Study on the prevention of drink-driving by the use of alcohol interlock devices

Final Report

Client: European Commission, DG for Mobility and Transport

Rotterdam, 18 February 2014

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Ecorys, The Netherlands

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SWOV, The Netherlands
ADV consultancy & research, The Netherlands

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Executive Summary

Background to the study

In July 2010 the European Commission adopted the Policy Orientations on Road Safety for 2010-2020. One of the strategic objectives identified by the Commission is the enforcement of road safety rules. Among the Commission's priorities in this field is the prevention of driving under the influence of alcohol (drink-driving).

As part of the continued effort to prevent drink-driving, thereby increasing road safety, the Commission wants to examine the possibility to make alcohol interlock devices mandatory for certain categories of drivers or vehicles. To this end the present study analyses the role of alcohol in road safety and the experience with alcohol interlocks in the EU and third countries in the prevention of drink-driving. It further explores the advantages and disadvantages of possible (legal) measures by the European Union, among which socio-economic costs and benefits.

Alcohol and road safety

An extensive review of existing literature has been carried out, leading to the following conclusions:

- Alcohol affects the driving skills already at low levels. The effect is gradual, there is no sudden transition from unimpaired to impaired driving capability;
- The fatality risk increases exponentially with the blood alcohol content (BAC) level of the driver. The risk for drivers with low BAC levels (0.1 tot 0.5 g/L) is 1 to 3 times the risk of sober drivers. For drivers with a BAC level of 0.5 to 0.8 g/L it is already up to 20 times higher, increasing to 5-30 times for drivers with BAC levels of 0.8 to 1.2 g/L. For high BAC offenders the risk is 20-200 times higher that of sober drivers.

Drink driving in Europe

On the basis of available studies the following conclusions can be drawn on drink-driving in Europe:

- Drink-driving occurs frequently in the EU. The share of drivers having been driving with BAC-levels above the legal limit in the past month varies from 2% in some Member States, to above 30% in others.
- On the basis of an extensive study on alcohol use in Europe, it has been concluded that 3.45% of all passenger car kilometres in Europe are being driven by drivers under the influence of alcohol (0.1 g/L or higher), while 0.4% of all kilometres are being driven with a BAC level of 1.2 g/L or higher.
- Based on a detailed assessment by Member State, it is concluded that 20 to 28 % of all road fatalities in the EU in 2012 can be attributed to drink-driving. This equals 6,000 to 8,500 road fatalities in that year.
- On average almost 75% of all seriously injured and killed drivers who where positive for alcohol had a BAC level above 1.2 g/L. This leads to the conclusion that high BAC offenders are responsible for the vast majority of alcohol related road accidents.

Alcohol interlock programmes

The first pilot on rehabilitation programmes involving the installation of alcohol interlocks in cars of drink-driving offenders started in Sweden in 1999. A permanent programme for drink-driving offenders followed in 2003. Other Member States with rehabilitation programmes for high-BAC offenders are Finland (as of 2008), Belgium (2010) and The Netherlands (2011).

Participation rates in these programmes differ, from around 35% in Sweden and The Netherlands, to only one driver in Belgium. The level of participation is related to the legal situation: in Belgium a court conviction is required, while in the Netherlands this is not the case.

Apart from rehabilitation programmes, some Member States have preventive programmes, such as Sweden (trucks, buses, taxis), Finland (professional drivers; mandatory installation in vehicles that transport pupils) and France (buses).

Other countries have developed plans, but not (yet) implemented alcohol interlock programmes. There are various barriers to implementation, among which legal barriers (legislation is not in place) and bureaucratic (procedures not in place, or not being implemented), or barriers related to cross border issues (harmonisation of codes on driving licences indicating the enrolment in a rehabilitation programme, harmonisation of standards).

Other barriers are more technical, such as problems with retrofitting new car models with alcohol locks, intrusiveness of the use of present generation interlocks and the possibility to circumvent the interlock. The problems now experienced with the use of the alcohol interlocks may be solved in future when systems based on new technologies (e.g. spectrometry) become available.

Lastly, there are various issues related to data management (reporting needs and standardisation; feedback and confirmation) and read-out of data (privacy and security) that need attention.

Possible measures at EU level

Based on the evidence presented above five options have been formulated for possible action by the European Union. These are:

1. Stimulating the exchange of information and best practices among all Member States;
2. Harmonisation of technical and cross border aspects of the use of alcohol interlocks;
3. Adoption of legislation offering the option of a rehabilitation programme involving alcohol interlocks, as alternative to revocation of driving licence, to all high BAC offenders in the Union;
4. Adoption of legal measures involving the compulsory preventive use of alcohol interlocks in all commercial goods vehicles or all buses and coaches;
5. Adoption of legislation requiring all passenger vehicles on European roads to be equipped with alcohol interlocks.

Stakeholders

The analysis presented above and the five policy options have been shared with stakeholders by means of a stakeholder questionnaire and a meeting in Brussels. Although the opinions of stakeholders differ considerably on the options involving legal measures, more uniformity of opinion was found for actions involving exchange of information and harmonisation.

Costs and benefits to society

Based on an overview of advantages and disadvantages of the policy options for groups of stakeholders, a socio economic cost benefit analysis has been carried out comparing each option with a business-as-usual situation. The CBA reveals that:

- The policy options *Stimulating exchange of information* between Member States and *Harmonisation* show a favourable benefit cost ratio and have relatively low risks.
- The potential benefits of offering *rehabilitation programmes to all high BAC offenders* in Europe can easily outweigh costs.
- The benefits of Issuing legislation in order to prevent all *professional drivers of goods vehicles* in the European Union from driving while having consumed alcohol could potentially also outweigh costs, provided that the alcohol interlocks are sufficiently effective (no cheating possible).

Other policy options show less favourable benefit/cost ratio's.

- The option of having an alcohol interlock device installed in *all passenger cars* shows a Benefit Cost ratio of 0.8 to 1.3, depending on the effectiveness of the device in avoiding accidents. This option is presently hampered by disadvantages like the intrusiveness of the devices, which contribute to the low acceptance of such devices. However, if in future the devices would become less intrusive and costs of having an alcohol interlock build-in in all passenger cars would reduce substantially, for instance as a result of economies of scale in production or technological development, the option of making an alcohol interlock a compulsory device in all passenger cars could also show a robust net benefit to society.
- The policy option to have an alcohol interlock device installed in all *buses and coaches* in the EU shows the least favourable ratio between benefits and costs (0.3). The reason for this is the low number of road deaths that can be attributed to drink-driving by bus/coach drivers.

Recommendations

Based on the analysis it is recommended that the European Union:

- further stimulates the exchange of knowledge and best practices on the use of alcohol interlocks among Member States;
- together with the stakeholders, focuses on harmonisation of technical and cross border aspects of the use of alcohol interlocks as preventive measure;
- drafts guidelines on the possibility to offer an alcohol interlock programme to high BAC offenders, as an alternative to the revocation of the driving licence, in all Member States;
- closely follows and if necessary stimulates the development of new generation alcohol interlocks, with a view to future compulsory installation ex-factory in specific groups of vehicles, like commercial goods vehicles.

1 Introduction

In the context of a framework contract with the European Commission, DG for Mobility and Transport, the COWI consortium has been awarded the contract to perform a study on the prevention of drink-driving by the use of alcohol interlock devices.

The study has been carried out by Ecorys Netherlands, member of the COWI consortium, in cooperation with the consultancy organisations SWOV and ADV. This report presents the findings of this study in accordance with the Terms of Reference (see Annex 1).

1.1 Context and background

In July 2010 the European Commission adopted the Policy Orientations on Road Safety for 2010-2020. One of the strategic objectives identified by the Commission is the enforcement of road safety rules. Among the Commission's priorities in this field is the prevention of driving under the influence of alcohol (drink-driving).

Despite lower alcohol limits, increased enforcement and awareness campaigns, drink-driving is still a major safety problem. According to recent data from the DRUID study[1], alcohol-impaired road users are involved in about a quarter of all fatal crashes in Europe.

As part of the continued effort to prevent drink-driving, thereby increasing road safety, the Commission wants to examine the possibility to make alcohol interlock devices mandatory for certain categories of drivers or vehicles.

1.2 Objectives of the study

Following the Terms of Reference (ToR), the purpose of this study is to provide the Commission with relevant information that will assist in:

- deciding whether or not to propose EU legislative measures requiring the installation of alcohol interlock devices as a means to prevent drink-driving, and
- determining to what extent vehicle and device standardisation is deemed necessary.

Therefore, this study assesses the possible effects of the use of alcohol interlocks on road collisions caused by drink-driving in all EU Member States[2], as well as its cost/benefit implications.

Based on this assessment, and a process of stakeholder consultation, the study provides recommendations on the mandatory implementation of alcohol interlock devices in vehicles at EU level, and appropriate categories of drivers and/or vehicles that should be subject to these measures. Furthermore, the study recommends on the level of vehicle and device standardisation that is deemed necessary for effective installation of alcohol interlock devices.

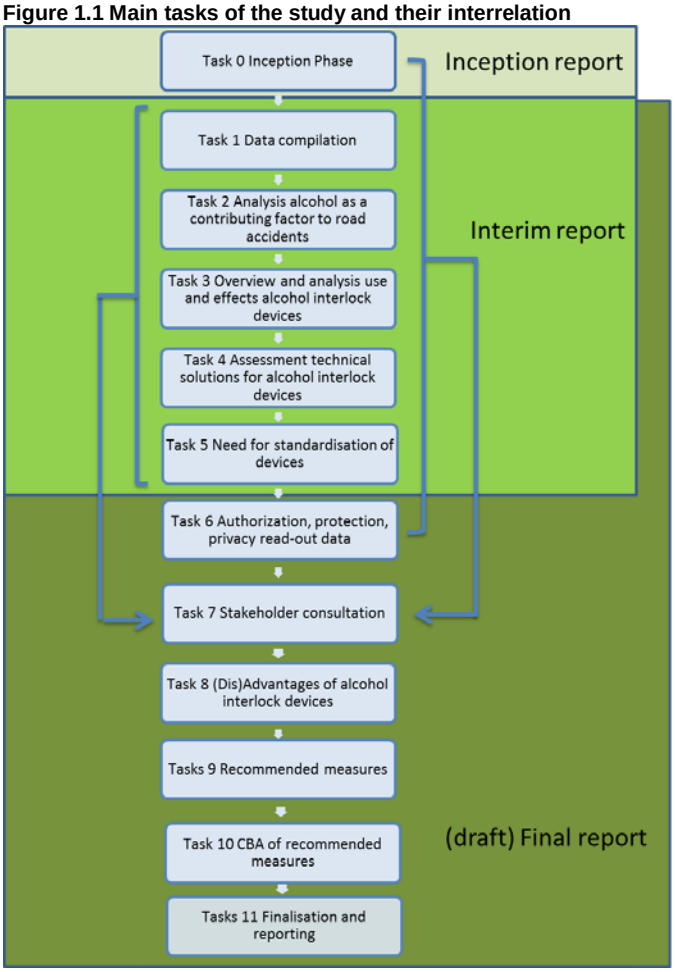
[1] DRUID (2012) Driving Under the Influence of Drugs, Alcohol and Medicine, Integrated Project 1.6. Sustainable Development, Global Change and Ecosystem 1.6.2: Sustainable Surface Transport, 6th Framework Programme.

[2] As the study was started in December 2012, Croatia has not yet been included in the analysis.

1.3 Methodology

The study consists of the following main tasks, which follow the ToR. The figure below shows the tasks and their interrelation.

Figure 1.1 Main tasks of the study and their interrelation



The study relies on the combination of extensive desk research and direct interaction with stakeholders. The tasks 1 and 7 provide the main input for the analysis that has been carried out in the other tasks. In particular the input from tasks 1-7 has been used in task 8 to provide an integral assessment of advantages and disadvantages, and in task 10 to assess costs and benefits of possible measures. This assessment underpins the recommendations concerning the adoption of EU measures on alcohol interlock devices.

1.3.1 Desk research

Systematic desk research has been carried out of all available sources of information on alcohol related fatalities in road traffic, as well as on the development, implementation and impact of alcohol interlock devices. The data sources include general literature; websites; EU and national statistical databases; EU Member States' national legislation; targeted reports by stakeholder organisations; reports of EU funded and Member States' projects dealing with road safety, alcohol and alcohol interlock devices.

1.3.2 Stakeholder interaction

A stakeholders consultation has been carried out, consisting of a questionnaire and a stakeholders meeting in which the results of the questionnaire have been discussed. A detailed online questionnaire has been designed and submitted to 140 stakeholders, including representatives of

government agencies, research organisations, consultants, industry (car industry, manufacturers of alcohol interlocks, transport operators) and various public interest groups

The consultation collected the views and opinions of stakeholders about the potential road safety benefits deriving from the use of alcohol interlock devices, and the possibility to adopt EU measures. The results of the consultation have been discussed and finalised at the stakeholders meeting held in Brussels on 1 July 2013.

In addition to the stakeholder consultation, the consultants participated in various meetings and seminars:

- The 121st Meeting of the European Commission Working Group on "Motor Vehicles"(MVWG), 04 February 2013, Brussels. The MVWG includes representatives from the European Commission, Member States, Accession Countries and European stakeholder organisations and associations.
- The Nordic ignition interlock meeting, 12-13 March 2013, Oslo. The meeting was attended by representatives of governmental bodies only. The aim of the meeting was to exchange information and to learn from each other's experience in working with alcohol interlock related issues.
- The Safe and Sober workshop in the Belgian Federal Parliament in Brussels, 5 September 2013.

1.4 Structure of the report

This report contains the following chapters:

Chapter 2 provides an analysis of the **role of alcohol** as a contributing factor in road accidents.

Chapter 3 describes and analyses the experiences in Member States and third countries with the installation and use of **alcohol interlock devices,** and in which context the device is used (e.g. voluntary or mandatory use, part of a specific rehabilitation programme, means to obtain insurance benefits).

Chapter 4 provides an overview of the **different types of technical solutions** for alcohol interlock devices (e.g. single breath sample, multiple breath sampling, remote sensing). For each of these technical solutions a qualitative (and if possible quantitative) evaluation of its advantages and disadvantages has been carried out, including aspects like installation and use, accuracy and precision, technical complexity, reliability, maintenance, cost and the risk of fraud to bypass the system.

Chapter 4 also reviews the need for (additional) specific **standardisation** of alcohol interlock devices and for enabling the compatibility between vehicles and devices (e.g. facilitating applications with standard vehicle interface). Lastly, this chapter describes and analyses applied measures with regard to **read-out of data**, namely who is authorised to do so and the protection of privacy.

Chapter 5 reviews the potential **benefits for road safety** and of the mandatory installation of alcohol interlock devices for all vehicles, for certain categories of vehicles and for certain categories of drivers.

Chapter 6 presents **alternative means to reduce drink-driving** in road traffic and gives evidence of the effectiveness of these measures (e.g. of stronger enforcement).

Chapter 7 provides the results of the **stakeholder consultation** on the use and effectiveness of alcohol interlocks in improving road safety.

The analysis of the a**dvantages and disadvantages** of various policy options with respect to alcohol interlock devices is presented in Chapter 8.

In chapter 9 an assessment is made of the **costs and benefits** of these policy options.

Lastly, on the basis of the overview of advantages and disadvantage and the cost benefit analysis, chapter 10 provides **conclusions** concerning the adoption of EU measures on alcohol interlock devices.

2 Alcohol and road accidents

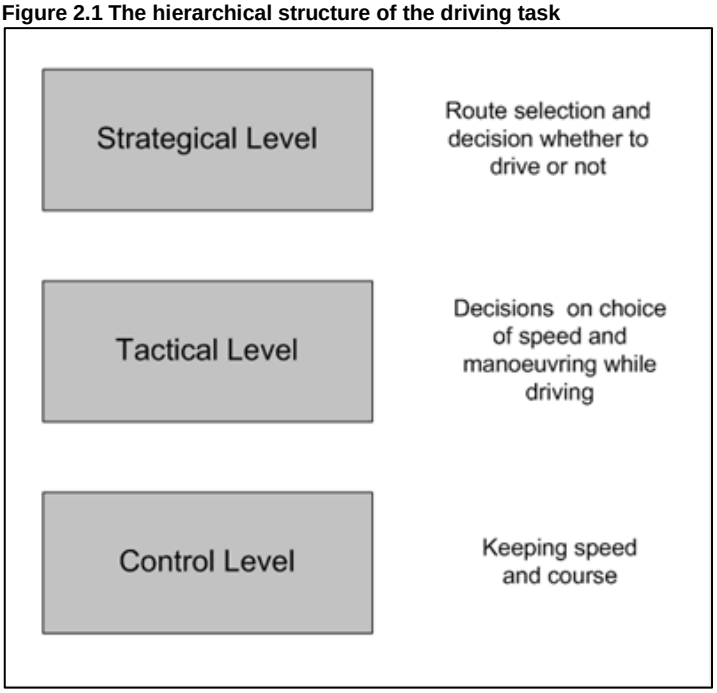
2.1 Effect of alcohol use on driving performance

2.1.1 Even low levels of alcohol can impair driving skills

The effects of alcohol on mental and physiological functions are numerous, causing both acute and chronic impairments. Amongst others, alcohol intoxication impairs a wide range of skills necessary for carrying out the many tasks involved to drive a vehicle.

The driving tasks that determine overall driving performance can be divided in three different levels (see figure below) that can be active at the same time and can influence each other.

Figure 2.1 The hierarchical structure of the driving task



Source: Michon, 1985

The *strategic* level defines the general planning stage of a trip, including the determination of trip goals, route and modal choice, plus an evaluation of the costs and risks involved. Deciding on whether or not to drive when one has consumed alcohol, or even when one is planning to consume alcohol, falls within this category.

At the *tactical* level drivers exercise manoeuvre control, allowing them to negotiate the prevailing circumstances. It involves tasks in relation to route navigation, the interaction with other traffic and adherence to the rules of the road. Examples include actions like overtaking, turning or gap acceptance.

The *control* level consists of tasks at operational level. These tasks are the basic actions to operate vehicle control functions and keep speed and course. They include steering, changing gear, accelerating, braking, but also actions like switching on the windscreen wipers.

