



**SUMMARY AND PUBLICATION OF BEST PRACTICES  
IN ROAD SAFETY IN THE MEMBER STATES**

**THEMATIC REPORT:  
POST ACCIDENT CARE**






**THE FINAL REPORT OF SUPREME CONSISTS OF 14 PARTS:**

<b>PART A</b>	METHODOLOGY
<b>PART B</b>	LIST OF MEASURES COLLECTED AND ANALYSED
<b>PART C</b>	BEST PRACTICES IN ROAD SAFETY LEVEL HANDBOOK FOR MEASURES AT NATIONAL LEVEL
<b>PART D</b>	BEST PRACTICES IN ROAD SAFETY HANDBOOK FOR MEASURES AT EUROPEAN LEVEL
<b>PART E</b>	REVIEW OF IMPLEMENTATION AT THE COUNTRY LEVEL
<b>PART F1</b>	THEMATIC REPORT: EDUCATION AND CAMPAIGNS
<b>PART F2</b>	THEMATIC REPORT: DRIVER EDUCATION, TRAINING & LICENSING
<b>PART F3</b>	THEMATIC REPORT: REHABILITATION AND DIAGNOSTICS
<b>PART F4</b>	THEMATIC REPORT: VEHICLES
<b>PART F5</b>	THEMATIC REPORT: INFRASTRUCTURE
<b>PART F6</b>	THEMATIC REPORT: ENFORCEMENT
<b>PART F7</b>	THEMATIC REPORT: STATISTICS & IN-DEPTH ANALYSIS
<b>PART F8</b>	THEMATIC REPORT: INSTITUTIONAL ORGANISATION OF ROAD SAFETY
<b>PART F9</b>	<b>THEMATIC REPORT: POST ACCIDENT CARE</b>

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## PROJECT MEMBERS

	KfV Kuratorium für Verkehrssicherheit (Co-ordinator)	AT		ADT Malta Transport Authority	MT
	ÖRK Austrian Red Cross	AT		SWOV Institute for Road Safety Research	NL
	IBSR-BIVV Institut Belge Pour La Sécurité Routière	BE		TNO Business Unit Mobility & Logistics	NL
	CDV Transport Research Centre	CZ		DHV Group	NL
	DTF Danish Transport Research Institute	DK		TØI Institute of Transport Economics	NO
	DVR Deutscher Verkehrssicherheitsrat e.V.	DE		IBDIM Road and Bridge Research Institute	PL
	CERTH/HIT Hellenic Institute of Transport	EL		PRP Prevenção Rodoviária Portuguesa	PT
	FITSA Foundation Technological Institute for Automobile Safety	ES		SPV Slovene Road Safety Council	SI
	INRETS Institut National de Recherche sur les Transports et leur Sécurité	FR		VÚD Transport Research Institute Inc.	SK
	NRA National Roads Authority	IE		bfu Schweizerische Beratungsstelle für Unfallverhütung	CH
	SIPSiVi Italian Society of Road Safety Psychology	IT		VTT Technical Research Centre of Finland	FI
	ETEK Cyprus Scientific and Technical Chamber	CY		VTI Swedish National Road and Transport Research Institute	SE
	Celu satiksmes izpete, SIA (Road Traffic Research Ltd)	LV		TRL Limited	UK
	TRRI Transport and Road Research Institute	LT		CIECA Commission Internationale des Examens de Conduite Automobile	INT
	KTI Institute for Transport Sciences	HU		ETSC European Transport Safety Council	INT
	WHO Europe World Health Organization - Regional Office for Europe				

## TABLE OF CONTENTS

<b>INTRODUCTION.....</b>	<b>5</b>
1 The SUPREME project .....	6
2 Objectives of this volume.....	7
<b>OVERVIEW ON OTHER RELEVANT PROJECTS.....</b>	<b>8</b>
3 HESCUAEP .....	9
4 ROSEBUD.....	10
5 OHEMS (WHO Europe).....	10
<b>DESCRIPTION OF THE SELECTION PROCESS .....</b>	<b>13</b>
6 Data collection .....	14
6.1 First Aid.....	14
6.2 Emergency Call.....	14
6.3 Efficient response of emergency systems.....	15
6.4 Security and safeguarding of accident sites.....	15
6.5 Transportation .....	16
7 Identification process for best practice measures .....	16
<b>DESCRIPTION AND ANALYSIS OF BEST PRACTICE MEASURES .....</b>	<b>19</b>
8 Received best practice suggestions .....	20
9 Categorization and description of the best practice suggestions .....	20
10 First Aid.....	21
10.1 Best Practice: First Aid courses connected to driver education .....	21
11 Emergency call.....	23
11.1 Best Practice: Finish recall system for new cars starting from 2010.....	23
12 Efficient response of emergency systems .....	25
12.1 Best practice: Efficient response of emergency systems with tow trucks .....	26
12.2 Best practice: “Rettungsgasse” – route for emergency vehicles.....	27
12.3 Best practice: Efficient response of emergency systems with a two tier emergency system .....	28
12.4 Security and safe-guarding of accident sites .....	31
13 Transportation .....	31
13.1 Best practice: Psychological support for victims.....	31
13.2 Best practice: Transport by helicopter .....	33
14 Integrated approach for Post Accident Care.....	36
14.1 EMS, Ambulance and rescue service.....	36
14.2 Dispatch Centres on the example of LEBIG – www.lebig.at.....	38
<b>RECOMMENDATIONS.....</b>	<b>45</b>
15 Expertise and Recommendations .....	46
16 Policy Guidelines.....	46
<b>SUMMARY.....</b>	<b>47</b>

<b>REFERENCES.....</b>	<b>49</b>
<b>ANNEX.....</b>	<b>51</b>
17 Annex 1: Questions for the country survey .....	52
18 Annex 2: Questionnaire Post Accident Care .....	52

# Introduction

# 1 The SUPREME project

The objective of the SUPREME project is to collect, analyse, summarise and publish best practices in road safety in the Member States of the European Union as well as in Switzerland and Norway, with a view to implementation in as many partner states as possible. By making the study results available to a broad target audience across Europe – and thereby encouraging the take-up of successful strategies – the project wants to contribute to reaching the 50% reduction target of road fatalities, which the European Commission set in its White Paper "European transport policy for 2010: time to decide" (2001).

Analysis, synthesis and further selection of collected data were carried out along nine categories of measures and covers all areas of road safety work.

1. Education & Campaigns
2. Driver Education, Training & Licensing
3. Rehabilitation and Re-Licensing
4. Vehicles (incl. ITS)
5. Infrastructure (incl. ITS)
6. Enforcement
7. Statistics & In-depth Analysis
8. Institutional Organisation of Road Safety
9. Post Accident Care

In order to avoid overlapping between these categories, a detailed list of subcategories and – in some cases including even sub-subcategories - has been provided.

Accordingly, nine "Thematic Reports" (of which one is the volume in front of you) shall give a detailed description of best available practices for each of these categories, featuring basic characteristics such as target groups, quantitative and qualitative goals, key issues, duration of implementation and effects, coverage, costs, actors involved, implementation procedures as well as **key success factors** and potential **implementation barriers** in other countries or at the European level.

The crucial task of the project lies within the sound **identification of best practice** from the vast amount of available measures. In order to facilitate this process, a set of tools for collection, classification and selection of measures has been developed, along with guidelines for the assessment process at country level. As the common basis of all further activities, a list of eight best practice criteria was developed and transferred into a questionnaire. While the major part of this questionnaire consisted of a common set of core elements, some questions also addressed key features for each category.

On this basis, the SUPREME network of "Country Experts" has provided information from various stakeholders in cooperation with the respective Analysis Group members. Although 227 questionnaires have been completed, not all subcategories of road safety measures have been addressed. So this is the first step of data collection.



As an additional step, a list of road safety measures that had not been covered by questionnaires but were considered potential best practices by the SUPREME consortium, was compiled. Additional information was gathered from available scientific literature and earlier European projects. This extended list of potential best practices was the starting point for the second step of selection and analysis within each of the nine Thematic Reports.

#### **Further SUPREME activities**

Based upon these findings, 27 country surveys will be produced. The current status of implementation of best practice measures as well as implementation barriers shall be addressed and necessary steps shall be outlined.

Further, two separate handbooks will be provided, one for the European level (European institutions, international organisations, global industries) and one for the Country level (Ministries, regions, local level: stakeholders, policy makers, practitioners and the interested public).

For more information about the SUPREME project and latest results, please visit the SUPREME website, which is [http://ec.europa.eu/transport/supreme/index\\_en.htm](http://ec.europa.eu/transport/supreme/index_en.htm).

## **2 Objectives of this volume**

The care after an accident usually consists of the following measures:

- ◆ First Aid
- ◆ Emergency Call
- ◆ Efficient response of emergency systems
- ◆ Security and safeguarding of accident sites
- ◆ Transportation and medical treatment to enable a transport of the victims
- ◆ Further medical treatment and Psychological Support

The aim of the project was to identify best practice examples for the listed categories of measures to find new and innovative ways to improve and optimize the emergency system in Europe.

# **Overview on other relevant projects**



### 3 HESCULAEP

In the frame of the strategic objectives of the ERA-NET scheme (6th EU Framework Programme), the overall objective of HESCULAEP is to coordinate the National/Regional Research Programmes in the field of the management of medical emergencies, thus overcoming their current fragmentation, and creating sustainable long term cooperation, in order to improve their overall management.<sup>1</sup>

Through a better mutual understanding of different strategic management of medical emergencies, the HESCULAEP project will improve care of European citizen in any case of emergency situation, all throughout Europe and create the basis of a European Research Area in the field of medical emergencies.

Especially in the report 2.1 (HESCULAEP, Deliverable 2.1, ARCHITECTURE DESCRIPTION, BENCHMARKING AND PRIORITISATION) of the project there are some interesting aspects which are relevant for the SUPREME project, too.

In the descriptions of the Emergency Medical Systems the following topics could be identified (most of the topics are already covered by the suggested best practice cases (see chapter 4)):

- ◆ transport by Helicopter: can be found in most of the participating countries of the project: Spain, Sweden, United Kingdom, France, Italy and the Czech Republic; not in Slovenia and in Iceland
- ◆ psychiatric units for psychological support were described only for Italy and France, mainly under the light of possible terrorist threats
- ◆ in some countries General Practitioners can be called in as an alternative to ambulances in emergency situations (e.g. in Slovenia, Spain, Sweden and France)
- ◆ in Sweden and the UK there is an interesting emergency system, supported by voluntary “first responders”, who cover designated areas and are alerted by the dispatch centre in case of an emergency; usually they arrive before the ambulances and can provide first aid

The first two described points are already covered by suggested best practice cases and therefore no additional recognition is necessary.

