

**HIGH-LEVEL GROUP ON ROAD SAFETY CONSULTATION
ON THE DEVELOPMENT OF THE INJURIES STRATEGY**

2nd Working Document:

NEXT STEPS IN THE DEVELOPMENT OF THE INJURIES STRATEGY

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Summary of recommended next steps

Recommendation 1. The *Injuries Strategy* should adopt the long-term *Safe System* goal and approach to eliminate deaths and serious injuries which is recommended to all countries by the main international organisations concerned with road safety.

Recommendation 2. The *Injuries Strategy* should adopt a simple, aspirational, interim quantitative EU target to reduce serious injuries (MAIS=>3) by 2020 at a targeted level against baseline to be agreed.

Recommendation 3 The *Injuries Strategy* should target key road safety problems and improved intermediate outcomes (e.g. increasing seat belt use) with evidence-based intervention packages to include EU and country actions and using an agreed set of safety performance indicators in line with effective practice.

Recommendation 4 The national representatives of the CARE expert group should play a key role in assisting Member States, where necessary, with country management of the process of preparing for and reporting on the new common definition of serious injury as an additional field to the existing CARE database.

Recommendation 5 Subject to any further proposals by the CARE expert group, it is recommended that Member States should report on the total number of serious injuries (MAIS=>3) starting with an annual total for 2014 and agree an acceptable timescale for fuller reporting of CARE database variables. In the meantime, it is envisaged that Member States would continue contributing as usual to the CARE database.

Recommendation 6 It is recommended that the High Level Group considers the range of identified actions on driver assistance technologies actions by the EU and Member States and which are broadly consistent with the CARS 21 strategy and the stated aims of the EU institutions. These include recommendations on EU type approval as well as good practice national actions to promote the take-up of effective new technologies.

Recommendation 7 It is recommended that monitoring and evaluation of the effectiveness of vehicle safety technologies is included in the discussion of driver assistance measures, particularly in relation to the establishment of a Pan-European in-depth crash investigation system.

Recommendation 8 It is recommended that the next HLG meeting determines whether a small HLG *Injuries Strategy* working group comprising road safety policy leaders, supported by technical experts, should be established to assist the Commission in determining the scope and further development of the strategy, based on the conclusions of the next HLG meeting.

1 Background

This Working Document has been prepared at the request of the European Commission and provides complementary information to the first working document ¹ prepared for the High Level Group meeting held in Copenhagen on June 27th on the development of an EU *Injuries Strategy*. Some material is duplicated where relevant and for ease of reference. It is not the intention to set out a draft injuries strategy but to outline key issues and approaches which can inform the next steps for development of the new strategy taking account of the June 2012 HLG discussion.

The background to the high-level consultation is as follows. The Commission's White Paper² proposed the development of a comprehensive strategy of action on road injuries as a priority for EU action including common definitions of injuries and fatalities and with a view to adopting an injuries reduction target. This subsequently formed one of the strategic objectives outlined in the *Policy Orientations on Road Safety 2011-2020*.³ These elements have been widely supported by the EU institutions and stakeholders and in the *Public consultation on an EU strategy to reduce injuries resulting from road traffic accidents*⁴ launched by the Commission on 17th April 2012. A report of this Consultation was circulated to the high level group on 3rd August 2012 and is appended in Annex 1⁵. The aim of the *Injuries Strategy* is to provide a framework for road safety activity to 2020 which develops the themes covered in the White Paper and in *Policy Orientations on Road Safety 2011-2020*. These developments provided the context for the high-level consultation with Member States' representatives which commenced during the meeting of 26th-27th June 2012.

Following several expert presentations at their June meeting, the High Level Group had a first discussion based on several questions concerning the scope, content and performance framework of a common road injuries strategy. The main focus of the discussion was a common definition of serious injury (non-fatal severe injury) and secondly, the setting of a measurable quantitative target. A number of conclusions were reached:

- A positive response was received from Member States representatives towards the development of an EU Injuries Strategy;
- Support was expressed for a long-term goal and quantitative target for serious injury to be set and adopted in line with the aspirations for the prevention of fatal injury;
- A common definition of serious injury is needed;
- Length of stay in hospital (24 hours) stay is not the best way to define serious injury;
- All countries agreed to MAIS 3+ (Maximum Abbreviated Injury Scale) as the common definition of serious injury to be applied;
- Member States would assess their national capacity to apply the new definition and present to the next HLG meeting a timeframe for reporting serious injury outcomes in national statistics using the new definition towards a common serious injury target.
- A questionnaire would be sent to Member States in order to receive more detailed information on the above. A further working document concerning the application of the new definition. would be prepared for the next HLG meeting, the focus of which would be

¹ Breen J, *Working document for the meeting of the High Level Group on Road Safety 27th June 2012*, Copenhagen.

² European Commission (2011) White Paper: *Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system* COM(2011) 144 final, Brussels, 28.3.2011.

³ European Commission (2011) *Towards a European road safety area, Policy orientations on road safety, 2011-2020*, Brussels.

⁴ European Commission (2009), *Public consultation on the European Road Safety Action Programme 2011-2020*, Brussels.

⁵ European Commission (2012) *Report on public consultation on an EU strategy to reduce injuries resulting from road traffic accident*, Brussels.

to agree a time-frame for reporting on the new serious injury definition. A discussion of road safety ITS solutions which might be included in an *Injuries Strategy* was also envisaged.

2 What road safety results should be targeted in the *Injuries Strategy*?

2.1 *Goals and targets are the focus of road safety strategy*

The EU aspires to be the world leader in the safety and security of all modes of transport.⁶

Experience in EU countries and elsewhere indicates that the rationale for effective road safety strategy is a focus on achieving results produced by the implementation of system-wide, evidence-based intervention made possible by well-orchestrated and government-led institutional management which engages fully with the private sector and civil society.^{7 8}

The level of road safety ambition whether at international, country or organisational levels is expressed in terms of long-term goals which provide a far-reaching vision statement for road safety work supported by measurable interim quantitative targets, usually expressed as a reduction in numbers of fatal and serious injuries. This approach is recommended to all countries, jurisdictions and organisations by the ITF/OECD, ISO and other international bodies.^{7 9}

2.1.1 *The strategy's long-term goal*

Countries have become progressively more ambitious in the results they want to achieve culminating in the *Safe System* (the generic term used globally by the UN, OECD and others) goal to eliminate in the long-term road user deaths and severe injuries (See Box 1). This long-term goal and associated strategy, first promoted by the leading EU road safety performers, re-defines what is meant by 'safety' in effective road safety management and has been adopted in the Commission's Transport White Paper and by the EU Council¹⁰, although in the former only in relation to the prevention of fatalities in road crashes.

Box 1: The four evolutionary phases of managing for better road safety results^{15 16}

Progressive shifts in road safety management thinking and practices in high-income countries have been evident. Since the 1950s there have been four significant and progressively ambitious phases of development:

- **Phase 1:** focused on driver intervention, with safety management characterized by dispersed, uncoordinated, and insufficiently resourced units performing isolated single functions.
- **Phase 2:** focused on system-wide interventions guided by the 'Haddon Matrix'. Dr. William Haddon, an American epidemiologist, developed a systematic framework for road safety based on the disease model which encompassed infrastructure, vehicles and users in the pre-crash, in-crash and post-crash stages¹¹

⁶ European Commission (2011) *White Paper: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system* COM(2011) 144 final, Brussels, 28.3.2011

⁷ World Bank Global Road Safety Facility, Bliss T & Breen J (2009). *Implementing the Recommendations of the World Report on Road Traffic Injury Prevention. Country guidelines for the Conduct of Road Safety Management Capacity Reviews and the Specification of Lead Agency Reforms, Investment Strategies and Safe System Projects*, Washington DC

⁸ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris

⁹ ISO 39001 (2012) *Road traffic safety (RTS) management systems – Requirements with guidance for use*, International Standard, ISO.

¹⁰ Council of the European Union (2010), *Council Conclusions On Road Safety 3052th* Transport, Telecommunications And Energy Council Meeting Brussels, 2–3 December 2010.

¹¹ Haddon Jr W (1968). *The changing approach to the epidemiology, prevention, and amelioration of trauma: the transition to approaches etiologically rather than descriptively*. American Journal of Public Health, 58:1431–1438. 33. Henderson M. Science and society.

- **Phase 3:** focused on system-wide interventions, targeted results and institutional leadership. Good practice countries used action plans with numerical outcome targets to be achieved with evidence-based packages of system-wide measures and new institutional leadership.
- **Phase 4:** is focusing on system-wide interventions; long-term elimination of death and serious injury; shared responsibility – *Safe System*. This comprises stepwise targets towards a long-term goal to eliminate death and serious injury which are seen as an unacceptable price for mobility; system-wide intervention (foreseen in Phase 2 and used successfully in Phase 3), but with renewed emphasis on better road and vehicle crash protection, post-crash care; new emphasis on speed management aimed at more effective injury prevention; strengthened, accountable institutional leadership and meaningful shared responsibility to achieve results.

According to key international organisations including the OECD, World Bank, WHO, and ISO the *Safe System* approach represented as Phase 4 in Box 1 represents the current recommended road safety management approach and is the only means by which the ambitious ultimate goal can be reached. In addition, the *Safe System* approach aligns well with other societal objectives such as sustainable development and environmental protection, energy security, public health as well as occupational health and safety policies. It presents opportunities, given sufficient stimulus, encouragement and the right frameworks, for integrating, building better business cases and achieving co-benefits with these and other areas of activity. There is remarkable international alignment in support of this approach.

The last public road safety strategy consultation carried out by the Commission (2009/2020) outlined the need for the EU and Member States to address levels of death and serious injury throughout the road network – both in built-up and non built-up areas; to reduce levels of socio-economic cost; to adopt and promote a long-term vision to eradicate death and serious injury and to set challenging but achievable quantitative targets to reduce them for the interim.¹²

In line with the recommendations of the EU institutions, other international organisations and the public consultation with the key stakeholders on the road safety action programme, it would be consistent with current policy that the long-term goal of the *Injuries Strategy* is the elimination of death and serious injury. Furthermore, in line with the global Decade of Action on road safety it is recommended that the injuries strategy adopts the *Safe System* approach (See Annex 1). In so doing, the EU can continue to play its important global road safety leadership role.

Recommendation 1. The Injuries Strategy should adopt the long-term *Safe System* goal and approach to eliminate deaths and serious injuries recommended to all countries by the main international organisations concerned with road safety.

2.1.2 Interim quantitative target(s) to reduce serious injury

Setting challenging but achievable step-wise quantitative final and intermediate outcome and output targets towards the ultimate *Safe System* goal to eliminate death and long-term injury is recommended as effective practice.¹³ Quantitative targets lead to better programmes, more effective use of public resources and an improvement in road safety performance.¹⁴ An ambitious long-term or purely symbolic goal which is not supported by interim targets has little value.¹³ However, targets that are ambitious are associated with better performance than

¹² COWI (2010) *Final Report: Technical Assistance in support of the Preparation of the European Road Safety Action Programme 2011-2020 prepared for the European Commission DG-TREN* February 2010.

¹³ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris

¹⁴ OECD (1994) *Targeted Road Safety Programmes*, Paris.

less ambitious targets.¹⁵ The ambitious target set by the EU to 2010 to halve road deaths and the national and regional targets set by Member States underscores an amalgam of successful activity, associated with a 43% reduction in EU road deaths.

Interim quantitative targets are usually expressed in terms of *final outcomes*¹⁶ e.g. numbers of deaths and serious injuries. Targets can also be expressed in terms of *intermediate outcomes*¹⁷ which are causally related to *final outcomes*, as practiced in several better performing countries. One example is targeting percentage increases in seat belt use. It is known that seat belt use reduces serious and fatal injury risk by around 50%. Around 12,400 car occupants survived serious crashes in 2009 in EU countries because they wore a seat belt. Another 2,500 deaths could have been prevented if 99% of occupant had been wearing a seat belt.¹⁸ Targeting reductions in seat belt use from a known baseline will contribute to reducing serious and fatal casualty reduction targets. Some countries go further and set targets for their service delivery in terms of institutional *outputs*¹⁹ e.g. number of seat belt checks required to be given annually by the police which, combined with publicity will contribute a high visibility activity deterring seat belt offences, or the percentage of the national vehicle fleet fitted with seat belt reminders.¹⁸

An ambitious EU interim quantitative target has been set to reduce deaths by 50% by the year 2020. In line with the recommendations for the EU institutions and the public consultation with the key stakeholders on the road safety action programme, a preferred option is to set an interim EU-wide target(s) for *serious injury* for the *Injuries Strategy*.

The casualty groups which determine the priorities for reductions in deaths and serious injuries in EU countries are *car occupants, powered two-wheeler users and pedestrians*. The casualty groups which determine the priorities for reductions in numbers of deaths and serious injuries amongst highest risk (number of deaths per 100,000 of population) groups in EU countries are *young novice drivers, powered two-wheeler users, pedestrians and cyclists*. The main road traffic crash types which need to be addressed to reduce fatal and serious injury are head-on crashes, run-off-road crashes, intersection crashes and pedestrian and other vulnerable road user crashes.²⁰

Based on current practice, four possible further options were identified in Working Document 1 circulated to the High Level Group in June and some conclusions can be drawn based on the discussion in the Copenhagen meeting:

- There was general support for establishing an EU interim target for serious injury to 2020 to accompany the existing target to reduce fatalities to provide a focus on serious injury reduction in EU road safety work in the current timeframe. The public

¹⁵ Wong S. C., Sze, N.N., Yip, H.F., Loo, Becky P.Y.; Hung, W.T., Lo, H.K. (2006) *Association between setting quantified road safety targets and road fatality reduction*. Accident Analysis and Prevention, 2006, 38, 997-1005.

¹⁶ *Final outcomes* can be expressed as a long-term goal of the future safety of the road traffic system and as short to medium-term targets expressed in terms of social costs, fatalities and serious injuries and also in terms of fatal and serious injury rates per capita, vehicle and traffic volume.

¹⁷ *Intermediate outcomes* are linked to improvements in final outcomes and typical measures include average traffic speeds, the proportion of drunk drivers in fatal crashes, seat belt wearing rates, helmet wearing rates, safety ratings of the vehicle fleet, safety ratings of the road network and the efficiency of emergency medical assistance.

¹⁸ European Transport Safety Council (ETSC) (2012) Thomas P, *How can improved vehicle safety contribute to EU road safety targets for 2020?* Presentation to CARS 21 WP1 meeting on road safety 31 January 2012, Brussels.

¹⁹ *Outputs* represent physical deliverables that seek improvements in intermediate and final outcomes and typical measures include kilometres of engineering safety improvements, the number of police enforcement operations required to reduce average traffic speeds or excess alcohol or alternatively they can correspond to milestones showing a specific task has been completed (Bliss, 2004).

²⁰ COWI (2010) *Final Report: Technical Assistance in support of the Preparation of the European Road Safety Action Programme 2011-2020* prepared for the European Commission DG-TREN, January 2010.

consultation on the current road safety action programme and road safety organisations identified a 40% reduction in serious injuries to 2020 (based on Member States existing definitions) as challenging but achievable. The rationale for a lesser target than the fatality reduction target is that serious injury reduction poses a greater challenge.

