates in Sweden.

5.10 Apply measures with known effectiveness

When it comes to countermeasures, only those with known effectiveness should be applied. There is an accumulated experience of the effectiveness of a large number of road safety countermeasures published in the Handbook of Road Safety Measures [19], as well as in the Highway Safety Manual [60], which is a useful tool for practitioners to identify the most appropriate safety countermeasures based on Crash Modification Factors supported by the Clearinghouse webbased database [61]. However, even if these countermeasures have been tested in various countries, they should also be tested in the country in question, since there may be differences in geographical settings, traffic culture, regulatory aspects, norms and other preconditions that may influence the effect of any countermeasure.

5.11 Monitor performance

A very important issue – most often neglected after the introduction of a countermeasure – is monitoring of performance. The status of the target indicators should be monitored on a yearly basis, and feedback on their performance should be given to the responsible bodies and to the national coordinating body; if any of them does not develop in the right direction, suitable countermeasures should be taken. Systematic monitoring of performance and evaluation of the effects of the applied measures instigate the implementation of the most effective safety measures [9], but also, the need for improving
the quality of data on fatalities, injuries, interim indicators and exposure data was pointed out by several sources [8, 10, 11, 14, 15, 17, 37].

A good source of complementary information on the road safety situation in the country/region is gathering public opinion. To comprehend the risk perception of the population as well as popular support for safety measures, regular surveys are recommended to be carried out. This kind of survey is a good source for following changes in public attitudes to important traffic safety issues over time. The Swedish Transport Administration, which has overall responsibility for traffic safety work, carries out surveys yearly among the population to collect information on public attitudes. An important finding from these surveys is that, in general, it takes years before any major differences in attitudes can be traced [62].

5.12 Stimulate research and capacity building

A road safety research programme should be a natural part of a scientifically based RSM system [41]. Elvik et al. [42] showed that the benefits of road safety research are greater than the costs of conducting such research and implementing road safety measures based on research findings.

Hauer [63] concluded that there is an emerging trend in RSM toward decisions based on facts and science, where RSM is based on factual knowledge maintained by well-trained professionals. To get there, there is a need for the systematic training of road safety professionals in road safety knowledge as well as in research methods. For capacity building, Muhlrad [15] proposes training to enhance the skills and knowledge of road safety stakeholders as well as development of support tools.
6. RSM: Open questions

Twelve essential elements constituting a “package” of systematic road safety work on the national level have been put forward. The question may arise: which elements are the most important to reduce road traffic injuries? It is tempting to jump to “problem solving” and assume that implementing countermeasures is the most relevant thing to do. And this is the problem of the approach taken today! There is a lack of problem analysis to build a base for adequate, effective and cost-efficient countermeasures.

One of the biggest obstacles to carrying out successful knowledge-based traffic safety work is the opinion-governed interference by decision makers. When it comes to road traffic, everybody with a driver’s licence considers himself an expert. Decision makers are no exceptions and just like other self-appointed experts are convinced that a certain solution based on their beliefs should be prioritised, and they push for it. Also, many of them refer to the often cited “scientific fact” that the human factor is assumed to play a role in about 94% of accidents (referring to [64]). Then, the obvious countermeasure seems to be to teach and train humans to behave in a safe way and not make mistakes. However, humans cannot be trained not to make mistakes; we have always made and will always make mistakes and the most efficient countermeasure is not necessarily training or education to behave safely in a system that has been built in a way, that, sooner or later, an accident will inevitably occur. A well-designed traffic environment, adapted to the “weakest” road user, inviting to an appropriate behaviour for the current situation can affect road user behaviour faster than educational activities.

Road Safety Management would benefit from decision makers keeping to their business, i.e. formulating Road Safety Policy and staying away from trying to control details in traffic safety work, leaving the responsibility for it to transport professionals. Decision makers would never intervene in a surgeon’s profession, telling them what part of the body to operate on and how to do it. They recognise that they are not experts in medicine and they respect the medical profession, which seems not to be the case with the transport profession. The Swedish model seems to work in this respect; parliament decided on the road safety philosophy (the Vision Zero); it approved the road safety goals (put forward by transport professionals) and the government commissioned the Swedish Transport Agency to supervise road safety work on the national level. This model gives a
certain degree of freedom to transport professionals to analyse the situation, to test new, unproven countermeasures (e.g. central barriers on rural roads, alco-gates in ports for screening drivers arriving with ferries) and implement them on a wide scale (there are now about 1,500 automated speed cameras installed on rural roads around the country).