The other (last) two points are describing the widely common use of volunteers and medical doctors as part of the emergency system, what shall not be handled as best practice in this report, although they are interesting and specialized forms of cooperation.

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<sup>1</sup> Hesculaep Homepage: [http://www.hesculaep.org/cat.php?rubrique\\_id=1](http://www.hesculaep.org/cat.php?rubrique_id=1), Deliverable 2.1, May 2005



## 4 ROSEBUD

ROSEBUD means Road Safety and Environmental Benefit-Cost and Cost-Effectiveness Analysis for Use in Decision-Making

ROSEBUD is a thematic network funded by the European Commission to support users at all levels of government (European Union, national, regional, local) with road safety related efficiency assessment solutions for the widest possible range of measures. ROSEBUD will bring together e.g. users, researchers, decision makers, policy makers and other relevant stakeholders around efficiency assessment of road safety measures. It is designed to facilitate networking of organisations, co-ordination of activities and exchange and dissemination of knowledge.

Although that project is highly relevant for SUPREME, there are little topics dealing with “post accident care”. Nevertheless two already identified best practice cases are also described in ROSEBUD (Recommendations, Deliverable WP5, Dec. 2005):

- ◆ First aid education for drivers (and for the public)
- ◆ Automated emergency call (+ GPS tracking) with the Finish eCall system

## 5 OHEMS (WHO Europe)<sup>2</sup>

Out-of-hospital emergency medical services (OHEMS) and hospital emergency departments form the two pillars of emergency medical services (EMS).

Out of hospital emergency medical services require a fast response, well coordinated resources and appropriate distribution. Although better coordination could improve performance and reduce mortality and morbidity, it is not achieved in most cases.

The aim of the project is to support all Member States in developing and maintaining their emergency medical services at pace with the needs of the population.

The focus is on providing the best attainable quality of care, preserving its maximum level of equity and accessibility.

The EMS programme develops common instruments of work such as tools for assessing the capability of EMS in meeting needs; instruments for better planning and managing services; guidelines for crisis preparedness at hospital level. In addition, ad hoc expertise is provided in this field e.g. training package on triage at EMS level, as well as reviews of national policies and structures.

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<sup>2</sup> WHO Europe OHEMS Homepage: [http://www.euro.who.int/emergservices/About/20020226\\_3](http://www.euro.who.int/emergservices/About/20020226_3), Dez. 2006



The WHO OHEMS project is cooperating with HESCULAEP and is currently running.

During our desk research, relevant information was found only in HESCULAEP reports by now, but further publications will follow for sure.



# **Description of the selection process**

## 6 Data collection

A detailed and comprehensive questionnaire was created for the purpose to collect information from the member states of the European Union as well as in Switzerland and Norway about their experience regarding good or best practise in road safety.

The topic “Post accident care” was divided into the following categories:

### 6.1 First Aid

First Aid	First Aid education connected to driver education	First Aid campaigns or courses in driving schools?
		e.g.: in Austria it is obligatory to attend a 6 hour First Aid course before attending driving school
		Is First Aid education obligatory connected to driver education (versus voluntary)?
	Enhancement of First Aid - motivation of road users	First Aid trainings for special road users (e.g. truck drivers, policemen, ...)?
		First Aid training for students (e.g. special training for young cyclists, ...)
		Other kinds of campaigns specially designed for road users

Table 1: First Aid

### 6.2 Emergency Call

Emergency call	sole versus several numbers	comparison of efficiency of sole emergency number versus several emergency numbers
		Bafflement of too many different numbers in case of emergency
		call taking & dispatching - integrated emergency control centre versus separated control centres for police, fire-brigade and ambulance service
	innovative/alternative emergency-call-systems	in - vehicle automated emergency calls (e.g. ecall)
		SOS-telephones on highly frequented or specified roads (e.g. highways, tunnels) / possible side effects
		Professional emergency dispatch systems
		road surveillance (e.g. cameras) in connection with early-warning systems for other road users and/or alarm-systems for emergency services
		area-wide infrastructure of mobile phoning



Table 2: Emergency call

### 6.3 Efficient response of emergency systems

Efficient response of emergency systems	aid provided by special trained persons before arrival of ambulance service	Any kinds of first responder systems, either depending on health care professionals or First Aiders Assistance of general practitioners (perhaps integrated in an emergency response system)
	reduction of arrival time by (re)allocation of vehicles in emergency services	positioning of emergency vehicles near to road-sections with high likelihood for accidents at certain times (e.g. rush-hours)
	reduction of arrival time by means of infrastructural measures	separate lanes for emergency services (e.g. emergency lanes)
		width of lanes and roads
	reduction of arrival time by means of technical measures	traffic signal pre-emption for emergency vehicles
		warning-signals of emergency vehicles
	reduction of arrival time by positively influencing behaviour of road users	corridor for emergency vehicles (e.g. in Germany learner drivers are thought how to behave in case that an emergency vehicle has to overtake a motorcade).
		special trainings in driver education or schools
aid by paramedics vs. emergency physicians on the accident-site	e.g. in Austria after an emergency call the dispatcher can send out to the accident site either a paramedic team or an emergency physician (or both of them). This decision depends on different parameters, such as expected severity of injury, symptoms, ...	

Table 3 Efficient response of emergency systems

### 6.4 Security and safeguarding of accident sites

Security and safeguarding of accident sites	on site coordination between enforcement and rescue services	early rerouting of traffic
		early blocking of lanes of accident site
		common use of means of communication (e.g. radio)
	visibility of accident sites	early warning for other road-users by raising visibility of the accident site (e.g. use of breakdown triangles) or systems along the road-side (e.g. flashing SOS-telephones)
	visibility of persons being or working on accident sites	sufficient perceptibility of emergency vehicles and personnel
		safety capes obligatory on accident sites
other kinds of protective equipment (e.g. flash lights)		

Table 4 Security and safeguarding of accident sites

## 6.5 Transportation

Transportation	decrease of transport-exposure of patients	use of ambulance helicopters
		psychosocial support during transport of patients
		technical equipment of emergency vehicles indented to reduce exposure
		"..."
	decrease of time for transport to medical facility	nearest hospital vs. Trauma-centre-strategy
		"..."

Table 5 Transportation

## 7 Identification process for best practice measures

Post accident care is taking place after an accident occurred. This implies, there are already victims, who are injured or death. Different from the other fields in the SUPREME project, post accident care is not about preventing accidents, but mitigating the suffering of victims.

For that reason the “target group” and the numbers are much smaller as they are for the whole topic (prevention of accidents), because post accident care is dealing only with the victims.

The best possible “post accident care” for everyone cannot be granted, as this would be too expensive and - nobody wants to pay for it, because nobody thinks it could affect oneself. Especially for quite low risks - like traffic accidents - there is little willingness to pay (in advance) in the population.

As a consequence the funds to use are - unfortunately - limited and for that reason decisions have to be made about which measures should be implemented and which not. Of course it is necessary to be able to evaluate different measures in order to be able to rank them and decide which should be implemented first.

To be able to rank and evaluate different measures it is necessary to compare the cost-benefit ratios. Cost-benefit analyses are able to draw a good picture of all possible effects of a measure.<sup>3</sup>

Usually cost-benefit analyses are valuating all costs and all benefits in monetary figures in order to be able to reflect all effects that might occur (including effects on human lives, injuries, time in traffic jams, environmental damage etc.).

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<sup>3</sup> WINKELBAUER, M.: „Sicherheit – Kosten und Nutzen“, ZVR Zeitschrift für Verkehrsrecht, 381-416, Dec. 2005, Manz Verlag Wien

Under the view, that - especially for many side effects – it wasn't possible to get detailed numbers for each measure, we didn't perform detailed cost-benefit analyses. Another reason is, that the monetary valuation of each effect means a loss of information (by transforming all effects in monetary values).

For that reasons we decided to valuate the effects in stages:

In order to be able to identify cost-effective measures, 4 criteria (see below) have been used, each to be valuated from “- - -”<sup>4</sup> to “+++” (= very negative to very positive). A Zero “0” was used, if there were no clear effects in any direction.

The criteria were as follows:

### 1. Incidence:

How many victims will need the measure (incidence per year)? How often does the incident occur?

Valuation: “0” would mean nobody is affected, “+++” would mean, (nearly) all incidents with injuries are highly affected. Negative ratings are not possible for that criterion.

### 2. Cost - QALY ratio:

A common way to valuate the outcome of measures in the public health sector is the valuation in QALYs<sup>5</sup> (quality adjusted life years). A quality adjusted life year is a life year at the best possible state of health, so all effects which will reduce the life quality, like psychological or physical diseases/injuries, will also lead to a reduction of the quality adjusted lifetime

Instead of monetary valuated benefits (as it would have been at a classical cost-benefit analysis), we used with QALYs a unit for lifetime. Benefits of a measure are mainly affecting the victims – usually it will be a gain of QALYs.

To underline the importance of human lives we valuated all QALY – benefits separated from all other effects, which were accounted under the next criterion “other side effects”. In a classical cost-benefit analysis all effects would have been counted/valuated together.

The question for this criterion is:

What are the costs for the measures and how many QALYs could be saved with the measures?

The total QALYs saved by a measure can be calculated by multiplication of the affected victims (incidence) with the saved QALYs/victim.

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<sup>4</sup> As no negative incidence is possible and all post accident care measures are not expected to have any negative effects on QALYs, the negative valuation is only relevant for the criterion “other side effects”.

<sup>5</sup> ZECKHAUSER/SHEPARD 1976, zitiert in: BREYER F. / ZWEIFEL P.: Gesundheitsökonomie, 3. Auflage Berlin 1999, Springer Verlag, S. 49-51



Valuation: “0” would mean no effect on QALYs, “+++” would mean a very high effect on QALYs. Negative effects should not occur, as all measures are expected to help the victims.

### **3. Other side effects:**

But of course there might be also other side effects like economic benefits (e.g. by preventing traffic jams) or benefits for the society (e.g. by increasing awareness) or environmental benefits.

The question is:

Are there any other side effects, like economical benefits or benefits for the society (e.g. like an improvement in the field of civil protection)?

Valuation: “0” would mean there are no clear effects, “+++” would mean a very high positive side effect. Negative effects could occur, but were not identified in the suggested best practice examples.

### **4. Transferability:**

Can the measure be transferred to other countries? Are there any technological barriers (different standards) or any scenic or cultural differences, which might have influences on the transferability?

Valuation: “0” would mean the measure cannot be transferred, “+++” would mean it should be no problem to transfer the measure to other countries. Negative valuations are not possible.

Based on these criteria a list of best practice measures will be constructed in order to deliver a basis for political decisions.