Alcohol affects task performance at all three levels. Extensive research has shown that the many skills involved in driving are not all impaired at the same Blood Alcohol Content (BAC) levels. The

vast majority of this research focusses on the effects alcohol has on the tasks at the control level and the tactical level. Studies by Moskowitz & Fiorentino (2000), Caird et al. (2005) and Schnabel (2012) provide overviews and meta-analyses of studies on the effect of alcohol on driving performance.

The studies demonstrate that:

- Some of the main skills required at the *control* level are already affected at low BAC levels. Skills at this level include tracking, psychomotor skills, visual functions as well as driving reaction time (including simple reaction time and choice reaction time).
  - Tracking and driving performance are most affected by alcohol with impairment beginning at very low BACs around 0.02%. Also psychomotor skills are considerably affected by rather low BACs.
  - Impairment of visual functions occurred at BACs of 0.04% and increases substantially with higher BACs.
  - The reaction time on a visual detection task (perception) when driving starts to decrease significantly at a BAC of 0.08%.
  - Choice reaction time begins to deteriorate at a BAC of 0.06%. With choice reaction drivers have to respond differently to two stimuli. For example, in a laboratory test environment this can be simulated by requesting participants to press separate buttons depending on the stimulus. This in contrast to simple reaction tests in which a driver would have to press a key as quickly as possible after a stimulus (auditory or visual) has been presented. For simple time tasks the minimum BAC is considerably higher before significant prolonged reaction times appear[3]. Simple reaction time is the least sensitive parameter to the effects of alcohol.
- Skills required at a *tactical* level include dividing attention, scanning capabilities, and, more in general, information processing.
  - Alcohol impaired drivers have more difficulties with maintaining the proper course of the vehicle and therefore they focus more on the driving task and less on the environment. Some studies have found that decreases in the ability to divide attention between the driving task and another task start at BACs between 0.03% and 0.1% BAC (depending on the complexity of the second task); considerable impairment only occurs at higher BACs.
  - Eye movement studies (Buikhuisen and Jongman, 1972; Marple-Horvat et al., 2007) show that alcohol impaired drivers are more likely to use their central sight and less their peripheral sight. As a consequence they may overlook information on coming events like sharp bends and oncoming traffic. Studies found that impairment of general information processing occurs at BACs of 0.04%.

Compared to studies on the impact of alcohol on the performance of a driver at the control and tactical levels, the impact at the *strategic* level has been studied far less. Probably because skills and actions at this level cannot be studied in driving simulators or instrumented vehicles. Nevertheless, it is well known that after having consumed alcohol, self-control becomes less stringent and even when a little drunk, people are more inclined to think that they are still able to drive safely (Steyvers and Brookhuis, 1996). It is thus concluded that alcohol has a significant negative impact on the strategic level.

Based on meta-analysis of the findings of 450 studies Schnabel (2012) has established a global impairment function. The study concludes that, similar to most skills for more specific driving tasks, alcohol impairs general safe driving capability at BACs of 0.05%, with motor functions being more affected than cognitive functions and complex tasks more than simple tasks. The study also concludes that there is no evidence of a threshold effect for alcohol. Alcohol gradually affects

[3] DaCoTA (2012) Alcohol, Deliverable 4.8a of the EC FP7 project DaCoTA.

driving skills. There is no sudden transition from unimpaired to impaired occurring at a particular BAC level.

2.1.2 Alcohol use also affects road safety in other ways

Apart from the negative effects of alcohol on the performance of the driving task, alcohol intoxicated drivers are also known to wear their seat belts less often than sober drivers (Andersen et al., 1990; Desapriya et al., 2006; Isalberti et al., 2011; Li et al., 1999). Furthermore, the physical health of alcohol dependent persons is believed to be lower than that of persons who do not drink much alcohol on a regular base. An important acute effect in relation to road safety is that the muscles weaken. This could also cause a higher chance of getting (more severely) injured in case of a traffic crash (Shepherd and Brickley, 1996).

2.2 Alcohol use in European traffic

It is clear that alcohol use impairs driving performance. This section first reviews the prevalence of impaired driving in Europe, before assessing its impact on road safety in terms of injury and fatality risks.

Several studies have been conducted on the use of alcohol in European traffic. However, definitions of drink-driving and research methods applied differ from country to country. This makes it difficult to make a fully accurate comparison of the prevalence of drink-driving in EU Member States. Despite the differences the studies nevertheless still provide a clear picture on the overall situation in Europe and general differences between Member States. A short overview of the results of relevant studies is provided here.

2.2.1 DRUID roadside surveys

Between 2007 and 2011 the European research project DRUID (Driving Under the Influence of Drugs, Alcohol, and Medicines) was conducted. The DRUID-project is probably the most comprehensive project ever in the field of driving under the influence. This large-scale project included 13 national studies on the prevalence of psychoactive substances (including alcohol), which were conducted according to a uniform study design.

Data on alcohol use (and the use of other psychoactive substances) was collected from 13 European countries during all times of the day and all days of the week to get a representative sample of psychoactive substances use in national traffic. All data were collected using a uniform protocol and using the same cut-off levels. Although data is available for countries from all European regions, some large European countries did not participate in these studies, among which the United Kingdom, Germany and France. Furthermore, some roadside surveys suffer from large shares of non-response, which make the data less reliable and less usable (Houwing et al., 2011).

Table 2.1 presents the results of the 13 prevalence studies on alcohol use in traffic that were conducted within the European research project DRUID.

The results of these studies show that alcohol is the most commonly used psychoactive substance in European traffic. Based on these results it was estimated that on average 1.65% of all drivers in European traffic are driving with a blood alcohol concentration (BAC) of 0.5 g/L or higher (Houwing et al., 2011). For alcohol levels above 0.1 g/L the estimated prevalence was 3.85%.

The prevalence of alcohol in traffic varies between 0.1% in Hungary and 5.23% in Italy. On the scale of European regions a pattern can be seen: in the Eastern and Northern European countries that were included in the DRUID study, the use of alcohol in traffic was below average (except for Lithuania which scored just above the weighted European mean), whereas in Southern Europe alcohol use in traffic is above average.

Table 2.1 Prevalence of alcohol (0.5 g/L and higher) in general traffic

Country	BAC limit	Prevalence of alcohol in traffic (0.5 g/L and higher)
BE	0.5 g/L	2.16%
CZ	0.0 g/L	0.45%
DK	0.5 g/L	0.48%
ES	0.5 g/L	1.62%
IT	0.5 g/L	5.23%
LT	0.4 g/L	2.31%
HU	0.0 g/L	0.10%
NL	0.5 g/L	0.61%
PL	0.2 g/L	0.58%
PT	0.5 g/L	1.22%
FI	0.5 g/L	0.26%
NO	0.2 g/L	0.06%

Source: Houwing et al (2011)

2.2.2 SARTRE4 study

These findings on regional differences in drink-driving patterns are supported by the findings of the study SARTRE4 (Social Attitudes to Road Traffic Risk in Europe). This European study focused on attitudes, opinions and perceptions of road users regarding several traffic safety issues, such as drink-driving. Amongst others, the study has provided data for 17 European countries on the frequency with which drivers have driven above the legal limit in the past month.

Table 2.2 gives an overview of the results of the SARTRE project. As legal BAC limits vary between the countries, not only the share of alcohol use above the limit is presented in table 2.2, but also the share of respondents that indicated to have never driven a car in the past month after having drunk alcohol (even a small amount).

In total 12,507 car drivers were asked for their self-reported alcohol use in traffic. Of these drivers 31% reported to have driven a car in the past month after taking an amount of alcohol, with the highest shares of self-reported drink-driving found in countries in Southern and Western Europe (respectively 46% and 37%) and the lowest shares in the North (10%) and Eastern (17%) European countries.

The share of drivers that reported to have driven with *alcohol above the legal limit* in the past month is the highest in South European countries (14-34%) and the lowest in Northern (2-9%) and Eastern Europe (2-12%). In Western Europe (7-26%) the share of drink drivers was roughly between that of the Southern and the other European sub regions.

The results on the question whether *any alcohol* was used in traffic in the past 30 days show a similar pattern, but the variation between the results is generally larger (especially for those countries with legal BAC limits that are relatively high).

Table 2.2 Self-reported drink-driving behaviour

Country	Legal limit	Drink-driving above the legal limit in the past month	Drink-driving with any amount of alcohol in the past month
BE	0.5 g/L	26%	39%
CZ	0.0 g/L	12%	14%
DE	0.5 g/L	10%	33%
EE	0.2 g/L	4%	11%
EL	0.5 g/L	14%	38%
ES	0.5 g/L	26%	42%
FR	0.5 g/L	19%	45%
IE	0.5 g/L	9%	19%
IT	0.5 g/L	33%	59%
CY	0.5 g/L	34%	51%
HU	0.0 g/L	5%	5%
NL	0.5 g/L	7%	32%
AT	0.5 g/L	20%	43%
PL	0.2 g/L	2%	2%
SI	0.5 g/L	11%	34%
FI	0.5 g/L	2%	13%
SE	0.2 g/L	2%	8%

Source: SARTRE

Furthermore, the study found that countries with low legal limits (0.0-0.2 g/L) all have a relatively low share of self-reported drink-driving. Self-reported drink-driving in countries with a legal BAC limit of 0.5 g/L was significantly higher.

It is important to understand that these shares are based on the incidental use of alcohol in the ***past 30 days***. These figures are therefore higher than those on the prevalence of alcohol in traffic as described in section 2.2.1, which measure alcohol use in traffic at a given moment.

2.2.3 Share of alcohol offenders

Another indicator of alcohol use in traffic is the share of alcohol offenders per country. An alcohol offender is a driver with a BAC level which is higher than the legal BAC limit. Table 2.3 provides an overview of the share of alcohol offenders among drivers that were tested for alcohol at roadside police checks in 2008. Additionally, information is provided regarding the legal limit and (if available) the number of police tests per 1,000 inhabitants. These results were collected from the PIN4 report from the ETSC (ETSC, 2010).

The share of alcohol offenders that were caught by the police during roadside police checks varies between 0.8% in Sweden and 9.5% in Poland. These figures are difficult to interpret since the roadside checks are not comparable between the countries on aspects such as randomness, the place and time of the road checks, and on the relative ease for (alcohol impaired) drivers to avoid the alcohol checks. Furthermore, the legal limit differs between the countries.

Table 2.3 Number of police tests for alcohol per 1,000 inhabitants and share of alcohol offenders per country

Country	Legal limit	Police tests alcohol per 1,000 inhabitants (2008)	Share alcohol offenders (above legal limit) roadside police checks (2008)
EE	0.2 g/L	95	1.1
EL	0.5 g/L	135	3.1
ES	0.5 g/L	112	1.8
FR	0.5 g/L	190	3.3
IE	0.5 g/L	128	3.2 (legal limit 0.8 g/L in 2008)
CY	0.5 g/L	182	5.9 (legal limit 0.9 g/L in 2008)
LT	0.4 g/L	40	1.7
HU	0.0 g/L	130	3.1
AT	0.5 g/L	87	5.8
PL	0.2 g/L	47	9.5
PT	0.5 g/L	63	5.9
SI	0.5 g/L	200	5.8
FI	0.5 g/L	385	1.3
SE	0.2 g/L	287	0.8
IS	0.5 g/L	69	2.2

Source: ETSC (2010)

2.2.4 Alcohol consumption in the general population

Alcohol consumption in the general population may be used as a surrogate measure for alcohol use in traffic, under the assumption that higher alcohol consumption would, in general, lead to higher alcohol use in traffic. Establishing a direct relationship, however, may be difficult, since the use of alcohol in traffic is also influenced by other factors, such as the legal alcohol limit and enforcement activities.

Table 2.4 provides an overview of general alcohol use in Europe. The first indicator includes the alcohol consumption per capita of 15 years and older. The other indicators are based on the results of a survey on the attitudes of European citizens towards alcohol. This survey was conducted in 2009 on behalf of the EC Directorate-General Health and Consumers. The survey applied a standard method that is used for the Standard Eurobarometer surveys of the EC Directorate-General Communication ("Public Opinion and Media Monitoring Unit"). Frequent drinking is defined as the use of alcohol in the past 30 days on a daily base, and heavy drinking is defined as drinking at least once a week 5 or more alcoholic drinks. For both indicators a ranking has been made for the included countries.

The results show that frequent drinking is relatively more common in Southern European countries, whereas binge drinking seems to be relatively frequent in countries in other European regions such as Ireland, the UK, Romania, Austria and Germany.

Table 2.4 Alcohol use in Europe

Country	Litres alcohol consumption per capita aged 15+	Share of respondents that used alcohol in the past 30 days on a daily base	rank	Share of respondents that had at least one time a week 5 or more alcoholic drinks	rank
BE	12.0	14%	8	28%	9
BG	11.5	14%	8	18%	20
CZ	16.6	7%	17	24%	13
DK	12.9	12%	13	22%	16
DE	12.9	9%	16	36%	3
EE	14.1	4%	20	18%	20
EL	10.6	13%	10	34%	5
ES	13.1	23%	3	34%	5
FR	12.7	20%	5	20%	18
IE	12.9	3%	22	44%	1
IT	9.6	25%	2	30%	8
CY	9.5.	6%	19	26%	11
LV	n.a.	2%	24	11%	27
LT	13.0	1%	25	18%	20
LU	12.8	17%	6	14%	25
HU	14.2	11%	14	24%	13
MT	8.0	17%	6	26%	11
NL	9.7	21%	4	23%	15
AT	13.0	7%	17	36%	3
PL	13.6	1%	25	19%	19
PT	13.4	43%	1	28%	9
RO	16.3	13%	10	39%	2
SI	15.3	13%	10	18%	20
SK	14.6	4%	20	17%	24
FI	12.3	3%	22	22%	16
SE	8.9	1%	25	13%	26
UK	12.5	11%	14	34%	5

Source: Special Eurobarometer 331; n.a. = not available

2.3 Effect of alcohol on injury and fatality risks

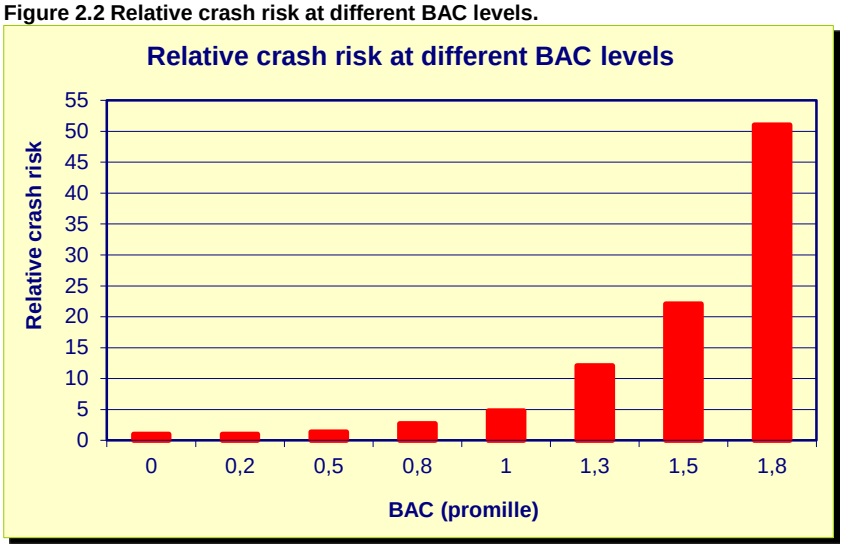
2.3.1 Effect of alcohol on injury risk

As part of the DRUID project, a population based case-control study has been executed to estimate the risk of getting seriously or fatally injured in a car crash due to the use of psychoactive substances (Hels et al., 2011). The combined results of these studies show that the highest risk of getting seriously injured or killed is associated with driving with high alcohol concentrations (above 1.2 g/L) and alcohol combined with other psychoactive substances. These two groups indicate extremely high risks of about 20-200 times the risk of sober drivers.

Other high risk groups are drivers with medium blood alcohol concentrations (between 0.8 g/L and 1.2 g/L). The risks indicated for this group are about 5-30 times that of sober drivers. A medium increased risk level of about 2-10 times that of sober drivers was found for alcohol concentrations between 0.5 and 0.8 g/L.

The relative risk associated with a low alcohol concentration (between 0.1 g/L and 0.5 g/L) is estimated to be elevated with 1-3 times the risk that of sober drivers. These findings of exponential increase of risk by BAC-level are in line with the results of previously conducted case-control studies, such as the study from Blomberg et al. (2005) which is presented in figure 2.2.

Figure 2.2 Relative crash risk at different BAC levels.

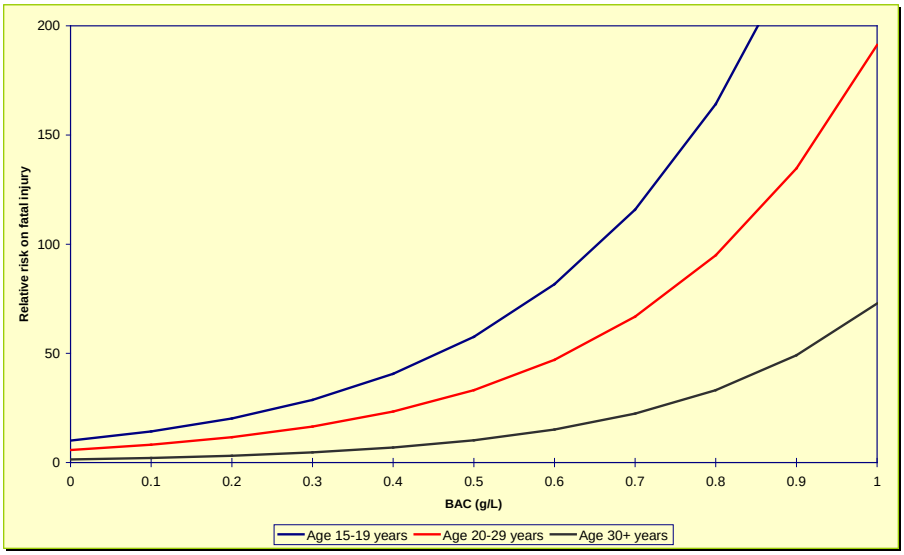


Source: Blomberg et al. (2005)

Despite the fact that young drivers generally consume less alcohol when driving than older drivers, they are overrepresented in the group of casualties and drivers involved in alcohol-related crashes (Mathijssen & Houwing, 2005). Due to their lack of experience, young novice drivers not only have a higher crash rate even when they are sober, but their crash rate when driving after having consumed alcohol increases faster than that of older, more experienced drivers (Keall et al., 2004). This can be seen in Figure 2.3.