On the other hand, it is the task of transport professionals to shed light on the external costs transports generate, among others, in the form of fatalities and injuries. This is necessary for showing the burden of road accidents on society in order to gain decision makers’ insight and get their commitment for improving road safety. Monetary valuation of the prevention of a fatality/severe injury accident will provide a good basis for knowledge-based decisions in the socio-economic assessments of infrastructure projects.

After having been commissioned by the government to coordinate road safety work at the national level, it is up to the responsible body to develop the Road Safety Targets. The involvement of all relevant stakeholders in formulating the targets is of great value (e.g. the Swedish Transport Administration introduced the so called “OLA” working method inviting actors, who can have an influence on road safety, from all relevant sectors of the society to contribute to safety improvements [65]. The actors invited in dialogue develop concrete actions for improving traffic safety within a problem area of their field of activity; they can adopt the ISO 39001:2012 Road Traffic Safety (RTS) [66] management system to enable their organization to reduce deaths and serious injuries related to road traffic crashes which they can influence. The action plans are then presented through a mass media seminar or similar where the participants publicly display their intentions to act. Participating in these activities strengthens the image of the company/organisation. Examples of participating actors are transport companies, municipalities, motorcycle associations, associations of driving schools.

The establishment of a combined accident database based on the police register and the hospital register requires some effort. A basic issue here is how to encourage the police to register accident data properly and transfer the data to a national data base. In some countries, it is the police who are the responsible body for road safety. However, it should not be the same organisation responsible for road safety that maintains the accident data base. The eagerness to show improvements in road safety might lead to “data loss”. Another issue is how to motivate hospitals and accident and emergency departments to regularly provide data on traffic victims to a central database. Continuous
motivation and feedback to the staff doing this recording is necessary so that they feel their contribution is of importance.

To keep momentum and motivation of those involved, regular follow-ups with the responsible bodies and actors involved are of importance.

It is impossible to point out one specific element of this “package” of 12 essential elements of systematic Road Safety Management as more important than any of the others. These elements are not part of a “smorgasbord” where you can pick the parts you think suit you. It is a “package” and Road Safety Management at the national level cannot be stronger than the weakest link of it. However, there is one element which is the most critical one, and that is getting commitment from decision makers. Without their commitment, no achievements of significance can be made.

In Road Safety Management, besides a systematic approach with clear responsibilities and accountability of the involved stakeholders, there is a need for:

- Monetary values of statistical life.
- A combined police register and hospital register of accidents.
- Exposure data (person-kilometres) for all transport modes.
- The use of a three-dimensional analysis of road safety problems.
- The use of Safety Performance Indicators.
- Applying only countermeasures with known effectiveness.
- Monitoring performance of applied countermeasures on a yearly basis.

Last - but not least - road safety management is one of the themes for new legislative also. For example, in [68] the Commission proposed second legislative proposal, which aims to improve road infrastructure safety management, to reduce both the number of accidents and their severity. It will improve the transparency and follow-up of road safety procedures (impact assessments, audits, inspections) and introduces a new procedure to map the risks of accidents across the entire network. This will make it possible to compare safety levels of roads across Europe and inform investment decisions, including for EU funding. In addition, the scope of legislation should be extended beyond the Trans-European Transport network to primary roads relevant to cross-EU transport, where a large percentage of severe accidents occur. This serves the interests of all EU citizens and businesses as they use the integrated road network and confirms the practice of many Member States that have already extended the application of the EU legislation to include major roads outside the Trans-European Transport Network.
7. References


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[53] SafetyNet, Quantitative road safety targets. Project report, 2009


8. Analysis of established practices in XXXX for traffic safety management

✓ Introduction;

1.1 The Safe System Approach

1.1.1 Traditional and Safe System approaches

✓ Description;

1.1.2 Safe System Principles

✓ Description;

1.2 Traffic safety management functions

1.2.1 Result focus

✓ Description;

1.2.2 Coordination

✓ Description;

1.2.3 Legislation

✓ Description;

1.2.4 Funding and resource allocation

✓ Description;

1.2.5 Promotion

✓ Description;

1.2.6 Monitoring and evaluation

✓ Description;

1.2.7 Research and development and knowledge transfer

✓ Description;

1.3 Traffic safety activities

1.3.1 Safe roads

✓ Description;

1.3.2 Safe vehicles

✓ Description;

1.3.3 Safe road use
1.3.4 Post-Accidents Care
✓ Description;

2. Introduction with traffic safety innovative practices in XXXX
✓ Description;

3. Discussion