# **Description and analysis of best practice measures**

## 8 Received best practice suggestions

The questionnaire was responded by 9 organisations from 7 countries ( 2x CH, 2x NL, ES, DK, FL, EE, PL). Two additional possible best practice measures were identified in expert interviews / literature. The identified measures were:

No.	Title	Country/ Organisation	received
336	Two-tier emergency care system	CH/St. Gallen Hospital	26.7.06
124	Trauma helicopter	NL, Ministry of health	3.7.06
116	Support network for traffic victims	ES, non-profit association	7.7.06
69	Incident management (tow trucks sent to incident locations)	NL, ministry of transport	26.6.06
216	Mobile Intensive Care Unit (similar to No. 336)	DK, Copenhagen Hospital Corporation	4.7.06
189	eCall	FL, Ministry of transport, Ministry of Interior	2.7.06
319	First Aid in driver education	Estonia, Ministry of Economics and Communications	23.7.06
255	PL, PRC (similar to No. 319)	Polish Red Cross campaign for road safety	7.7.06
WW	Practical advice: „First Aid in Road Accidents“ (similar to No. 319)	CH, Fed. Of Samaritans	6.9.06
	“Rettungsgasse“: reserved lane for ambulances, police etc. in traffic jams	D, CH – regulated by law (StVO)	21.12.06

Table 6 Received best practice suggestions

## 9 Categorization and description of the best practice suggestions

In a second step the campaigns and examples listed above were categorized as mentioned in chapter 3. The best practice examples were identified and used to word recommendations for the topic “post accident care”.

## 10 First Aid

Category	Subcategories	BPM submitted
First Aid	First Aid education connected to driver education	No 319 Estonia: First Aid & licensing
	Enhancement of First Aid - motivation of road users	No 255: First Aid Polish RC

Table 7 First Aid

### 10.1 Best Practice:

#### First Aid courses connected to driver education

First aid courses during the driver education process are integrated in the following countries: Austria, Bosnia and Herzegovina, Estonia, Germany, Hungary, Latvia, Lithuania, Slovakia and Switzerland.

The measure is especially important in rural roads where the emergency service cannot arrive at the accident place within 5-15 minutes. First aid in the first minutes after an accident will give possibility to survive because 57% of deaths consequent of road crashes occur within a few minutes of crash at the accident scene, 22% occur during transport to the hospital or within the same day.

Public acceptance is high and also willingness to apply the first aid courses connected to driver education. Participants of driver courses pay for first aid courses, so financing of the first aid courses is no problem (for the government).

Globally, around one million people die each year in traffic accidents and a further 20 million are injured or disabled. Of all victims who are killed, 57% die in the first minutes after the crash, before the arrival of the emergency services. Immediate first aid action provided on the spot in these vital first minutes can save lives as well as having a clear psychological support value for the victim and other people involved.

Similar measures are undertaken in Poland: there is currently running a Road Safety Campaign of the Polish Red Cross, which started already in 2001.

The main aim of the campaign is to reduce the death level on Polish roads by increasing awareness of road users. The campaign is done according to Polish Red Cross and International Federation of Red Cross Strategy 2010 and national road safety program called GAMBIT.

It is expected to decrease the death level and injury level by increasing road user's awareness by first aid courses for drivers and by public road rescue shows.

Certainly, any first aid training programme or campaign has to be valued positive, but mandatory courses connected to driver education during the licensing would be much more effective and would



reach – ideally – all drivers, instead of some volunteers. So the main target for each country should be to get a legal requirement for new drivers to attend a first aid course. But of course additional campaigns to motivate also non-drivers are useful, too.

Maybe it would be a good idea to re-certificate drivers in first aid in intervals of some years to keep their responsibility and ability to help in their minds. It is much more important to repeat courses regularly than to have long courses (usually 1-2 days/course will be enough).

It would be a clear benefit for a society, if the education in schools would contain much more first aid than it does now – and with each learning child, their parents might refresh their knowledge, too.

The “ideal” first aid education system in a country should be built as follows:

- ◆ mandatory (legal requirement) “first aid” education for drivers during their licensing
- ◆ first aid education in schools, repeated e.g. once a year, to keep the knowledge present and in mind
- ◆ re-certification of “first aid” for drivers in regular intervals
- ◆ optional: first aid campaigns to motivate non-driving adults, maybe with special focus on special target groups, like senior citizens

VALUATION OF FIRST AID COURSES FOR DRIVERS		
Valuation-Category	Rating (- - - to +++)	Comments
Incidence and Impact	+++	ALL ACCIDENTS WITH INJURIES: e.g. about 450.000 - 500.000 persons in Germany (2002, 2003) <sup>6</sup> , which is about 0,6% of the population each year(!); during one’s lifetime (est. 78 yrs) the probability of being injured at a traffic incident at least once in your lifetime increases up to about 47% (!).
Cost-QALY ratio	+++	The amount of affected QALYs depends on the accident severity. As first aid can help to save lives and prevent massive neurological damages in numerous cases, the effect on QALYs can be seen as very high. The costs for first aid courses will be paid by the drivers, no additional costs for governments have to be expected. Especially the fact, that nearly half of the population will be injured in a traffic incident once in their life and the positive side effects listed below makes that measure a MUST for each society.
Other side effects	+++	Beside the advantages for traffic accident victims, all other accident/incident victims will benefit, too. A well-trained population will help to increase the public awareness and improve the civil protection of a country. Moreover positive effects on the social behaviour in a society could occur (self-reference as “responsible” citizen, improved charity).
Transferability	+++	First Aid is useful everywhere and for everyone.

<sup>6</sup> UNECE Statistics: [http://www.unece.org/trans/main/wp6/pdfdocs/\\$RAS%202005.pdf](http://www.unece.org/trans/main/wp6/pdfdocs/$RAS%202005.pdf), S.59, Dec. 2006

Table 8 Valuation of first aid courses for drivers

## 11 Emergency call

Emergency call	sole versus several numbers	
	innovative/alternative emergency-call-systems	No 189: eCall Finland

Table 9 Emergency call

### 11.1 Best Practice:

#### Finish recall system for new cars starting from 2010

eCall is an automatic in-vehicle emergency call service developed in the European Union. An eCall-equipped vehicle has a terminal with satellite positioning, wireless communication and sensors for detecting a crash, rollover and fire. When an accident has occurred, the terminal dials the emergency response centre and sends the information on vehicle position and type of accident to the centre. It also opens a voice connection between the vehicle occupants and the operator of the emergency response centre. The pan-European eCall system has received widespread support both from the EU member states and the car manufacturers. The objective is to equip all new cars with eCall terminals starting from the year 2010. Finland has been active in promoting eCall. The nationwide implementation of the eCall system has been under way in Finland since the spring of 2004. The eCall system itself will not reduce the number of accidents. The benefits of the eCall system are primarily based on the faster relaying of essential initial accident information, such as the type of accident and the precise accident location. Some estimations about the impacts of the eCall system have been made, for example by the EU, but these estimations are not, however, necessarily applicable to Finnish emergency response centre processes or traffic accident statistics, so a more detailed evaluation was needed.

VALUATION OF THE eCALL SYSTEM		
Valuation-Category	Rating (- - - to +++)	Comments
Incidence and Impact	+	Potential beneficiaries: All car accidents with serious car-damages (so that the sensors will react), where no passengers or witnesses are able to send an emergency call themselves.  Of course only cars, which are equipped with the eCall system can benefit.
Cost-QALY ratio	+	eCall will not prevent accidents but will ensure a fast and reliable emergency call, which will lead to a faster post-accident care.  The benefits of the eCall system were found to be greatest in rural roads and in single vehicle accidents. In such extreme situations, an eCall system can save lives and there is a potential of saving QALYs,



		<p>through a fast emergency call.</p> <p>Of course the occurrence of such “lonely accidents” depends on the size and population density in a country.</p> <p>In Finland 71% of the fatal accidents that included one or more motor vehicles in the period 2001–2003 occurred in rural areas, while the proportion of single-vehicle accidents was 41% (Finnish Motor Insurers’ Centre, 2006). There were about 800 fatal motor vehicle accidents in 2001–2003.</p> <p>The eCall system could very probably have prevented 4.7% of the fatalities in accidents involving motor-vehicle occupants. In the accidents involving fatal unprotected road user, however, the system could probably have prevented no fatality. In all, eCall system was estimated to be able to reduce 5–10% of motor vehicle fatalities and 4–8% of all road fatalities in Finland. The evaluation was carried out prior to the implementation of the eCall system (ex-ante evaluation), but based on an analysis of empirical data of actual accidents that had occurred in Finland in 2001-2003. Virtanen, N. 2005. [Impacts of an automatic emergency call system on accident consequences]. Ministry of Transport and Communications Finland. AINO publications 14/2005, ISBN 952-201-966-6.</p> <p>The cost for an automated emergency call system would be borne mainly by car-customers. An interview of almost 100 drivers made in March 2004 revealed that an automatic emergency call system is the second most required accessory or service for a vehicle. Only antilock brakes were deemed more essential. The necessity of an automatic emergency call system compared to other equipment was not affected either by the annual kilometres driven or whether the driver drove mainly on rural roads or in towns. One third of the drivers are willing to pay 100-299 euros for eCall equipment and one third 500-999 euros.</p>
Other side effects	0	<p>One positive side effect might be the possibility to locate stolen cars through the integrated GPS, although it might be assumed that thieves will learn to deactivate it, soon.</p> <p>A negative side effect might be a loss of civil courage in the population, as accident-witnesses might think they need not help any more, because eCall does...</p>
Transferability	+	<p>The transfer requires compatible eCall systems in Europe, otherwise a Finish eCall system wont work in Germany. But there are also country-differences, which makes the eCall system different useful:</p> <p>Compared to almost all the rest of Europe Finland has a lot of lightly trafficked roads and severe winter conditions and thus the self alarming eCall system could be more beneficial here than in the rest of Europe. In Finland 70% of the accidents leading to fatality occur outside urban areas where the distances to hospital and other institutions are long and the alarms are delayed with greater probability than in urban areas. The description of location is also more difficult outside urban areas. This is why the delay from the detection of an accident to the call and arrival of help is often long. The benefits of the eCall can be assumed to be greatest just in the countries where a great percentage of accidents occur outside urban areas. E.g. in Finland the percentage of single accidents of all fatal traffic motor vehicle accidents (47% in 2004) is greater than in many other European countries (e.g. only 7% in Denmark). The benefits of the eCall system were found to be greatest just for single accidents with no eyewitnesses and in which the trauma to the injured were so severe that they were unable to call for help by themselves. The comparison</p>



		<p>of the 4–8% decrease in traffic accident fatalities arrived at in this study with the figures of other European studies one can see that the results are similar to the German (5%) and Dutch (7%) estimations. The estimations in Sweden (2–4%) and Great Britain (2%) are smaller and the estimate for the whole 25 member state EU area (5–15%) greater than the estimate in this study. The American estimation for the decrease in traffic accident fatalities based on field studies was smaller (2–3%) than in this study. the estimate made by the doctors was, however, greater (9–11%). When comparing the estimates from Finland and elsewhere one should remember that, unlike the other studies, the Finnish estimate is based on detailed accident analysis. Therefore the results of this study can be deemed somewhat more reliable than the other estimations based solely on statistics and databases.<sup>7</sup></p>
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Table 10 Valuation of the eCall system