Furthermore, young males (aged 18-34) have been found to test positive three times more often for the combination of drugs and alcohol than other groups. The combination of alcohol and drugs leads to an extremely high relative risk of getting seriously injured in a car crash (Hels et al., 2011).

Figure 2.3 Relative risk on fatal injury by age



Source: Keall et al, 2004

2.3.2 *Alcohol related road fatalities in Europe*

Information on the number of alcohol related fatalities on European roads is mainly based on official statistics that are available at the national level. Apart from these statistics, two additional sources are available: results from epidemiological studies on substance use among injured and killed road users and estimates from national experts.

Recorded drink-driving fatalities

Information on the official recorded number of drink-driving fatalities is available from data published by the European Transport Safety Council in the report "Drink-driving: Towards Zero Tolerance" (ETSC, 2012). In this report data is presented for 30 European countries for 2001 to 2010. In approximately 50% of the countries the national definition of deaths attributed to drink-driving is based on the definition that was recommended by SafetyNet: *Any death occurring as a result of a road accident in which any active participant was found with a blood alcohol level above the legal limit*. For the other countries definitions are used that do not emphasize all road users, but are e.g. related to killed drivers only.

Table 2.5 provides an overview of the share of the recorded drink-driving fatalities in Europe for the EU 25 plus Norway and Switzerland. Data is presented for 2005, 2008 and 2010. The first two years have been chosen for reasons of comparability, since they relate to the year for which most of the estimates from national experts were available (2005) and the year for which the results of most DRUID studies were gathered (2008). The final year (2010) is the year for which most recent data are available at the moment of this study on alcohol interlock devices.

Recorded data on drink-driving fatalities are available for 29 European countries (including Norway and Switzerland) for the year 2005; 2008 data are available for 25 countries; and data for the year 2010 are available for 28 European countries. The median for the share of alcohol related road fatalities for 2005 is 11.1% (range 2 to 37.9%), for 2008 8.7% (range 3.3 to 41.7%), and for 2010 13.5% (range 0.8 to 43.3%). It has to be kept in mind, though, that the underreporting varies per country, that different definitions are used and that these data are based on the legal limit prevailing in the particular country (ETSC, 2010).

Table 2.5 Share of road deaths attributed to alcohol

Country	Legal BAC limit	Official statistics 2005	Official statistics 2008	Official statistics 2010
BE	0.5 g/L	3.5%	5.7%	4.7%
BG	0.5 g/L	4.9%	4.2%	na
CZ	0.0 g/L	5.5%	7.9%	13.5%
DK	0.5 g/L	25.7%	22.9%	25.1%
DE	0.5 g/L	11.2%	11.7%	9.4%
EE	0.2 g/L	37.9%	41.7%	30.0%
EL	0.5 g/L	10.7%	7.5%	7.0%
ES	0.5 g/L	28.2%	28.0%	31.0%
FR	0.5 g/L	28.8%	28.3%	30.8%
IE	0.5 g/L	29.8%	n.a.	n.a.
IT	0.5 g/L	2.0%	4.3%	n.a.
CY	0.5 g/L	22.5%	23.2%	43.3%
LV	0.5 g/L	21.7%	18.4%	10.1%
LT	0.4 g/L	13.7%	11.0%	10.7%

Country	Legal BAC limit	Official statistics 2005	Official statistics 2008	Official statistics 2010
LU	0.5 g/L	n.a.	n.a.	34.4%
HU	0.0 g/L	12.8%	11.1%	8.3%
MT	0.8 g/L	n.a.	n.a.	n.a.
NL	0.5 g/L	4.4%	3.3%	2.8%
AT	0.5 g/L	7.3%	7.7%	5.8%
PL	0.2 g/L	8.4%	8.6%	6.9%
PT	0.5 g/L	4.7%	5.5%	n.a.
RO	0.0 g/L	7.3%	8.7%	8.2%
SI	0.5 g/L	37.0%	36.0%	35.5%
SK	0.0 g/L	6.2%	4.0%	0.8%
FI	0.5 g/L	23.5%	27.9%	23.5%
SE	0.2 g/L	11.1%	9.7%	16.1%
UK	0.8 g/L	16.5%	15.8%	13.5%
NO	0.5 g/L	3.5%	5.7%	4.7%
CH	0.5 g/L	4.9%	4.2%	n.a.

Results from epidemiological studies on substance use in injured and killed drivers

Another source for assessing the alcohol related road toll are epidemiological studies that have been conducted in various European countries. Results are available from the European DRUID-project (2006-2011) (Isalberti et al., 2011), the French SAM-study (2001-2003) (Amoros et al., 2010) and the European IMMORTAL-project (2000-2004) (Assum et al., 2005).

Epidemiological studies on substance use in injured and killed drivers from the sources mentioned above have been conducted in 12 European countries. The studies include both information on alcohol use in killed and in seriously injured drivers. Table 2.6 provides an overview of the results from these studies per country, categorized by injury severity (seriously injured and fatally injured). For each study the share of alcohol intoxicated drivers was used who had a BAC of 0.5 g/L or higher.

Within the group of injured drivers, the share of car drivers positive for alcohol above 0.5 g/L varies between 14.9% in Norway and 38.2% in Belgium. For the group of fatally injured this share varies between 16.3% and 60.9%. The median scores are 23.6% and 29.3% for injured and killed car drivers respectively. These medians are much higher than the medians of the reported number of road fatalities related to drink-driving.

Most epidemiological studies show outcomes within a relatively close range for the various countries. The one exception is the Lithuanian culpability study on killed drivers that was conducted in the European DRUID-project. The study found that the share of killed drivers in Lithuania who were positive for alcohol (60.9%) is more than 2 times higher than the mean share of alcohol positive drivers in all other studies involving killed drivers, and even 4 times higher than the share of seriously injured drivers in Lithuania that tested positive for alcohol (16.1%). Therefore, it is likely that the share of drink-driving fatalities in the Lithuanian study was subject to a selection bias, which caused a large overrepresentation of fatally injured drink-drivers.

Table 2.6 Results from the European research project DRUID, the Sam-study, and the European research project IMMORTAL

Country	Legal BAC limit	results injury studies BAC 0.5+	results fatality studies
BE	0.5 g/L	38.2%	
DK	0.5 g/L	17.8%	
DE	0.5 g/L		19%
FR	0.5 g/L		28.6%
IT	0.5 g/L	20.6%	
LT	0.4 g/L	16.1%	60.9%
HU	0.0 g/L		31.1%
NL	0.5 g/L	28%, 26.5%	
PT	0.5 g/L		35.1%
FI	0.5 g/L	30.2%	29.3%
SE	0.2 g/L	16.3%	
NO	0.2 g/L	14.9%	23.8%

Estimates from national experts

Apart from the official recorded statistics and results from the epidemiological studies road deaths attributed to alcohol, estimates from national experts are also available as a data source.

Table 2.7 provides an overview of estimates of the share of drink-driving fatalities provided by national experts. These estimates are derived from three different publications (Assum and Sørensen, 2010; Buttler, 2005; ETSC, 2013). Most of these estimates are higher than the reported share of drink-driving fatalities.

Table 2.7 Estimates on the share of alcohol related road fatalities from national experts

Country	Legal BAC limit	Expert estimates
CZ	0.0 g/L	15-20%
FR	0.5 g/L	Official data are reliable (28-30%)
NL	0.5 g/L	20-25%
AT	0.5 g/L	18%
PL	0.2 g/L	13%
SE	0.2 g/L	25 and 25-30%
UK	0.8 g/L	Official data are reliable (13-16%)

Estimates from national experts have been found in literature for 7 countries ranging from 13% in Poland to 25-30% in Sweden. The expert opinion on the data on drink-driving fatalities from France and the UK was that the official statistics provided reliable data (Assum and Sørensen, 2010). For Sweden two estimates were found. One estimate in Assum et al. (2010) estimating a share of 25% of alcohol related road fatalities, whereas an interview with a Swedish national expert published in the Drink-driving Monitor number 18 of the ETSC (2013) included an estimate 25-30%.

2.4 Assessment of the share of alcohol-related road fatalities in Europe

One of the main tasks of this study is to assess the present European share of road fatalities due to drink-driving. According to an estimate by the European Commission, approximately a quarter of all road fatalities are related to alcohol (ETSC, 2010). This estimate has been used in official EU publications in the past years, but may not be up to date anymore due to changes in drink-driving patterns in the past decade. This section presents an assessment of current estimates on the share of road fatalities due to drink-driving in the EU.

2.4.1 Methodology to assess the share of alcohol-related road fatalities

The estimate for alcohol related road fatalities on European roads is ideally calculated by summing the alcohol related road fatalities for all European countries and divide this number by the total number of road fatalities in Europe. However, calculating a European share based on these data is faced with at least three issues:

The first issue relates to the comparability of alcohol related road fatalities in the various European countries. Between 2004 and 2008, the European SafetyNet project was conducted, in which the comparability and usability of road safety performance indicators in Europe were studied. In this project the following definition for an alcohol fatality was recommended (ETSC, 2012): *Any death occurring as a result of a road accident in which any active participant was found with blood alcohol level above the legal limit*.

However, not all countries use the SafetyNet recommended definition. Furthermore, those countries that use the SafetyNet recommended definition, may not have comparable data due to different legal limits. E.g. in the United Kingdom, only killed drivers with BAC above the legal limit of 0.8 g/L are included in the national definition of death attributed to drink-driving, whereas in Lithuania novice and professional drivers with a BAC above the legal limit of 0.2 g/L and all other drivers with a BAC above the legal limit of 0.4 g/L are included.

The second issue relates to the quality of the data. Not all countries include systematic testing of all road users who are involved in crashes. In some countries, such as Belgium and the Netherlands, drivers who are killed on the spot are not tested on alcohol, which leads to an underreporting of alcohol use in traffic. Underreporting is rarely mentioned in official documents. Therefore, it is very difficult to know whether official statistics on the share of road fatalities due to drink-driving are reliable or not.

A third issue is the availability of the data. The most recent national data on the number of alcohol related road fatalities that are available relate to the year 2010. The estimate that is prepared in this study thus reflects the situation in 2010. As the share of drink-driving fatalities may either have increased or decreased in the past few years, the present situation may thus deviate from the 2010 picture.

As described in section 2.3, two alternative sources of data may be usable when estimating the share of drink-driving fatalities in European traffic.

The first alternative source consists of the results of epidemiological studies on substance use among killed and seriously injured drivers. Within the recently finished European research project DRUID, six studies were conducted on substance use in seriously injured drivers and four studies on killed drivers. The limitation of this source is that data is only available for nine European countries and that for some countries the number of included drivers was very low (e.g. only 54 drivers were included in the Finnish study on seriously injured drivers). A low number of samples

leads to less precision of the data which could affect the representativeness of the study. Furthermore, culpability studies were conducted in the DRUID project collecting data on fatally injured car drivers in five European countries. Additionally, some older results from the European research project IMMORTAL and the French SAM-study are usable as well.

The second alternative source is based on expert estimates. National experts often have a better understanding of the quality of data and are therefore able to come up with good expert estimates. However, these expert opinions are difficult to retrieve from literature and are only available for a few countries.

By combining the results from the official statistics with the results from epidemiological studies and expert estimates, a first impression can be derived of the quality of the official recorded shares of alcohol related road fatalities. This does not constitute a structural assessment of the quality of the data, which is outside the scope of this study, however, if the results of official statistics are in line with the experts' estimates and/or the results of the epidemiological studies, we consider the official statistics as reliable.

For countries for which no alternative country data is available from other sources to compare with official statistics on drink-driving fatalities, a comparison can be made with selected other countries for which drink-driving fatality statistics have been "tested" and found plausible. In case the official statistics in the former show similar shares of drink-driving fatalities to the latter, tested, benchmark countries, than also the national statistics for these countries are assumed to be reasonably reliable as well.

For countries for which data epidemiological studies and/or expert opinions is available, but the results strongly deviate from the official statistics, the results of the epidemiological studies and/or expert opinions are considered leading for the estimated share of alcohol related road fatalities. To reflect the higher level of uncertainty concerning this data[4], a bandwidth has been used in this study of +5 per cent points and -5 per cent points for data from epidemiological studies and/or national expert estimates. The band width is chosen for practical reasons and based on a doubling of the bandwidth that is commonly used by national experts (5%).

After the three steps described above, we use data on the prevalence of alcohol in traffic to assess the alcohol related road toll in EU Member States for which results obtained are thought to show a relatively strong bias. We compare prevalence data of these Member States, with neighbouring Member States that already were included in the assessment. Based on this comparison we create estimates for the final countries. These estimates are probably less reliable and will therefore be surrounded by a larger band width of +10% and -10%.

The result is an estimated share of alcohol related road fatalities per country. The estimated share of alcohol related fatalities per country is used in the final step to calculate a European estimate. This European estimate is calculated by using the following formula:

- Lower estimate European alcohol related road toll = sum of (Lower estimate (%) per country * total number of road fatalities per country for the year 2010).
- Higher estimate European alcohol related road toll = sum of (Higher estimate (%) per country * total number of road fatalities per country for the year 2010).

For calculating the European share, these figures need to be divided again by the total number of road fatalities in Europe for the year 2010.

[4] Uncertainty rises also from the fact that many of the known expert estimates are several years old and might not be applicable anymore for the present situation.

2.4.2 *Resulting estimate in five steps*

In this section we discuss the results of each of the five steps of the method to estimate the share of alcohol related fatalities in Europe.

Step 1: Combining official statistics on the share alcohol related road fatalities with the results of epidemiological studies and estimates of national experts

Table 2.8 integrates the results from table 2.5 to 2.7 in one table. By comparing the recorded data with expert estimates and data from epidemiological studies on killed and injured drivers, an indication can be provided for some countries on the reliability of the recorded crash data.

Table 2.8 Overview of all information regarding the alcohol related road toll

Country	Legal BAC limit	Official statistics 2005	Official statistics 2008	Official statistics 2010	results injury studies	results fatality studies	Expert estimates
BE	0.5 g/L	3.5%	5.7%	4.7%	38.2%		
BG	0.5 g/L	4.9%	4.2%	n.a.			
CZ	0.0 g/L	5.5%	7.9%	13.5%			15-20%
DK	0.5 g/L	25.7%	22.9%	25.1%	17.8%		
DE	0.5 g/L	11.2%	11.7%	9.4%		19%	
EE	0.2 g/L	37.9%	41.7%	30.0%			
EL	0.5 g/L	10.7%	7.5%	7.0%			
ES	0.5 g/L	28.2%	28.0%	31.0%			
FR	0.5 g/L	28.8%	28.3%	30.8%		28.6%	Official statistics are regarded as reliable data
IE	0.5 g/L	29.8%	n.a.	n.a.			
IT	0.5 g/L	2.0%	4.3%	n.a.	20.6%		
CY	0.5 g/L	22.5%	23.2%	43.3%			
LV	0.5 g/L	21.7%	18.4%	10.1%			
LT	0.4 g/L	13.7%	11.0%	10.7%	16.1%	60.9%	
LU	0.5 g/L	n.a.	n.a.	34.40%			
HU	0.0 g/L	12.8%	11.1%	8.3%		31.1%	
MT	0.8 g/L	n.a.	n.a.	n.a.			
NL	0.5 g/L	4.4%	3.3%	2.8%	28%, 26.5%		20-25%
AT	0.5 g/L	7.3%	7.7%	5.8%			18%
PL	0.2 g/L	8.4%	8.6%	6.9%			13%
PT	0.5 g/L	4.7%	5.5%	n.a.		35.1%	
RO	0.0 g/L	7.3%	8.7%	8.2%			
SI	0.2 g/L	37.0%	36.0%	35.5%			
SK	0.0 g/L	6.20%	4.00%	0.8%			
FI	0.5 g/L	23.5%	27.9%	23.5%	30.2%	29.3%	
SE	0.2 g/L	11.1%	9.7%	16.1%	16.3%		25% and 25-30%
UK	0.8 g/L	16.5%	15.8%	13.5%			Official statistics are regarded as reliable data

Based on the comparison between the official statistics and the other sources we assume that the recorded statistics of drink-driving fatalities in Denmark (25.1% in 2010), France (30.8% in 2010), Finland (23.5% in 2010), United Kingdom (13.5% in 2010) and Norway (19.0% in 2010) are reliable.

Step 2: Comparing data that are considered reliable with data from countries which were not assessed in step 1

The recorded share of alcohol related fatalities in 2010 for the five countries identified in step 1 varies between 13.5% (United Kingdom) and 30.8% (France), the median is 23.5% (Finland). The share of alcohol related fatalities in the United Kingdom is relatively low, what might be caused by the higher legal BAC limit (0.8 g/L). Furthermore, the share of alcohol related fatalities dropped in the United Kingdom from 15.8% in 2008 to 13.5% in 2010.

For countries for which no data is available from other sources than the national statistics, it is assumed that these national statistics are sufficiently reliable in cases the recorded shares fall within the same range as the shares recorded for the countries identified in step 1.

Based on the inventory of the data in table 4.1 we regard the recorded data on alcohol fatalities from Estonia (30% in 2010), Spain (31% in 2010), Cyprus (43.3% in 2010), Luxemburg (34.4% in 2010), Slovenia (35.5% in 2010), and Switzerland (19.3% in 2010) as being reliable as well. Although for Ireland only data was available for 2004 (29.8%), this share seems to be in line with those of the other countries which are assumed to have reliable data. Therefore, we also use the older data of Ireland as an estimate.