- It was agreed that the need was to target serious injury rather than non-fatal injury in general.
- Some reservations were expressed about setting an EU-wide target using existing definitions of serious injury. While this may encourage Member States to set a target for serious injury where such a target is absent, international comparisons of results achieved would not be possible.
- A target based on the new common definition of serious injury (MAIS 3 =>) was seen as the preferred option to be adopted as soon as possible. A simple percentage reduction for all serious injury based on the new definition seems entirely possible but dependent on Member States' capacity and time-frame to deliver. Technical input will be needed to determine a challenging but achievable level to 2020. The baseline year will depend upon the year selected for common reporting of serious injury to the new definition.
- An option for disaggregated final outcome targets (for example by user groups) would be more challenging and require more work. It is noted that no such targets exist at EU level for road fatalities, nor are used widely in road safety work..
- While raised but not discussed in the June meeting due to lack of time, additional sub-targets or intermediate outcome targets could be set using safety performance indicators for key safety behaviours such as increasing seat belt use, crash helmet use and reducing average speeds; improving the safety quality of the new vehicle fleet through use of Euro NCAP star ratings or for the road infrastructure using road assessment programme ratings (See Box 3). This approach is highly recommended as international best practice by the OECD, World Bank, ISO and other organisations and EU countries are increasingly working with these factors. Where linkages are made between targeting intermediate outcomes and final outcomes, then the targeting process becomes increasingly manageable and meaningful.²¹ It is worthy of note that in countries which have yet to establish effective national crash injury databases and arrangements for data sharing, the use of this type of intermediate outcome survey data can be very useful in getting started with demonstration projects targeting high-volume, corridors and areas and is being used widely in current country assistance aid in international development.

Recommendation 2. The *Injuries Strategy* should adopt a simple, aspirational, interim quantitative EU target to reduce serious injuries (MAIS=>3) by 2020 at a targeted level against baseline to be agreed.

Recommendation 3 The *Injuries Strategy* should target key road safety problems and improved intermediate outcomes (such as increasing seat belt use) with evidence-based intervention packages to include EU and country actions and using an agreed set of safety performance indicators in line with effective practice.

²¹ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris.

3 The common definition of serious injury

3.1 HLG agreement and rationale for a common definition

The main focus and outcome of the June HLG discussion was agreement on a new definition for serious injury at MAIS=>3. The background to this decision is summarised below.

The EU-funded *SafetyNet* project highlighted that, currently, the numbers of *fatalities* are the only comparable measurement units available in the CARE system and for international comparisons at EU level. Here, the degree of under-reporting is acceptably small in most EU Member States and there is a commonly derived and accepted definition (30 days) and adjustment protocol.²² Currently, *serious* injuries, which represent a large part of the public health burden and socio-economic costs of road traffic crashes cannot be compared in different Member States. The definition of *serious injury* differs among Member States and is usually not based on a medically classified standard. The most commonly used definition of *length of stay* at hospital is accepted as a sub-optimal way of defining a serious injury since it is likely to be significantly influenced by clinical practices and the availability and organisation of hospital services rather than by the level of road safety.²³ These differences result in a casualty being recorded in one country but not in another. Equally, a casualty which might be recorded as *seriously* injured in one country might be recorded as *slightly* injured in another. Experts agree that the global and EU picture of road casualties is incomplete and is impeding effective road safety management.²⁴

The rationale for a common EU-wide definition therefore is the need to:

- identify the real magnitude of the road safety problem and the scale of long-term impairment and associated socio-economic costs, given the known common problems of *misreporting*²⁵ and *under-reporting*²⁶ (the mean reporting level for serious injuries is roughly 70%) under current arrangements;
- allow the identification of effective intervention towards the prevention of serious health loss in road traffic crashes; and
- facilitate monitoring and evaluation of targets and international benchmarking amongst the EU Member States.

Identified effective practice acknowledges that no single database will provide enough information to give a complete picture of road traffic injuries and to fully understand underlying injury mechanisms. Road safety experts agree that use of health sector data for meaningful injury classification at country level is necessary to complement police data and to provide an optimal means of defining and reporting serious injury.^{27 28} A consensus has emerged over adoption of the Maximum Abbreviated Injury Scale equal or greater than three (MAIS=>3) as the EU definition..

²² SafetyNet Project, Broughton J, Amoros E, Bos N, Evgenikos P, Hoeglinger S, Holló P, Pérez C, Tecl J (2008), *Estimating the real number of road accident casualties*, Deliverable D.1.15, SafetyNet. www.erso.eu/safetynet/content/safetynet.htm.

²³ Brasel KJ, Lim HJ, Nirula R, Weigelt JA, (2007) *Length of stay: An appropriate quality measure?* Archives of Surgery 2007, vol. 142, pp. 461-466.

²⁴ IRTAD (2011) *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, International Traffic Safety Data and Analysis Group, OECD/ITF, Paris

²⁵ *Misreporting* is where injury severity is under or overestimated by the Police (e.g. serious casualties that are reported as slight or vice-versa).

²⁶ *Underreporting* is where only a limited proportion of non-fatal hospitalised injuries are recorded by the Police.

²⁷ IRTAD (2011) *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, International Traffic Safety Data and Analysis Group, OECD/ITF, Paris.

²⁸ SafetyNet Project, Broughton et al (2008), *Estimating the real number of road accident casualties*, deliverable D.1.15, SafetyNet. www.erso.eu/safetynet/content/safetynet.htm.

The need for establishing/improving definitions in EU road safety work is acknowledged by all the EU institutions including the European Parliament which called on the Commission in their latest road safety report in 2011 to draw up within two years better definitions of injury severity to allow necessary monitoring.²⁹ Legislative requirements providing for changes to national reporting systems are not anticipated. Nevertheless, several legislative or administrative provisions might be required at national level if countries decide to put in place new data collection arrangement which might, for example, necessitate changes in personal data protection requirements.

Following the decision of the HLG to adopt this new definition the next task is to establish an acceptable timescale for reporting and the next steps needed towards this.

3.2 Implementation timescale for the EU and Member States

On the basis of the discussion to date there seems to be strong support for moving as soon as possible towards reporting on a new common definition of serious injury which can provide a solid basis for targeting and monitoring *Injuries Strategy* results. Some Member States are in a position to report in the very near future, others will require time to decide on the method to carry out the necessary recording and reporting procedures and to establish national coefficients based on police and health data linkage. These are technical issues and the national representatives of the CARE expert group are well-placed to play an important role in country management of this process. An opinion from the CARE expert data group on a reasonable timescale for reporting to the EU would be valuable. The length of time needed will depend on what information is required to be reported initially – whether a simple aggregated serious injury total or serious injury totals disaggregated into all the variables currently reported in the CARE system. Less time would be required for the former reporting requirement, which can be achieved through a relatively simple procedure, and would also allow a serious injury target to be set within the current 2020 targets framework. These issues are further discussed in the next sections.

Recommendation 4 The national representatives of the CARE expert group should play a key role in assisting Member States, where necessary, with country management of the process of preparing for and reporting on the new common definition of serious injury as an additional field to the existing CARE database.

Recommendation 5 Subject to any further proposals by the CARE expert group, it is recommended that Member States should report on the total number of serious injuries (MAIS=>3) starting with an annual total for 2014 and agree an acceptable timescale for fuller reporting of CARE database variables. In the meantime, it is envisaged that Member States would continue contributing as usual to the CARE database.

3.3 Using police data and MAIS data to report serious injury

Sections 3.4 and 3.5 discuss the means by which Member States can move from their current definition and reporting of serious injury to the commonly agreed definition (if they have not already done so) and outlines (notwithstanding Recommendations 4 and 5) possible next steps. This section provides a brief outline of current practice and key background information.

²⁹ European Parliament (2011) *European Parliament resolution of 27 September 2011 on European road safety 2011-2020* (2010/2235(INI)).

Current road traffic injury data recording

A range of databases contribute data on road crashes and their consequences, the most important being police and health sector databases. An assessment of injury severity may also take place within the judicial process following a road traffic crash which leads to injury and on the basis of in-depth crash injury investigation studies.

Police reporting: The police complete a road traffic crash data collection form in each country typically assigning a ‘serious’ or ‘slight’ injury score for non-fatal road casualties and providing other detailed information about crash circumstances, location, vehicles and users involved. In most EU countries, the police assess the injury severity of road casualties for the national road crash injury database. This is not a medical assessment; it is difficult to assess injury severity and injury consequences at the scene without clinical diagnosis; and a systematic process is usually missing to check police data subsequently against medical sources about non-fatal injury severity. Some countries establish correction factors for this understandable and common *under-reporting* to the national police-reported crash injury database, based on health sector data

Hospital reporting: Encouraged by the World Health Organisation and other institutions, medical authorities have established international recording systems, in particular the International Classification of Diseases and related Health Problems (ICD) and the Abbreviated Injury Scale (AIS) coding systems which are outlined in Box 1.

The International Classification of Diseases (ICD) is a system designed to promote international comparability in the collection, processing, classification, and presentation of mortality statistics and is developed collaboratively between the World Health Organization (WHO) and 10 international centres. It aims to ensure that medical terms reported on death certificates are internationally comparable and lend themselves to statistical analysis. The ICD is revised approximately every ten years. These revisions reflect advances in the medical field and developments in understanding of disease mechanisms and terminology, and are designed to maximise the amount of information and flexibility a code can provide. ICD-10 more closely reflects current medical knowledge than ICD-9.

The Maximum Abbreviated Injury Scale (MAIS) and the Injury Severity Score (ISS) can be derived from these commonly used ICD codes. In some countries, serious injury is already defined based on indices such as the AIS (Abbreviated Injury Scale), MAIS and ISS. In The Netherlands, for example, a seriously injured casualty is defined as “an in-patient, with injury level MAIS=>2” and corrects for under-reporting in the national police-reported crash data systems. Sweden bases its definition of injury severity on health sector data using ISS, corrects for under-reporting and has established an indicator of long-term impairment, and targets reduced road injuries.

Box 1: Definition of injury classification and severity indices

Source: IRATD 2011³⁰

International Classification of Diseases and related Health Problems (ICD)

The ICD is published by the World Health Organisation and provides codes to classify diseases as well as signs, symptoms and external causes of injury or disease. Every health condition can be assigned to a unique category and given a code, of up to six characters. In addition to enabling the storage and retrieval of diagnostic information for clinical, epidemiological and quality purposes, these records also provide the basis for the compilation of national mortality and morbidity statistics by WHO Member States. The ICD is revised periodically and is currently in its tenth edition (ICD 10). The 9th edition is still widely used (ICD9). Causes of accidents are classified. Traffic injuries have a specific code in the section “external cause”, as well as codes to describe the injury.

Abbreviated Injury Scale (AIS)

The AIS is published by the Association for the Advancement of Automotive Medicine and is an internationally agreed tool to describe the severity of injury for each of nine regions of the body: 1 Minor, 2 Moderate, 3 Serious, 4 Severe, 5 Critical, 6 Unsurvivable. The regions are 1 Head, 2 Face, 3 Neck, 4 Thorax, 5 Abdomen, 6 Spine, 7 Upper Extremity, 8 Lower Extremity, 9 External and other. AIS does not reflect the combined effects of multiple injuries. It was initially developed for crash investigation purposes to provide researchers with a simple numerical method for ranking and comparing injuries by severity, and to standardize the terminology used to describe injuries. It is possible to convert ICD9 or ICD10 codes into AIS.

Maximum Abbreviated Injury Scale (MAIS)

The severity of road traffic injuries can be assessed on the basis of the universal Maximum Abbreviated Injury Scale) (MAIS) which is an internationally accepted summary measure of injury severity. The MAIS is the maximum AIS severity score of a casualty with several injuries. These scores allow to assess injury severity on the basis of a standardised medical indicator.

Injury Severity Score (ISS)

The Injury Severity Scoring is a process by which complex and variable patient data are reduced to a single number. The Injury Severity Score (ISS) is an anatomical scoring system that provides an overall score for patients with multiple injuries. Each injury is assigned an AIS and is allocated to one of six body regions (Head, Face, Chest, Abdomen, Extremities (including Pelvis), External). Only the highest AIS score in each body region is used. The three most severely injured body regions have their score squared and added together to produce the ISS score. ISS was developed to predict mortality.

Linking police and health sector data

Reliable numbers of injuries can be identified by comparing the number of injured road users treated in hospitals to the number recorded by the police. In terms of hospital data, ICD data (either ICD 9 or ICD 10) on road traffic injury can be easily converted by computer software into AIS data to derive an overall injury severity score. In the case of the new EU serious injury definition, this is $MAIS \Rightarrow 3$.

Reporting to this new definition requires a simple cross-reference of overall totals. If the ICD data is computerised, the task can be conducted in minutes. Where ICD data is still in manual form, and this might apply to one or two countries, then these might start with a regional initiative to computerise ICD data, convert to $MAIS \Rightarrow 3$ using computer software and

³⁰ IRTAD (2011) *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, International Traffic Safety Data and Analysis Group, OECD/ITF, Paris.

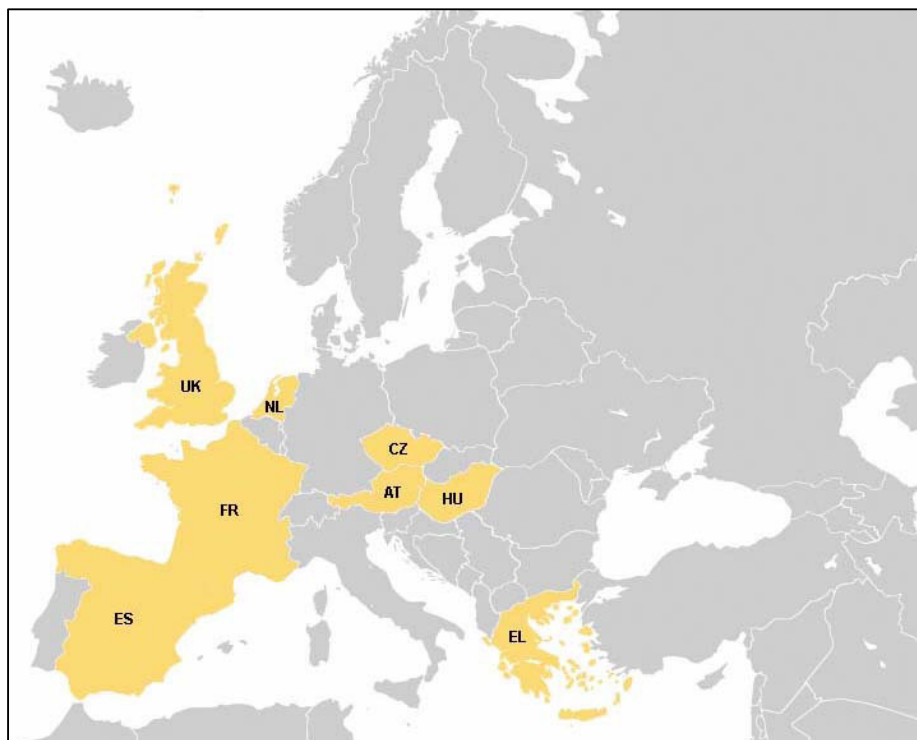
compare against police data collected for that region from which a national coefficient can then be derived. Further disaggregation by road user type and other variables requires further anonymised record linkage. There is good agreement amongst experts about appropriate protocols for anonymised record linkage and these were used in the SafetyNet project (Task 1.5) which reported in 2008. Here, eight countries took part in the project (See Figure 1) and police and hospital records were matched nationally in two (Austria and the Netherlands). France, Greece, Spain and the UK matched data on a regional basis, and the Czech Republic and Hungary matched local data. All studies used crash data from national crash injury databases that had been compiled from police crash reports. Most studies used files of medical data compiled by national or regional authorities from hospital records. From these studies, new national coefficients were produced which allowed the estimation of ‘true’ casualty totals from the numbers recorded in CARE, although not for an EU level estimate.