## 12 Efficient response of emergency systems

Efficient response of emergency systems	aid provided by special trained persons before arrival of ambulance service	
	reduction of arrival time by (re)allocation of vehicles in emergency services	
	reduction of arrival time by means of infrastructural measures	
	reduction of arrival time by means of technical measures	No 69: tow trucks Netherlands
	reduction of arrival time by positively influencing behaviour of road users	“Rettungsgasse” (route for emergency vehicles) in Germany/ Switzerland
	aid by paramedics vs. emergency physicians on the accident-site	216 Denmark: mobile intensive care unit 336 Switzerland: two-tier emergency care system

Table 11 Efficient response of emergency systems

<sup>7</sup> Virtanen, N. 2005. Impacts of an automatic emergency call system on accident consequences, Ministry of Transport and Communications Finland, AINO 14/2005

## 12.1 Best practice:

### Efficient response of emergency systems with tow trucks

The Dutch Incident management aims to improve safety and reduce the delays associated with incidents (accidents, spilled loads, etc.). The focus is on further reduction of the arrival times of emergency services by improving the coordination between the key service providers. The core of the measure is the agreement between insurance companies and the Ministry of Transport that a tow truck is sent to the incident location immediately after the incident has been reported. In case of false alarm, the bill is paid by the Ministry of Transport. In all other cases the bill is paid by the insurance company. Due to this measure arrival times are reduced with approximately 15 minutes (average for all accidents that require a tow truck).

The measure has been fully implemented on the national scale (motorway network), and partially implemented on the regional network. The measure covers all Dutch national roads (about 3300 km), and about 200 km of regional roads (rough estimate). The legal background is an agreement (covenant) between the Ministry of Transport and insurance companies.

There are benefits in terms of reduced costs of secondary accidents and there are benefits in terms of reduction in vehicle delay, estimated to be 5 - 15 minutes per incident (on total incident clearance time). The total number of saved vehicle hours amounts (on a yearly basis) 2 - 4 million vehicle hours (application of the measure on the national road network)

The measure is transferable to other countries/regions. Incident management in general has been implemented in many parts of the world (e.g. United States). The specific measure described is transferable to other countries/regions that have obligatory car insurance (for towing). For heavy vehicles, the measure can be applied everywhere. Factors contributing to the transferability are good relations between parties involved (road managers and insurance companies, and emergency services) and obligatory car insurance to cover towing costs.

VALUATION OF THE EFFICIENT RESPONSE WITH TOW TRUCKS		
Valuation-Category	Rating (- - - to +++)	Comments
Incidence and Impact	++	All accidents for which assistance is required.
Cost-QALY ratio	+	The measure is post-accident, but may help to reduce the number of secondary incidents (by reducing the clearance time and queue length and duration). Moreover the arrival time for ambulances can be reduced by keeping the roads open and preventing traffic jams.  The cost of a useless trip of the tow truck (false alarm) amounts 100 Euro per trip. Every year 20,000 incidents are reported of which 6,500 reports appear to be false.

Other side effects	+	There are benefits in terms of reduction in vehicle delay, estimated to be 5 - 15 minutes per incident (on total incident clearance time). The total number of saved vehicle hours amounts (on a yearly basis) 2 - 4 million vehicle hours (application of the measure on the national road network). Benefit-cost ratio varies from 27.8 (5 minutes reduction in vehicle delay) to 76.3 (15 minutes reduction in vehicle delay), the calculation of the cost-benefit ratio includes also costs related to false alarms (approximately 30% of all incident reports), safety impacts (benefits) are here not taken into account. <sup>8</sup>
Transferability	+++	Tow trucks exist already in all countries, so it should be no problem to integrate them in the emergency management system.

Table 12 Valuation of the efficient response with tow trucks

## 12.2 Best practice:

### “Rettungsgasse” – route for emergency vehicles.

The German term “Rettungsgasse” is defined by law in Germany and Switzerland (StVO) and means, if there is a traffic jam and an emergency vehicle needs to get through, all others shall form a free lane in the middle of two lanes. If there are more than two lanes, all cars on the outer left lane shall move to the left, all others shall move right. (see picture on next page)

This free lane enables all emergency vehicles to provide fast and efficient help to those who need it – not only victims of an accident but also all other emergency cases that might occur.



<sup>8</sup> Immers et al: Benefit/cost ratio of introducing the passenger car agreement, TNO, May 2000 Schrijver et al: Calculation of the impact of a nationwide introduction of various incident management measures on vehicle delay, TNO 2006

Picture 1: "Rettungsgasse"

VALUATION OF THE "RETTUNGSGASSE"		
Valuation-Category	Rating (- - - to +++)	Comments
Incidence and Impact	++	All accidents for which assistance is required.
Cost-QALY ratio	++	The measure is post-accident and may help to reduce the arrival time for ambulances.  It is easy to implement (law), but it has to be communicated to all drivers in an appropriate manner. Except of the information cost there won't be many other efforts, so the cost-QALY ratio can be seen as good.
Other side effects	++	As all emergency vehicles will be able to drive through traffic jams, there are benefits for all other emergencies, too – not only for those with traffic accidents.
Transferability	+	At the moment there are a few regulations and some accepted customs regarding emergency vehicles and traffic jams in Europe. For example in Austria it is common, that emergency vehicles drive on the breakdown lane (which has the disadvantage of the occurrence of broken down cars). But in Germany and Switzerland, the "Rettungsgasse" is defined by law and drivers are used to form it if an emergency vehicle occurs. The result is a struggle of different behaviours – which causes problems especially in transit countries like Austria.  So it would be helpful if there would be a European regulation/recommendation for all countries, so that all drivers behave in the same way in case of traffic jams.

Table 13 Valuation of the "Rettungsgasse"

### 12.3 Best practice:

#### Efficient response of emergency systems with a two tier emergency system

The Copenhagen Mobile Intensive Care Unit (MICU) provides advanced pre-hospital treatment for the citizens of Copenhagen, Denmark. The ambulances are each manned with an experienced anaesthesiologist and a specially trained fireman, and they turn out 24 hours a day to acute illness or trauma. The ambulances carry a wide range of medical equipment, which gives the personnel the ability to handle almost any possible emergency situation in the field. At the crash site the anaesthesiologist can assess and stabilize the patient in order to improve chances of survival, minimising risks when transporting the patient.

The MICU is combined with the ordinary ambulance service at the crash site. The MICU has participated in different activities to increase the public knowledge of first aid treatment.

The measure is fully implemented locally in Copenhagen, but is continuously being improved (e.g. paramedics working in the units have been further educated to upgrade them from level 1 (almost no training) to level 2 (extensive training). This upgrading is expected finished in 1.1.2008)

The MICU is part of a “rendezvous” system used in accidents where it is deemed necessary. The primary ambulances located at different sites in Copenhagen (8 fire stations) are usually first on the crash site. This ambulance calls in the MICU if needed (in cases of sure signs of death the MICU is not considered necessary at the site). At other times the MICU is the primary ambulance at the crash site. The assessment of whether the MICU is to be primary or secondary ambulance at the crash site is done by the Emergency Call Service (Vagtcentralen).

Systemized training of rescue and ambulance teams in cooperation at a crash site may reduce the extrication time of entrapped car/truck crash victims by 40-50 %. Each MICU is thus manned with an anaesthesiologist, who is capable of making highly competent decisions at the crash site. In a sparsely populated country with long transportation distances it can be necessary to use MICU helicopters as well as ambulances.

MICUs are already implemented in many EU countries. Sweden is using a system, where highly trained Registered Nurses are part of each MICU-team. In Austria there are “emergency physicians” together with specially trained paramedics (e.g. provided by the Austrian Red Cross) in cars, ambulance cars or even helicopters.

The different personnel is reflecting different systems, in many countries it is common, that firemen are performing paramedic services or are combined with ambulances. The advantage is to have always a team member, who can perform fireman-tasks (acting in “hot zones”, liberation of victims after a car-crash,...). The disadvantages are mainly higher education cost/time than for a “simple”-paramedic, in many cases a modular system (with separated firemen/paramedics) is also more cost-effective.

A two-tier emergency care system has also been introduced Switzerland in the early nineties. Two-tier in Switzerland means that Paramedics (PMs) or emergency medical technicians (EMTs) will be deployed in less serious cases and that they will be accompanied by a specially trained physician (emergency physicians – EPs) in serious cases. This system comprises all types of trauma of which road traffic accidents represent the major part (67%).

The timeslot between alert of the MICU and actual arrival at the accident site was 5 minutes in 2003 (Median response time, 10 and 90 percentile was 3 and 8 minutes., N=6500, MICU Annual Report 2003) Paramedics at the MICUs in Copenhagen are currently being trained to reach a higher level (level 2 out of 3) all paramedics are expected to finish this training by Jan. 2008. The MICU service has been accredited as a part of the Copenhagen Hospital Corporation by Joint Commission International Accreditation

The combination of MICU and the Emergency Call Service is optimal. The coordination of primary and secondary ambulances including the use of the MICU is done by the Emergency Call Service, so



part of the success of the MICU is dependent on the effectiveness of this service and on the quality of the radio communications system used.

Summing up, the MICU service can be seen as a highly competent unit, which secures and stabilises trauma patients at the crash site, thereby increasing the chances of the patient’s survival when transporting the patient from the accident to the hospital.

VALUATION OF A TWO TIER EMERGENCY SYSTEM		
Valuation-Category	Rating (- - - to +++)	Comments
Incidence and Impact	+	Only severe accidents, where special treatment before or during transportation is necessary.
Cost-QALY ratio	++	Especially accidents with severe injuries are those which will lead to a significant loss of QALYs for the victims.  Evidence especially from the U.S. points out the importance of the correct and professional handling of injuries during the first critical hour after an injury event (the "Golden Hour"). If the critical trauma patient is not given definitive surgical care within 60 minutes from the time of injury the odds of his successful recovery diminish dramatically.  The additional personnel costs for doctors are high but can help reducing the hospital work/cost.
Other side effects	0	One of the positive unexpected side effects is that the MICU has shown to be able to treat also milder cases at the site in order to relieve some of the pressure from the hospital emergency room. But that’s more a shift of work than a real new effect.  Of course MICUs help creating new jobs for medical doctors.
Transferability	+++	The transfer should be no problem.

Table 14 Valuation of a two tier emergency system

## 12.4 Security and safe-guarding of accident sites

Security and safeguarding of accident sites	on site coordination between enforcement and rescue services	
	visibility of accident sites	
	visibility of persons being or working on accident sites	

Table 15 Security and safe-guarding of accident sites

Within this subcategory, no best practice cases could be identified and no other measures have qualified as best practice candidates.