For Latvia the share of alcohol related fatalities dropped drastically in 2010 (10.1% compared with 18.4% in 2008 and 21.7% in 2005). A large drop like this could also be caused by a change in the recording of alcohol in fatal crashes. Therefore, in the calculation of the total share of alcohol related road fatalities for the EU, this study uses the Latvian share of alcohol related road fatalities of 2008 (18.4%) instead of the share in 2010.

The share of alcohol related road fatalities in Cyprus for 2010 (43.3%) is almost twice as high the share in 2005 (22.5%) and 2008 (23.2%). The total number of traffic fatalities is relatively low with less than 100 fatalities a year, which increases the possibility of large fluctuations of the share of alcohol fatalities between the years. Due to the relatively low number of traffic fatalities the impact on the estimated European share of alcohol related fatalities is negligible.

Although no alternative data sources are available for comparison, it is assumed that, based on the size of the share, the recorded data on drink-driving fatalities are also acceptable for these countries.

Step 3: Replacing official statistics with estimates from national experts and with estimates based on epidemiological studies

This list of countries can be expanded by including those countries for which data is available from studies on fatal or seriously injured drivers or from expert opinions. In case the estimated shares of alcohol related road fatalities from epidemiological studies or national experts deviate 5 per cent points from the values in the official statistics, the results from the epidemiological or expert review have been adopted in this study with a band width of +5 per cent points and -5 per cent points.

In this step estimates for Belgium (33.2%-43.2%), Czech Republic (15-20%) Germany (14%-24%), Italy (15.6%-25.6%), Hungary (26.1%-36.1%), Austria 18%, and Poland 13% are included.

For Lithuania, the Netherlands, and Sweden more than one source estimate was available. For these countries we have based the results on a combination of the sources. For all three countries this has led to an estimate of 20-30% of road fatalities related to alcohol.

Step 4: Assessing the alcohol related road toll based on prevalence data for those countries that were excluded from the first three steps

For Bulgaria, Greece, Slovakia, Romania, and Malta no estimates of alcohol related road fatalities are available yet. To include estimates for these countries surrogate data for drink-driving fatalities might provide an indication of the share of drink-driving fatalities. The estimate for these five countries is based on a comparison for the surrogate data with countries from the same European region. Both Greece and Malta are compared with other Southern European countries, whereas Bulgaria, Slovakia, and Romania are compared with Middle and Eastern European countries.

The additional assessment for the five countries is presented in table 2.9.

Table 2.9 Alcohol related road toll in five Member States

Country	Legal BAC limit	Estimated share of drink driving fatalities	limit, Sartre4	any alcohol, Sartre4	liters alcohol consumption per adult	alcohol past 30 days	rank	share heavy alcohol users	rank	Police tests per 1,000 population (2008)	Share alcohol offenders (pin4) 2008
EL	0.5 g/L	**20%-40%**	14%	38%	10.6	13%	10	34%	5	135	3.1
MT	0.8 g/L	**15%-35%**			8	17%	6	26%	11		
ES	0.5 g/L	31%	26%	42%	13.1	23%	3	34%	5	112	1.8
IT	0.5 g/L	15.6%-25.6%	33%	59%	9.6	25%	2	30%	8		
CY	0.5 g/L	43.30%	34%	51%	9.5	6%	19	26%	11	182	5.9*
PT	0.5 g/L	35.10%			13.4	43%	1	28%	9	63	5.9
SK	0.0 g/L	**10%-30%**			14.6	4%	20	17%	24		
BU	0.5 g/L	**20%-40%**			11.5	14%	8	18%	20		
RO	0.0 g/L	**25%-45%**			16.3	13%	10	39%	2		
CZ	0.0 g/L	15-20%	12%	14%	16.6	7%	17	24%	13		
HU	0.0 g/L	26.1%-36.1%	5%	5%	14.2	11%	14	24%	13	130	3.1
AT	0.5 g/L	18%	20%	43%	13	7%	17	36%	3	87	5.8
PL	0.2 g/L	13%	2%	2%	13.6	1%	25	19%	19	47	9.5
SI	0.5 g/L	35.50%	11%	34%	15.3	13%	10	18%	20	200	5.8
* legal limit 0.9 g/L in 2008											

Step 5: Combining the national estimates to a European estimate

Table 2.10 presents the combined results of both the assessment on indicators and the assessment on the surrogate measures. For each country the estimated share of drink-driving fatalities is provided as a bandwidth with an upper and a lower limit.

Table 2.10 Estimated drink-driving fatalities in Europe

Country	Legal BAC limit	Estimated share of drink-driving fatalities	Total number of traffic fatalities (2011)	Estimated number of drink-driving fatalities (low)	Estimated number of drink-driving fatalities (high)
BE	0.5 g/L	33.2%-43.2%	858	285	371
BG	0.5 g/L	20%-40%	658	132	263
CZ	0.0 g/L	10%-25%	773	77	193
DK	0.5 g/L	25.10%	220	55	55
DE	0.5 g/L	14%-24%	4009	561	962
EE	0.2 g/L	30%	101	30	30
EL	0.5 g/L	20%-40%	1114	223	446
ES	0.5 g/L	31%	2060	639	639

Country	Legal BAC limit	Estimated share of drink-driving fatalities	Total number of traffic fatalities (2011)	Estimated number of drink-driving fatalities (low)	Estimated number of drink-driving fatalities (high)
FR	0.5 g/L	30.8%	3963	1221	1221
IE	0.5 g/L	29.8%	186	55	55
IT	0.5 g/L	15.6%-25.6%	3860	602	988
CY	0.5 g/L	43.3%	71	31	31
LV	0.5 g/L	18.4%	179	33	33
LT	0.4 g/L	20%-30%	296	59	89
LU	0.5 g/L	34.4%	33	11	11
HU	0.0 g/L	26.1%-36.1%	638	167	230
MT	0.8 g/L	25%-45%	17	4	8
NL	0.5 g/L	20%-30%	661	132	198
AT	0.5 g/L	13%-23%	523	68	120
PL	0.2 g/L	8-18%	4189	335	754
PT	0.5 g/L	35.1%	891	313	313
RO	0.0 g/L	25%-45%	2018	505	808
SI	0.2 g/L	35.5%	141	50	50
SK	0.0 g/L	10%-30%	323	32	97
FI	0.5 g/L	23.5%	292	69	69
SE	0.2 g/L	20%-30%	319	64	96
UK	0.8 g/L	13.5%	1960	265	265
NO	0.2 g/L	19%	168	32	32
CH	0.5 g/L	19.3%	320	62	62
Total EU27			**30,353**	**6,018**	**8,395**
Total EU27+ 2			30,841	6,112	8,489

The estimated share of alcohol related fatalities per country is used in the final step to calculate a European estimate. This European estimate is calculated by using the following formula:

- The lower estimate of the European share of alcohol related road fatalities = sum of the lower estimate of all countries divided by the total number of road fatalities.
  Based on the input from table 2.10 we estimate that the lower estimate for the alcohol related road fatalities in EU27 = 6,018/30,353= 19.8%.
- The higher estimate of the European share of alcohol related road fatalities = sum of the higher estimate of alcohol related road fatalities of all countries divided by the total number of road fatalities.
  Based on the input from table 2.10 we estimate that the higher estimate for the alcohol related road fatalities in EU27 = 8,395/30,353 = 27.8%.

2.4.3 Conclusion

The results of this assessment indicate that an estimated 20-28% of the road fatalities in the EU is related to alcohol use. It needs to be kept in mind that this estimate is based on the information available and that all sources that have been used to arrive at this estimate have their limitations.

The average of this estimate is just below the estimate of 25% that has been used in official EU documents for the past years. Since official figures tend to underestimate the share of alcohol related road fatalities (Assum and Sørensen, 2010), it is likely that the actual share is closer to the higher end of the estimate of 28% than to the lower end of 20%. Therefore, it is concluded that the previous estimate that 25% of all road fatalities are related to alcohol, is still acceptable and should not be discarded.

At the same time, it should be realized that the fact that alcohol was involved in the crash resulting in serious injuries and fatalities, it can not be stated with a 100 per cent certainty that alcohol actually caused the crash and subsequent outcomes. However, experimental studies that show the effect of alcohol on driving skills, demonstrate that at high(er) BAC levels, alcohol is increasingly likely to be the most important contributing crash factor. Since drivers with high BAC's are involved in almost three quarters of all alcohol crashes with seriously injured drivers, we assume that the *contributing* effect of alcohol in serious and fatal crashes will not be that much lower than the estimated 25% in which alcohol is *involved*. Given this uncertainty on the contributing effect, we use a higher and a lower estimate of potential road safety benefits of alcohol interlock use on a European level, respectively of 75% and 100%, in the cost benefit analysis.

2.5 Target groups and the share of alcohol-related road fatalities in Europe

2.5.1 Professional drivers

Alcohol use in traffic

Information on alcohol use in traffic by professional drivers is sparse. To our knowledge no studies on alcohol use in traffic by taxi drivers and drivers of school buses exist.

For truck drivers, a recent Norwegian study (Assum and Erke, 2009) among 2836 truck drivers shows that only 0.035% of these drivers had breath alcohol concentrations above the Norwegian legal limit of 0.2 g alcohol per kilogram in blood. In a more recently published study by Gjerde et al. (2012) among drivers in the south-eastern part of Norway, 0.1% of truck drivers (n=882) were positive for alcohol above the legal limit, whereas 0.5% of car and van drivers (n=5305) were positive. After adjustment for gender, age, nationality and time period, truck drivers were found to have an 8 times smaller chance of being positive for alcohol than drivers of cars and vans.

An Australian study (Drummer et al., 2007) among different types of drivers reports that 0.5% of the truck drivers (n=1901) appeared to have a BAC above the legal limit of 0.2 g/L alcohol. An older study from the United States (Lund et al. 1988) found no alcohol concentrations above the legal limit among 317 truck drivers that were stopped at the roadside.

Furthermore, a recent French study (Labat et al., 2008) collected urine samples from 1000 truck drivers at the work place. In total 50 drivers (5%) were positive for alcohol. This study, however, has two limitations. First, drivers were not selected from traffic, but at the work place. A second limitation is the use of urine samples for determining substance use. The presence of alcohol and other substances in urine provides information on substance use, but it is difficult to determine how recent a substance has been used by urine sampling (Verstraete, 2004).

A national survey on drug use and health that was conducted between 2002 and 2004 in the United States (US Department on Health and Human services, 2005) found that 8.8% of the full time workers reported to be a heavy alcohol user (5 or more drinks on 5 different occasions within the past 30 days). Truck drivers were more likely to be a heavy alcohol user (11.2%), whereas bus drivers were less likely (2.7%).

In Finland, no national statistics exist on drink-driving among professional drivers. However, according to regional police data 8.6% of the drink-drivers in traffic were professional drivers.

A Canadian study on alcohol and drug consumption by Quebec truck drivers (Lemire et al., 2002) found that 2 of the 2,629 breath tested truck drivers (0.08%) had a blood-alcohol level higher than the legal limit. Another six truckers had traces of alcohol in their blood, but below the limit (between 20 and 80 mg), making up 0.2% of the population.

Alcohol use and traffic accidents

Apart from studies on alcohol use in traffic by professional drivers, studies are also available on alcohol use by truck drivers injured in traffic accidents. However, no studies were found for alcohol related fatalities or injuries among taxi drivers and drivers of school buses.

A study from the United States (Crouch et al., 1993) that was conducted to assess the impact of alcohol and other drug use in the trucking industry, found in 13% of the blood samples from 168 fatally injured truck drivers traces of alcohol use. During the same period the total share of alcohol-related fatalities was much higher with shares just above 40% (Stewart and Fell, 2007).

A French study (Longo et al., 2000) analysed blood samples from fatally injured drivers and found that 5.5% of fatally injured truck drivers (n=55) were positive for alcohol, whereas 12.7% of fatally injured car drivers were positive for alcohol (n=2164).

A Finnish evaluation study on alcohol interlocks for professional drivers (Vehmas et al., 2012) reported that in Finland, the share of drink-driving accidents among heavy-traffic accidents is relatively small with 2.5% , whereas the estimated share of all drink-driving accidents in Finland is around 25%.

The results from a recently conducted Belgian hospital study (Isalberti et al., 2011) found among 22 seriously injured truck drivers no alcohol positives, whereas for seriously injured drivers of personal cars (n=171) 30.9% were positive for alcohol.

Dutch official crash figures also found no seriously injured or killed truck and bus drivers who were positive for alcohol in the period 2006-2011 (source: Dutch accident database BRON). Data for taxi-drivers were not available since it is not possible to distinguish taxi drivers from other drivers in person vehicles in the official Dutch accident data.

Both injury studies and studies on the prevalence of alcohol at the roadside indicate that alcohol use among truck drivers is lower than among car drivers. Based on the NSDUH study it may be assumed that the prevalence of alcohol is also lower among drivers of school buses and taxi drivers. The exact share of alcohol related fatalities among professional drivers is difficult to determine due to the sparse data.

2.5.2 *Alcohol use among high BAC offenders*

Within the European DRUID project information has been collected on substance use in European traffic and among seriously injured and killed drivers. Alcohol is the most commonly used psychoactive substance in European traffic. According to an estimate of the DRUID-project (Houwing et al., 2011) 3.45% of all vehicle kilometres driven by car drivers in Europe are driven while being positive for alcohol at blood alcohol concentrations (BAC) of 0,1 g/L or higher, and 0.39% of the vehicle kilometres is estimated to be driven with BAC's of 1.2 g/L and higher.
This estimate is based on the prevalence of psychoactive substances recorded in roadside surveys during all time periods of the day and all days of the week in thirteen European countries. The prevalence found in the participating countries was weighed taking into account differences in traffic volumes for the different time periods and days of the week, and taking into account the number of inhabitants of each of the participating countries.

In the same DRUID-project information has been collected on the prevalence of alcohol and other psychoactive substances in seriously injured (six countries: BE, DK, FI, IT, LT and NL) and killed drivers (four countries: FI, NO, PT, and SE) (Isalberti et al., 2011). The total alcohol use (above 0.1 g/L) varied between 17.7 and 42.5% in the injury studies, while for the studies of killed drivers the share of alcohol positive drivers varied between 19% and 44.9%. On average almost three quarter of all seriously injured and killed drivers who were positive for alcohol, had high BAC levels above 1.2 g/L (Hels et al., 2011).

These European outcomes are in line with results from studies from the US. Analysis of US data on fatalities in alcohol-impaired-driving crashes from 2010 (NHTSA, 2012) showed that in 70% of alcohol-impaired-driving fatalities, at least one driver in the crash had a BAC of 1.5 g/L or higher.

2.5.3 *Repeat and first time offenders*

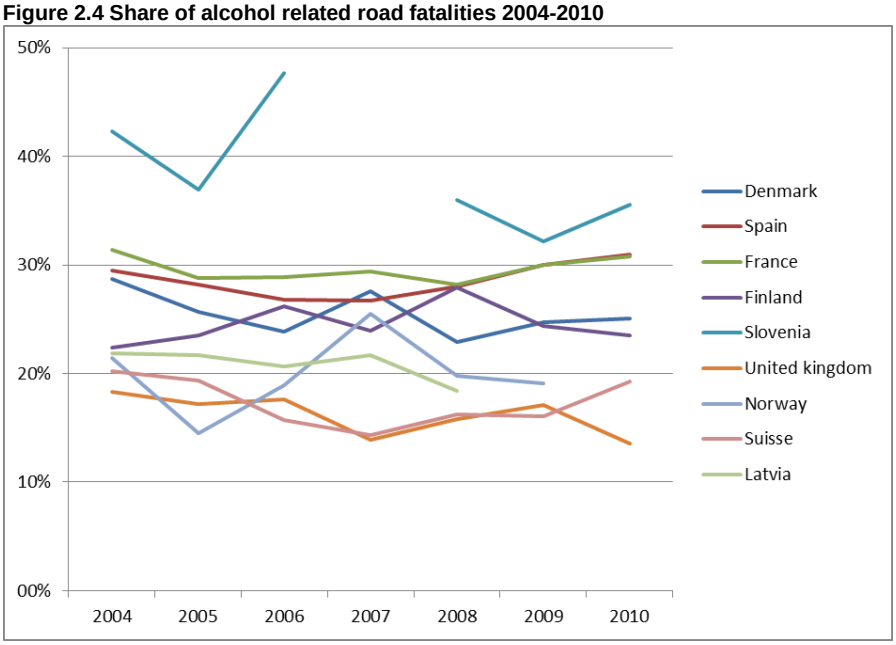
First-time offenders more closely resemble repeat offenders than non-offenders, according to a statement in Elder et al. The idea that there should be any important difference between the risk posed by a first offender and a repeat offender is unsupported (Voas, Roth, Marques, 2005). The average first offender has driven drunk many times before he or she was arrested.

The big risk difference is between non-offenders and first offenders. The risk difference between first offenders and repeat offenders is small by comparison." The use of biomarkers as predictor for high recidivism rates has been researched in Canada (Couture et al., 2010; Ouimet et al., 2007). In this study no distinction was found between first time offenders and recidivists on several biomarkers.

2.6 Development of drink-driving fatalities over time

The development of the share of alcohol related road fatalities can be analysed for those countries that are assumed to have reliable data available for the period 2004-2010 (see section 2.4). Such data is available for nine countries: Denmark, Spain, France, Finland, Slovenia, United Kingdom, Norway, Suisse, and Latvia. Figure 2.4 provides an overview of the trend in these countries.

Figure 2.4 Share of alcohol related road fatalities 2004-2010



The percentages of these European countries show that for each country fluctuations are visible over the years. However, a clear upwards or downwards development is not apparent. Although the scope of information that figure 2.4 provides is limited, it is assume that the development of the European share of road fatalities has been stable in the period 2004-2010, although on country level some fluctuations may have occurred.

3 International experience with alcohol interlocks

This chapter describes the experiences in Member States and third countries with the installation and use of alcohol interlock devices.