The Safety Net project reported that the pragmatic solution originally envisaged had been to use information provided by governmental experts (including the existence of corresponding data or studies in their countries) to:

- (i) identify, for each country *without* a national study, which of the countries *with* a national study it most closely resembles in terms of its national accident reporting system; and to
- (ii) generalise the coefficients estimated for each country *with* a national study to all analogous countries.

The project concluded that this could not be achieved on the basis of the information provided and that even if such a solution could be identified, any approach which generalised from studies in a minority of EU Member States would not be wholly satisfactory, and that individual national assessments of levels of under-reporting would be necessary. This would allow a national coefficient to be devised which would be updated periodically.

Figure 1: Countries where studies were carried out



3.4 Country next steps to allow reporting of *MAIS=>3* serious injury

This section looks at different scenarios for next steps for Member States depending upon their current arrangements.

3.4.1 *Member States with MAIS=>3 data with established police and health data linkage*

Where *MAIS=>3* data is already recorded nationally and linkages have been carried out recently between police and health sector databases, countries can report the total number of serious injuries defined as *MAIS =>3* directly to the CARE database as well as establishing a national coefficient for under-reporting.

Next steps:

- ➔ Review availability of health sector data on road traffic injury
- ➔ *MAIS =>3* data available and linkages between health and police data
- ➔ Report total serious injuries to CARE database
- ➔ Report on other CARE variables where possible

3.4.2 *Member States with MAIS=>3 data without established police and health data linkage*

Where *MAIS=>3* data is already recorded in some hospitals but not yet linked to police data, linkage procedures can be carried out. The Safety Net project demonstrated that these can be conducted in a regional study which is nationally representative which could produce a coefficient to derive a simple national total of serious *MAIS=>3* injuries to be reported to CARE and updated periodically. Where Member States are unable but wish to report disaggregated data on *MAIS=>3* injuries e.g. by road user type, such studies can be carried out covering the relevant variables.

Next steps:

- ➔ Review availability of health sector data on road traffic injury
- ➔ *MAIS =>3* data available
- ➔ Carry out linkages between health and police data
- ➔ Report total serious injuries to CARE database
- ➔ Report on other CARE variables where possible

3.4.3 *Member States without MAIS =>3 data*

A number of options are available to Member States and the selection of a method which reflects available national capacity and resource is important.

One option would be to inform the Commission of the national intention to make necessary changes in the near future and to request its assistance in securing the exchange of expertise from a Member State which has carried out the necessary procedures to allow reporting. It is worth noting that in the CODES system in the US, the US Federal Government's National Highway Traffic Safety Administration routinely supports the state-wide linkage of crash and medical records in about thirty States. The Commission could support regular national linkage studies in the Member States which would have benefits in addition to the preparation of conversion factors for use with CARE.

A variety of methods are available to determine AIS and *MAIS* levels as outlined in the tables below from IRTAD's report on serious injury data in 2011 and the SafetyNet project. The most common method is to transpose ICD data which is routinely collected by countries for public health management purposes. Where countries have computerised coding of ICD 9 or 10 data nationally, available computer software can be used to translate ICD data into *MAIS*

data to report a national total MAIS =>3 injuries.³¹ The two main software packages to map AIS from ICD9-10 have been developed by the European Centre for Injury Prevention (EU Apollo Project)³¹ and the Johns Hopkins University.

Table 2.6. Methods to determine AIS in IRTAD countries

<i>Czech Rep</i>	Derived from the diagnosis expressed in ICD-10 classification.
<i>Denmark</i>	Determined by medical doctors.
<i>France</i>	The medical diagnosis is directly coded into the Abbreviated Injury Scale (which includes the AIS severity score). This is done by a trained physician; the diagnosis is the result of all text injury descriptions from all hospital departments the person has attended.
<i>Japan</i>	Determined by medical doctors. The Japan Association for the Surgery of Trauma periodically trained medical doctors and other relevant staff on AIS coding.
<i>Netherlands</i>	AIS is derived from the ICD-9 by use of ICDmap90 (Johns Hopkins 2002).
<i>Spain</i>	Software can convert ICD9-CM codes to AIS: - ICDMAP (Johns Hopkins University). - ICDPIC: (Boston College Department of Economics). This is a STATA module to provide methods for translating ICD9-CM diagnosis codes into standard injury categories and/or scores.
<i>United Kingdom</i>	Mapping from ICD-10 codes using coding developed by University of Navarra (European Centre for Injury Prevention, University of Navarra, Algorithm to transform ICD-10 codes AIS and ISS, version 1 for SPSS. Pamplona, Spain 2006).
<i>United States</i>	AIS derived either from ICD-9 codes provided by hospitals, or, in the case of NASS-CDS, by forensic analysts reading the case file.

Source: IRTAD 2011³²

Table 1: Summary details of studies

Country	Study area	Period	Coding of MAIS
Austria	National	2001	From ICD10
Czech Republic	Local (Kromeriz, central Moravia)	2003 - 2005	From ICD10
France	Regional (Département of the Rhône)	1996 - 2003	Coded directly
Greece	Regional (Corfu)	1996 - 2003	From ICD9
Hungary	Local (part of Budapest)	Aug 2004 - Jan 2006	Coded directly
Netherlands	National	1997 - 2003	From ICD9
Spain	Regional (Castilla y Leon)	July - Dec 2005	From ICD9
United Kingdom	Regional (Scotland)	1997 - 2005	From ICD10

Source: SafetyNet 2008³³

Where countries have manual data, records can be computerised at regional level, transposed to MAIS using computer software and linked to regional police data. to produce a coefficient to derive a simple national total of serious *MAIS* =>3 injuries which can be reported to CARE and updated periodically reported.

³¹ http://www.euroipn.org/apollo/reports/ANNEX%202.2.1%20AISE%20project_Final%20Report.pdf and <http://www.euroipn.org/apollo/APOLLO%20RESULTS.htm>

University of Navarra (requested)

³² IRTAD (2011) *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, International Traffic Safety Data and Analysis Group, OECD/ITF, Paris.

³³ SafetyNet Project, Broughton J, Amoros E, Bos N, Evgenikos P, Hoeglinger S, Holló P, Pérez C, Tecl J (2008), *Estimating the real number of road accident casualties*, Deliverable D.1.15.

Next steps: → Review availability of health sector data on road traffic injury
→ No data
→ Request Commission assistance to obtain expert help **OR**

Next steps: → Review availability of health sector data on road traffic injury
→ No data
→ Collect and code computerised ICD data
→ Carry out simple conversion from ICD to AIS and obtain total MAIS =>3

3.5 European Commission steps to support the reporting of MAIS=>3 serious injury

A range of steps will also be need to be carried out by the European Commission in support of EU-wide reporting using the new definition of serious injury:

Next steps:

- Determine the values of the new MAIS field following consultation with the CARE group experts and conclude steps to produce an updated CARE database structure to including the new MAIS field;
- consult with the CARE expert group on a reasonable timeline for the reporting of serious injury to the new definition on a disaggregated basis;
- produce some transformation rules in cooperation with each Member State who chooses to derive a national coefficient from sample data to complete the new data field, as for the 30 day definition of fatality in a road traffic crash;
- update the data on the CARE database using the new definition for those Member States who are able to report;
- produce a single EU-wide total of serious injury and any additional available information using the new definition for all countries (for the year 2014)

4 Identifying system-wide interventions

While the priority is to first address the issues raised in sections 2 and 3, a key aim of the *Injuries Strategy* is to identify specific priority interventions on the basis of effective international practice and EU-funded research to date. Such action would necessarily need to be based on the subsidiarity principle and be in line with Treaty obligations to deliver a high level of protection with due consideration to effectiveness, cost, practicality and public acceptability.

Presentation of various options was made in the last Working Document and the text therein has been updated in this draft. Although there was little time for discussion of these during the last HLG meeting, it was agreed that the focus of the next meeting would extend to intervention and its implementation and include discussion of in-vehicle technologies.

4.1 A systematic, multi-disciplinary and multi-sectoral approach

The road safety public consultation carried out by the Commission in the preparation of the Policy Orientations paper³⁴, indicated wide acknowledgement that serious and fatal injuries in road crashes are preventable and need to be addressed by *system-wide intervention*. EU,

³⁴ COWI (2010) *Final Report: Technical Assistance in support of the Preparation of the European Road Safety Action Programme 2011-2020 prepared for the European Commission* DG-TREN February 2010.

national and local policies should focus on the *implementation of evidence-based approaches* to reduce exposure to the risk of death and serious in-jury; the prevention of death and serious injury; mitigating the severity of injury when a crash occurs and reducing the consequences of injury. Interventions needed to better address the safety of all users and take account of future demographics, notably the physical vulnerability of an ageing society. The need to address *excess and inappropriate speed, reducing impaired driving, insufficient seat belt wearing and crash helmet use, high novice driver and rider risk, improved safety quality of vehicles and road infrastructure for all users and improved emergency medical response* was cited throughout the consultation.

Measures proposed at EU level can often seem ad hoc or fragmentary, overly focused on legislative change, insufficiently related to the key problems and the needs of all Member States and insufficiently engaged with other Commission Directorate to achieve a range of policy co-benefits. The *Injuries Strategy* provides an opportunity to adopt an holistic approach to EU activity, as envisaged in the Policy Orientations paper, to embark upon packages of effective programme measures which address the key road safety problems and provide the rationale for engaging with health, environment and employment sectors to build stronger business cases and support for implementation..

4.2 Safe System intervention

The rationale of the recommended *Safe System* approach is to ensure that in the event of a crash, the impact energies remain below the threshold likely to produce either death or serious injury. This will vary from one crash scenario to the next, depending upon the level of protection offered to the road users involved. For example, the chances of survival for an unprotected pedestrian hit by a vehicle diminish rapidly at speeds greater than 30 km/h, whereas the critical threshold for severe and fatal injury for a properly restrained motor vehicle occupant in the best designed vehicle is 50 km/h in typical side impact crashes and 70 km/h for head-on crashes.³⁵

All elements in the road traffic system are interconnected and affect one another. For example, the available crash protection in vehicles will be of little help if unsafe road speeds are posted in the road network or the intrinsic level of protection offered by road design and layout is too low; the fitment of seat belts will be of no use unless compliance with seat belt use legislation is achieved; lane departure assist systems in vehicles will have little value without roads authority intervention to ensure quality road marking; eCALL systems rely on effective emergency medical response. In fact, the many potential benefits from leading EU vehicle safety technologies will not be realised without attention to and integration with other road traffic system elements.

The general scope of effective intervention strategy is set out in Box 2. These comprise evidence-based strategies which are supported by the substantial body of road safety research carried out over the last 50 years.^{36 37}

³⁵ Tingvall C and N Haworth (1999) *Vision Zero - An ethical approach to safety and mobility*, Paper presented to the 6th ITE International Conference Road Safety & Traffic Enforcement: Beyond 2000, Melbourne, 6-7 September 1999.

³⁶ Eds Peden M, Scurfield R, Sleet D, Mohan D, Hyder A, Jarawan E, Mathers C (2004). *World Report on Road Traffic Injury Prevention*, World Health Organization and World Bank (Washington), Geneva.

³⁷ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris

³⁷Kopits E, Cropper M. *Traffic fatalities and economic growth*. *Accid Anal Prev* 2005 January;37(1):169-78.

Box 2: A summary of Safe System intervention principles

The key intervention, evidence-based strategies which can reduce deaths and serious injuries in road traffic crashes comprise:

- Separation of or safe integration of dangerous mixed road use
- Managing vehicle speeds to crash protection levels in roads and vehicles
- Providing crash protective roadsides and vehicles
- Deterring dangerous road user behaviour (e.g. through combined police enforcement and publicity and also through in-vehicle driver assistance systems)
- Managing risk through driver and rider licensing and testing standards
- Managing risk through vehicle safety standards /designs and their compliance
- Fast and efficient emergency medical help, diagnosis and care

Box 3: Safe System engineering in practice³⁸

Sweden's rollout of median barriers, roadside barriers and roundabouts: Against the background of over 70% of deaths occurring in single vehicle crashes and head-on collisions, Sweden commenced a *Vision Zero* investment program in innovative safety engineering targeting an increased proportion of total traffic volume to be travelled on roads with new median and roadside crash protection. Between 2003 and 2010, the percentage of total traffic volume travelling on roads with speed limits of more than 80 km/h and fitted with median barriers has risen from 50% to 67% against a 2020 target of 75%. The 2+1 median barrier treatments have reduced deaths by 80% and deaths and serious injuries by 50-60%. Improved junction safety has also been targeted and 80-90% fewer deaths have occurred at sites where roundabouts have been implemented.³⁹

Sustainable safety engineering measures in The Netherlands: The aim of the Dutch *Sustainable Safety* policy is to re-engineer and manage the road network to provide compatibility between road functions, speed limits and road layouts in order to encourage safe use and substantially reduce crash deaths and serious injuries. Many of the measures in the Start-Up Program of *Sustainable Safety* in 1998 were targeted at safer road infrastructure. During the period 1998-2007 nearly all road authorities drew up a plan for the re-classification of their roads into *Sustainable Safety* categories. Substantial reductions in crash deaths were achieved on newly classified 30km/h and 60km/h roads in the period 1998-2008. During this time more than 2,300 roundabouts were constructed and a study of those provided between 1999 and 2005 showed a 76% reduction in road fatalities.⁴⁰

4.3 Programme measures: identifying future options

It is clear from the previous sections that the *Injuries Strategy* could address and support a range of useful, specific, evidence-based intervention at EU, national, regional and local levels. Some have already been foreseen in the Transport White Paper, the Road Safety Action Programme and following the Council discussion in November 2010. The European Parliament has also indicated very broad support for a wide range of actions.

While identifying specific programme measures and their potential impact in detail is beyond the scope of this working document, some examples are provided in Boxes 3 and 4 of key areas which might be addressed by a range of EU, national and local intervention. These are in line with many recent statements of the EU institutions – both governmental and non governmental and reflected in public consultation results and also the results of an EU-wide opinion survey. Here, people driving under the influence of alcohol were considered to be a

³⁸ Bliss T and Breen J (2012), *Unpublished World Bank road safety resource paper*.