## 13 Transportation

Transportation	decrease of transport-exposure of patients	No 116, Spain
	decrease of time for transport to medical facility	No 124, Netherlands, trauma helicopter

Table 16 Transportation

### 13.1 Best practice: Psychological support for victims

An innovative project to support road accident victims was proposed in 2005 by the Spanish NGO “STOP ACCIDENTES” to the Ministry of Health and Consumer Protection (STOP Accidentes, 2005). The project titled “Road Violence Victims Care” foresees a two-stage intervention and three different actions designed both for “direct” victims and for “indirect” ones (mainly relatives and close friends). The first proposed intervention stage would take place immediately after the accident while the second would imply a longer term treatment of psychological consequences resulting from the accident.

The three actions that give shape to this proposal are:

- ◆ the creation of a traffic victim supporter network (based mainly by social workers and psychologists),
- ◆ the organization of training activities on psychological support for victim supporters and hospital workers and, in the third place,
- ◆ the design of a “victim support protocol” including the definition of a (quiet) physical environment in hospitals to receive the “indirect victims”, a written guide for victims, as well as other psychological, social and legal matters.



This is a national level measure. The number of support points will be decided upon confirmation on financial support, attempting to cover as many hospitals and cities as possible. Nowadays, "STOP ACCIDENTES" has 700 members, including victims, policemen, and interested individuals, and covers the whole national territory.

Effects on the victims and their families are perceived in a short period of time. The increase of public awareness is expected in the long term.

Traffic victims and their families need help and support. Support to victims is given when a catastrophe occurs, but not for "routine" accidents in a systematic way: but the accident is never a routine for the individuals affected, therefore this measure is considered to be a fundamental one. "STOP ACCIDENTES" provides this help and more generalized measures are demanded. Furthermore, increase in public awareness about traffic safety is obtained.

VALUATION OF POST-ACCIDENT PSYCHOLOGICAL SUPPORT		
Valuation-Category	Rating	Comments
Incidence and Impact	+++	<p>A psychological traumatisation can occur at any accident, even if nobody gets hurt physiologically.</p> <p>An extreme scenario would be a truck driver, who quits his job because of traumatisation after his truck crashes on a freeway, even if nobody got hurt. If he fails to find a new job then, a downward-spiral could be started and – in worst case - his life could be ruined in the end.</p>
Cost-QALY ratio	+++	<p>Some months ago a paramedic told me a story of a woman saved out of an inferno, which was burned very badly. After some weeks medical treatment she was getting back to life.</p> <p>After one year she was dead – committed suicide and jumped from a balcony. All outer wounds were healed, but not the inner, psychological wounds.</p> <p>It is a problem of our time that family structures are often loose and people are alone with (already) many problems – if there are added some additional problems, e.g. because of a traumatisation at a traffic accident, the problems could be too much. Life quality can suffer significant of such psychological traumas and they can even lead to death, as shown in the example.</p> <p>In Austria the Red Cross has “crisis intervention teams” for psychological support in 8 of 9 regions of Austria, the cost per year is about 0,3 Mio. EUR, which is peanuts compared to the cost of one life, lost because of psychological traumatisation. Of course it has to be taken into account, that the Red Cross has many volunteers and for that reason other cost structures than e.g. governmental organisations, but it seems to be clear, that there is an extremely positive effect between the invested money and the increase of QALYs.</p>
Other side effects	++	<p>A broader approach at defining health and illness and a standardized psychological treatment could be helpful in many situations.</p> <p>There are numerous side effects of psychological traumas, ranging from a limited ability to work to a negative effect for social life and so on.</p>
Transferability	+++	<p>The transfer should be no problem. European standards would be helpful.</p>

Table 17 Valuation of the post accident psychological support

## 13.2 Best practice:

### Transport by helicopter

Severe injured persons in The Netherlands can be transported to a hospital after an accident by a trauma helicopter to decrease the duration of transport to the hospital. Four trauma helicopters are in operation in Groningen, Amsterdam, Rotterdam and Nijmegen. These four locations cover the main part of The Netherlands. Areas near the border of The Netherlands are served by trauma helicopters from Belgium and Germany.

Since 1995 the use of a helicopter trauma team was tested in Amsterdam and Rotterdam. Since 1998 the measure is implemented.

Helicopter ambulance services exist in several other European countries (for instance Belgium, Germany, Austria).

41% of the victims with polytraumas were transported by the trauma helicopter. For 66% of the whole group of victims with polytraumas were their injuries not that severe that a trauma helicopter to prevent dying was necessary. For 19% of the whole group victims with polytraumas were their injuries that severe that could not prevent that the victim died. For 16% of the whole group victims with polytraumas was transport with the trauma helicopter very effective.

The effects were estimated by the Dutch national road safety research institute and the Erasmus University Rotterdam. The effects take two aspects of the group who have used the trauma helicopter into account:

- ◆ The mortality of the whole group.
- ◆ The quality of life of the victims who survived their injuries.

The expected effects were that the mortality is lower for the group transported by helicopter in comparison with the group transported by ambulance. There is no difference in quality of life between the group transported by helicopter and the group transported by ambulance.

The group transported by the trauma helicopter was compared with a comparable group transported by ambulance. A minimal and a maximal model for the mortality effect was developed. The minimal model was the most conservative. Age and severity of the injury were used as a severity indicator. In this model it is not possible to dedicate effects to the use of a trauma helicopter. In the maximal model age and severity of the injury are not used for the calculation of the severity indicator. In the minimal model was calculated that mortality would be 11% higher if the group of victims transported by the trauma helicopter would have been transported by ambulance. In the maximal model was calculated that mortality would be 17% higher if the group of victims transported by the trauma helicopter would have been transported by ambulance. The effect on quality of life was calculated with a questionnaire for the victims of both groups nine and fifteen months after the accident. The used questionnaires were the Short form36 and the EuroQol-5d tests. The results were that there was no significant difference on both tests after nine and fifteen months after the accident between the group transported by helicopter and the group transported by ambulance.

Trauma helicopters in the Netherlands, operating 12-hours a day, cost 10 million Euros. Then 4.5 trauma helicopters can be exploited. Four helicopters in the Netherlands and 0.5 as compensation for the use of Belgian and German helicopters in the parts of the Netherlands close to the border. Each trauma helicopter costs 2.1 million Euro: 0.8 million Euros for the medical team, 0.6 million Euro material costs for the helicopter and 0.7 million Euros for insurances, pilot staff costs and other operational costs.

The use of a trauma helicopter has a positive effect on reduction of the number of fatalities and a reduction on the number of seriously injured persons. Costs per fatality in the Netherlands: 1.39 million Euros. Costs per (hospital) injury in the Netherlands: 0.18 million Euros.

Based on the costs of operating a trauma helicopter and costs of medical help the costs of (for quality compensated) saved years of a life are calculated. These costs are in the interval between 18.000 and 37.000 Euro for each saved year, which is acceptable in the medical world.

A low-density of hospitals in a region can contribute to the effectiveness of the measure because transport by helicopter is much faster than by car. The trauma helicopter can also be used in this kind of areas for other medical services.

The use of the trauma helicopter is integrated with the incident management process. The coordination, communication and collaboration with the ambulance personnel is fine-tuned. The medical team on the helicopter consists of a specialist, a nurse and a pilot. This team has to be certified with special diplomas for trauma help and flying tasks.

Summing up it is clearly a measure which has a positive effect on the decline of the mortality rate by road accidents.

VALUATION OF HELICOPTER AMBULANCE TRANSPORTS		
Valuation Category	Rating (- - - to +++)	Comments
Incidence and Impact	+	41% of the victims with polytraumas were transported by the trauma helicopter. For 66% of the whole group of victims with polytraumas were their injuries not that severe that a trauma helicopter to prevent dying was necessary. For 19% of the whole group victims with polytraumas were their injuries that severe that could not prevent that the victim died. For 16% of the whole group victims with polytraumas was transport with the trauma helicopter very effective.
Cost-QALY ratio	+	In the minimal model it was calculated that mortality would be 11% higher if the group of victims transported by the trauma helicopter would have been transported by ambulance. In the maximal model it was calculated that mortality would be 17% higher if the group of victims transported by the trauma helicopter would have been transported by ambulance.  Based on the costs of operating a trauma helicopter and costs of medical help are the costs of (for quality compensated) saved years of a life are calculated. These costs are in the interval between 18.000 and 37.000 Euro for each saved year, which is acceptable in the medical world.
Other side effects	0	No other side effects.
Transferability	++	The transfer should be no problem, but of course the measure is quite expensive compared to other best practice measures.

Table 18 Valuation of helicopter ambulance transports

## 14 Integrated approach for Post Accident Care

To provide good post accident services in all parts of a region, possibly at the same quality standard and reliability is quite a complex task. Road traffic crashes are only a minor factor in this counting for about 5 % for injuries and 20 % of fatal injuries<sup>9</sup>. Therefore it is hardly possible to put road crashes on top of the priority list, when it comes to design regional or national rescue systems.

By discussing different measures for the improvement of post accident care, a broad systemic view should be used. It has to be accounted, that a new measure may affect (or require changes) in other, already implemented fields. The aim should always be to optimize the whole system, not only single measures.

The following chapter shall give an overview over the whole picture by describing the field of post accident care at the Austrian Red Cross as an example for such an integrated approach.

In almost all parts of the country, the Austrian Red Cross provides the following services:

- ◆ Ambulance service
- ◆ Rescue service
- ◆ Emergency medical service (EMS)
- ◆ Emergency Dispatch Centres (receipt of emergency calls, dispatching, coordinating)
- ◆ Psychosocial Support
- ◆ Critical Incident Stress Management (CISM)

### 14.1 EMS, Ambulance and rescue service

About 9% of all EMS/rescue services of the Austrian Red Cross are because of traffic accidents.

The chance to survive a traffic accident in Austria has doubled in the last 20 years – thanks to continuous improvements of the Red Cross rescue service.

The introduction and implementation of the mobile emergency medical service (EMS) has enabled the Austrian Red Cross to improve rescue services considerably. EMS provides immediate and optimal medical care by transporting doctors and medical teams directly to the scene of the accident in emergency vehicles and helicopters. This system is time efficient and thus increases the likelihood that the patient will be stabilised and transported safely to the hospital.

The Austrian Red Cross has almost reached its goal of implementing a nation-wide system of mobile emergency units - 128 EMS units (type C of standard EN 1789) are already available twenty-four hours a day. Additionally 1,780 ambulance vehicles (type A1, A2 and B of standard EN 1789) are

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<sup>9</sup> Injuries in the European Union, Summary 2002 to n2004. KfV, 2006.



available for transporting patients. The Red Cross rescue and ambulance service not only arranges the majority of all transports within Austria, but also provides medical teams in the emergency helicopters, and staffs the 424 networked Red Cross branches which are on-call around the clock.