3.1 Overview of current alcohol interlock programmes

Two types of alcohol interlock programmes can be distinguished:

6. Alcohol interlock programmes for drink-driving offenders, aimed at preventing recidivism. Target groups may be all offenders or specific groups like high-BAC offenders and/or recidivists. These programmes are generally of a more or less mandatory nature. Some are called 'voluntary', but often the alternative is license revocation.
7. General-preventive alcohol interlock programmes. Here, too, various target groups can be distinguished: the general driving population, (specific groups of) professional drivers – e.g., drivers of school or public transport buses, drivers of trucks, lorries or dangerous goods vehicles, taxi drivers – or problem drinkers[5] with a valid driver's license. Implementation of this kind of programme is generally more or less voluntary, but may be required by employers or clients like e.g. the national road authority of a country.

Apart from the programmes, alcohol interlocks can also be purchased for voluntary private use.

The table on the following page gives an overview of the present status of (introduction of) alcohol interlock programmes in the EU and some non-EU countries. The following sections provide a short description of various programmes.

3.1.1 Current programmes for drink-driving offenders in EU Member States

Currently three EU Member States have an operating programme for drink-driving offenders in place. The first EU pilot of a regional alcohol interlock programme for drink-driving offenders started in **Sweden** in 1999, followed by nationwide implementation in 2003. Since then the programme has provided an alternative for license revocation to drink-driving offenders. In January 2012 a new system was adopted and the share of applications tripled to 33%. During the first 8 months of 2012 over 1,300 offenders applied for participation.

Finland started a pilot programme in 2005 followed by a permanent programme in 2008. During the period 1 July 2008 – 12 June 2012, a total of 1,687 drivers entered the alcohol interlock programme. Since 2012, approx. 50 drivers enter the programme on a monthly basis.

The **Netherlands** conducted a small-scale pilot project aimed at practical aspects of a mandatory alcohol interlock programme for drink-driving offenders in 2008, in preparation of a full-scale programme. From the start on 1 December 2011 until April 2013, almost 6,000 offenders were sentenced to participate in the programmes; the total number of participants by the end of April 2013 was 2,200 (37%).

In **Belgium**, an offender programme came into place in 2010. Since the start, however, only one offender has entered the Belgian offender programme.

[5] A problem drinker is defined as someone who drinks substantial amounts of alcohol over a longer period and due to this intake has problems in functioning, with e.g. health, work or relations. Unlike alcoholics, problem drinkers are NOT physically dependent on alcohol.

Alcohol interlock programmes are currently running in the following EU member states:

Legislation	Pilot project on going	Legislation in preparation	Legislation under discussion in Parliament	Legislation adopted	Legislation in implementation	Rehabilitation programme	Programmes Commercial Transport	Voluntary use interlocks in commercial transport
Austria	√ for school and commercial drivers						√	√
Finland				√	√ for school and day care transport	√	√	√
Sweden				√	√	√	√	√
Netherlands				√	√	√		
France				√	√	√	√ for school buses	
Belgium				√	√	√		√
Denmark						√	√	
Germany	√	√				√		√
United Kingdom								√
Switzerland		√				√		√
Norway		√				√		√

SOURCE: ETSC Alcohol Interlock Barometer from Drink-driving Monitor, May 2013.

3.1.2 *Current preventive programmes in EU Member States*

Besides the offender programmes in Member States, there are several preventive programmes operational in the EU.

Sweden has stimulated the voluntary use of alcohol interlocks in trucks, buses and taxis. The Swedish government started promoting alcohol interlock use by professional drivers in 1999. Fourteen years later, in 2013, the number of alcohol interlock-equipped commercial and public transport vehicles in Sweden has grown to over 75,000. In addition, alcohol interlocks are installed in some trains, trams, ferries and ships (Vehmas et al., 2012). Many municipalities have made installation in school buses mandatory, while the Swedish Road Authority requires trucks that perform transport on its behalf, to have alcohol interlocks installed. Furthermore, Regulation SFS 2009:1 describes the requirements for contracts for the purchase or lease of vehicles or transportation. It requires Swedish authorities to investigate the possibility to acquire transport by vehicles equipped with alcohol interlock devices with the aim to have 75% of all transportation vehicles bought or leased by the Swedish authorities should be equipped with alcohol interlock devices.

According to the Swedish Public Transport Association and the Swedish Transport Administration, alcohol interlocks are currently installed in approximately 60% of all taxis, 85% of public buses and in all cars used in driving school children. Besides alcohol interlocks are used in connection to key cabinets and passage systems at work places[6].

There are only a few alcohol interlocks installed in private vehicles. Swedish Transport Administration believes that, in order to make a next step in decreasing alcohol-related accidents, there is a need to start using vehicle integrated solutions, such as alcohol interlock devices.

In **Finland** a trial regarding voluntary alcohol interlock use in commercial transport took place in 2007–2008 (Vehmas et al., 2012). Five taxi, bus and freight transport companies participated in the trial, which included 64 vehicles and over a hundred drivers.

From August 1st 2011 alcohol interlocks have become mandatory for or all vehicles providing transportation services for pupils until secondary education, and for day care in case transport is organised or (partially) funded by public institutions. In November 2011, an estimated 8,000 alcohol interlocks were in use in commercial transport, the majority in taxis that are used in school and day care transport. Finland intends to extend this requirement to all publicly funded transport services, bus traffic and professional goods transport by 2014.

In **France** a law entered into force on 1 January 2010 that makes an alcohol interlock mandatory for all new vehicles that can transport at minimum 8 people; as of 1 September 2015 all 60,000 French buses need to have an alcohol interlock installed. The law followed after a pilot project started early 2009, in which three bus companies participated with 300 school buses. Early 2010 around 600 French buses had an interlock installed. By February 2013, approximately 10,000 buses were alcohol interlock-equipped (Mercier-Guyon; personal communication, March 2013).

3.1.3 *Plans for alcohol interlock programmes in other Member States*

In 2004, a small-scale regional alcohol interlock programme for drink-driving offenders started in Annecy, **France**, which in 2005 was extended to four other French regions. Preparation for nationwide implementation succumbed.

[6] Swedish Public Transport Association (2013). A Statistical Hub with statistic data concerning environment, traffic safety, and availability (only in Swedish). Retrieved from http://frida.port.se/sltf/ntal/publik.cfm (2013-04-18).

In 2006, alcohol interlock legislation came into place in the **UK**, but to date it has not yet resulted in a specific implementation plan.

The use of alcohol ignition interlock devices is part of the strategy laid out in the National programme for Traffic Safety in **Slovenia**. Preparatory activities to support the implementation of an interlock programme have been underway since 2007 in small scale pilots with voluntary installation of interlock devices in private cars and public transport.

Denmark adopted alcohol interlock legislation for first offenders and recidivists in 2010, but by the end of 2012 the law had not yet come into force, and a date for the start of the programme still had to be set. Denmark has the intention, after the implementation of an offender program, to proceed with voluntary alcohol interlock use in private and public companies and possible groups at risk. The long-term objective is to make alcohol interlocks mandatory in all vehicles (Vehmas et al., 2012).

In 2011 **Austria** started two alcohol lock pilot programmes; one implementing alcohol locks for professional drivers and one installing alcohol locks as a tool for driver rehabilitation.

In **Germany** the Federal Highway Research Institute (BASt) launched a research project and trial in 2011 for a comprehensive programme concept for the use of alcohol ignition interlocks as an additional measure to psychological rehabilitation for drink-driving offenders.

In March 2013, **Ireland** formulated a new road safety strategy, which included the option of a compulsory installation of alcohol interlocks in cars of repeat drink-driving offenders as part of their sentence.

3.1.4 Alcohol interlock programmes outside the EU

The first alcohol interlock device based on a driver's BAC was introduced in the **United States of America** in 1970 (Elder *et al*., 2009). In the early 90's a second generation of devices was introduced in a majority of the United States, which had several features that made circumvention more difficult. In 1992, the National Highway Traffic Safety Administration (NHTSA) integrated these features into a standard model, available for all states. These standards increased the use of interlock devices in the US, up to roughly 110,000 units installed in 2006 and 212,000 in 2010 (Robertson *et al,*, 2011).

Currently, all fifty states have some form of alcohol interlock law in place. Fifteen states have mandatory provisions for all alcohol related offenses: the others either for repeating offenders or specific offenses for which the interlock is mandatory (e.g. when a driver causes an accident and his or her BAC is above a certain limit) (NCSL, 2013). For an overview containing a summary of the legislation of each state, see Annex 2.

In **Canada**, the first alcohol interlock device was installed in 1990, in the state of Alberta. Following successful reviews of the (relatively small) programme in 1997 and 1999, legislation was introduced that gave federal approval to interlock programmes and renewed interest for (further) development of alcohol interlock programmes across the country (Beirness, 2007).

Currently, all ten states and two of the three territories have some form of alcohol interlock programmes in place; only the Nunavut territory has no interlock programme in place (Solomon and Perkins-Leitman, 2013). Next to the formal programmes, the traffic authorities have the ability to impose various terms and conditions on the license of any driver, which can be used to impose interlock orders on federal impaired driving offenders. Nova Scotia has both a mandatory and a

voluntary programme in place: all other provinces and territories have one of the two. Although the exact criteria differ slightly, the inclusion criteria are roughly similar across the country. For a detailed overview of the different voluntary and mandatory programmes, see Annex 2.

In **Norway**, a multidisciplinary working group was installed in June 2011 in order to prepare an alcohol interlock programme for drink-driving offenders. At the end of 2012, the working group completed a report containing preliminary proposals to introduce new legislation to implement an alcohol interlock programme under the existing ”Driving under the Influence Prevention Program” (Harestad, 2012).

In **Australia**, national standards were established for alcohol interlock devices in the early 1990’s. For a variety of reasons, including the costs of the devices, evaluation issues and concerns about the vulnerability of the devices, the standards did not facilitate the development of Australian legislation. It wasn’t until a trial in Queensland commenced in 2001 that court-based implementation was introduced. In the first few years of the 21st century, multiple trials were performed in several states and territories, often followed by legislation (Schonfeld and Sheehan, 2004).

Currently, only the state of Western Australia does not have any legislation in place yet. The state however has a programme ready for implementation, designed in 2003. The exact reason for not implementing this programme are unknown: some sources indicate political reasons (see for instance a press release of the National Drug Research Institute (2013) on this topic). For an overview of alcohol interlock legislation in Australia, see Annex 2.

3.2 Barriers for implementation of alcohol interlock programmes

Several factors that are delaying or preventing EU alcohol interlock implementation will have to be removed in the years to come. The most important ones are legal and bureaucratic barriers. Some striking examples of legal barriers can be found in the Netherlands. A couple of months before the implementation of the mandatory alcohol interlock program, parliament adopted a law which made license revocation inevitable for recidivists with a BAC over 1.3 g/L. Furthermore, first offenders with a BAC over 1.8 g/L were excluded from direct participation in the alcohol interlock program. These offenders have to undergo a medical examination by a psychiatrist in order to find out whether they are fit-to-drive or not. If the psychiatrist decides a person is not fit-to-drive (because he is alcohol-dependent), his driver’s license will be revoked. In practice, more than 75% of these examinations result in the verdict “not fit-to-drive”.

The Dutch government’s decision was based on an assertion by the Dutch Association for Psychiatry (NVvP), not substantiated by facts however, that an alcohol-dependent driver with an alcohol interlock-installed car would be a threat for road safety because of the withdrawal symptoms associated with sobriety. According to NVvP, the alcohol interlock would provoke multiple attempts to stay sober during short periods, thus aggravating withdrawal symptoms with every sober period. In order to check this assertion, the Dutch government commissioned two different studies into this subject. Both studies came to the same conclusion: there is no evidence at all for the psychiatrists’ assertion (Weingart et al., 2010; Nickel, 2010). Nickel’s main conclusions were:

1. the total effect on road safety under the condition of an Alcohol Interlock Programme including alcohol addicted drivers is substantial and exceeds that of other measures;
2. there is no need to introduce an upper BAC limit for the alcohol interlock program.

Evaluation of the Swedish offender programme even produced strong indications of a beneficial health effect. Swedish programme participants, in vast majority diagnosed as problem drinker or alcohol-addicted, needed significantly less hospital care than before entering the program; and also less than a control group with revoked licenses. Furthermore, their number of sick leave days were significantly lower (Bjerre et al., 2007).

In spite of the conclusions of the aforementioned studies, the Dutch government not only decided to maintain the existing limit for a medical examination, but to even lower it from 2.1 to 1.8 g/L BAC. The result was a strong devaluation of the alcohol interlock programme: offenders who need the alcohol interlock programme most are not eligible to participate.

But not only in the Netherlands legal barriers prevent effective implementation of an alcohol interlock programme for drink-driving offenders. Probably all EU countries will have to amend their drink-driving laws in order to make these programmes possible.

Also other bureaucratic issues can prevent drivers from entering into an alcohol interlock programme. For example in Belgium, problems have been reported with the transfer of court orders for alcohol interlocks to convicted drivers. Furthermore, Belgian judges must evaluate when interlock is appropriate. Due to cost- and length-considerations interlocks will probably rarely be imposed in the first years to come.[7]

It is unlikely, however, that this problem could be solved by making the alcohol interlock programme part of the criminal justice system, as is shown by experiences in the USA. For instance, a survey among Utah judges revealed that only 34% of all judges always or regularly sentenced felony DUI offenders to an ignition interlock as a condition of probation. In order to be following the law, this percentage should have been one hundred (Christenson & Haddon, 2004).

In the Netherlands a barrier results from the fact that the police has to inform the Dutch Driving Test Organization CBR about all arrested drinking drivers who are eligible for some kind of administrative measure (driver improvement program, medical examination of fitness-to-drive or alcohol interlock program). According to oral personal communication by a CBR representative, an estimated 50% of eligible drivers are not communicated to CBR by the police. This may be due to the workload of the police and/or the priority the police has to give to the criminal justice system (rather than to administrative procedures).

Apart from legislative problems, technical problems may prevent future installation of alcohol interlocks in offenders' cars. This is due to the fact that vehicle technology is developing more and more into electronically controlled vehicle systems using data bus communication. As a result, after-market installation of alcohol interlocks becomes much more difficult and it is envisaged that today's conventional installation method will no longer be possible in the near future (Lagois, 2012). In order to solve this problem, cooperation between the automotive industry and alcohol interlock manufacturers is required.

Finally, also practical issues regarding cost, maintenance and monitoring require much attention when implementing an alcohol interlock programme for drink-driving offenders (Voas & Marques, 2003). Amongst other evaluations of alcohol interlock programme pilots in Belgium and Sweden have indicated that cost (and duration) for participation in an alcohol interlock programme are too high, in particular compared to traditional sanctions.

[7] Silverans, P. (2012) Implementation challenges in Belgium Alcohol interlock symposium 13 Helsinki, Finland, September 9-11 2012.

4 Technical solutions for alcohol interlock devices

4.1 Alcohol interlock devices

Alcohol interlock devices are systems installed in the vehicle to prevent a driver impaired by alcohol from operating the vehicle. They consist of a detection device, designed to detect and measure the driver's BAC, which is connected to the starting system of a motor vehicle. Once the detection device registers a BAC that exceeds a predetermined limit, it will prevent the vehicle from starting. This limit value is typically lower than the BAC limit set by justice authorities for drinking and driving offences.

Nowadays several types of alcohol interlock devices are on the market, using a variety of (brand) names and techniques, with various technical elements being patented and unique to each system. Moreover, new technologies are under development for potential future application.

In order to describe and evaluate these technical solutions, a distinction is made between interlock devices for use in drink-driving offender programmes and those for general preventive use. As the former are imposed as a sanction following a drink-driving offence, their general requirements logically differ from those devices for all users, regardless of prior drink-driving history.

This distinction in focus between targeting drink-driving offenders versus general prevention can also be found in the technical standards that have been developed for alcohol interlock devices.

4.2 Technical standards for alcohol interlock devices

Technical standards, or model specifications define the minimum requirements and test procedures needed for type approval. They contain technical specifications, features, functionality and qualification testing requirements for alcohol interlock devices.

Technical standards are essential to maintain an acceptable quality of approved devices. Although the standards are by no means intended to define how interlock programmes would function, they still play a critical part of alcohol interlock programme operations. The overall integrity of the programme relies on properly functioning devices that provide accurate readings of BAC levels, with only a minimum of false positive readings and that are difficult to tamper with.

Several countries have adopted technical standards for alcohol interlock devices. Currently the European standards are considered to be one of the most rigorous and comprehensive standards for interlock devices

4.2.1 European standard for alcohol interlock devices

CENELEC working group BTTF 116-2 designed a European standard for breath-alcohol controlled alcohol interlocks, EN 50436. It is an industrial standard (not a legal standard), but the standard is often referenced in European law, as well as laws within EU countries.

In total EN 50436 consists of six parts, some of which are still in the stage of draft.

Parts 1 and 2 of the standard have been adopted by all European member states. These part specify essential performance requirements and test procedures for type testing and are directed at test laboratories and manufacturers of alcohol interlocks. Furthermore, these parts contain instructions for after-market installation, for use and for servicing.

The two parts are:

- *EN 50436-1: Instruments for drink-driving offender programmes.*
  Alcohol interlocks used in programmes for drink-driving offenders should comply with this part of the European standard. The content and requirements of part 1 of EN 50436 are based on the experience and necessities of drink-driving offender programmes in different countries over several decades.

  The original EN 50436-1 document dates from 2005, but is currently under revision. It expected that the new version will be accepted by CENELEC-members by the end of 2013. Differences between the current version and the updated version include amongst others the inclusion of clarified test methods for laboratories; additional anti-circumvention tests and requirements for accessories; more references to ISO standards; and the standardisation of the event descriptions of the data log.

- *EN 50436-2: Instruments having a mouthpiece and measuring breath alcohol for general preventive use.*
  General preventive use concerns a much larger number of drivers and vehicles than usage by offenders and applies to both professional and private drivers of motor vehicles. Main differences with part 1 reflect the fact that these instruments have a general preventive application rather than an enforcement application. These differences include:
  - A data memory in the alcohol interlock is optional.
  - The capability of the alcohol interlock to request retests at random time intervals is optional.
  - The required operational temperature range is smaller (-20 °C to 70 °C ambient temperature).
  - Accuracy of the alcohol concentration for 0,75 mg/l is removed.
  - After expiry of the calibration interval, the alcohol interlock will not be de-activated, but displays a reminder of the expiry.