³⁹ Lie A: *2+1 - Roads with Cable Barrier - a Swedish Success Story*, Swedish Transport Administration.

⁴⁰ SWOV (2009) *Sustainable Safety Effect*, Leidschendam.

major safety problem by 94% of respondents, followed by drivers exceeding speed limits (78%) and drivers/passengers not wearing seatbelts (74%).⁴¹

In view of the forthcoming discussion on road safety ITS technologies planned for the next HLG meeting, Section 4.4. looks at the role of in-vehicle driver assistance technologies in addressing these problems and possible next steps for the EU and Member States in taking these forward.

Box 4: Examples of possible areas for targeting and intervention in the Injuries Strategy

- *Reducing inappropriate or excessive speed* Excessive and inappropriate speed is a primary factor in about one third of fatal crashes and contributes to increased crash severity.⁴² It is estimated that speed violations are still up to 70% on rural roads and as many as 80% on urban roads. More than 2,200 road deaths could be prevented each year if average speeds were reduced by 1 km/h on all roads across the EU - 1,100 on urban roads, 1,000 on rural roads and 100 on motorways.⁴³
- *Reducing driving under the influence of alcohol* it is estimated that alcohol-related deaths contribute up to 25% of all road deaths.⁴⁴ At least 7,500 deaths could be prevented each year if crash-involved drivers reported to be exceeding the limit had been sober.⁴²
- *Increasing the use of front and rear seat belts* Research studies indicate that the risk of dying in a crash could be reduced by about 60% by using the seat belt and by more, when belts and air bags are combined.⁴⁵ Despite compulsory use requirements, the level of seat belt use in the front seat varies widely is insufficiently high and wearing rates remain low in rear seats in many EU countries.⁴² Around 12,400 car occupants survived serious crashes in 2009 because they wore a seat belt. Another 2,500 deaths could have been prevented if 99% of occupants had been wearing a front seat belt.⁴²
- *Improving the safety quality of vehicles* e.g. Research shows that 5-star rated Euro NCAP cars have a 68% lower risk of fatal injury and a 23% lower risk of serious injury compared to 2-star rated cars.⁴⁶
- *Improving the safety quality of the road network:* See Box 3 for examples.
- *Improving emergency medical response* Reducing the time between crash occurrence and arrival of emergency services from 25 to 15 minutes reduces deaths by one third.⁴⁷

4.4 The role of in-vehicle technologies in addressing key road safety problems

In-vehicle technologies play a key role in a *Safe System* approach. They can reduce the risk of serious and fatal crash involvement, mitigate the severity of injuries sustained before the crash, help to protect during the crash and to reduce post-crash consequences.⁴⁸ Increasingly, vehicle systems which integrate these objectives are being pursued. *Safe System* approaches also aim to inter-link vehicle safety measures with other system measures e.g. separated facilities in the road network, crash protective medians and roadsides and speed management to ensure tolerable kinetic energy in the event of a serious and fatal crash.

⁴¹ http://ec.europa.eu/public_opinion/flash/fl_301_en.pdf 2010

⁴² OECD/ECMT (2006) *Speed management*, Paris.

⁴³ ETSC (2010) *PIN Flash n.16 Tackling the three main killers on the roads*, Brussels.

⁴⁴ European Road Safety Observatory (ERSO) (2012 in preparation) ERSO (2012) *Alcohol web text*.

⁴⁵ Peden M, Scurfield R, Sleet D, Mohan D, Hyder A, Jarawan E, Mathers C eds. (2004). *World Report on Road Traffic Injury Prevention*, World Health Organization and World Bank (Washington), Geneva.

⁴⁶ Kullgren A, Lie A, Tingvall C. (2010) *Comparison between Euro NCAP test results and real-world crash data*. *Traffic Injury Prevention*. 2010 Dec 11(6):587-93.

⁴⁷ Sánchez-Mangas R, García-Ferrer A, De Juan A, Arroyo A M (2010). *The probability of death in road traffic accidents. How important is a quick medical response?* *Accident Analysis and Prevention* 42 (2010) 1048).

⁴⁸ European Road Safety Observatory (ERSO) (2012 in preparation) ERSO (2012) *eSafety web text*

Substantial and evidence-based improvements have been made in the last 20 years. Improvements to vehicle safety result from type approval legislation (much of which is now agreed in the European Union and within the UN ECE process) consumer information and notably Euro NCAP, product liability considerations as well as specific initiatives of the car manufacturing industry. EU legislation aims for a minimum but high level of protection across the product line; consumer information aims to encourage the highest possible levels of safety performance based on state of the art testing and assessment; and car industry policies increasingly promote safety as a marketable commodity. The interaction of these processes has led to substantial improvements in vehicle safety design, particularly in the field of passive safety/crash protection and reducing the risk of death and serious injury for car occupants by 50% or more.⁴⁹ Through these, EU-registered vehicle production leads the world in the provision of life-saving vehicle safety technologies both to EU and global markets..

At the same time, further improvements have been identified. UN ECE and EU legislation in important areas falls well behind the state of the art and manufacturing practice. Key issues for vehicle safety design and policy to 2020 and beyond will be 1) adapting existing type approval standards to technical progress in line with EEVC and Euro NCAP recommendations and protocols, especially for frontal and side-impact crash protection in cars; 2) achieving safe compatibility through new and improved standards between different types and sizes of motor vehicles, between vehicles and non-motorised vehicles (improvements in vehicle safety design and equipment for pedestrians and motorcyclists are expected) and 3) implementing in-vehicle technologies as an efficient and relatively low-cost route to securing user compliance with the most important road safety rules. In this area, a range of driver assistance/in-vehicle enforcement technologies are available for deployment to follow the successful implementation of measures such as electronic stability control (being phased in from 2012, with all new cars being equipped by 2014). These are the principal focus of the next sections, given the forthcoming HLG discussion..

It has also been noted that the safety levels of vehicle fleets are notably lower in some European countries than others in relation to vehicle age (varying from 7 years in the UK to around 15 years in Latvia⁵⁰). This means that without further initiatives, such as fast-tracking the fitment of equipment nationally through governmental procurement and in-house travel policies, new life-saving vehicle safety technologies will take longer to come through into new vehicle fleets and the used car market.

EU type approval legislation, supported by Euro NCAP and national initiatives such as fast-tracking and financial incentives through fiscal and insurance regimes, are needed to improve vehicle safety performance and create new demand and markets for safety products supplied by the car manufacturing industry.

⁴⁹ European Road Safety Observatory (ERSO) (2012 in preparation) *Vehicles* web text

⁵⁰ ACEA, European Car Manufacturers Association, http://www.acea.be/news/news_detail/vehicles_in_use/

Box 5: Swedish Transport Administration's Safety Requirements for Vehicles ⁵¹

Sweden legislation (2009) sets a high vehicle safety requirement standards for government fleets. Recommended minimum traffic safety requirements have been developed, not only for government-owned vehicles but also for lease vehicles, short-term rental vehicles and private vehicles used for work purposes. The legislation requires all governmental bodies to buy or rent only 5-star Euro NCAP cars ("government specification" as is the case for environment standards). The levels of safety requirements increase with length of time a vehicle is used for. It is recognised that the highest Euro NCAP standards should be aimed for and this is a moving target with room for continual technological improvements. Due to the requirement to rent only 5-star Euro NCAP cars this has had another overspill effect as rental companies, such as Hertz, Avis and Europcar, are upgrading their whole fleet to offer 'Swedish Transport Administration recommended cars' to all their customers.

Box 6: What can a country/organisation/company do to promote safer vehicles? ⁵²

- Use travel policies
- Look at management systems (ISO 39001)
- Include vehicle safety in traffic safety work
- Support Euro NCAP and actively use the results
- Support every organisation that wants to focus on safety
- Be the market
- Get occupational health and safety on-board
- Follow up new technologies

4.5 Driver assistance technologies

There is large future promise of casualty reduction from crash avoidance, crash injury protection and mitigation and post-crash care via active driver assistance safety technologies where development and implementation is prioritised to maximise casualty reduction.

The EU institutions support new attention to this area and various initiatives are underway by the European Commission in more than one Directorate, by Euro NCAP and individual Member States to advance the deployment of key in-vehicle safety technologies which have received substantial research framework support over the last decades.

For example, EC Regulation 661/2009 on Type Approval requirements for the general safety of motor vehicles, the ITS Directive (2010) and the launch of its implementation plan - the ITS Action Plan adopted in 2008 – brings new attention to road safety aspects, albeit with limited coverage of the range of measures deemed as priorities by road safety experts to date.

Box 7: EU ITS Action Plan Area 3: Road safety and security

1. Promotion of in-vehicle safety systems
2. Introduction of Europe-wide eCall
3. Regulatory framework on safe human-machine interfaces including nomadic devices
4. Best-practice guidelines: impact of ITS on vulnerable road users
5. Best-practice guidelines: secure parking places for trucks (ITS support)

⁵¹ European Road Safety Observatory (ERSO (2012) (in preparation) *Integrated road safety* web text

⁵² Lie A. (2010) *Vehicle safety policy – Swedish Transport Administration*, PRAISE Seminar, 12.5.2010, ETSC, Brussels

The European Commission’s Cars 21 strategy envisages an EU automotive industry that is leading in technology producing new vehicles purchased by EU consumers, which are clean in terms of regulated pollutants, more fuel-efficient, quiet, safe and connected. In terms of driver assistance, CARS 21 supports the consideration of selective use of alcolock devices, the extension of seat belt reminders (to cover additional seats), the use of speed management devices and systematic monitoring through crash injury research .

The European New Car Assessment Programme has developed a new role in assessing the safety quality of key in-vehicle technologies through *Advanced Euro NCAP* and a new road map is underway to allow emerging crash avoidance technologies to be included into the assessment scheme by 2015.

A summary of development and future needs which address key safety problems found on roads in EU countries is presented below.

4.5.1 Driver assistance – ISA

A range of ISA technologies are available to assist drivers in complying with speed limits. ISA is a well-proven technology that informs drivers when they are exceeding the road speed limit either by a warning signal as in Speed Alert Systems, (advisory) or where the accelerator either vibrates or offers resistance which is possible for the driver to set and override (voluntary) or by increasingly interventionist systems which do not allow driver override (mandatory). Research indicates that the more the system intervenes the more significant are the benefits, as shown in Table 1.

Table 1: Expected road safety results from a range of ISA options ⁵³

	Advisory % reduction	Voluntary % reduction	Mandatory % reduction
Fatal crashes	5%	21%	46%
Serious injury crashes	3%	14%	34%

The importance of intelligent speed assistance systems has been acknowledged by the European Parliament, the European Commission and the Council of Ministers. The European Parliament’s Report on Road Safety called on the Commission to ‘draw up a proposal to fit vehicles with ‘intelligent speed assistance systems’ which incorporate a timetable, details of an approval procedure and a description of the requisite road infrastructure’. The European Commission’s Transport White Paper states the intention of harmonising and deploying road safety technologies which include smart speed limiters. Towards this end the ITS Directive and Action Plan includes definition of procedures for accurate public data for digital maps of speed limits on the network - an important prerequisite for the implementation of ISA but falls short of mandatory requirement either for speed limit mapping or for fitment of ISA driver assistance systems. A Euro NCAP protocol for speed assist systems has recently been published and will be used in the rating system in 2013.⁵⁴

Road casualty groups affected: All road users
Crash types:: All crash types
Estimated EU casualty savings: See Table 1.
Estimated benefit to cost ratio: 3.4 (voluntary), 7.4 (mandatory)

⁵³Carsten O (2012) Personal communication of additional results to study Lai F, Carsten O and Tate F, *How much benefit does Intelligent Speed Adaptation deliver: An analysis of its potential contribution to safety and environment*, Accident Analysis and Prevention 48 (2012) 63– 72

⁵⁴ Euro NCAP (2012) *Speed Assist Protocol*, August 2012, Brussels

Co-benefits: Public health, occupational health and safety gains, emissions reduction, trade gains,.

Possible actions by the EU and Member States:

- The EU could adopt legislation to require that speed limits are mapped in every Member State.
- The EU could adopt legislation to require that every new vehicle has as a driver-set speed limiter as standard equipment.
- The EU and Member States could carry out surveys to determine excess speeding, target its reduction and monitor results.
- The EU and Member States could lead by example and contribute to the fast-tracking of the fitment of ISA in procurement and in-house governmental safe fleet and travel policies.

4.5.2 Driver assistance - Seat belt reminders

Seat belt reminders are intelligent, visual and audible devices that detect whether seat belts are in use in various seating positions and give out increasingly urgent warning signals until the belts are used.

Regulation EC 661/2009) adopts an existing UN ECE regulation which foresees the compliance with the provision of visual and audible seat belt reminders for the driver's seat by 1st November 2012. The regulation does not exclude provision for fitting seat belt reminders to front seat and rear seat passenger seats but further EU initiative is required to put these latter provisions into effect such that all seating positions are protected. Euro NCAP has also developed guidelines for seat belt reminders and awards points for their fitment in the star-rating assessment..

<i>Road casualty groups affected:</i>	Vehicle occupants
<i>Crash types::</i>	Head-on, intersection and run-off crashes
<i>Estimated casualty savings:</i>	In a country with relatively high seat belt wearing rates fitment in all cars and seating positions estimated to contribute to a reduction of 20% of car occupant deaths ⁵⁵
<i>Estimated benefit to cost ratio:</i>	6 to 1 ⁵⁶
<i>Co-benefits:</i>	Public health, occupational health and safety, trade gains

Possible actions by the EU and Member States:

- The EU could adopt legislation to ensure that every new vehicle has as standard equipment an enhanced seat belt reminder system with audible and visual warnings for all occupants.
- The EU, in its research programme, could support the further development of restraint systems that adapt to the biomechanical needs of users and crash severity.
- The EU and Member States could carry out surveys to determine seat belt use in all seating positions, target their increased fitment in road injury reduction strategies and monitor results periodically.
- The EU and Member States could lead by example and contribute to the fast-tracking of the fitment of seat belt reminders in procurement and in-house governmental safe fleet and travel policies.

⁵⁵ Kullgren et al ed (2005) *In Car Enforcement Technologies Today*, ETSC, Brussels

⁵⁶ Janitzek, J and Achterberg, F. (2006), *Seat belt reminders*. ETSC, Brussels.

4.5.3 Driver assistance - Alcolocks

Alcolocks or alcohol interlock systems are automatic control systems which are designed to prevent driving with excess alcohol by requiring the driver to blow into an in-car breathalyser before starting the ignition. The alcohol interlock can be set at different levels and limits. The fitment of alcolocks is a well-established feature of rehabilitation schemes for excess alcohol offenders. Several Member States as well as road transport operators are now promoting and including the fitment of alcolocks in passenger cars and in commercial and passenger transport operations.