The Red Cross aid workers help people in need around the clock. They respond to emergencies more than two million times a year, they save lives – and provide medical service. This is only possible because 30,000 Red Cross paramedics provide their services voluntarily, supported by approx. 4,000 employed. And because every year almost 3,000 young Austrians work in community service for the Red Cross as an alternative to the obligatory military service.

By having this high number of volunteers, the Austrian Red Cross is part of the so called “Austrian Model of disaster relief and civil protection”, where the main actors in the field of ambulance and rescue service as well as fire brigade are voluntary organisations. Added value of this system is the availability of a high number of rescue workers after big accidents have been happened, such as crashes of busses, accidents in tunnels, etc.

## 14.2 Dispatch Centres on the example of LEBIG – [www.lebig.at](http://www.lebig.at)

### One emergency medical communication and coordination centre - several locations

LEBIG is a private and non-profit limited company where the Austrian Red Cross, Regional Branch of Lower Austria is main owner of the company.

#### Lower Austria

Lower Austria (Niederösterreich) is the largest federal state of Austria. There are 1.8 million inhabitants, it is a partly mountainous country and tourism plays a role besides a well developed economy and industry.

#### LEBIG

Basically the LEBIG System is based on one emergency medical coordination system, operated at several locations. All information is merged in one central database and accessible from every location.

#### Dispatch operations

All LEBIG locations are connected in a redundant wide area network. The main system components used to handle the workload:

- ◆ VOIP telephony network  
emergency certified  
the complete telephone work is handled via VOIP
- ◆ advanced medical priority dispatch system
- ◆ computer aided dispatch system (novotec)  
computer telephone integration  
geographical information system
- ◆ radio system  
analogous system, 4m frequency band
- ◆ digital paging network  
satellite based alerting  
[www.pagernetz.at](http://www.pagernetz.at)



Besides the emergency dispatching operations LEBIG is the central inbound call centre for additional services (e.g. home nursing services, meals on wheels, ...) and a large work-load of non emergency patient transports has to be dispatched every day.

### Statistics:

- ◆ ambulance stations: 157
- ◆ BLS Ambulances, Transport Units 710
- ◆ ALS Units 32 (air / ground)
- ◆ LEBIG Staff 115
- ◆ ~ 3500 deployments / day
- ◆ ~ 600 time critical incidents (emergencies) / day
- ◆ ~ 12000 in-/out - bound telephone calls / day

### **AMPDS - actually the most effective Dispatch System for Emergency Medical Services.**

AMPDS (Advanced Medical Priority Dispatch System) provides optimal assistance simultaneously for callers and dispatchers. AMPDS standardizes work sequences for questioning and disposition of EMS.

In the meantime a lot of successful resuscitations and nativities were instructed by our call centre agents (CCA) via the telephone – before EMS crews arrived at the scene - see our news page on [www.lebig.at](http://www.lebig.at).

More information about AMPDS: [www.emergencydispatch.org](http://www.emergencydispatch.org)

In these cases, our call centre agent is depending on the cooperation of the caller. Turning the caller in a condition of cooperation the CCA gets a well-founded education in basic-psychological sequences. Using questions and orders, easily to understand and execute, we provide the caller with instructions for simple first-aid manoeuvres, but also safety-hints.

Using the Emergency Call "144" in Lower Austria, you are instantly connected to specialist of LEBIG, who cares about all your requests and problems. All necessary actions (dispatching, communication, etc) are provided at the same time in background-work, without your attention, to provide you with the best, most efficient and rapid help.

While talking to our CCA, answering additional important questions, a further LEBIG staff member dispatches the necessary EMS Crew(s), which is automatically recommended by our computer aided dispatch system. In case of a high priority (life critical) emergency, after the identification of the place of action and type of emergency, the EMS is dispatched even after only two questions.

Average dispatch times have radically decreased since the continuous use of AMPDS.



## Local knowledge

One challenge running a supra-regional emergency coordination centre is the knowledge of places and regional conditions for every dispatcher. For a large region as the LEBIG provides coordination and communication services, this can only be assured in using a computer-based map and routing-system (GIS = geographical information system).

To locate every place of action we use the innovative Novotec-ELS-GEOFIS System (CAD-system = computer aided dispatch system). While typing the address and for example a street name, the appropriate map is displayed on an additional screen. Local names, although they are not official, are used in our system to easily define the accurate location. Despite all assistance, oral evaluation of the directions is required, to be absolutely sure about the place of action.

Every verified address is exactly shown with a crosshair and defined with GPS coordinates, which can be automatically transferred to a navigation-system or any other electronic device, to direct the EMS crews.

Also in-official maps, like panorama-maps of skiing regions, site plans, or even hand-drawn sketches are integrated in the CAD system.

In past times, coordination of EMS was often reduced to simple telephoning service.

Nowadays standards of emergency coordination centres have elementarily changed. So the requirements of education and training of dispatchers and technical equipment have reached new levels, to provide expeditiously Emergency Medical Service, even in peak times.

## Training & Education

One of LEBIG's main goals is intensive education and training of our dispatchers.

We are conscious of our responsibility for the security of lower Austria's inhabitants, our patients and customers. Education of our staff members is oriented on principles, processes, targets and participants according to latest knowledge in emergency medicine. Our training uses newest, most innovative and didactical-methodical concepts.

All of our instructors are well experienced Dispatcher and EMS-Workers, mainly in leading positions or even special qualifications in emergency coordination centres. Practical training is an emphasis of LEBIG training. Role-playing games, case studies, mentorship and teamwork are the fundamentals.

Reaching qualification as Dispatcher, a LEBIG staff member passes through a combination of theoretical and practical training with different tests, and is able to obtain specialised skills for additional work according to his or her talents.

As an additional condition for our dispatchers we urge them to be also active in EMS.



## Continuing education

Deadlock is a step backwards – is the principle of our "Continuing Dispatch Education - CDE".

Only with this intensive and perpetual training it is possible to operate such a high-quality emergency coordination centre. In every three months every staff member has to prove his knowledge in our training coordination centre in Tulln. So at least 32 hrs of continuing education are done by every LEBIG staff member per year.

## Advanced skills

Highly qualified and motivated staff is authorized to acquire advanced skills like "Instructor", "Mentor", "Supervisor" or system-technician.

## Psychosocial Support

Several tragic incidents (cable car fire of Kaprun, avalanches of Galtür or motorway tunnel fire of "Tauern tunnel"). motivated to develop immediate support for people affected, based on theoretical concepts.

Therefore the Austrian Red Cross has developed a general framework covering all Red Cross branches and both fields of activities, the peer system for supporting the own staff after traumatic events (CISM) and the psychosocial support for victims. Teams are mostly made up of volunteers and support other relief organisations.

Post trauma support is well established and serves amongst other reasons, to avoid more serious long term affects to the health of individuals. Homogenous standards have been established on a national level, so that different systems can be compatible in the case of disasters, in areas such as: training, organisational structures, intervention indicators. Over the years an information campaign has taken place along with enlarging emergency response teams.

### Legal basics:

Due to the reason that provincial governments are responsible for disaster response, there are no harmonised legal basics to regulate the service on a common base. In Vienna, acute support is organised by the City Administration – Acute Support Vienna (ASV). ASV cooperates with University of Vienna, Institute of Psychology. In Styria and in Vorarlberg the provincial government has established a comparable model by law. In the other regions, the Red Cross has taken the initiative to offer emergency support, very often in close cooperation with universities.



*How is the service provided?*

General principle: The decision to deploy a psycho-social support team does not depend on the number of those affected, but on the degree of possible traumatisation. The services are available free of charge to all residents.

The objective of this support is the recovery of the capacity to act and the support in the mourning process. The affected person needs to be cared for and accompanied in his/her coping with this traumatic situation. Moreover, it is envisaged to make the social network of the person (e.g. friends, neighbours, etc.) available. Should the psycho-social team-member detect that further professional therapeutic or psychiatric interventions are needed he is called upon organising this. In this respect there is a cooperation with professional organisations.

The mission does not cover only the classical support dialogue but also the creation of the requested structure. Through practical assistance and evaluation of the event the person concerned gets a clearer picture of the next steps to be taken. In this respect it is most important to reactivate the self-coping measures of the person in need. The psycho-social team member has to commit himself to respect the obligation of secrecy.

In scientific terms the psycho-social support has to be understood as a prevention measure. Traumatic events can create post-traumatic stress disorder which result in further health risks and damage. Therefore the system acts in an area which is a central demand of pre-clinical emergency medicine and has therefore to be understood as an extended field of activity of the ambulance and rescue service. The deployment of psycho-social support has to be launched immediately after the event, which means already within the rescue operation itself and is therefore an emergency intervention and not a therapy. In other words it closes the gap between the event itself and the possibly necessary psychological support measures long after the event.

The detailed goals of the support:

- ◆ Emotional stabilisation
- ◆ Restoring an ability to act
- ◆ Providing information and support for family members who were not directly involved in the event.
- ◆ Networking with institutions that offer psycho-social follow-up care.
- ◆ Reduction of the acute stress
- ◆ Prevention of secondary illnesses



Members of psycho-social support teams provide support during the first few hours after an unusually critical stressful experience by

- ◆ taking time to listen
- ◆ responding to momentary needs
- ◆ assisting people affected, other people involved and survivors to express their feelings and
- ◆ accept them as a normal response to an abnormal event
- ◆ helping people affected, other people involved and survivors to put the incomprehensible
- ◆ event in words and place it in some kind of context
- ◆ providing support when those who have suffered a bereavement bid farewell to the deceased

Post accident care at the Austrian Red Cross is a dynamic, innovative discipline which is improved constantly. In some aspects the Austrian Red Cross can be seen as leading organisation in Austria, in some even in Europe.

Many fields, including e.g. First Aid, Emergency Medical Services or Psychological Support, might be taken as “good practice example” for other countries, too. But as described above there are already many similar systems in other countries, which might be seen as good practice, too. So it’s quite often not only learning from one other country, but learning from a couple of other countries.



# **Recommendations**

## 15 Expertise and Recommendations

All measures which were suggested as best practices can help saving lives and improving the medical treatment of victims. For that reason, no measures should be excluded; all are worthy to be implemented. But with scarce funds and restricted budgets the following list could help to define priorities. Based on the valuations of the preceding chapter, the following list can be formed:

- ◆ Increasing the public awareness with mandatory First Aid courses for drivers (e.g. EST,...)
- ◆ Psychological support for victims after accidents
- ◆ “Rettungsgasse” – a route for emergency vehicles regulated by law which is formed in traffic jams when emergency vehicles occur (standardization of driver’s behaviour in Europe)
- ◆ Integrated incident management with tow trucks in order to prevent car delays and secondary incidents (e.g. in NL)
- ◆ Two tier emergency systems with “emergency physicians” (e.g. in DK, A, CH) as additional option for serious accidents/emergencies (complement to “normal” paramedic services)
- ◆ Use of ambulance helicopters as option for severe accidents
- ◆ Implementation of an eCall emergency system as option in new cars

## 16 Policy Guidelines

The list above should be a good guideline and help in making decisions. Many of the measures described cost – compared to the saved lives - little money and need mainly good will and a legal basis.