Also part 2 is under revision and to be accepted later this year. It incorporates the practical experience with alcohol interlocks in European countries during the past decade.

Besides part 1 and 2 the remaining four parts of EN 50436 include:

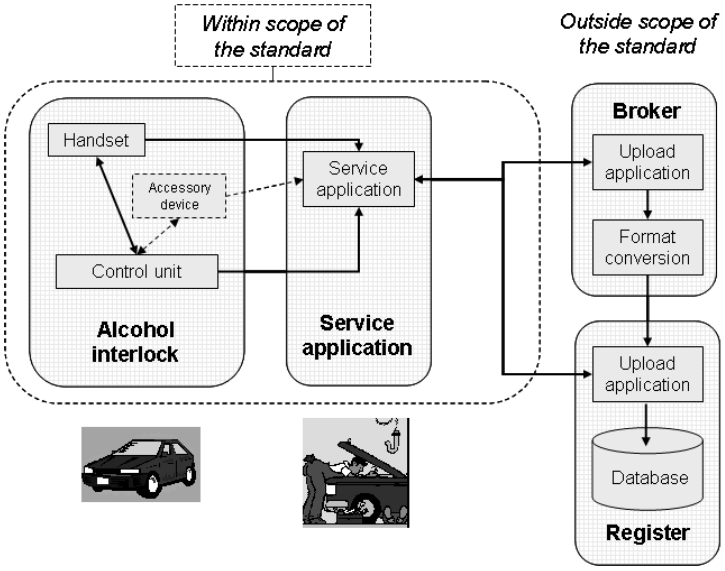
- *EN 50436-3 : Guidance for decision makers, purchasers and users*
  EN-50436-3 is a Technical Report, containing Guidance for decision makers, purchasers and users. Officially published in July 2010, it is operational today, within EU and EEA countries.

- *EN 50436-4 : Connectors for the electrical connection between the alcohol interlock and the vehicle.*
  Draft document prEN 50436-4 contains an effort to create a standard for the electrical connection between the alcohol interlock and the vehicle. The draft was put on hold because it was not accepted by car manufacturers. There is a need for renewed attention to this draft, e.g. as new hybrid vehicles now start to appear in the market without the option of installing alcohol interlocks.

- *EN 50436-5 : Instruments not having a mouthpiece and measuring breath alcohol for general preventive use.*
  Parts 1 and 2 of the European standard do not apply to instruments measuring the alcohol concentration in the ambient air in the vehicle, nor to alcohol interlocks not having a mouthpiece. Draft CENELEC document prEN 50436-5 is a first effort to prepare a European standard for instruments *not having a mouthpiece* and measuring breath alcohol for general preventive use.

- *EN 50436-6 : Data security*
  Draft document prEN 50436-6 relates to the ability of alcohol interlock devices to detect events, such as failed tests, and store records of these events. With the use of a service application the data (event records) can be read out and transmitted, but also deleted .

Figure 4.1 Scope of data security standard EN 50436-6



This registration function is a key element in alcohol interlock *offender* programmes. Therefore, part 6 should primarily be used in conjunction with part 1.

Given the nature of the data that is recorded, data security is of high importance. Data needs to be protected against loss, unauthorized reading, modification, deletion, insertion and disclosure. Therefore, the standard sets security requirements related to the event recording and memory of the interlock device, as well as for the records which are transferred to a register of supervising persons or organizations.

The security requirements apply to the alcohol interlock itself and to the service application that is used to transfer data from the interlock to the register. However is does not apply to data security for systems at the recipients end of the data, nor for the register or databases in which data are kept, or for requirements for organizational processes, for example defining rights of access to the data.

EN 50436-6 is the latest standardisation document prepared by CENELEC Working Group BTTF. By the end of 2013 it will be presented to CENELEC member countries for approval and vote.

4.2.2 *Reciprocity and harmonisation and further development of standards*

At minimum, a technical standard should require that the interlock device functions as expected. It should also facilitate reciprocity, and allow for jurisdictional flexibility to address issues as they arise.

Reciprocity and harmonisation of standards

Mutual acceptance of standards across the EU, or even wider, is seen by various stakeholders as a promising way to further develop the market for and implementation of alcohol interlock devices.

Several parameters (such as alcohol concentration or breath volume) are specified in parts 1 and 2 of the EN 50436 that have been accepted by all Member States with involvement in alcohol interlocks. At the same time EN 50436 already notes that "it may be necessary due to national regulations or depending on user requests to set the values of the prescribed parameters differently when the alcohol interlocks are in use".

National differences between EU Member States in adoption of standards can already be found in relation with EN 50436-6. For example strict national regulations regarding the access and protection of personal data in The Netherlands, resulted in more stringent requirements for the encryption of data and transfer of data compared to other EU countries.

Further differences exists between the EU standards and those of countries outside the EU. Amongst others the USA, Canada, Australia and Japan have also developed their own technical standards for alcohol interlock devices[8].

Finding a consensus about a common standard that indicates the minimum requirements for alcohol interlock devices will remain a challenge for the years ahead. A common international standard, with a minimum requirement defined on the basis of past lessons and good practice examples, could indeed contribute to creating a bigger market for alcohol interlock devices. However, if countries start setting additional requirements above an agreed minimum standard, a bigger market will not easily emerge. This applies to the European standard EN 50436, as well as to any other, more widely applicable international standard that might be developed.

Further development of standards

Looking at the further development of technical standards for alcohol interlock devices it is important to realise that a standard like EN50436 does not contain static requirements. As already mentioned, the European standards EN50436-1 and EN 50436-2 are currently under revision. Also Canada and the USA recently adopted revised standards[9].

Technology is developing continuously and countries are gaining more experience with alcohol interlock programmes and also learning from each other. This leads to new requirements and therefore standards are periodically updated. For example, currently the standards applied in the EU and various other countries are intended for alcohol interlocks that use human breath as the medium for the determination of blood alcohol content, using a mouthpiece to take a breath sample. In the future, it may be possible to detect blood alcohol levels by other methods.

The following sections provide a short overview of some basic characteristics and functionalities of alcohol interlock devices and technological developments. The functionality of alcohol interlock devices and users' perception thereof impacts on the effectiveness of the alcohol interlock use.

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8 In these countries the standards apply to alcohol interlock devices used in offender programmes.

9 In Canada the province of Alberta adopted technical standards in 1992. Canada adopted its first national standard (CSTT-HVC-TR-114) in August 2011. The USA replaced its 1992 Model Specifications in 2013.

4.3 Main technical issues

EN 50436 specifies a performance standard for the alcohol interlock devices in order to guarantee that devices that apply to these standards and have received type approval function as intended.

However, this does not mean that no issues exist regarding the functioning of type approved alcohol interlock devices. The main technical issues identified in studies and from stakeholder consultations are described in this section. These include:

- installation and interference electrical vehicle systems;
- warm up time;
- breath sampling;
- running retests;
- sensitivity alcohol detection, false positives.

4.3.1 Installation and interference electrical vehicle systems

For installing an alcohol interlock into the vehicle it has to be connected to the electric circuits of the vehicle. According to EN 50436 the electrical properties of the vehicle (e.g. alternator, accessories, on-board circuitry, grounding, contact safety etc.) shall not be adversely affected by an alcohol interlock when installed according to the manufacturer's instructions.

Technically, it was so far possible to install alcohol interlocks in all vehicles. However, the technology of vehicles develops more and more into electronically controlled vehicle systems using data bus communication. As a result, installation of alcohol interlocks becomes much more difficult and it is envisaged by CENELEC Working Group BTTF 116-2, that today's conventional installation method will no longer be possible in the near future (Lagois, 2012).

In order to solve this problem, cooperation between the automotive industry and alcohol interlock manufacturers is required.

Draft document prEN 50436-4 prepared by CENELEC Working Group BTTF 116-2, contains an effort to create a standard for the electrical connection between the alcohol interlock and the vehicle. The draft was put on hold because it was not accepted by car manufacturers. There is a need for renewed attention to this draft, e.g. as new hybrid vehicles now start to appear in the market without the option of installing alcohol interlocks.

4.3.2 Warm up time

While warm-up time is an inherent feature of the alcohol interlock (similar to a photocopier), it nonetheless can cause inconvenience and frustration for drivers in extreme temperatures (Beirness et al. 2007). In general the lower the temperature is, the longer the warm-up time gets. As such warm up times typically range from several seconds to several minutes at very low temperatures. Various studies (Burström, 2008; Trafi 2012, 2013) have identified warm up times as one of the largest problems experienced by drivers participating in alcohol interlock programmes. The waiting time results in costs to the user (Svensson Smith, Nilsson & Schönning, 2006). It is however unclear if, or to what extent, these problems could deter drivers in general and drink-driving offenders in particular, from participation in an alcohol interlock programme.

4.3.3 Breath sampling

According to EN 50436-1 and EN 50436-2 alcohol interlock devices used in respectively drink-driving offender programmes and general preventive programmes require a breath sample using a mouth piece.

The breath sample needs to fulfil certain requirements for volume, flow, exhalation time. Also alcohol interlock devices should be able to detect if breath samples are delivered directly by a person and not, for example by using pressurized artificial air or an indirect method, like breathing through a water bottle. Therefore alcohol interlock devices make use of some form of human recognition feature that the driver must provide when providing the breath sample. This can include making sound vibration, breath pulse codes or hum-tones when the driver is exhaling.

Research has shown that drivers can face difficulties mastering the correct exhalation technique. In a survey carried out by Trafi (2013) amongst drivers participating in a drink-driving offender programme, exhalation problems were the most frequently stated problem with the functionality of alcohol interlocks along with warm up time.

Almost 40 per cent (N=664) of drivers indicated to have problems with the exhalation technique, which could lead to unaccepted breath samples[10]. Although some drivers indicated that problems ceased after having mastered the exhaling technique, for other drivers the problems persisted. In particular respondents with asthma, pulmonary or vocal cord diseases or influenza found exhaling difficult.

Based on a manufacturer estimate and interlock log data analysis quoted in the same report, it was estimated that on average between 9 and 15 per cent of drivers' exhalations were erroneous. The average percentage of exhalation errors decreased toward the end of the probationary period. This could indicate that in time drivers indeed master the required exhalation technique. At the same time it has also been noted that offenders often try to circumvent the interlock in the first few weeks by tampering with breath samples and attempting to disengage the device. Tampering rates decrease over time as offenders recognize the futility of trying to circumvent the technology (Beirness et al., 2007).

4.3.4 Running retests

Another feature related to breath sampling that has been mentioned in evaluation studies for causing problems is 'running retest' requirement.

Alcohol interlock devices that are used in drink-driving offender programmes require random, repeated breath tests (running retests) once a vehicle has been started successfully. For alcohol interlock for general preventive use this feature is optional.

Random retesting is to detect and deter drivers from drinking once the vehicle has been started and the engine is idling. As the driver must repeatedly provide alcohol-free breath samples, alcohol interlock device can detect a rising BAC level in drivers also after the vehicle has been started. Running retests also reduce the likelihood of a bystander providing a breath sample to start the vehicle on behalf of a driver.

If a driver fails to provide a running retest or register a BAC in excess of the pre-set limit, either an auditory or visual warning or activation of an alarm will occur to alert law enforcement. The event is registered in the data log and shortens the maintenance service intervals. The interlock does not have the ability to stop the vehicle once it is running for safety reasons.
Surveys conducted under participants in alcohol interlock offender programmes in several studies (e.g. DeYoung, 2002 and Trafi, 2013) pointed out various issues related to random retest:

[10] It should be noted that acceptance or rejection of the breath sample is independent of alcohol concentration, but relates to fulfilling the requirements for volume, flow, exhalation time and other considerations such as human recognition.

Amongst others, drivers thought exhalations were required too often and drivers did not always notice the request, or the device did not accept the exhalation. More importantly, concerns have been raised regarding the safety of performing a running retest while the vehicle is in motion.

Running retests are not designed to be done while the car is actually rolling. Interlocks give people a few minutes – enough time to pull over – to perform the retest. This is also strongly recommended by alcohol interlock manufacturers (Robertson et al., 2006). Nevertheless, most people take retests whilst driving (92% in the survey carried out by Trafi). In particular in heavy urban traffic, at crossings and when the traffic was congested surveys found that some drivers felt distracted or unable to stop at the road side, leading to dangerous situations.

At the same time the majority of drivers do not experience dangerous situations due to the running retest requests. Also there is no known data on accidents levels that would indicate that retest could result in more accidents.

4.3.5 Sensitivity alcohol detection and false positives

Another technical issue frequently discussed with regards to alcohol interlocks is their accuracy and sensitivity of alcohol detection.

When properly calibrated alcohol interlocks type approved are accurate enough to determine the presence of alcohol and its concentration (see also next section). False positive readings for alcohol will therefore be kept to an acceptable minimum in accordance with the standard.

At the same time it is known that drivers could test positively for alcohol without the driver having drunk. This can be caused by the presence of ‘mouth alcohol’. If alcohol from recent consumption of food, drink, mouth spray, or medicine is present in the mouth or throat at the time that a breath sample is being delivered, an elevated alcohol concentration will be detected. Residual mouth alcohol will dissipate within a few minutes of consumption as it is taken up by saliva or absorbed into the body. The breath test violation will be recorded however. This shortens the maintenance interval of the interlock device and might also lead to administrative or judicial sanctions.

4.4 Alcohol sensor technologies

4.4.1 Alcohol sensor technologies

Several devices and technologies exist to measure BAC. Their application in alcohol interlock systems is one of various applications. Other main applications include self-testing (e.g. mobile or wall mounted devices for individuals to test themselves as a precaution); screening (e.g. road traffic law enforcement, industrial safety programmes) or evidential testing (to be used in court).

Most devices for these applications do not test the BAC directly, which requires the analysis of a blood sample, but use an indirect method. Main technologies to detect and estimate BAC-levels include:

- Semiconductor sensor technology.
- Electrochemical sensors (fuel cell) technology:
  - Breath analysis based system
  - Transdermal
- Infrared spectrometry:
  - Tissue
  - Distant

Some of these technologies are more suitable or readily available for application in alcohol interlock devices than others. This also depends on whether the alcohol interlock is to be used in offender or general preventive programmes.

The current technology is designed primarily for use in offender programmes and will likely be less appropriate for general preventive use. For this reason, efforts are underway to develop unobtrusive methods for detecting alcohol consumption by drivers.

4.4.2 Semiconductor sensor technology

Semiconductor technology uses the alcohol released in a person's breath to estimate that person' BAC. The estimate is based on a physical reaction between ethanol molecules from a breath sample and a semiconductor sensor, also called a solid-state or Taguchi sensor. The sensor consists of a small bead of a tin oxide across which a voltage is applied to produce a small standing current.

When the ethanol molecules come in contact with the tin oxide, it is adsorbed on to the surface, changes the electrical resistance of the sensor, and hence the current. The semiconductor measures this change in current and estimates the BAC, using a predetermined algorithm.

Advantages and disadvantages

Compared to the other sensor technologies, semiconductor technology is relatively inexpensive, small and requires little electrical power to operate. However, semiconductor technology also has some disadvantages. First, semiconductors are non-specific to alcohol. Other substances than alcohol, like cigarette smoke or ketones, can also trigger the sensor and thus result in false positive readings for BAC. For the driver using an interlock with this type of sensor, a false positive reading will prohibit legitimate use of the vehicle and create frustration. For programme administrators, this renders it impossible to determine whether low readings are the result of alcohol consumption by the driver or other volatile substances in the atmosphere (Kärki & Mathijssen, 2001).

A second disadvantage is that semiconductor technology is considered less accurate compared to fuel cell technology. Semiconductors have been found to vary in sensitivity to alcohol with changes in climate, and even more so at changing altitudes of operation and have a non-linear response to alcohol vapour concentration (Breakspere & Williams, 1995).

As alcohol interlock devices using semiconductor technology tend to have a wider variation of the results over time and accumulated uses, they require frequent calibration. Typically calibration is required every month.

Finally, semiconductor technology is less suited to take consecutive samples in a short period of time. As the amount of tin dioxide in the sensor decreases with each sample, it needs to be rested after a number of tests so that atmospheric oxygen can oxidise to replenish it again.

Application as alcohol interlock device

Given the above-mentioned shortcomings, semiconductor technology is no longer much used in alcohol interlock devices and only for devices for voluntary self-screening and general preventive use. Currently there are no devices using this technology that meet the European Standard EN 50436 for alcohol interlock devices.

Nevertheless, this type of technology is still being considered and developed for further application in devices for screening and general preventive purposes. Due to its advantages in terms of size,

cost, and power consumption - which allows for its installation in, for example, a key fob – it fulfils the desire to have convenient, unobtrusive technology.

Research suggests substantially improved accuracy and specificity may be obtained by replacing the current tin-oxide sensor with other materials such as nano-crystalline perovskite oxides doped with strontium or gallium arsenide detectors. However details on these technologies are still largely proprietary, as are data on the accuracy and reliability of these devices (Pollard, Nadler & Stearns, 2007).

4.4.3 Electrochemical sensors (fuel cell) technology

Electrochemical sensor devices come in two types: breath and transdermal (sweat) sensors.

Electrochemical breath sensors

In devices using electrochemical breath sensors, the alcohol in the breath sample undergoes a electrochemical oxidation reaction when it comes into contact with a platinum disc. The oxidization produces an electrical current that is measured to determine the BAC. The strength of the current corresponds to the volume of alcohol present in the sample. The more alcohol is present the greater voltage the fuel cell generates, leading to a higher reading.

Advantages and disadvantages

On average, electrochemical breath sensors are more expensive than semiconductor technology. Also they need to be warmed up to breath temperature to meet the accuracy specification. This requires a heater assembly and significant energy use for heating; this is not a problem for a device that is hardwired to a vehicle, but is a major barrier to the use in wireless devices like key fobs.

At the same time electrochemical breath sensors have some key advantages over semiconductors, since electrochemical sensors:

- are alcohol specific, meaning that they only react to alcohol and not to breath substances, such as acetone and ketones, or other substances like cigarette smoke. As a result, fuel cell based interlock devices are far less likely to provide a false positive reading for alcohol;
- are more accurate and provide consistent results. Fuel cell technology provides more accurate BAC estimates, especially for higher BAC levels. In addition, they are more likely to provide the same test result when tested repeatedly in a short period of time;
- require less calibration and maintenance (e.g. once every several months), as they maintain their accuracy over a larger number of tests and for a longer period of time;
- are able to take more consecutive readings without breaks.