The results of cost benefit analyses for implementing alcolocks for drivers caught twice with a BAC between 0.5g/l and 1.3g/l and for drivers caught with a BAC above 1.3g/l in several countries are shown below.⁵⁷

Box 8: Benefits to cost of alcolocks in different countries ⁴²

- For the *Netherlands*, the reduction of 35 traffic fatalities annually is valued at 4.8 million per death, leading to a benefit of 168 million Euros. Benefit/cost ratio = 4.1
- For the *Czech Republic*, the 8 fatalities prevented are counted at 1.1 million Euro/death, leading to estimated benefits of 9 million Euro/year. Benefit/cost ratio = 1.6
- For Norway, the benefits are calculated as 5.5 deaths less per year a rate of 5.9 million Euro per death, or at 32.5 million Euro /year. Benefit/cost ratio = 4.5
- For Spain, the reduction with 86.5 deaths/year at 800.000 Euro per death would imply benefits of 69 million Euro/year. Benefit/cost ratio = 0.7

The European Parliament Report on Road Safety recommends the fitment of alcolocks to the vehicles of road users who already have more than one drink-driving conviction and to all new types of commercial passenger and goods transport vehicles. It called on the Commission to prepare by 2013 a proposal for a Directive for the fitting of alcolocks, including the relevant specifications for its technical implementation.

The European Transport Safety Council (ETSC) has called for making the use of alcohol interlock devices obligatory in certain specific cases, in particular for professional transport and for this to be extended to cover the rehabilitation of recidivists as well. The gradual introduction of alcolocks starting with target groups (commercial vehicles and public transport vehicles including buses especially transporting children, dangerous good trucks and repeat drink driving offenders) could reduce the high toll of drink driving casualties every year in the EU. In its *Policy Directions* paper the European Commission outlined its intent to examine the appropriateness of making the installation of alcohol interlock devices in vehicles compulsory, for example with respect to professional transport (e.g. school buses).

<i>Road casualty groups affected:</i>	All road users
<i>Crash types:</i>	All crash types
<i>Estimated EU benefits:</i>	28% - 65% reduction in the rate of repeat excess alcohol offences (DfT, 2005).
<i>Estimated benefit to cost ratio:</i>	See above for country estimates
<i>Co-benefits:</i>	Public health, occupational health and safety, trade gains

⁵⁷ EU IMMORTAL Project (2005), European Commission, Brussels

Possible actions by the EU and Member States:

- The EU could introduce a specification for alcolocks and mandate their use for professional and commercial transport and for excess alcohol recidivists.
- The EU and Member States could lead by example and contribute to the fast-tracking of the fitment of alcolocks in procurement and in-house governmental safe fleet and travel policies.
- The EU, in its research programme, could support the further development of alcolock systems for use in cars and light vehicles.
- The EU and Member States could carry out surveys to determine the level of drinking and driving in normal traffic, target reductions and monitor results periodically.

4.5.4 Driver assistance - Autonomous Emergency Braking Systems

Autonomous Emergency Braking (AEB) systems can help to avoid crashes or to mitigate their severity by warning the drivers and supporting their braking response and/or by applying the brakes independently. All EU heavy commercial vehicles have to be fitted with autonomous emergency braking (AEB) technology by November 2013, though a requirement is not in place for other vehicle types. According to Euro NCAP, real world performance data suggests that these systems can reduce car crashes by up to 27% and some car models are attracting Euro NCAP Advanced rewards.⁵⁸ Euro NCAP has grouped systems into three main categories: City, Inter-Urban and Pedestrian. Systems may fall into more than one category, or may meet the requirements of all three. One manufacturer has developed a pedestrian detection system that automatically brings a car to a halt at speeds of up to 35 km/h whenever a person steps out in front of it. It should be noted that this form of autonomous emergency braking differs from Emergency Brake Assist which requires action from the driver and alongside crash protective requirements forms part of the EU legislative package on pedestrian protection. A recent study of real-world pedestrian crashes found that the isolated effects of Emergency Brake Assist on pedestrian safety were not significant.⁵⁹

A recent survey undertaken by Euro NCAP reveals that AEB is unavailable on 79% of the car models on sale in Europe and that 66% of manufacturers do not offer an AEB system on any of their new car models. Consequently, Euro NCAP will include AEB assessments as part of the overall star rating from 2014 onwards and is promoting the need for AEB to be mandatory on all new vehicle types.

<i>Road casualty groups affected:</i>	All users involved in motor vehicle crashes
<i>Crash types::</i>	All crash types
<i>Estimated EU casualty savings:</i>	27% reduction in crashes
<i>Estimated benefits to cost:</i>	Mixed results found
<i>Co-benefits:</i>	Public health, occupational health and safety, trade gains

Possible actions by the EU and Member States:

- The EU could include Autonomous Emergency Braking Systems in vehicle type approval.
- The EU and Member States could lead by example and contribute to the fast-tracking of the fitment of Autonomous Emergency Braking Systems in-house safety travel and procurement policies.

⁵⁸ <http://www.euroncap.com/Content-Web-Article/c79b2bdc-f914-4ad0-8d49-54254cda0ddc/euro-ncap-to-drive-availability-of-autonomous-emer.aspx>

⁵⁹ Strandroth J, Rizzi M, Sternlund S, Lie A and Tingvall C (2011), The Correlation Between Pedestrian Injury Severity In Real-Life Crashes And Euro NCAP Pedestrian Test Results, ESV 2011, Washington DC

4.5.5 Driver assistance - eCall

The eCall technology aims to generate, either manually or automatically, a call from a crashed vehicle immediately after the impact. Basic data on the crash, including its location is transmitted to an eCall operator and simultaneously a voice communication will be established between an emergency centre and the vehicle occupants. The efficiency of the emergency medical system (EMS), however, is essential to the success of this in-vehicle system which makes this probably one of the most complex of the driver assistance technologies to implement. Given a well-functioning EMS, the European Commission has adopted an estimate that eCall could save up to 2,500 lives annually in EU countries and prevent 15% of all injury crashes.⁶⁰

The CARS 21 strategy⁶¹ recommends that the European Commission should include eCall in vehicle type approval, consider extending eCall to other vehicle types such as powered two wheelers and ensure that eCall works in all 27 EU countries and in new cars of all makes and models and countries of origin by 2014.

The EU ITS action plan includes as priority development action the harmonised provision for an interoperable EU-wide eCall; i.e. the definition of the necessary measures for the harmonised provision of an interoperable EU-wide eCall.⁶²

<i>Road casualty groups affected:</i>	All users involved in motor vehicle crashes
<i>Crash types::</i>	All crash types
<i>Estimated EU casualty savings:</i>	2,500 lives and 15% reduction in injury crashes (but dependent on efficient emergency medical system)
<i>Estimated benefits to cost:</i>	Mixed results found
<i>Co-benefits:</i>	Public health, occupational health and safety, trade gains

Possible actions by the EU and Member States:

- The EU could include eCall in vehicle type approval.
- The EU could extend eCall to other vehicle types such as PTWs
- The EU and Member States could lead by example and contribute to the fast-tracking of the fitment of eCall in in- house safety travel and procurement policies.

4.5.6 Driver assistance - Lane Keeping Warning Devices and Lane Keeping Assist

These driver assistance system aim to monitor and warn or correct vehicles which unintentionally deviate from the driving lane. Most currently available systems are warning systems. Some warning systems are 'rewarded' under the Advanced Euro NCAP framework while the technical and operational feasibility of systems which intervene has still to be demonstrated.⁶² The EU-funded EUROFOT project is expected to produce shortly some assessments of the potential effectiveness of using these technologies.

Lane Keeping Warning Devices are electronic warning systems that monitor the position of the vehicle on the road and are activated if the vehicle is about to deviate from the lane or the road with the potential consequence of loss of control and collision with another object. According to Euro NCAP, different systems are available using different warnings: some give

⁶⁰ Boulter Y. (2005) *Clarification Paper – BC 1 Overview of available studies on proven or assessed benefits of e-Call*, Renault, 27 August 2005

⁶¹ CARS 21 (2012) High Level Group on the Competitiveness and Sustainable Growth of the Automotive Industry in the European Union, Final Report, June 2012, DG Enterprise and Industry, Brussels

⁶² Commission Decision of 15 February 2011 Concerning the adoption of the working programme on the implementation of Directive 2010/40/EU, Brussels, 15.2.2011 c(2011) 289 final

an audible signal while others use a vibrating steering wheel to simulate the feeling of the car running over a 'rumble strip'. The intention is simply to make the driver aware that the car is in danger of crossing the line. Some systems need a line only on one side of the vehicle while other systems rely on having a distinct marking on either side. A camera is normally situated behind the rear view mirror at the top of the windscreen. The images of this camera are continuously analysed by a computer to identify the lane markings and, in some cases, an unmarked road edge. At the same time, the driver's steering input is monitored as well as the speed and trajectory of the vehicle. These parameters are combined to determine whether or not the car is about to depart the lane of travel. Lane departure warning systems rely on distinct lane markings: their effectiveness is reduced if lines cannot be clearly distinguished such as in heavy rain or fog, or if the road markings are obscured by mud or snow. In such cases, an indication is given to the driver that the system is unable to assist.⁶³ Driver reaction time is key to the effectiveness of this measure.

Lane-Keep Assist Times to collision in safety-critical lane changes are normally much less than one second. Since mean driver reaction time is about one second, there is normally insufficient time for a driver to respond to a warning before crashing and lane-keep assist systems aims to address this problem by proactively steering the vehicle back into the lane (except if the turning indicator is activated) either by applying gentle braking to one wheel or, in the case of electric steering systems, by applying a direct steering input. Some systems deactivate if they sense that the driver is no longer steering the vehicle. The systems aim to take corrective action only if the lane marking is being approached very gradually.⁶²

Simultaneous road lane marking is key to the effectiveness of these measures.⁶⁴ While promising and prospective estimates have been identified for the different systems available on the market, little information is available to confirm assessments or indicate their real-world performance in reducing casualties.

4.5.7 Driver assistance - Blind spot monitoring systems

-Cars

Euro Advanced also rewards blind spot monitoring systems in cars citing the road safety problem which they address as follows:

On a motorway, the car travelling behind and at a distance can be clearly seen in the rear view mirror. However, as the car approaches, a point is reached where the car cannot be seen in either the interior or exterior mirrors. Typically this occurs when the car is just behind and to one side of the vehicle it is overtaking. A common driving error is to change lanes when there is a vehicle in this "blind spot", a manoeuvre which Euro NCAP states causes many crashes on European motorways.

Several manufacturers have developed systems which monitor the blind-spot and help a driver change lanes safely. Some systems are camera-based, others rely on radar. Either way, the area to one side and rearward to the vehicle is monitored and the driver is warned when there is a vehicle in a position where it may not be seen in the rear view mirrors.

-Heavy goods vehicles

Directive 2003/97/EC introduced the mandatory provision of blind spot mirrors to substantially increase the field of view in new trucks and buses sold in the EU from January

⁶³ European New Car Assessment ProgrammeEuro NCAP Advanced

<http://www.euroncap.com/rewards/technologies/lane.aspx>

⁶⁴ Euro NCAP, iRAP (2011) *Roads that can read*,

2007. This addressed the blind spot at the front of the vehicle and on the passenger side of the vehicle. Retro-fit requirements were subsequently introduced in 2007. Monitoring has indicated that retro-fitting blind spot mirrors has been successful, although the precise extent has been difficult to establish. Further recommendations for improvements have been made. These include driver assistance technologies and are identified as follows: extensions to the indirect field of view either using on-board mirrors or alternatives such as Fresnel lenses and/or cameras, roadside mirrors, improvements in the direct field of view, the fitment of proximity sensors and/or collision warning systems, increasing the use of rear steering and improving under-run protection.⁶⁵ The Commission notes that despite the reduction in the number of vulnerable road users killed in road crashes, there are still more than 1,200 vulnerable road user deaths each year involving heavy goods vehicles. Further work is anticipated to quantify potential effects and establish the cost-effectiveness of further measures.

4.5.8 Monitoring the effectiveness of vehicle safety technologies

- **CARE data supplemented by reporting on serious injuries MAIS=>3**

Better reporting of serious injury will play a key role in evaluating the potential effect of vehicle safety technologies and their cost-effectiveness in reducing serious and fatal injuries in road crashes.

- **Pan-European in-depth crash injury investigation system**

In-depth crash injury research is essential to complement CARE data when conducting impact assessments of existing or future safety policies and plays a key role when developing and evaluating vehicle safety technology interventions. It supports the development of new safety measures and provides a direct link between injuries, their causes and the long-term impact to individuals and to society. Currently across Europe the collection and use of in-depth data is largely on an individual member state basis with few countries conducting systematic data collection. There is no in-depth data available to describe the causes of crashes and injuries for Europe as a whole, though protocols have been developed. *CARS 21* has highlighted the need for EU-wide crash research as a routine activity to identify measures which are most cost-effective in reducing crashes and fatalities and to monitor their effectiveness. The DaCoTA project has established a framework for a pan-EU road crash injury investigation system.⁶⁶ for an on-going crash injury information programme which can be followed through in the further development of the *Injuries Strategy*.

- **Naturalistic driving studies**

Naturalistic driving studies which are being used increasingly in EU-funded research also provide a useful monitoring tool for driver assistance technologies and are expected to provide greater insight into how and when hazardous situations occur.⁶⁷ Naturalistic Driving is a relatively new research method for the observation of everyday driving behaviour of road users. A SWOV fact sheet explains that for this purpose systems are installed in subjects' own vehicles that unobtrusively register vehicle manoeuvres, driver behaviour (such as eye, head and hand manoeuvres) and external conditions. In a Naturalistic Driving study, the subjects drive the way they would normally do, in their own car and without specific instructions or

⁶⁵ Knight I (2011) *A study of the implementation of Directive 2007/38/EC on the retrofitting of blind spot mirrors to HGVs*, Transport Research Laboratory, Crowthorne.

⁶⁶ Hagstroem, L., Fagerlind, H., Danton, R., Reed, S., Hill, J., Martensen, H., Margaritis, D., Jahi, H, Morris, A. & Thomas P. (2010). *Report on purpose of in-depth data and the shape of the new EU-infrastructure*, Deliverable 2.1 of the EC FP7 project DaCoTA contract no: 233659.

⁶⁷ SWOV (2010) *Naturalistic Driving: observing everyday driving behaviour: Fact sheet*, Leideschendam.

interventions. This provides key information about the relationship between driver, road, vehicle, weather and traffic conditions, not only under normal driving conditions, but also in the case of near misses. Compared to conventional research methods, this new method is expected to provide greater insight into how and when hazardous situations occur and the possibilities it offers to make the traffic system safer.⁶⁸

Recommendation 6 It is recommended that the High Level Group considers the range actions on driver assistance technologies actions by the EU and Member States which have been identified above and which are broadly consistent with the CARS 21 strategy and the stated aims of the EU institutions. These include recommendations on EU type approval as well as good practice national actions to promote the take-up of effective new technologies.

Recommendation 7 It is recommended that monitoring the effectiveness of vehicle safety technologies is included in this discussion, particularly in relation to the establishment of a Pan-European in-depth crash injury investigation system.

5 Strategy development – next steps

The vehicle safety measures and recommendations outlined in the previous section are highlighted to provide background for the HLG’s forthcoming discussion. A range of issues will need to be worked through to define further intervention needs in addition to the possibilities outlined in Section 4.5. Implementation arrangements for the development of a successful *Injuries Strategy* which can meet existing and new EU long-term goals and interim targets will also need to be identified. This activity will require further technical and policy expert inputs.