Each of the suggested best practice cases can help saving lives and therefore the full list should be on the “To-Do” List of decision makers responsible for post accident care.

# Summary



Many interesting best practice cases had been suggested and were identified – some of them are already implemented in many countries, but some are still missing in others. As mentioned before all optimizations should be under a systemic and integrated view of the whole picture. The aim should be to optimize the system, not only singular measures.

The following measures to improve the post accident care at traffic accidents were identified and valuated positive following the SUPREME-criteria (high incidence, positive cost-QALY-ratio, positive side effects, transferability to other countries):

- ◆ First Aid: mandatory First Aid courses for drivers (e.g. EST, ...) will not only help to enable people to help each other in case of traffic accidents, but will also raise the public civil protection.
- ◆ Psychological support for victims after (traffic-) accidents can help to prevent long-lasting psychological traumata – and to make lives more liveable.
- ◆ “Rettungsgasse” – a route for emergency vehicles (regulated by law) which is formed in traffic jams when emergency vehicles occur. This standardization of a driver’s behaviour in Europe can help to prevent misunderstandings and to establish clear rules for how to free the way for emergency vehicles like ambulances.
- ◆ An integrated incident management with tow trucks will help to prevent car delays (and following emergency vehicles will come through more easily) and secondary incidents (which could cost lives).
- ◆ A two-tier emergency system with “emergency physicians” (e.g. in DK, A, CH) as additional option for serious accidents/emergencies (complement to “normal” paramedic services) can optimize the transport for severe injured victims.
- ◆ The use of ambulance helicopters as option for severe accidents will help to save lives and prevent serious damages in time-critical situations.
- ◆ Implementation of an automated eCall emergency system as option in new cars would bring a significant improvement for “lonely” accidents in rural areas. The measure would be financed by customers and can be seen as an additional safety improvement for new cars.

All measures are transferable to other countries and would mean a clear benefit for post accident care – for the society and especially for the victims

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# **Annex**

## **17 Annex 1:**

### **Questions for the country survey**

1. Do you have any programmes to train the public in first aid (please describe)?
2. Do you have any psychological support for victims after traffic accidents? Which measures are implemented / can be called upon (please describe)?
3. Is there any regulation how to behave in traffic jams when an emergency vehicle appears (please describe)?

## **18 Annex 2:**

### **Questionnaire Post Accident Care**

## SUPREME: Best Practice Questionnaire Category “Post Accident Care”

⇒ *Red Cross, Petra Schmidt*

### Step 1: Selection of measure

Please select road safety measures from your country that are examples for very good - and possibly best - practice in road safety in Europe. **Best practice** refers to a road safety policy that is successful. A successful road safety measure is one that brings about a sustained **reduction in the number of road accidents and accident victims**, in particular fatalities and serious injuries.

Evaluation of measures and selection of best practice will be based on a list of criteria. Each measure you select will be assessed with an individual questionnaire, i.e. you fill out one questionnaire for each measure.

As different measures require different criteria, the questionnaire you fill out depends on the type of measure. At the end of this chapter you will find an overview of **categories** of safety measures, with examples of measures included in each of the categories. To open a questionnaire, please select the category for the measure you want to assess, and click on the link provided in the overview. There are two types of criteria: General description criteria (to be assessed for all measures, except for those in the categories “Statistics and In-depth analysis” and “Institutional Organization of Road Safety”), and specific description criteria (specific for measures in each category).

The questionnaire is organised as follows:

**Part 1:** The first part of each questionnaire contains questions on **background** information about the selected measure.

**Part 2: General description criteria** are assessed in the second part of the questionnaire. This part is identical for all measures in all categories. In some cases, not all criteria are applicable. In these cases, the criteria are marked “not relevant”, or may be marked as such by the respondent. General description criteria are:

- **Focus of the measure:** A clearly defined **road safety problem** that the measure is intended to solve.
- **Size of the road safety problem:** Quantitative assessment of the number of accidents, fatalities and severe injuries that the measure is expected to influence.
- **Expected effects on safety:** Quantitative assessment of the likely impact of the measure on accidents or accident-contributing risk factors.
- **Evaluation of effects:** Actual impact of the measure on accidents or accident-contributing risk factors.
- **Costs and benefits:** Assessment and comparison to alternative measures.
- **Acceptance:** Public, policy maker, and user / driver acceptance.
- **Sustainable effects:** Commitment to the continued use of the measure, long-term effects.
- **Transferability:** Applicability on a wider scale, within and across countries.

**Part 3: Specific description criteria** are assessed in part 3 of the questionnaire. This part is specific for each category, you will find more detailed information in the questionnaires.

**Resume:** Summary of why the measure is proposed as Best Practice.

## **Categories**

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### 9.1 First Aid

9.1.1 First Aid education connected to driver education

9.1.2 Enhancement of First Aid - motivation of road users

### 9.2 Emergency call

9.2.1 sole versus several numbers

9.2.2 innovative/alternative emergency-call-systems

### 9.3 Efficient response of emergency systems

9.3.1 aid provided by special trained persons before arrival of ambulance service

9.3.2 reduction of arrival time by (re)allocation of vehicles in emergency services

9.3.3 reduction of arrival time by means of infrastructural measures

9.3.4 reduction of arrival time by means of technical measures

9.3.5 reduction of arrival time by positively influencing behaviour of road users

9.3.6 aid by paramedics vs. emergency physicians on the accident-site

### 9.4 Security and safeguarding of accident sites

9.4.1 on site coordination between enforcement and rescue services

9.4.2 visibility of accident sites

9.4.3 visibility of persons being or working on accident sites

### 9.5 Transportation

9.5.1 decrease of transport-exposure of patients

9.5.2 decrease of time for transport to medical facility



- When can (90% of the) effects be expected (e.g. immediately, in 5 years, long term)?

### **In which other European countries is the measure currently in use or available?**

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- Please give information, if available.

### **Who is responsible for the measure?**

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- Responsibility refers to implementation, enforcement, incentives to use the measure, and activities related to the measure.

*E.g.: Legal form of implementing body/bodies, international organisation, authority, industry, NGOs, others.*

### **What is the legal background for implementation of the measure?**

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- Legal background includes laws, directives, norms, certificates, incentives, voluntary measures.

## **Part 2: General description criteria**

In this part of the questionnaire, the safety measure will be assessed by 8 general description criteria. This part is identical for all categories.

If a criterion is not applicable to your measure, please answer "not relevant", and give a short explanation why the criterion is not applicable.

### **1. Focus of the measure**

The focus of a safety measure is the **road safety problem** the measure is intended to solve. It may be a specific type of accident, a type or group of road users, or a type of accident location. Some measures may be more general.

#### **What is the focus of the measure?**

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Please specify the focus of the measure in terms of **at least one** of the following aspects.

If the focus is a **combination** of factors (e.g. group of road users with specific type of accident), you can describe the focus under both aspects, or under the aspect that seems most important. (*If you are uncertain, it may be helpful to look at question "2. Size of the road safety problem"*).

- **Accident types**, specified by type of collision, condition under which the accident occurs, or type of vehicle involved in the accident:

*E.g.: Single accidents, side collisions, animal collisions, head-on-collisions, night time-accidents, accidents on wet roads, accidents involving heavy trucks, accidents in working zones.*

- **Road users**, specified by personal or demographic characteristics (e.g. age, sex, length of licence ownership, car- or truck driver) or by certain types of behaviour (e.g. speeding, driving under influence, traffic violations):

*E.g.: Children, inexperienced drivers, old people, drunk drivers, drivers not using seat belts, speeding drivers.*

- **Accident locations:** Specified by road category, type of intersection, driving conditions, or other characteristics of accident locations.

*E.g.: highways, acceleration lanes, rural roads, urban areas, roundabouts, pedestrian crossings, roads or location with specific characteristics, slippery roads.*

- **Vehicles:** Specified by adaptations to vehicles, prevention of unsafe participation in traffic, other modes/vehicle category, etc.

*E.g. adaptations to (the use of) heavy vehicles, passenger cars, mopeds, bicycles.*

- **Unspecified / all accidents:** If a specific focus cannot be defined, please give a short explanation.

### **How does the measure affect accidents?**

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- Please describe the **mechanism** by which the measure has an impact on the specified focus. If available, please refer to relevant **theoretical background** or empirical **studies**.

*E.g.: Avoidance of skidding due to improvement of vehicle dynamics, reduction of exposure, improvement of skills, change of attitudes, decrease of impact (air bag).*

- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

## **2. Size of the road safety problem**

In a first step we would like to know how large the focus of the measure is. In a second step we would like you to describe the risk of accidents, fatalities, and severe injuries within the focus of the measure.

### **How large is the focus of the measure?**

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Please give your assessment according to the specified focus of the measure. If a quantitative assessment is not possible, please give an estimation and explain the rationale.

- **Accidents:** If a type of accident is the focus of the measure, what is the **proportion** of the specified type of accident, relative to all accidents?

*E.g.: "X% of all accidents are head-on-collisions."*

*E.g.: "X% of accidents occur on slippery roads."*

- **Source/s (Accidents):** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

- **Road users:** If a type or group of road users is the focus of the measure, what is the **proportion** of the specified type of road users, relative to all road users. If possible, also include **exposure** data in your answer.

*E.g.: "X% of all driving license holders are over Y years old."*

*E.g.: "X% of all vehicle kilometres travelled (VKT) are driven by professional drivers of trucks over 20t."*

*E.g. "X% of road users do not use seat belts, exceed speed limits, are fined more than twice a year...."*

- **Source/s** (Road users): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Locations:** If a type or group of accident location is the focus of the measure, what is the **proportion** of this type of location relative to the whole road net (in terms of km or vehicle kilometres travelled), or relative to other variants of this type of location.  
*E.g.: "X% of all roads in this country are rural roads."*  
*E.g.: "X% of all VKT are travelled on rural roads."*  
*E.g.: "X% of all motorway crossings are designed as cloverleaves."*
- **Source/s** (Locations): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Vehicles:** If the measure focuses on a specific group of vehicles (or how these vehicles are used), what is the proportion of the specified type of vehicle, relative to all vehicles. If possible, also include exposure data in your answer.  
*E.g.: "in X% of all accidents, a heavy vehicle is involved."*  
*E.g. "the share of moped kilometres is X% of all kilometres travelled, while the share of moped accidents with fatalities/injuries is Y%"*  
*E.g. "X% of heavy vehicles is not equipped with blind spot mirror."*
- **Source/s** (Vehicles): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Unspecified focus / all accidents as focus of the measure:**
- **Source/s** (Unspecified focus): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### **What is the accident risk within the focus of the measure?**

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The definition of accident risk varies, depending on the specified **focus**:

- **Accidents:** If a specific type of accidents is the focus of the measure, please give information about
  - the probability of the accident being **fatal**
  - the probability of the accident having **serious injuries** as a consequence.
  - If possible, relate these risks to **other** types of accidents.