Compared to infrared spectrometer, an electrochemical sensor requires a lot more intensified maintenance. However compared to infrared devices, electrochemical sensors are much smaller and are specific and accurate at low BAC levels.

Application as alcohol interlock device

Alcohol interlock devices equipped with electrochemical breath sensors are already in widespread use. Currently interlock devices that are equipped *with a mouthpiece* using this technology are the only device that can meet the technical requirements listed in the European Standard EN 50436 1-2 (see section 4.2).

Remote alcohol sensing can also be realised by using electrochemical sensors in the interior of the car. This method, however, is less advanced than the method of breath spectrometry which is tested in the framework of the DADSS program.

Transdermal (sweat) sensors

Electrochemical transdermal ethanol detection is a relatively new method of alcohol detection. A small proportion of consumed alcohol (0.1%) is lost through sweat, which can be detected at the surface of the skin. In addition to sweat, alcohol is also absorbed from the blood by the skin. Using an electrochemical touch sensor the alcohol on the skin can be detected and analysed to estimate BAC.

Advantages and disadvantages

The main advantages of this method is that it is non-evasive and could allow continuous monitoring. The main problem with this method to measure BAC is that it is less accurate compared to electrochemical breath sensors or infrared spectrometry, particularly because alcohol does not diffuse through the skin instantly. There is a significant time delay (30 – 120 minutes) between the equivalent blood and skin concentration values, which is mainly determined by the amount of alcohol consumed[11]. Therefore readings from transdermal sensors lag behind true BAC. They underestimate actual BAC level while it is rising and overestimate when it is falling.

Application as alcohol interlock device

While sweat sensors have primarily been used in body-worn devices, this technology can be transported to vehicles. The integration of electrochemical alcohol sensors into, for example, the steering wheel of a vehicle, could allow an interlock system to continuously monitor the concentration of alcohol emitted from the driver's hands.

Given the advantages that other sensors currently have over electrochemical sweat sensors, it is unlikely that this technology will be widely applied in the near future.

4.4.4 Infrared spectrometry

Infrared spectrometry is based on the principle that most molecules absorb infrared light. Different chemical functional groups absorb characteristic frequencies of infrared radiation, making it possible to identify them. As the amount of light absorbed is proportional to the concentration of molecules, their level can be determined as well.

Two types of spectrometry are currently being tested for use in alcohol interlock devices:

- distant Spectrometry;
- tissue Spectrometry.

Distant Spectrometry

Distant Spectrometry uses mid-infrared (MIR) light to determine concentrations of carbon dioxide as a measure of dilution of the exhaled breath of the driver.

The working principle of the sensor is to use measurements of expired carbon dioxide (CO2) as an indication of the degree of dilution of the alcohol in expired air. Normal concentration of CO2 in ambient air is close to zero. Furthermore, CO2 concentration in alveolar air is both known and predictable, and remarkably constant. Thus, by simultaneously measuring CO2 and alcohol, the degree of dilution can be compensated for using a mathematical algorithm[12]. The breath sample can be taken remotely by using multiple sensors placed in the vehicle cabin.

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[11] Webster, G.D. & Gabler, H.C. Feasibility of Transdermal Ethanol Sensing for the Detection of Intoxicated Drivers. Annual Proceedings of the Association for the Advancement of Automotive Medicine 2007 (51): 449–464.

[12] Ferguson, S.A.; Zaouk, A.; Dalal, N.; Strohl, C.; Traube, E.; Strassburger, R. (2011) DRIVER ALCOHOL DETECTION SYSTEM FOR SAFETY (DADSS) – PHASE I PROTOTYPE TESTING AND FINDINGS. Paper Number 11-0230.

Advantages and disadvantages

Distant spectrometry has several advantages. Firstly, the system is designed to remotely analyse alcohol in a driver's breath without having to specifically provide a deep-lung breath sample. This make it unobtrusive measurement of the driver's breath alcohol. Also some exhalation problems related to breath sampling with current alcohol interlock devices in use (electrochemical breath sensors with a mouthpiece) might be avoided.

Furthermore, infrared spectrometry has the greatest long-term calibration stability of all technologies.

The major disadvantages connected with this approach are that currently it is not possible to realise BAC measurement with sufficient specificity and accuracy at low BAC levels. Another problem is that current devices are too large and have to be miniaturized to proportions that make it suitable for installation in a car. Finally cost have to be brought down to an acceptable level, as currently infrared spectrometry is by far the most expensive technology.

Application as alcohol interlock device

Significant additional research and development is needed to develop type-approved alcohol interlock devices using distant spectrometry that would be fit for use in general preventive alcohol interlock programmes. Nevertheless, proof-of-principle that this technology can be used for unobtrusive breath testing has been obtained[13], without interference from drinking by car passengers.

In both Sweden and the United States serious attempts are made to further develop an alcohol interlock based on infrared spectrometry (Ferguson et al., 2011) through projects like DADDS and KAIA. However, it will probably take at least another 5 to 10 years before large-scale practical application is possible.

Tissue spectrometry

Tissue spectrometry is another touch based technology for measuring BAC. It allows estimation of BAC by measuring how much light has been absorbed at particular wavelength from a beam of Near-Infrared (NIR) light reflected from the subject skin.

Measurement begins when a driver touches a sensor and an infrared light is shone on the skin. A portion of the light scatters several millimetres through the skin before returning back to the skin's surface where it is collected by the optical touch pad (DADDS, 2012). It is possible to analyse the tissue's unique chemical properties, based on the characteristic of light absorption. Using a proprietary system algorithm the properties can be analysed to determine the tissue alcohol concentration.

Tissue spectrometry offers a promising solution for unsupervised alcohol monitoring, because the alcohol and biometric signals are obtained from the same NIR measurement. It could thus be used to verify the identity of the user.

Advantages and disadvantages

Tissue spectrometry has similar advantages as distant spectrometry: it is non-obtrusive and has long-term calibration stability. Furthermore, it may be used to verify the identity of the user.

Regarding the disadvantages, also tissue spectroscopy must be reduced in size and in cost. Furthermore it must be re-designed to work on palms and fingers, as currently the most accurate

[13] Kaisdotter Andersson, A..; Karlsson, A.; Pettersson, H.; Hök,B. (2013) Unobtrusive Breath Testing. Presented at ICADTS 2013, Brisbane, Australia, August, 25-28, 2013.

measurements can only be obtained from the skin of the forearm. Challenges with tissue spectroscopy are mainly related to poor perfusion in the skin layers, especially in a cold environment. At the present state of the art, the measuring time is 120 seconds; this needs to be reduced substantially.[14]

Application as alcohol interlock device

Like with distant spectrometry, tissue spectrometry needs further development, but research in this field shows promising results for future application. Future versions are expected to work with the skin on the hand, such as a finger or hand scan, which allows better integration of the device in a vehicle's steering wheel or gearstick.

4.5 Issues related to data management and read-out of data

The ability to collect, store, analyse and effectively communicate data across the various agencies involved in carrying out alcohol interlock programmes, is essential to the success of the interlock programme.

The complexity of communication increases with the amount of data collected, and more importantly, the number of institutions or agencies that report to, or receive information from the system.

The flow of data related to the implementation of an alcohol interlock programme could already start with the court or administrative order to have an alcohol interlock device installed following a drink-driving conviction. It ends with completion of the programme, including the re-issuance of the licence and removal of the interlock.

Data to be considered could include data collected by the interlock device; information about participants using the device; information about programme operations and information about programme components (e.g., sanctions or reinforcements that are applied). The information that is collected may not only be relevant to the management of the interlock programme itself, but also for any future evaluation[15].

Users and suppliers of data could include amongst others the Court, road traffic authorities, motor vehicle administration, driver education and driver's license agencies, alcohol interlock suppliers and service agents, as well as agencies and institutions involved in (medical/addiction) treatment.

The management and reporting of alcohol interlock data varies widely across jurisdictions. Most countries or jurisdictions that have started an alcohol interlock programme in recent years, have developed an automated data management system. Automated data management system Examples form the US have shown that failure to automate and continued reliance on paper-based reporting systems can lead to offenders slipping through gaps in the system or being overlooked as a result of lack of staff, weak communication channels, and untimely exchange of information between various agencies[16].

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[14] Ridder, T.D.; Hull, E.L.; Ver Steeg, B.J. and Laaksonena, B.D. (2011) Comparison of spectroscopically measured finger and forearm tissue ethanol concentration to blood and breath ethanol measurements, in Journal of Biomedical Optics 16(2), 028003 (February 2011).

[15] Robertson, R.D., Holmes, E.A. and Vanlaar, W.G.M. (2013) Alcohol Interlock Programs: Data Management System Implementation. Traffic Injury Research Foundation, March 2013.

[16] Idem.

However, regardless whether systems are automated or not, from international experience it is clear that, amongst many, particularly important issues that need to be considered related to data management include:

- Reporting needs and standardisation.
- Privacy and security.
- Feedback and confirmation.
- Compatibility.
- Reciprocity.

4.5.1 Reporting needs and standardisation

Clear consideration should be given to the kind of data that should be collected. These data currently vary in accordance with the laws or administrative rules of each country or state. The programme authority may require notifications for installations, de-installations, violations, and other relevant data.

The development of standardised violation definitions and violation reports is essential to any successful interlock programme. Standardization is needed to create consistency in offender management and eliminate confusion among stakeholders within a jurisdiction. Definitions should be determined by the state authority in administrative rules and not written in legislation to allow for reasonable flexibility in decision-making.

4.5.2 Privacy and security

Based on the data collected from the interlock device, some far-reaching decisions can be made about the participants, like whether they must forfeit their driver's license or remain in the programme. By necessity, the communication between organisations that read out data and state agencies includes personal and/or sensitive information. Therefore the integrity and confidentiality of interlock data must be ensured. All parts of the alcohol interlock protect the event records against unauthorized modification, deletion, insertion and disclosure.

Policies regarding the transmission of data and communication between vendors and agencies should be created to address some of these security concerns. The policies currently adopted vary between countries and states. The Netherlands currently have adopted the most stringent privacy and data protection policy. Alcohol interlock devices are required to meet the CENELEC standards for alcohol interlocks, including EN 50436-6 on data security that applies to the interlock and service application. In addition, the devices and their usage have to satisfy a set of rigorous domestic requirements listed in the so-called protection profile. Data are to be send in a specified format and encryption to the Road Traffic Authority, which manages the database and is responsible for reporting and data analysis. The protection profile will be certified in accordance with the Common Criteria Recognition Arrangement (CCRA) so that the security properties of alcohol interlocks can be evaluated by licensed laboratories.

4.5.3 Feedback and confirmation

In order to increase the effectiveness of an alcohol interlock programme, there should be a protocol that defines which information is shared, with whom and when. Those receiving (systems) must acknowledge receipt of messages, and a protocol is necessary to handle non-confirmed messages. This includes offenders, as research indicates that notifying offenders of both non-compliance and compliance holds them accountable for negative behaviour (violations), and reinforces good behaviour (lack of violations).

4.5.4 *Compatibility*

Alcohol interlock devices are typically programmable and can accommodate a range of different programme requirements (e.g., pre-set level, emergency override, running retests) and can provide different types of output data. This way they can accommodate requirements of various jurisdictions.

At the same time not all countries have databases that are designed so that the data from at least several types interlock devices or manufacturers can be captured and retained. This diminishes the level playing field between interlock suppliers, which could lead to higher costs.

Also, to facilitate communication across these different components, data management systems must have interface capabilities. Differences in technology across agencies involved in management of an alcohol interlock programme are likely to occur and must be taken into account and addressed. Not doing so could reduce the efficiency and effectiveness of the interlock programme.

4.5.5 *Reciprocity*

Currently there is no reciprocity for alcohol interlock programmes between EU Member States that could help to ensure that those offenders that cross jurisdictions are not able to avoid the use of the device. Also in other countries alcohol interlock programmes, like the US, Australia and Canada this reciprocity is very limited as transmission of data between jurisdictions is limited and there is no uniformity in stored data, adopted definitions, systems are incompatible, etc.

5 Potential safety benefits of alcohol interlocks programmes

This chapter reviews the potential effect of the use of alcohol interlock devices on road safety. Several target groups are discussed:

- Offenders
- Professional drivers
- All drivers (general population)
- Problem drinkers.

5.1 Offender programmes

In 2013, four European Member States had offender programmes in place: Belgium, Finland, The Netherlands and Sweden. The Swedish programme is the oldest; it started already in 1999. The Belgian programme was introduced in December 2010, but so far only one driver has been included in the program. In the Netherlands the programme started in December 2011 and around 4,000 drivers have been included in the programme in the first two years. In Finland, an offender programme was introduced in 2008 and in the first four years approximately 1,700 drivers entered the programme.

5.1.1 Method for assessing safety benefits of offender programmes

The effectiveness of alcohol interlock offender programmes depends on three elements:

1. the total number of alcohol related fatalities related to heavy offenders;
2. the road safety effect of alcohol interlocks;
3. the penetration level of alcohol interlock offender programmes.

Data regarding these three elements should be gathered for all countries. A Dutch cost-benefit analysis (SWOV, 2009) also used these three factors to estimate the effect of an alcohol interlock programme for offenders in the Netherlands.[17] At the time of the analysis it was not yet clear whether the programme would have a standard duration of two years with one prolongation of 6 months for recidivists or whether an unlimited number of prolongations would be included for recidivists.

In this study for the Netherlands, it was estimated that the total number of offenders in the Netherlands was 100,000, 1% of all driving licence holders. These offenders drive 10% of their driven kilometres with high BACs.

For the programme with only one prolongation it was estimated that 4.5% of the offenders in the Netherlands would be permanently included, and for the programme with the unlimited number of extensions it was 6%. Furthermore, it was estimated that the reduction in driving under the influence for these drivers would be 75%. The overall effect on road safety was estimated, respectively on a 3.4% and a 4.5% reduction of the total number of alcohol related road fatalities.

For calculating the European estimate it would in theory be most sound to use the same three elements of the calculation for all countries. However, in practice these data are sparse, dispersed

[17] The interlock programme was not aimed at all offenders with high BACs, since they have to undergo a medical-psychological test to see whether they are alcohol dependent. If this is not the case, they will be eligible for the program.

over several sources and the available data difficult to compare. Therefore, we base our estimates on information available at European level. The estimates are therefore not usable on the level of individual Member States.

Alcohol related fatalities due to heavy offenders

It is estimated in chapter 2 that the share of alcohol related fatalities in the European Union is around 25%. Results of the DRUID project (Isalberti et al., 2011) show that approximately 75% of all seriously and fatally injured drivers that tested positive for alcohol, are drivers with high BACs (1.3 g/L or higher). The European alcohol related road toll of heavy offenders is thus estimated to be 19% (=75% x 25%). As argued in chapter 2, for these high BAC offenders it may be assumed that all crashes could have been avoided when they had not used alcohol.

Road safety effect of alcohol interlocks for heavy offenders

The Dutch cost-benefit analysis (SWOV, 2009) assumed, based on international literature, that alcohol interlock programmes are 75% more effective in reducing recidivism than suspension of the driving licence. However, the CBA does not give the effect of driving licence suspension, which makes it difficult to quantify the effect of alcohol interlock programmes.

In their handbook of road safety measures Elvik et al. (2009) mention three studies that have evaluated the effect of licence suspension after alcohol use on road crashes. One of these studies (Hagen et al., 1978) found that a six year driving licence suspension resulted in a reduction of 25% in the number of alcohol related crashes. The other two studies (Preusser et al., 1988; Siskind, 1996) report a reduction of all road crashes varying between 16% and 65%, depending on the target group and the severity of the crash.

For this analysis we assume that the effect on alcohol related crashes would be higher than 25% in case of a 2 year ban, since suspended drivers will be more likely to drive without a licence during a longer suspension period. We therefore use three scenario's for the effect of suspension of the driving licence, namely 25%, 40% and 50%. These shares are rough estimates, but within the margins that were found in the studies by Preusser and Siskind. Taking a 75% higher effectiveness for alcohol interlocks the overall net effectiveness of alcohol interlocks, as compared to suspension of the driving licence, can be respectively assessed at a reduction of 18.75% to 37.5% reduction in alcohol related crashes in the three scenario's.

Elder et al. (2011) reported in their systematic review that the effects of the installation of alcohol interlock devices were only visible during the period when the devices were installed. After removal of the alcohol interlock devices, differences in alcohol use with alcohol offenders who had not an interlock devices installed in their vehicle were no longer visible. Therefore, we include in this analysis a road safety effect for the instalment period only, not for the period after removal.

Penetration level of the measure

The penetration level of the measure depends on the share of heavy offenders that is arrested by the police and the share of arrested heavy offenders that participate in the alcohol interlock programme.

Results from the European Sartre Study in 2010 (SARTRE, 2012) show that 15% of all interviewed drivers in 18 European countries reported to have driven with alcohol over the legal limit in the past month. The US National Survey on Drug Use and Health shows that in 2010 an estimated 15.1 per cent of 18 to 20 year olds reported driving under the influence of alcohol in the past year (NSDUH, 2011). Among persons aged 21 to 25 this was even 23.4 per cent. Beyond age 25, these rates

show a general decline with increasing age, with persons aged 55 to 59 at 10.1%, persons aged 60-64 at 6.4%. Persons aged 65+ had the lowest share at 2.7%.

No overall figure is given by this survey, but based on the distribution over the different age classes of the self-reported share of drink-driving in the past year, it will probably have been around 15%. As self-reported alcohol use may give an underestimation of the real share of drink-driving offenders, we assume for this study that 15-20% of the drivers in the European Union drive at least once a year with a BAC above the legal limit. There are no data, however, on the share of drivers that are driving with high BAC-levels.