Key evidence-based intervention will include:

- a range of Single Market vehicle safety measures briefly mentioned in section 4.4 which address provide improvement in safety of those seated in vehicles as well as to those outside, as recommended in the CARS 21 strategy;
- further attention to EU-funded road safety infrastructure measures; the importance of the International Road Assessment Programme as a tool to bring *Safe System* approaches into the mainstream of road engineering and injury-reducing crash-protective roadsides and medians; the importance of managing vehicle speeds;
- further improvements to managing exposure to risk in the EU framework for driver licensing standards;
- identifying potential improvements in the emergency medical assistance and trauma care to improve post crash road injury outcomes.

Implementation issues will include:

- In line with international recommended practice, the strategy should cite the results to be achieved for the long-term and interim, set out the leadership and roles of the EU and Member States, and consider any supporting institutional arrangements e.g. the capacity of the Commission’s road safety unit, possible new task forces/ study groups and national arrangements through road safety management capacity review.
- The Strategy would highlight the importance of cross-governmental and cross-sectoral coordination (important roles of the HLG and inter-service consultation and coordination).

⁶⁸ SWOV (2010) *Naturalistic Driving: observing everyday driving behaviour*. Fact sheet, Leidschendam.

- Other issues will include a road map for any further harmonisation, the urgent need to secure sustainable funding for road safety; monitoring and evaluation (e.g. establishing simple safety performance indicators, road safety management capacity review), promoting and supporting international best practice and knowledge transfer (e.g. via ERSO and other mechanisms such as twinning, professional exchange), and research and development through the framework programme and bilateral arrangements.

Recommendation 8 It is recommended that the next meeting determines whether a small HLG *Injuries Strategy* working group comprising road safety policy leaders, supported by technical experts, should be established to assist the Commission in determining the scope and further development of the strategy.

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**HIGH-LEVEL CONSULTATION ON THE DEVELOPMENT
OF THE INJURIES STRATEGY**

**Working Document
for the meeting of the**

HIGH LEVEL GROUP ON ROAD SAFETY

27TH JUNE 2012, COPENHAGEN

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1 Overview

The EU is a global leader in road safety. Substantial reductions in road deaths and serious injuries have been achieved in EU countries over the last decade. However, performance amongst countries at different stages of their road safety activity and management is variable with some Member States still experiencing large increases in motorisation.

Involvement in road crashes continues to be a leading cause of death and hospital admission for EU citizens under 45 years of age. In 2011, around 30,500 people lost their lives in road traffic crashes. Yet these represent only the tip of the iceberg of the burden of road traffic injury. It is estimated that for every death there are four permanently disabling injuries, ten serious injuries and forty minor injuries.

A high price is currently being paid for motorised mobility in human and economic terms. While estimates of the socio-economic costs of road traffic injury for the EU remain approximate and conservative, an annual cost equivalent to around 2% of GDP is estimated for the last decade. This large cost burden is borne by the health sector as well as by employers with premature serious health loss of the EU's most economically active citizens.

Current knowledge indicates that the vast majority of serious and fatal injuries are predictable and preventable. Accordingly, the road safety focus is turning away from the need to try and prevent all crashes (which is seen as unrealistic and of insufficient priority) to the prevention of death and serious injury. At the same time the acknowledged need is to define better, understand the scale and cost of, target the prevention of and monitor both fatal and serious injury in road traffic crashes.

The Commission's White Paper envisaged an extension of interim target-setting to include non fatal injuries. It also proposed the development of a comprehensive strategy of action on road injuries, including common definitions of injuries and fatalities with a view to adopting an injuries reduction target. These elements have been widely supported by the EU institutions and stakeholders provide the context for the *Public consultation on an EU strategy to reduce injuries resulting from road traffic accidents* launched by the Commission on 17th April 2012, and the high-level consultation with Member States' representatives which commences during the meeting of 26th-27th June 2012. The aim of the *Injuries Strategy* is to provide a framework for road safety activity to 2020 which develops the themes covered in the White Paper and in *Policy Orientations on Road Safety 2011-2020*.

This working document has been prepared to facilitate the June meeting of the High Level Group on Road Safety in Copenhagen and subsequent discussions towards identifying possible options for inclusion in a Commission Communication setting out an *Injuries Strategy* and agreeing next steps. It comprises several sections which discuss and set out policy options concerning the desired results and the focus for the *Injuries Strategy*; better assessment of the scale, severity and costs of serious injury; the need for system-wide interventions at EU, national, and local levels and key implementation issues. Each section features a range of questions which aim to facilitate the work of the High Level Group. Annex 1 comprises a brief summary of first responses to the public consultation..

It is envisaged that this working document will be developed further to provide a primary reference paper for the Commission's development of the *Injuries Strategy* to take account of past activities, current consultations and the international road safety knowledge base.

2 Background to the consultation

2.1 *Current trends in road traffic injury*

The European Union is a global leader in road safety. Substantial reductions in road deaths and serious injuries have been achieved in EU countries through governmental leadership, long-term investment, a focus on achieving ambitious results and applying system-wide and evidence-based measures underpinned by a growing appreciation of the importance of effective organisational management. Over the last decade, the number of reported deaths in EU countries has declined by some 43% and injuries by 26%, though performance amongst countries at different stages of their road safety activity and management is variable. At the same time, some Member States are still experiencing large increases in motorisation and associated adverse safety impacts which they are trying to bring under some control.

Despite this progress, involvement in road crashes continues to be a leading cause of death and hospital admission for EU citizens under 45 years of age.¹ In 2011, around 30,500 people lost their lives in road traffic crashes. Yet these represent only the tip of the iceberg of the burden of road traffic injury.² While road deaths are typically used as the benchmark for defining and comparing road safety performance, it is estimated that for every death there are four permanently disabling injuries, ten serious injuries and forty minor injuries.³ In 2011, some 1.5 million people were reported to be injured in road crashes in EU countries⁴ and Member States reported that around one quarter of these were seriously injured.

Around two thirds of all fatal and serious injuries to road users occur outside urban areas, while most serious and fatal injuries to vulnerable road users such as pedestrians and children take place in urban areas. Car occupants comprise around 50% of deaths; 20% are pedestrians, 17% are motorcyclists and cyclists 6%. The main road traffic crash types which need to be addressed to reduce fatal and serious injury are head-on crashes, run-off-road crashes, intersection crashes and pedestrian and other vulnerable road user crashes.

2.2 *Social impacts of road traffic injury*

A high price is currently being paid for motorised mobility in human and economic terms. While estimates of the socio-economic costs of injury for the EU as a whole remain approximate and conservative, these range from €134 billion⁵ to €172 billion - an annual cost equivalent to around 2% of Gross Domestic Product over the last decade.⁶ The large burden of costly injuries is borne by society in general, but particularly by the health sector and by employers with the premature loss or disablement of the EU's most economically active citizens. Road traffic crashes also have implications for social equity and have a disproportionate impact on disadvantaged citizens. The loss of the major family wage earner in road traffic crashes can push people into poverty as well limiting the ability of victims to cope with the consequences.⁷ The risk of child pedestrian crashes increases fourfold in

¹ European Commission (2009), *Public consultation on the European Road Safety Action Programme 2011-2020*, Brussels

² Eds Peden M, Scurfield R, Sleet D, Mohan D, Hyder A, Jarawan E, Mathers C (2004). *World Report on Road Traffic Injury Prevention*, World Health Organization and World Bank (Washington), Geneva

³ Mackay M, Quirks of Mass Accident Data Bases, *Journal of Traffic Injury Prevention* 6:4 (308-311), December 2005

⁴ European Commission (2012) CARE database.

⁵ Based on the cost of a statistical life calculated by the HEATCO study (Sixth Framework Programme for Research and Technological Development)

⁶ ETSC (2011) 2010 *Road Safety Target Outcome*: 100,000 fewer deaths since 2001, 5th Road Safety PIN Report, European Transport Safety Council, Brussels

⁷ Aeron-Thomas et al, 2004; *The Impact of Crashes on the Poor*. Study commissioned from TRL by GRSP with funding from the Swedish International Development Cooperation Agency (Sida) and TRL

deprived areas compared with other areas.⁸ Despite the increasingly ambitious goals and targets sought and demonstrated benefit to cost ratios of publicly acceptable measures, investment in preventing serious health loss in road crashes is not commensurate with its high socio-economic cost.⁹

2.3 Deaths and serious injuries are predictable and preventable

While it is considered unrealistic to try to prevent all crashes and minor injury, current knowledge indicates that the vast majority of serious and fatal injuries are predictable and preventable.¹ Accordingly, the road safety focus is turning to the prevention death and serious injury which has implications for road safety policymaking and the tools needed for effective management. The acknowledged need is to define better, understand the scale and cost of, target the prevention of and monitor both fatal and serious injury in road traffic crashes. (See Section 4)

2.4 Addressing the safety needs of all road users

It is also generally acknowledged that road safety interventions need to address the safety of all users more effectively and to take account of future demographics, notably the physical vulnerability of an ageing society. The paradigm shift in road safety identified by the *World Report in Road Traffic Injury Prevention (2004)* is that humans are fallible and that errors must be anticipated in their use of a road traffic system use and that humans have limited abilities to withstand crash forces. Professional road safety work means taking account increasingly of these realities and acknowledging that the road traffic system is imperfectly designed for general safe use in planning for the interim and longer term. (See Section 5)

2.5 EU policy responses

In 2010, the European Commission, supported subsequently by the European Parliament and the EU Council of Ministers adopted *Vision Zero*.¹⁰ This represents a highly ambitious long-term goal to eliminate death and serious injury, to expect and accommodate human error in the system as well as to take better account of the vulnerability of unprotected road users. *Vision Zero* along with *Sustainable Safety* is known generically as *Safe System* which is promoted in the Global Plan of the UN's Decade of Action¹¹ and is recommended to all countries irrespective of their socio-economic status by the OECD, WHO, UN, World Bank and ISO. The Commission's White Paper also envisaged an extension of target-setting to include non fatal injuries. It proposed the development of a comprehensive strategy of action on road injuries, including common definitions of injuries and fatalities with a view to adopting an injury reduction target. These elements were widely supported in the public consultation on the new road safety action programme in 2010¹² and, as one of the strategic objectives outlined in the Policy Orientations on Road Safety 2011-2020, by the EU Council of Ministers¹³ and the European Parliament¹⁴.

⁸ Graham, D., Glaister, S., Anderson, R. (2005) *The effects of area deprivation on the incidence of child and adult pedestrian casualties in England*. Accident Analysis and Prevention, 37, 125-135

⁹ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris

¹⁰ European Commission (2011) *WHITE PAPER: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system COM(2011) 144 final*, Brussels, 28.3.2011

¹¹ United Nations Road Safety Collaboration (2011). *Global Plan for the Decade of Action for Road Safety 2011–2020*, WHO, Geneva

¹² COWI (2010) *Final Report: Technical Assistance in support of the Preparation of the European Road Safety Action Programme 2011-2020 prepared for the European Commission DG-TREN* January 2010

¹³ Council of the European Union (2010), *Council Conclusions On Road Safety* 3052th Transport, Telecommunications And Energy Council Meeting Brussels, 2–3 December 2010

¹⁴ European Parliament (2011) *European Parliament resolution of 27 September 2011 on European road safety 2011-2020* (2010/2235(INI))

2.6 Public consultation: EU strategy to reduce injuries resulting from road traffic accidents

The developments noted above provide the context for the *Public consultation on an EU strategy to reduce injuries resulting from road traffic accidents* launched by the Commission on 17th April 2012¹⁵ and aimed at a broad range of stakeholders (See Annex 1). It is envisaged that a high-level discussion with Member States' representatives on the development of an *Injuries Strategy* will commence during the High Level Group meeting to be held on 26th-27th June 2012.

The internet consultation on the *Injuries Strategy* is a continuation of the process started during the development of the EU Road Safety Action Programme 2011-2020 which was carried out by the European Commission between July and December 2009. This previous consultation comprised a series of six thematic workshops and an internet consultation and culminated in a stake-holder conference on 2nd December, 2009.

The aim of the *Injuries Strategy* is to provide a framework for road safety activity to 2020 which develops the themes covered in the White Paper and in *Policy Orientations on Road Safety 2011-2020*. The purpose is to provide input to a comprehensive EU strategy to help reduce and ultimately eliminate the number and the severity of serious and fatal road traffic injuries.. An initial aim is to seek to find a common understanding of definitions and concepts relating to casualties (in particular, the definition of serious injuries), improve data collection and to identify specific actions that can assist the implementation of system-wide, evidence-based intervention with due consideration to cost, practicality, public acceptability and subsidiarity across the EU.

This working document aims to facilitate the High Level Group on Road Safety discussion on 26th-27th June in Copenhagen towards identifying possible options for inclusion in a Commission Communication setting out an *Injuries Strategy* and agreeing next steps. These are based on the conclusions already reached by the EU institutions and refer to international best practice. It comprises several sections which discuss and set out policy options concerning the desired results and the focus for the *Injuries Strategy*; better assessment of the scale, severity and costs of serious injury; the need for system-wide interventions at EU, national and local levels and key implementation issues.

3 What road safety results should be targeted in the *Injuries Strategy*?

3.1 Goals and targets are the focus of road safety strategy

Experience in EU countries and elsewhere indicates that the rationale for effective road safety strategy is a focus on achieving results produced by the implementation of system-wide intervention made possible by well-orchestrated and government-led institutional management.^{16,17}

3.2 Long-term goal

Countries have become progressively more ambitious in the results they want to achieve culminating in the *Safe System* goal to eliminate all road user deaths and long-term injuries..

¹⁵ European Commission (2012) *Public Consultation on an EU strategy to reduce injuries resulting from road traffic accidents*, Brussels

¹⁶ World Bank Global Road Safety Facility, Bliss T & Breen J (2009). *Implementing the Recommendations of the World Report on Road Traffic Injury Prevention. Country guidelines for the Conduct of Road Safety Management Capacity Reviews and the Specification of Lead Agency Reforms, Investment Strategies and Safe System Projects*, Washington DC

¹⁷ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris

(See Box 1) This long-term goal and associated strategy first promoted by the leading EU road safety performers re-defines what is meant by ‘safety’ in good practice safety management and, as noted previously, has been adopted in the Commission’s Transport White Paper and by the EU Council.

According to key international organisations including the OECD, World Bank, WHO, and ISO the *Safe System* approach represents the current recommended road safety management approach and assisted by time-limited interim, quantitative targets, exacting intervention strategies which better address the capacities of all users and strengthened institutional management to ensure their delivery is the only means by which the ambitious ultimate goal can be reached. In addition, *Safe System* approaches align well with other societal objectives such as environmental, energy, development, health and occupational health and safety policies. They present opportunities, given sufficient stimulus, encouragement and the right frameworks, for integrating, building better business cases and achieving ‘win-wins’ with these and other areas of activity.