*E.g.: "X% of all side-collisions are fatal, Y% of all side-collisions result in serious injuries. The risk of being fatal is Z times higher for side-collisions than it is for frontal collisions."*

*E.g.: "Night-time accidents have X times higher risk of being fatal than daytime accidents."*

- **Source/s** (Accidents): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Road users**: If a group of road users is the focus of the measure, please give information about
  - the probability of an **accident** within this group of road users,
  - the probability of a **fatal** accident within this group of road users,
  - the probability of a **severe injury** accident within this group of road users.
  - If possible, relate these risks to **other** groups of road users.

*E.g.: "The risk of being involved in a fatal accident for inexperienced drivers is X."*

*E.g.: "Young and inexperienced drivers have X times higher risk of being involved in an accident than experienced drivers, who are aged over 20 and have minimum 2 years unrestricted driving licence."*

*E.g.: "Professional drivers have X times higher risk of being involved in an accident due to sleepiness than non-professional drivers."*

*E.g.: "Drivers not using hands free mobile phones have X times higher risk of being involved in an accident than drivers using hands free mobile phone."*

- **Source/s** (Road users): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Locations**: If a specific type accident location is the focus of the measure, please give information about
  - the probability of an **accident** at this type of accident location,
  - the probability of a **fatal** accident at this type of accident location,
  - the probability of a **severe injury** accident at this type of accident location.
  - If possible, relate these risks to **other** types of accident location.

*E.g.: "On ramps of grade-separated junctions without an acceleration lane, the accident risk is X accidents per million vehicle km travelled. The risk of a fatal accident is Y, and the risk of a severe injury accident is Z accidents per million vehicle km travelled."*

*E.g.: "X% of all fatal accidents happen on rural roads in areas with low population density."*

- **Source/s** (Locations): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Vehicles**: If a group of vehicles is the focus of the measure, please give information about
  - the probability of an **accident** for this group of vehicles,

- the probability of a **fatal** accident for this group of vehicles,
- the probability of a **severe injury** accident for this group of vehicles.
- If possible, relate these risks to **other** groups of vehicles.

*E.g.: "The risk of being involved in a fatal accident for trucks is X."*

*E.g.: "The risk of being involved in accidents is X times higher for moped riders than for cyclists."*

- **Source/s** (Vehicles): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Unspecified focus / all accidents as focus of the measure:**
- **Source/s** (Unspecified focus): Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### 3. Expected effects

#### **Were the effects of the measure estimated before it was implemented?**

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- Yes or No? If yes, how and by whom where the effects estimated?
- **If yes**, what were the expected effects?
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- If effects were estimated, was this assessment **taken into account in decisions** concerning the measure?

### 4. Evaluation of effects

Evaluation of effects refers to the effects on numbers, types or proportions of **accidents, fatalities or severe injuries**, on **risk factors** that are known to contribute to accidents, and on **side effects** of the measure.

#### **How does the measure affect accidents in terms of reduced numbers of accidents, fatalities or severe injuries?**

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- Please give information about the effects of the measure, preferably from **empirical studies**. If a quantitative assessment is not possible, please give an estimation and explain the rationale or the source of the estimation.
- Please give **background information** about the evaluation of effects of the measure on accidents, fatalities, and severe injuries. The summary should include
  - a description of how the effect has been **calculated** (e.g. accident counts, indirect measure),

- information about the **type of study** (e.g. accident analysis, accident statistics, observational studies, survey)
- information about the **design of the study** (e.g. control group, duration of before and after periods),
- If the measure is a **part of a larger measure**, if road safety effects were evaluated separately.
- Please also make a short comment on the **quality** of the study, especially about possible confounding factors.

*E.g.: "Study X estimated a reduction of the total number of accidents in urban areas by Y%"*

*E.g.: "Based on the evaluation, X% of all accident fatalities are expected to be avoided by the measure. Y% of all fatal accidents will not be avoided but have less serious consequences (severe or light injuries), due to (...)"*

- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### **How does the measure affect accidents in terms of reduced accident-contributing risk-factors?**

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- Please give information about effects of the measure on accident-contributing factors (e.g. changes in behaviour or attitudes, traffic offences, exposure, traffic conditions), preferably from **empirical studies**. The summary should include information about
  - the type of **contributing factor**, and why, how, and to what degree it contributes to accidents,
  - the **design** of the study (e.g. control group) and how the effect has been calculated, and a comment on the **quality** of the study, especially about possible confounding factors.
- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### **Are any positive or negative side effects of the measure expected or witnessed?**

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- Side-effects can be expected or unintended. Unintended side effects include positive and negative effects on accidents or behaviour which are not specifically within the focus of the measure. Side effects also include those not directly related to traffic safety (i.e. health, environment). Please describe the side-effects and whether they were expected or not.
- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

## **5. Costs and benefits**

Please give a summary of the costs and benefits of the measure in your country.

The analysis may be based on empirical results or on estimations. If a quantitative assessment is not possible, please give an estimation and explain the rationale or the source of the estimation.

Please describe precisely, what types of costs / benefits you are referring to, how they are related to the measure, and how they have been computed.

### **What cost are associated with the measure?**

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- Costs in **financial** terms: e.g. investments, maintenance costs, enforcement costs, reward systems, administration costs, long-term costs (ecological or social costs). Please specify **type** and **amount** of financial costs associated with the measure.
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- **Who** bears the financial costs of the measure (e.g. user group, state government)?
- What **other types of costs** are there, for example ecological or social consequences, mobility, etc.?
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### **What benefits are associated with the measure?**

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- Benefits in **financial** terms, e.g. cost savings. Benefits include financial effects of reduced accident costs. Please specify **type** and **amount** of financial benefits, and specify the exact figures used in the analysis (e.g. the economic value attached to a saved live).
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.
- What **other types of benefits** are there, for example environmental or social effects, and traffic performance?
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### **What is the benefit-cost-ratio for the measure in your country?**

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- What **benefit-cost ratio** is associated with the measure? Please specify if the computed ratio is a benefit-cost-ratio or a cost- benefit-ratio.
- How has the benefit-cost ratio been **calculated**: Based on which types of costs, types of benefits, relevant actors, timeframe etc. has it been computed?
- At which **stage of the implementation** of the measure has the benefit-cost analysis been conducted (before, during or after implementation)?

- How do you judge the **quality** of the benefit-cost analysis (e.g. if the effect is likely to be over- or underestimated, consideration of confounding factors)?
- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

**Has the benefit-cost-ratio of this measure been compared to the benefit-cost-ratio for other measures aiming at reducing accidents within the same focus?**

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- If so, please give the benefit-cost-ratio for these measures.
- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

## 6. Acceptance

Acceptance of the measure includes **public acceptance, acceptance by road users, policy makers, and other stakeholders (e.g. automotive industry)**. It is related to attitudes and behavioural consequences of the measure, especially to willingness to apply the measure, or to comply. Other relevant issues can be political, legal, financial, technical and administrative aspects.

**To what degree is there acceptance for the measure?**

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- If possible refer to empirical quantitative or qualitative **studies**. Information about public acceptance may be based on surveys, media, consumer and / or behaviour studies, decision-making processes (e.g. in parliament). Please include information about the type and design of the study. In the absence of such a study, what is the perceived level of acceptance of the measure?
- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

**Has acceptance been taken into account in the planning and implementation process?**

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- At which stages of implementation (before, during or after) has acceptance been measured? Has there been public participation in the planning / implementation process?

## 7. Sustainability

Sustainability includes **long-term effects** and **changes of effects** over time. Effects are considered to be sustainable when the effect is permanent and does not decrease over time.

### **To what degree are the effects of the measure expected to be sustainable?**

- The assessment can be quantitative or stated in qualitative terms. It can be based on
  - a **study** of earlier similar measures: if so, please provide a short description and source,
  - a scientific **analysis**: if so, please provide a short description of the scientific basis, or
  - an assessment of **contributing factors** (factors necessary to achieve and maintain the effectiveness) to its effectiveness (e.g. commitment to make use of the measure, requirement of police enforcement, skill improvement, risk compensation, exposure effects, public support, quality assurance, continuous monitoring).
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

## **8. Transferability**

Transferability includes prospects for using the measure successfully in other **countries** or **regions**, or on a **larger scale**.

### **To what degree is the measure transferable?**

- If available, refer to studies of the measure in other countries, explicit comparison with other countries, and publications about the measure in other countries.
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### **Which factors contribute to the transferability of the measure?**

- Contributing factors include **conditions for the effectiveness** of the measure in other countries or regions, or on a larger scale, and **specific requirements** necessary which may be difficult to fulfil elsewhere.  
*E.g.: "The measure can only be expected to be effective if it is combined with enforcement"*  
*E.g.: "The effects of the measure within the focus are expected to be larger if measure Y is also implemented"*
- **Source/s**: Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

### **Which factors limit the transferability of the measure?**

- Limiting factors include potential **obstacles** for the effectiveness of the measure in other countries or regions, or on a larger scale.

- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

**To what degree can the measure be effective for types of accidents, groups of road users, or accident locations, other than those specified as the focus of the measure?**

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- **Source/s:** Please make clear whether the information is based on: empirical evidence (published / unpublished), expert opinion, own considerations etc. In case of published studies, please give full reference.

**Part 3: Specific part (Post Accident Care)**

Please note that in this category we are going to analyse a timeslot between the occurrence of a road accident and the arrival of a patient in a hospital.

**Which kind of rescue service is the measure: paramedics, emergency physicians ("load and go" vs. "stay and play"), ...?**

**Description of possible side effects (positive and negative) of the measure, like effects on public health, safety of workplaces,...**

**Description of quality of structure and process (quality management) of emergency service:**

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- structure quality: regional pattern of emergency service in the country, timeslot between alert of an emergency service and actual time of arrival at the accident site, security level, education and additional training of staff, equipment of the vehicles (e.g. EN 1789)
- Process quality: quality certificates (ISO, QM,...), management of interfaces (rescue service – hospital, rescue service – emergency physician,...)

**What are effects on the efficiency of emergency service?**

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**Resume**

**Why should the measure be included in the list of best-practice road safety measures in Europe?**

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- Please give a short statement about what qualifies the measure as "Best Practice" in Europe.