Against the background of unprecedentedly high rates of motorisation in many countries and forecasts of a 67% increase in global deaths by 2020 (+83% in low and middle-income countries without new, effective action and -27% in high-income countries)¹⁸, international development organisations are supporting rapidly motorising countries in the adoption of these approaches. The aim is to avoid the costly, evolutionary path taken by high-income countries as they built the road safety knowledge base and started to bring road safety outcomes under control. Countries are assisted through a staged investment strategy which takes account of the learning and absorptive capacity of the country concerned and is established by means of multi-sectoral capacity building *Safe System* projects.

Box 1: The four evolutionary phases of managing for better road safety results^{15,16}

Progressive shifts in road safety management thinking and practices in high-income countries have been evident. Since the 1950s there have been four significant and progressively ambitious phases of development:

- **Phase 1:** focused on driver intervention, with safety management characterized by dispersed, uncoordinated, and insufficiently resourced units performing isolated single functions.
- **Phase 2:** focused on system-wide interventions guided by the ‘Haddon Matrix’. Dr. William Haddon, an American epidemiologist, developed a systematic framework for road safety based on the disease model which encompassed infrastructure, vehicles and users in the pre-crash, in-crash and post crash stages¹⁹
- **Phase 3:** focused on system-wide interventions, targeted results and institutional leadership. Good practice countries used action plans with numerical outcome targets to be achieved with evidence-based packages of system-wide measures based and new institutional leadership.
- **Phase 4:** is focusing on system-wide interventions; long-term elimination of death and serious injury; shared responsibility – *Safe System*. This comprises stepwise targets towards a long-term goal to eliminate death and serious injury which are seen as an unacceptable price for mobility; system-wide intervention (foreseen in Phase 2 and used successfully in Phase 3), but with renewed emphasis on better road and vehicle crash protection, post-crash care; new emphasis on speed management aimed at more effective injury prevention; and strengthened, accountable institutional leadership and meaningful shared responsibility to achieve results.

¹⁸Kopits E, Cropper M. Traffic fatalities and economic growth. *Accid Anal Prev* 2005 January;37(1):169-78

¹⁹ Haddon Jr W (1968). The changing approach to the epidemiology, prevention, and amelioration of trauma: the transition to approaches etiologically rather than descriptively. *American Journal of Public Health*, 58:1431–1438. 33. Henderson M. Science and society

The last public road safety strategy consultation carried out by the Commission (2009/2020) outlined the need for the EU and Member States to address levels of death and serious injury throughout the road network – both in built up and non built up areas; to reduce levels of socio-economic cost; to adopt and promote a long-term vision to eradicate death and serious injury and to set challenging but achievable quantitative targets to reduce them for the interim.²⁰

In line with the recommendations of the EU institutions, other international organisations and the public consultation with the key stakeholders on the road safety action programme, it would be consistent with current policy that the long-term goal of the *Injuries Strategy* is the elimination of death and serious injury. Furthermore, in line with the global Decade of Action on road safety it is recommended that the injuries strategy adopts the *Safe System* approach (See Annex 1). In so doing, the EU can continue to play an important global road safety leadership role.

Question 1. Should the Injuries Strategy adopt the long-term *Safe System* goal and approach to eliminate deaths and serious injuries recommended to all countries by the key, international organisations concerned with road safety ?

3.3 *Interim target(s) to reduce serious injury*

Setting challenging but achievable step-wise quantitative final and intermediate outcome and output targets towards the ultimate *Safe System* goal to eliminate death and long-term injury is recommended practice.²¹ Quantitative targets can lead to better programmes, a more effective use of public resources and an improvement in road safety performance.²² While an ambitious long-term or purely symbolic goal which is not supported by interim targets has no value, targets that are ambitious are associated with better performance than less ambitious targets.^{18,23} Interim quantitative targets are usually expressed in terms of *final outcomes* e.g. numbers of deaths and serious injuries.

Targets can also be expressed in terms of *intermediate outcomes* which are causally related to *final outcomes*, as practiced in several better performing countries. For example, it is known that seat belt use reduces serious and fatal injury risk by 50%. Targeting reductions in seat belt use from a known baseline will contribute to reducing serious and fatal casualty reduction targets. Some countries go further and set *output targets* for their institutional service delivery e.g. number of seat belt checks required to be given annually by the police which, combined with publicity will contribute a high visibility activity deterring seat belt offences.¹⁸

An ambitious EU interim target has been set to reduce deaths by 50% by the year 2020. This follows on from the previous target set by the EU to 2010 and national and regional targets set by Member States which were associated with a 43% reduction in EU road deaths. In line with the recommendations for the EU institutions and the public consultation with the key stakeholders on the road safety action programme, one option is to set an interim EU-wide

²⁰ COWI (2010) *Final Report: Technical Assistance in support of the Preparation of the European Road Safety Action Programme 2011-2020 prepared for the European Commission DG-TREN* February 2010

²¹ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris

²² OECD (1994) *Targeted Road Safety Programmes*, Paris.

²³ Wong S. C., Sze, N.N., Yip, H.F., Loo, Becky P.Y.; Hung, W.T., Lo, H.K. (2006) *Association between setting quantified road safety targets and road fatality reduction*. *Accident Analysis and Prevention*, 2006, 38, 997-1005

target(s) for *serious injury* for the Injuries Strategy. Based on current practice, four possible further options are identified.

1. The EU develops a headline target – a simple, aspirational target (albeit with some reference to traffic and casualty trends) to reduce the number of serious injuries across the EU by a certain percentage, as with the fatal injury target. The public consultation on the current road safety action programme identified a 40% reduction in serious injuries to 2020 as challenging but achievable. In the absence of an agreed single EU definition of serious injury, the percentage reduction target would be based on the range of definitions of serious injury currently in use by EU countries.
2. A further option on the above basis is to add further targets for the reduction of deaths and serious injuries for vulnerable groups e.g. children and young drivers and riders.
3. Additional sub-targets or intermediate outcome targets could be set using safety performance indicators for key safety behaviours such as seat belt and crash helmet use, the safety quality of the new vehicle fleet and road infrastructure (See Box 3). In countries which have still to establish effective crash injury databases and arrangements for data sharing, the use of this type of survey data can be useful in getting started with targeted activity projects and are being used widely in country assistance aid in international development.
4. A further option would be to aim for a more empirically-derived target based on better assessment of the scale and severity of serious injury. This would provide an opportunity to take better account of under-reporting and misreporting and differentiate between both ends of the serious injury spectrum, from the less severe to permanent impairment.. This, however, may take some time to formulate and may be considered to be outside the time frame for current *Injuries Strategy* targets.

Question 2. Do you agree that an EU target should cover serious injury?

Question 3 Do you agree that an EU target for minor injury is unnecessary?

Question 4: Should the *Injuries Strategy* adopt an interim quantitative target to reduce serious injuries e.g. by 40%, based on the current definitions of serious injury currently in use?

Question 5. Should an EU serious injury reduction target be based on a single agreed definition of serious injury?

Question 6. Should additional targets be set to reduce death and serious injury amongst specific user groups e.g. children or young drivers and riders, or for specific intermediate outcomes e.g. levels of seat belt use, safety quality of the EU new car fleet?

4 Assessing the scale, severity and costs of serious injury

The priority actions identified by the Commission and Step 1 of the *Injuries Strategy* are to achieve, for the European Union, agreement on a common scheme of definitions of injury severity. This would allow the identification of the real magnitude of the road safety problem

and associated socio-economic costs, allow better target-setting into the future, the identification of effective intervention and international benchmarking.

4.1 An incomplete picture of road injuries

Experts agree that the global and EU picture of road casualties is incomplete and is impeding effective road safety management.²⁴ The main problem areas which have also been identified by several international and non-governmental organisations and projects- the World Health Organisation, the UN Road Safety Collaboration, OECD/ITF, IRTAD, the European Transport Safety Council and the EU-funded *SafetyNet* and *DaCOTA* projects - relate to large differences and inconsistencies in classifying non-fatal injury, especially serious injury and the widespread problem of the under-reporting of serious injuries. The key issues, which are acknowledged as being complex but in need of urgent resolution' are how to best define *serious* injury to reduce *misreporting*, how to define and identify the scale of *long-term impairment* and how to allow for *under-reporting*.

A complete picture of casualty totals from road crashes is needed to fully assess the consequences of road crashes, to target results and intervention and to monitor progress. Better understanding of trends in crash injury is needed especially when making international comparisons, there is a need to better describe the scale of priority needed for road safety compared with other sources of health loss and for where effective intervention can be most effectively deployed and for whom. Comparison with other major causes of death and other serious health loss is being called for increasingly as is a better estimate of the medical costs of road crash injury especially in relation to permanent impairment.

4.2 The need to define serious injury

The *SafetyNet* project highlighted the fact that, currently, the only comparable measurement units available in the CARE system and for international comparisons are the numbers of *fatalities*. Here, the degree of under-reporting is acceptably small in most EU Member States and there is a commonly derived and accepted definition (30 days) and adjustment protocol.²⁵ Currently, *serious* injuries cannot be compared in different Member States. The definition of injury severity differs among Member States, so that a casualty which would be recorded in one country might not be recorded in another. Equally, a casualty which might be recorded as *seriously* injured in one country might be recorded as *slightly* injured in another.

Criteria used in the police records and official statistics to classify the severity of a crash vary from country to country. The following list provides examples but is by no means exhaustive:

- The length of hospitalisation (used in many countries), a person seriously injured is a person hospitalised, other than for observation, for more than 24 hours.
- The type of injuries. In some countries, *seriously injured* is based on specific types of injury (e.g. MAIS).
- The inability to work.
- The length of recovery.
- Long-term disability.

²⁴ IRTAD (2011) *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, International Traffic Safety Data and Analysis Group, OECD/ITF, Paris

²⁵ SafetyNet Project, Broughton et al (2008), *Estimating the real number of road accident casualties*, Deliverable D.1.15, SafetyNet. www.erso.eu/safetynet/content/safetynet.htm

Identified effective practice acknowledges that no single database will provide enough information to give a complete picture of road traffic injuries and to fully understand underlying injury mechanisms. Road safety experts agree that use of health sector data for meaningful injury classification at country level is necessary to complement police data and to provide an optimal means of defining serious injury.^{26,27} Furthermore, in-depth data is needed from crash injury research to lead to meaningful conclusions concerning crash and injury causation. The need for establishing/improving definitions in EU road safety work is acknowledged by all the EU institutions including the European Parliament which called on the Commission in their latest road safety report in 2011 to draw up within two years better definitions of injury severity to allow necessary monitoring.²⁸ Legislative requirements providing for changes to national reporting systems are not anticipated. Nevertheless, several legislative or administrative provisions might be required at national level if countries decide to put in place new data collection arrangement which might, for example, necessitate changes in personal data protection requirements.

4.3 The need to assess levels of under-reporting

Studies linking police and hospital studies indicate that a large proportion of non-fatal injuries are unreported by national police.²⁴ This is partly because the legal requirement to report crashes to the police varies from country to country. A meta-analysis of 49 studies carried out in 13 countries in 1999 indicated that the mean reporting level for fatal injuries (using the 30 day definition) is 95% and the mean reporting level for serious injuries is roughly 70%. Serious injuries (hospital admissions) are reported more completely than slight injuries (not requiring hospital treatment) in all the countries included in this study. The mean reporting level for slight injuries was roughly 25%²⁹

Reliable numbers of injuries can be identified by comparing the number of injured road users treated in hospitals to the number recorded by the police and there is good agreement amongst experts about appropriate protocols for anonymised record linkage.

At present no estimate is available for the level of under-reporting across the EU, which could be rectified by a study funded by the EU and Member States of a representative sample of participating EU countries.

4.5 In-depth crash investigation and study

The limitations of police data in providing a detailed understanding of crash and injury causation are widely acknowledged. In-depth data which follows up police reports include a detailed scientific description of injuries and their causation using standard scales such as Abbreviated Injury Scale and they can be directly related to a wide range of outcome measures including cost, disability and impairment. In-depth data are gathered on a sample basis by specialist teams and have been used to drive most of the key developments in injury mitigation over the last 30 years. It can be used for routine evaluation of the safety benefits of in-vehicle and other safety technologies and when conducting impact studies of proposed

²⁶ IRTAD (2011) *Reporting on Serious Road Traffic Casualties: Combining and using different data sources to improve understanding of non-fatal road traffic crashes*, International Traffic Safety Data and Analysis Group, OECD/ITF, Paris

²⁷ SafetyNet Project, Broughton et al (2008), *Estimating the real number of road accident casualties*, deliverable D.1.15, SafetyNet. www.erso.eu/safetynet/content/safetynet.htm

²⁸ European Parliament (2011) *European Parliament resolution of 27 September 2011 on European road safety 2011-2020* (2010/2235(INI))

²⁹ Elvik R., Mynen A. B. (1999). *Incomplete accident reporting: Meta-analysis of studies made in 13 countries*. Transportation Research Record No 1665, 133-140

regulatory changes. It can also be used to monitor trends in serious injuries and to identify priority intervention.

4.6 Determining the socio-economic costs of road traffic injury

Only approximate, conservative estimates of the socio-economic costs of road crashes are currently available for the EU as a whole, as noted previously. A stakeholder and expert workshop on road safety economics organised by the Commission in 2009 concluded that notwithstanding the contribution made by projects such as IMPACT, further study/updating is necessary.³⁰

Better estimation of the cost to society of road traffic injuries, using state of the art protocols such as ‘willingness to pay’, is needed to identify the true socio-economic cost of mobility. This will also assist in highlighting the social return of investment in road safety and the relative benefits to cost between different policy options. While public resource for road safety intervention is typically hard won, research shows that investment in evidence-based road safety intervention yields high returns. For example, analyses in Norway and Sweden indicate that fatality reductions of about 50% can be realised by applying cost-effective measures. It is reasonable to believe that benefits of a similar magnitude can be attained in many European countries. In practice, however, it will never be possible to base road safety policy fully on cost-benefit analyses. Important considerations that may justify departing from the policy priorities implied by cost-benefit analyses include an objective of reducing disparities in risk, thus giving high priority to measures benefiting pedestrians and cyclists, and an objective of giving priority to those measures that provide the largest reductions of the number of road accident fatalities. These measures may not always be the most cost-effective.³¹

Additionally, better estimation of the socio-economic costs of crashes may assist in better understanding of the contribution that internalisation of the social costs generated by road traffic crashes could make in improving road safety. While the internalisation of external costs of road crashes is accepted as a good principle, the 2009 workshop concluded that its potential effectiveness in playing a major role in improving road safety has still to be established and would require further study.²⁹

Question 7. Should the *Injuries Strategy* work towards a single EU-wide definition of serious injury? If so, is there a preference for a particular definition today or does this require further work?

Question 8: Should any serious injury classification define different levels of injury?

Question 9. Should EU action be taken to obtain an estimate of the level of under-reporting of serious injuries?

Question 10. Do Member States agree that better estimation of the socio-economic costs of road traffic crashes is necessary?

Question 11 Would Member States support the development of EU in-depth crash investigation work to a) assist understanding of the causes of serious and fatal crashes and injury mechanisms b) monitor the effectiveness of vehicle safety technologies?

³⁰ DG TREN Workshop Report III: *Road Safety Economics: Internalising External Costs; Promoting Economic Incentives, Building Cases for Investment*, Technical Assistance in support of the preparation of the European Road Safety Action Programme 2011-2020, COWI, September 2009

³¹ ERSO *Cost benefit analysis*. ERSO Knowledge webtext.

5 Identifying system-wide interventions

While the priority is to first address the issues raised in sections 2 and 3, a key aim of the *Injuries Strategy* is to identify specific priority interventions on the basis of effective international practice and EU-funded research to date which can address the targeted reduction of serious and fatal injuries across the European Union. Such action would necessarily need to be based on the subsidiarity principle and be in line with Treaty obligations with due consideration to effectiveness, cost, practicality and public acceptability.

5.1 *The need for a systematic and multi-disciplinary approach*

The last road safety public consultation carried out by the Commission³², indicated that EU, national and local policies should focus on the *implementation of evidence-based approaches* to reduce exposure to the risk of death and serious in-jury; the prevention of death and serious injury; mitigating the severity of injury when a crash occurs and reducing the consequences of injury. Interventions needed to better address the safety of all users and take account of future demographics, notably the physical vulnerability of an ageing society. The need to address *excess and inappropriate speed, reducing impaired driving, insufficient seat belt wearing and crash helmet use, high novice driver and rider risk, improved safety quality of vehicles and road infrastructure for all users and improved emergency medical response* was cited throughout the consultation.

Stakeholders acknowledged that serious and fatal injuries in road crashes are preventable and need to be addressed by *system-wide intervention* comprising improvements in the planning, design, layout and operation of the road network, improvements in vehicle safety and driving/riding standards; securing better user compliance with important road safety rules through combined education and enforcement and improved post-impact care.

5.2 *Safe System intervention strategies*

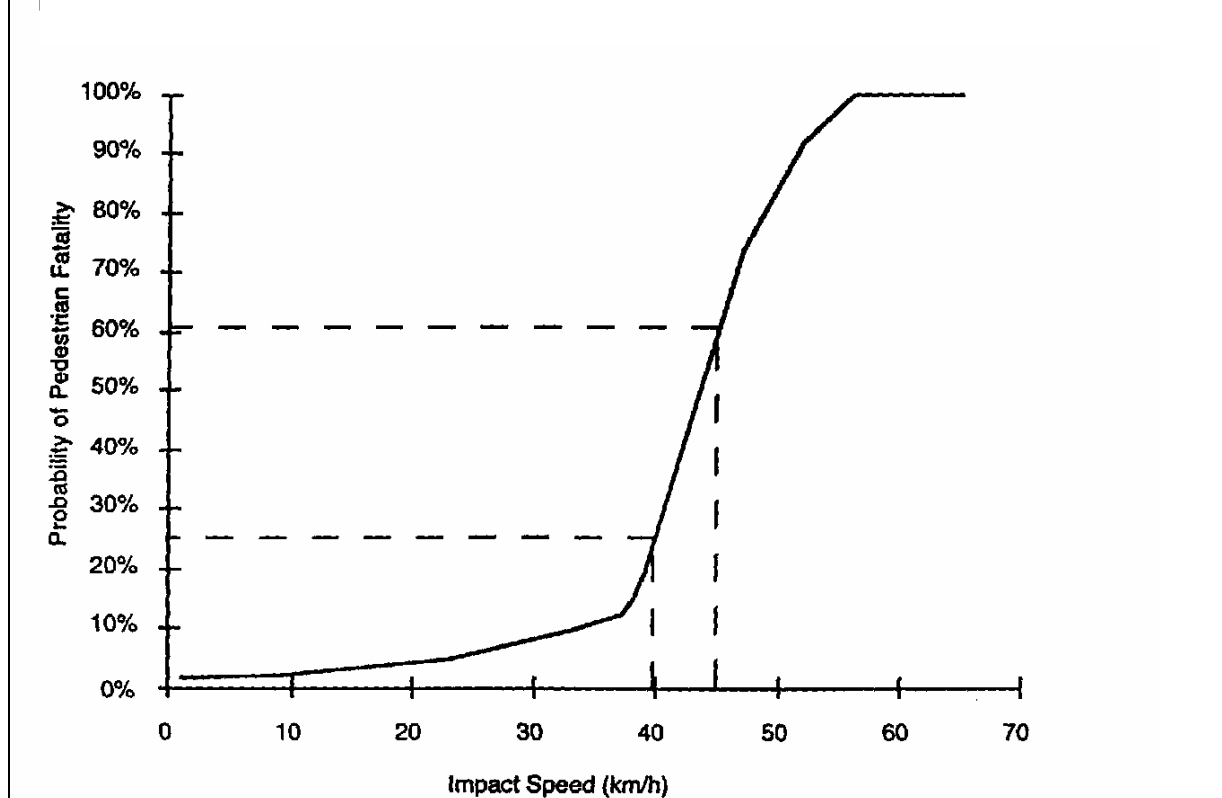
All elements in the road traffic system are interconnected and affect one another. For example, the available crash protection in vehicles will be of little help if unsafe road speeds are posted in the road network; the fitment of seat belts will be of no use unless compliance with seat belt use legislation is achieved; and lane departure warning system in vehicles will have little value without roads authority intervention to ensure quality road marking.

The rationale of the recommended *Safe System* approach is to ensure that in the event of a crash, the impact energies remain below the threshold likely to produce either death or serious injury. This will vary from one crash scenario to the next, depending upon the level of protection offered to the road users involved. For example, as illustrated in Figure 1, the chances of survival for an unprotected pedestrian hit by a vehicle diminish rapidly at speeds greater than 30km/h, whereas for a properly restrained motor vehicle occupant in the best designed vehicle the critical threshold for severe and fatal injury is 50km/h in typical side impact crashes and 70 km/h for head-on crashes.³³

³² COWI (2010) *Final Report: Technical Assistance in support of the Preparation of the European Road Safety Action Programme 2011-2020 prepared for the European Commission DG-TREN* February 2010

³³ Tingvall C and N Haworth (1999) *Vision Zero - An ethical approach to safety and mobility*, Paper presented to the 6th ITE International Conference Road Safety & Traffic Enforcement: Beyond 2000, Melbourne, 6-7 September 1999.

Figure 1: Probability of pedestrian fatality as a function on impact speed *



*SRA 2007: Tingvall C et al, *Safe, Clean, Affordable Mobility: presentation to World Bank, Washington*

The general scope of effective intervention strategy is set out in Box 2. These comprise evidence-based strategies which are supported by the substantial body of road safety research carried out over the last 50 years.^{34,35}

Box 2: A summary of intervention strategies

The key intervention, evidence-based strategies which can reduce deaths and serious injuries in road traffic crashes comprise:

- Separation of or safe integration of dangerous mixed road use
- Managing vehicle speeds to crash protection levels in roads and vehicles
- Providing crash protective roadsides and vehicles
- Deterring dangerous road user behaviour (e.g. through combined police enforcement and publicity and also through in-vehicle driver assistance systems)
- Managing risk through driver and rider licensing and testing standards
- Managing risk through vehicle safety standards /designs and their compliance
- Fast and efficient emergency medical help, diagnosis and care

The OECD and other international organisations highlight that road safety goals and the *Safe System* approach align well with other societal objectives such as public health, environmental, energy, development, and occupational health and safety policies. They

³⁴ Eds Peden M, Scurfield R, Sleet D, Mohan D, Hyder A, Jarawan E, Mathers C (2004). *World Report on Road Traffic Injury Prevention*, World Health Organization and World Bank (Washington), Geneva

³⁵ OECD (2008) *Towards Zero: Achieving Ambitious Road Safety Targets through a Safe System Approach*. OECD, Paris

³⁵ Koppits E, Cropper M. Traffic fatalities and economic growth. *Accid Anal Prev* 2005 January;37(1):169-78

present opportunities, given sufficient stimulus, encouragement and the right frameworks, for integrating and building better business cases for the introduction of measures. Significant ‘win-wins’ can be achieved in areas such as speed management, improved facilities for pedestrians and cyclists and reductions in work-related road crash costs to employers.

5.3 Programme measures: identifying future options

In addition the texts in the Knowledge Base of the European Road Safety Observatory which is currently being updated within the DaCOTA project, a wide body of international literature is available to inform knowledge on road safety interventions. For overviews see:

- *World Report of Road Traffic Injury Prevention* (2004)
- *Towards Zero: Achieving Ambitious Safety Targets - Summary, Full Report* (2008)
- *Implementing the Recommendations of The World Report on Road Traffic Injury Prevention Country guidelines for the conduct of road safety management capacity reviews and the related specification of lead agency reforms, investment strategies and safety programs and projects.* See Global Road Safety Facility (2009)
- *The Road Safety Handbook*, Elsevier (2009)
- *SUPREME Summary and publication of best Practices in Road safety in the EU Member States*
- ETSC reviews (1993-2012)

It is clear from the previous sections that the *Injuries Strategy* could address and support a range of useful, specific, evidence-based intervention at EU, national, regional and local levels. Some have already been foreseen in the Transport White Paper, the Road Safety Action Programme and following the Council discussion in November 2010. . The European Parliament has also indicated very broad support for a wide range of actions.

While identifying potential candidates is beyond the immediate scope of this working document, a possible framework for identifying future options could usefully be considered by the High Level Group depending on the outcome of discussions on future EU targets. For example, if any of all of the areas identified in Box 3 are targeted then it might be useful to group programme measures and their development into discrete policy and implementation packages as is typical in national safety strategy practice.

Box 3: Examples of possible areas for targeting and intervention in the Injuries Strategy

- *Reducing inappropriate or excessive speed* More than 2,200 road deaths could be prevented each year if average speeds dropped by 1 km/h on all roads across the EU.(ETSC, 2012)
- *Reducing driving under the influence of alcohol* At least 7,500 deaths could be prevented each year if crash-involved drivers reported to be exceeding the limit had been sober (ETSC,2012)
- *Reducing failure to wear front and rear seat belts* Around 12,400 car occupants survived serious crashes in 2009 because they wore a seat belt. Another 2,500 deaths could have been prevented if 99% of occupant had been wearing a seat belt.(ETSC, 2012)
- *Improving the safety quality of vehicles* E.g. Research shows that 5-star rated Euro NCAP cars have a 68% lower risk of fatal injury and a 23% lower risk of serious injury compared to 2-star rated cars. (Kullgren et al, 2010)
- *Improving the safety quality of the road network: e.g. combined road engineering and speed management measures to reduce the probability of impact speeds exceeding 30 km/h, have led to 25%-35% reductions in vulnerable road user deaths of (Koornstra et al, 2002)*
- *Improving emergency medical response* Reducing the time between crash occurrence and arrival of emergency services from 25 to 15 minutes reduces deaths by one third (Rocío Sánchez-Mangas et al(2010).

For example a package on increasing seat belt use could target, from an identified baseline, increases in seat belt use for the interim and long term. Its dimensions would be multi-disciplinary (e.g. seat belt reminders and combined police enforcement and publicity) and multi-sectoral (car industry, police, information providers) with appropriate actions identified at EU and national levels. Key attention would be paid to critical implementation arrangements: e.g. leadership, coordination, promotion, legislation, monitoring and evaluation, research and development and knowledge transfer. Other packages might include speed, drinking and driving, infrastructure safety, vehicle safety, work-related safety (in collaboration with EU OSHA) and motorcycle safety.. The Commission and Member States could provide a management framework of an Injury Strategy Task Force(s) to develop these results-focused elements.

Question 12. Should the *Injuries Strategy* work towards the adoption of results-focused intervention packages to address key road safety issues? If so, which issues are the priorities for development?

6 Key implementation issues

The sheer scope of the road safety task illustrated above requires meaningful institutional leadership, collaboration and capacity within Government amongst the key partners – transport, roads, police, health, planning and education agencies – as well as engagement with key partners in the business sector and the community to achieve goals and targets.

The strategy should demonstrate the importance of a focus on results which is the rationale for any effective road safety strategy, set out the leadership and roles of the EU and Member States, and any supporting institutional arrangements e.g. possible new task forces/ study groups.

Box 4: The road safety role of the European Union

The EU shared responsibility for road safety with Member States and can add value to their road safety efforts by:

- Establishing through target-setting and governmental leadership a focus on achieving road safety results across the EU.
- Coordinating actions across Commission Directorates at EU level, between levels of government to achieve results and with the business sector and civil society..
- Legislating in agreed areas e.g. Single Market vehicle safety legislation, TEN-T network, driver and rider licensing.
- Funding twinning programmes, research and development, benchmarking activity and review and supporting effective NGO activity and using resource allocation tools when prioritising intervention
- Promoting the societal shared responsibility for road safety through best practice approaches and creating demand for road safety.
- Monitoring and evaluation of interventions and EU action programmes through CARE and other projects.
- Research and development of new intervention and developing best practice guidelines and knowledge transfer through the European Road Safety Observatory and other means.

The Strategy would highlight the importance of cross-governmental and cross-sectoral coordination (important roles of the HLG and inter-service consultation and coordination);

legislation, sustainable funding (e.g. stating the intervention of establishing a specific budget stream for the *Injuries Strategy*); monitoring and evaluation (e.g. establishing simple safety performance indicators), promoting and supporting international best practice and knowledge transfer (e.g. via ERSO and other mechanisms such as twinning, professional exchange), and research and development through the framework programme and bilateral arrangements.

Question 13: Should the Commission set up an *Injuries Strategy* Task Force(s) in the Inter-Services framework and the High Level Group?

Question 14: How should the *Injuries Strategy* be resourced e.g. by dedicated budget lines, co-financing, public/private financing?

Question 15: Should key safety performance indicators be established for the Strategy?

Question 16: Should the EU support knowledge transfer on best practice?

Question 17: Should the EU provide targeted support for capacity building through requiring a formal road safety management capacity review (as recommended by the OECD and World Bank) in countries in which it provides infrastructure funding?

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8 Annexes

First indications from the public consultation on the Injuries Strategy

The public consultation was designed and subsequently launched by the Commission on 17th April 2012³⁶ and aimed at a broad range of stakeholders. As at 14th June 2012, 88 internet responses have been received and there have also been additional contributions from Member States and international organisations. Around 60% of response have been received from private individuals or individual experts with only a small number received from governmental agencies. Half of respondents requested anonymity. While numbers are too low to draw conclusions, the following indications are:

Road safety as a societal and political priority Transport accidents were cited by most as the number one societal threat and most respondents (82%) believed that road safety should be a top priority at EU, national and local levels and

Support for an Injuries Strategy and target-setting The majority (86%) believed that there would be added value in establishing an EU Injuries Strategy and there was support for a wide range of action. There was support for further target-setting, both at headline level and for specific targets. An EU injuries target was ranked higher by than global, national or local targets.

Definition of injury The majority (93%) supported EU definition. There was also majority support for the police to continue to be the main provider of data at national level. A medical score on the severity of an injury (Maximum Abbreviated Injury Scale or other medical score) was widely supported and, in terms of definition by number of days in hospital, most supported between 15-30 days and a classification which took into account the permanent reduction of ability.

See Commission attachment on preliminary results for further information.

³⁶ European Commission (2012) *Public Consultation on an EU strategy to reduce injuries resulting from road traffic accidents*, Brussels