An estimate of alcohol use on European roads which is based on the results from the European DRUID project shows that 1.49% of the drivers were driving with a BAC over 0.5 g/L which is the legal limit in approximately two thirds of all European countries. Seven countries of the 27 countries (with 23% of all road fatalities in Europe) in this study have BAC limit of 0.0 g/L or 0.2 g/L. The average share of drivers in the EU that is over the 0.1 g/L is 3.45%. Furthermore, the results of the DRUID study show that 0.39% of the drivers were driving with a high BAC of 1.2 g/L or higher.

The actual share of high BAC offenders is probably higher, since offenders may have been warned for the road side checks by e.g. social media. In the Dutch cost-benefit analysis (SWOV, 2009), the actual share of high BAC offenders was estimated to be around 1% of all drivers. Given the available information this seems the best estimate.

Furthermore, an estimated annual arrest rate of 10% was used in the Dutch cost benefit analysis. Based on the share of alcohol use in Dutch traffic, in relation to the European mean, it may be assumed that approximately 7.5 to 10% of the high BAC drivers are arrested by police on a yearly basis.

Of those heavy offenders who are caught during an alcohol police check, only a part will choose to drive with an alcohol interlock. The share of participants depends on several factors, such as whether the alcohol interlock is sentenced by court or whether it is an administrative measure. We have therefore included three scenarios for participation rates: a low scenario of 10% based on the early Swedish experience and the experience of the share of offenders in California that were sentenced by court of alcohol use; a middle scenario of 50%, which can be regarded as a high participation rate of alcohol interlock programmes that presently run; and a high scenario of 70% that represents a more optimal situation, but would be less feasible at present. These participation rates are more in less in line with participation rates reported by Elder et al. in 2011 (1%-63%; median 13%).

5.1.2 Estimate of safety benefits of offender programmes

To summarize the above:

- Around 1% of the driving population is (sometimes) driving with high BAC levels;
- Some 7.5%-10% of the high BAC offenders are expected to be caught;
- The participation rates of these offenders in alcohol interlock programmes is unsure an may vary between 10% and 70%;
- The net effect of an alcohol interlock as compared to suspension of the driving licence, in terms of a reduction in traffic fatalities ranges between 18.75 and 37.5%;
- and the alcohol related road toll related to high BAC offenders is 18.75% (=75% of 25%) of the total number of road deaths.

Table 5.1 – 5.3 present the estimated number of avoided road fatalities in various scenario's, under the assumption that all alcohol crashes could have been avoided if no alcohol would have been used. In the cost benefit analysis in chapter 9 also a more conservative assumption will be used.

The figures represent the total number of prevented road fatalities per scenario that are assumed to be avoided due to the implementation of an alcohol interlock programme in the European Union, given 2010 data.

Table 5.1 Estimated number of prevented road fatalities per year at an estimated effect of the alcohol interlock programme for heavy offenders of 18.75% reduction of the number of alcohol related fatalities

18.75% reduction alcohol related crashes		Penetration	
		7.5%	10%
Participation	10%	16	21
	50%	80	107
	70%	112	149

Table 5.2 Estimated number of prevented road fatalities per year at an estimated effect of the alcohol interlock programme for heavy offenders of 30% reduction of the number of alcohol related fatalities

30% reduction alcohol related crashes		Penetration	
		7.5%	10%
Participation	10%	26	34
	50%	128	171
	70%	179	239

Table 5.3 Estimated number of prevented road fatalities per year at an estimated effect of the alcohol interlock programme for heavy offenders of 37.5% reduction of the number of alcohol related fatalities

37.5% reduction alcohol related crashes		Penetration	
		7.5%	10%
Participation	10%	32	43
	50%	160	213
	70%	224	299

This means that depending on the scenario it is estimated that approximately between 16 and 299 road fatalities per year could be avoided with an alcohol interlock programme for heavy offenders instead of a driving licence suspension.

The relatively low numbers of road fatalities saved, as estimated above, are mainly due to the relatively low risk of being arrested for driving under the influence. Rauch et al. (2010) report for instance estimates from the Unites States that drivers can drive 200-2000 times under the influence of alcohol before being arrested.

5.2 Professional drivers

As described in section 3.1.2, alcohol interlock programmes for professional drivers currently exist in three European countries: Sweden, Finland and France. In Sweden the number of alcohol interlock-equipped in commercial and public transport vehicles is the largest with over 75,000

devices installed. In Finland the number of alcohol interlocks in commercial and public transport vehicles is much lower, at approximately 8,000. In France, approximately 10,000 buses are alcohol interlock-equipped.

5.2.1 *Method for assessing safety benefits professional drivers programmes*

The effectiveness of alcohol interlock programmes for professional drivers depends on three factors: the total number of alcohol related fatalities related to commercial vehicles, the road safety effectiveness of alcohol interlocks and the penetration level of alcohol interlock programmes for commercial vehicles.

Data regarding these three factors should be gathered for all countries. However, in practice these data are sparse, dispersed over several sources and the available data are difficult to compare. Therefore, we base our estimate on global European data and estimates. The estimates are therefore not usable on the level of individual Member States.

Total road toll in which professional drivers are involved

For heavy good vehicles data on the number of fatalities are available for 24 out of the 27 EU countries. In these 24 countries 4728 fatalities were recorded in 2010 in crashes with trucks (ERSO, 2012); this is 14.2% of all road fatalities in these countries. For Cyprus, Lithuania and Bulgaria no data are available. In order to assess total truck related fatalities in EU, we assume that 14.2% of all road fatalities in these countries are truck related (i.e. 179 fatalities). Based on this estimate, the total number of truck related road fatalities in the 27 countries would then be 4907.

For buses and coaches data on the number of fatalities are available for the same 24 EU countries. In these 24 countries 784 fatalities were recorded in 2010 in crashes with buses and coaches (ERSO, 2012). This is 2.6% of all road fatalities. For Cyprus, Lithuania and Bulgaria no data were available, but assuming an average level of 2.6% also for these countries, the total number of road fatalities in the 27 countries would then be 817.

Alcohol related road toll due to professional drivers

Data on the alcohol related road toll of commercial vehicles are sparse. No studies were found for alcohol related fatalities or injuries due to drink-driving of taxi drivers or drivers of school buses. Therefore, the effectiveness of alcohol interlocks is only estimated for truck drivers.

A study from the United States (Crouch et al., 1993) that was conducted to assess the impact of alcohol and other drug use in the trucking industry reported traces of alcohol use in 13% of the blood samples from 168 fatally injured drivers. In the same period the share of alcohol-related fatalities in the total was much higher, at just above 40% (Stewart and Fell, 2007).

A French study (Longo et al., 2000) analysed blood samples from fatally injured drivers and found that 5.5% of fatally injured truck drivers (n=55) were positive for alcohol, whereas 12.7% of fatally injured car drivers were positive for alcohol (n=2164).

A Finnish evaluation study on alcohol interlocks for professional drivers (Vehmas et al., 2012) reports that in Finland the share of drink-driving accidents among heavy-traffic accidents is relatively small, at 2.5%, whereas the estimated share of all drink-driving accidents in Finland is around 25%.

The results from a recently conducted Belgian hospital study (Isalberti et al., 2011) found no alcohol positives among 22 seriously injured truck drivers, whereas for seriously injured drivers of passenger cars (n=171) 30.9% were positive for alcohol.

Dutch official crash figures also show none of the seriously injured or killed road truck and bus drivers testing positive for alcohol in the period 2006-2011 (source: Dutch accident database BRON). Data for taxi-drivers were not available; it is not possible to distinguish taxi drivers from other drivers of passenger cars in the official Dutch accident data.

Based on the European studies on alcohol use among injured truck drivers (ranging from 0% in The Netherlands to 5.5% in France), and taking into account a small underreporting, we assume that the share of alcohol related fatalities among truck drivers is 2.5%-7.5% of all truck fatalities.

Road safety effect of alcohol interlocks

We assume that almost none of the professional drivers will be trying to manipulate or disable the device, as this will almost certainly result in dismissal if they are caught. Therefore, we use a compliance of 100% for our estimate.

However, alcohol will not be the main factor in all alcohol related alcohol crashes. Furthermore, we assume that drivers of heavy goods vehicles and buses will not be likely to drive a truck or a bus when they have high a BAC and that therefore alcohol use is much less a predominant factor in a crash with an alcohol positive truck driver as it would be the case for heavy offenders. On the other hand, driving a heavy goods vehicle is more difficult than driving a car, which may result in elevated crash causation risks at lower BAC levels, but no studies have been found that report a relative crash causation risk particular for drivers of trucks and buses.

Given the above, we estimate that between 50% and 75% of the alcohol related crashes with trucks and buses could have been avoided if all truck and bus drivers were sober.

Based on the self reported use of alcohol from the American NSDUH study (NSDUH, 2005) we assume that alcohol use among drivers of buses and coaches would be approximately 4 times lower than for truck drivers. We therefore assume that the number of alcohol related fatalities in crashes with buses and coaches would be 0.6% to 1.9% of all fatalities in crashes with buses and coaches.

5.2.2 Summary

In summary the following data will be used in assessing the effect of alcohol interlocks being installed in commercial vehicles:

- The number of truck fatalities in the European Union is estimated at 4907 (2010 data);
- The share of alcohol related truck fatalities in all truck fatalities is 2.5-7.5%;
- The number of bus/coach related road deaths in the European Union is estimated at 817 (2010 data);
- The share of alcohol related bus fatalities in all bus/coach related fatalities is 0.6 to 1.9%;
- 50% of the alcohol related road deaths can be avoided with an alcohol interlock.

5.3 Preventive installation for all passenger cars

The effectiveness of alcohol interlocks as a preventive measure depends on a few factors. Even though a substantial number of road deaths can be attributed to drink-driving, the possibility of avoiding all these depend on:

- How effective alcohol interlocks are in avoiding drink-driving: is it possible to by pass them? This has to do with the technical characteristics, as well as with acceptance of a system by the drivers (e.g. obtrusiveness).

- How many of the alcohol related road deaths could have been avoided if no alcohol had been used?

Also the costs of the alcohol interlock system and its maintenance plays a role, as well as the number of interlocks that are needed.

Effectiveness in avoiding drink-driving

The present generation of alcohol interlocks are either too intrusive, or can relatively easily be circumvented. “To be acceptable for use among the general public, including those who do not drink and drive, alcohol detection technologies must be far less intrusive – they must not impede sober drivers from starting their vehicles. They would need to be capable of rapidly and accurately determining and measuring alcohol in the blood. They would also need to be small, reliable, durable, repeatable, maintenance free, and relatively inexpensive” (Ferguson, 2012).

In the United States, the Automotive Coalition for Traffic Safety and the National Highway Traffic Safety Administration have entered into a cooperative research agreement “to explore the feasibility, the potential benefits of, and the public policy challenges associated with a more widespread use of in-vehicle technology to prevent alcohol-impaired driving” (Ferguson, 2012). The resulting research project is called Driver Alcohol Detection System for Safety (DADSS). The aim is to develop non-invasive in-vehicle alcohol detection technologies that can very quickly and accurately measure a driver’s blood alcohol concentration. The system will probably combine touch- and breath-based alcohol sensing. The goal is to have a research vehicle available by the end of 2013 that will demonstrate both of these technologies. Large-scale practical application will probably be a long time coming; at least another 5-10 years.

A complication for European application of the DADSS system might be that its purpose is to prevent the operation of a vehicle by a driver with a BAC over 0.8 g/L – the legal limit in all US states. Legal limits in EU countries, however, are (much) lower, varying from 0.0 g/L BAC in the Czech Republic, Hungary and Romania, to 0.8 g/L BAC in the UK and Ireland.

Avoidance of accidents

Although alcohol has been identified as a main factor in the road fatalities that were assessed to be alcohol related, this may not imply that all such road accidents and fatalities could have been avoided if no alcohol would have been consumed. If, for instance whether or road conditions were adverse at the time of the accident, the use of alcohol may have increased the risk, but may not have been the decisive factor. In other words, the driving conditions may have been as such that the accident and fatality might have occurred even without drink-driving. In other words, the effectiveness of alcohol interlocks in avoiding accidents may not be 100% in all cases.

Costs of device and maintenance

A last factor would be the cost of having an alcohol interlock built-in in the car, either by way of retrofitting or as integrated part of new car models. At present the costs of alcohol interlocks are still substantial (around € 1,000). With technology developing and a large and growing (world) market the costs may come down in the future, thereby reducing the costs to society of any widespread preventive use.

The overall effectiveness of preventive installation thus depends on a few uncertainties, which will be explored further in chapter 9.

5.4 Preventive programmes for problem drinkers

In the Netherlands, the annual number of problem drinkers who enter addiction care and have a valid driving licence, is approximately five times higher than the number of eligible drink-driving offenders: 25,000 (SWOV, 2010) versus 4,500 persons. Problem drinkers who voluntarily participate in an addiction care rehabilitation programme are probably better motivated to use an alcohol interlock than arrested offenders. Furthermore, the alcohol interlock may be helpful in the process of rehabilitation, not only as a monitoring instrument, but even as a curative instrument (see Bjerre et al., 2007). Therefore SWOV recommended the Dutch government to set up a trial in close cooperation with addiction care institutions.

An important barrier against implementation of a programme for problem drinkers is that the type of programme will have to be more or less similar to an offender programme. This means that the costs will be relatively high when compared to programmes which don't need close monitoring.

6 Alternative measures to reduce drink-driving

There are several measures to combat drink-driving. These measures are judged to be effective when they lead to either a substantial reduction of the crash rate associated with alcohol consumption, or to a substantial reduction of the number of kilometres driven while the driver is drunk (drink-driving prevalence). Measures to reduce drink-driving can be categorized in different groups:

- Reducing the availability of alcohol;
- Legal limits for BAC, enforcement and penalties for violating legal limits;
- Education and information.

The following sections describe these possible measures and their potential effectiveness.

6.1 Reducing the availability of alcohol

Alcohol will probably always be available, but demand may be influenced by price measures. By increasing alcohol taxes the price of alcoholic beverages will increase and higher prices may discourage drinkers to drink (much) alcohol. There is no information available, though, on the effectiveness of such measures in reducing drink-driving.

Another measure that may influence demand is to restrict the sale of alcohol in time (restricting the opening hours of the places where alcohol can be bought and where it can be consumed) and place (especially banning the sale of alcohol in petrol stations and transport cafes).
Since 2000, it is forbidden to sell alcohol at petrol stations in the Netherlands. The sale of alcohol is allowed, though, at restaurants and supermarkets that are located alongside the road. No effects are known of this measure.
In March 2010, the German federal state Baden-Wuerttemberg banned the sale of alcoholic beverages between 10 pm and 5 am in off-premise outlets such as kiosks, supermarkets and petrol stations. Based on hospital data, a study on the effect of the measure on binge drinking (Marcus and Siedler, 2013) found that the share of alcohol related incoming patients in hospitals decreased for 16-19 year olds, by 7%-10%.

Raising the minimum drinking age could prevent alcohol use in traffic as well. In the United States the legal drinking age is 21 years, substantially above the minimum driving age. Evaluation studies show that increasing the drinking age from 18 to 21 years leads to a decrease of 24% of all fatal crashes involving drivers of 18 to 21 years of age and a 31% decrease of injury crashes in this age group (Elvik et al., 2009).

6.2 Legal limits, enforcement and sanctions

6.2.1 The effect of having low legal limits

According to a meta-analysis carried out by Elvik et al. (2009), reducing the existing BAC-limit for all drivers in a country leads to a reduction of 8 % in fatal crashes and a reduction of 4% in injury crashes. Bartl and Esberger (2000) found that lowering the legal BAC limit in Austria from 0.8 g/L to 0.5 g/L was accompanied with a 10% reduction of the number of injury crashes involving alcohol. As in this case the new BAC level was accompanied with increased enforcement and more severe

sanctions, it was impossible to determine which part of the reduction was specifically due to lowering the legal limit.

Two studies (Borschos, 2000; Norstrom and Laurell, 1997) on the effect of the reducing the legal limit in Sweden from 0.5 g/L to 0.2 g/L in 1990 found a reduction of 10% on all fatal and injury crashes. However, in this study other factors played a role as well, such as more severe sanctions, increased enforcement and time trends. Allsop (2005) estimates that in the United Kingdom 65 lives would be saved annually if the legal limit for the general driver population is reduced from 0.8 g/l to 0.5 g/l. If a reduction of the BAC-limit always leads to a decrease in the number of crashes, a BAC-limit of 0 g/l for all drivers would be the very best to have. From the perspective of getting the clear message across 'one should never combine drinking and driving' a BAC-limit of 0 g/l indeed would be the best solution. If it is 0 g/l, it is clear to everyone that even the slightest amount of alcohol in the blood is forbidden for all road users. When the limit is above zero, there is always the appraisal a driver has to make whether that one glass of wine (or any other alcoholic beverage) can be consumed or not.

However, there are also possible limitations when implementing a 0 g/L legal BAC-limit. For older (more experienced) drivers the crash rate starts to rise from 0.5 g/l onward (Keall et al., 2004; Vollrath et al., 1994). This means that up to 0.5 g/l older drivers are no substantial threat to other road users or themselves.

Another aspect is that with a BAC-limit of 0 g/l a driver also cannot use a mouth spray and the devices to measure the BAC-level are still not accurate enough to detect very low levels. A third drawback is that a very low limit might hamper catching the big fish (the drivers that drive with levels far above the legal limit). If too much time is spent on the small fish (drivers with a BAC between 0 and 0.5) and the enforcement system is not very efficiently organized, this may lower the chance of getting caught for drivers with a high BAC-level, who are involved in most of the alcohol related crashes.

Although a BAC-limit of 0 g/l for all drivers may cause problems, this is not the case for young drivers. As the crash rate for young drivers significantly starts to rise at very low levels, a BAC-limit of 0 g/l for young drivers is good for road safety . If one takes account of the inaccuracy of the devices and the fact that one can have a presence of alcohol in the mouth without having consumed alcohol, a BAC-limit of 0.1 g/l or 0.2 g/l for young drivers may be more realistic than 0 g/l. After implementing a BAC limit of 0.1 g/l in Austria for novice drivers, there was a 16.8% fall in fatal crashes involving drivers with a BAC-level of 0.8 g/l or more (Bartl and Sturmvoll, 2000).

6.2.2 The effect of police enforcement

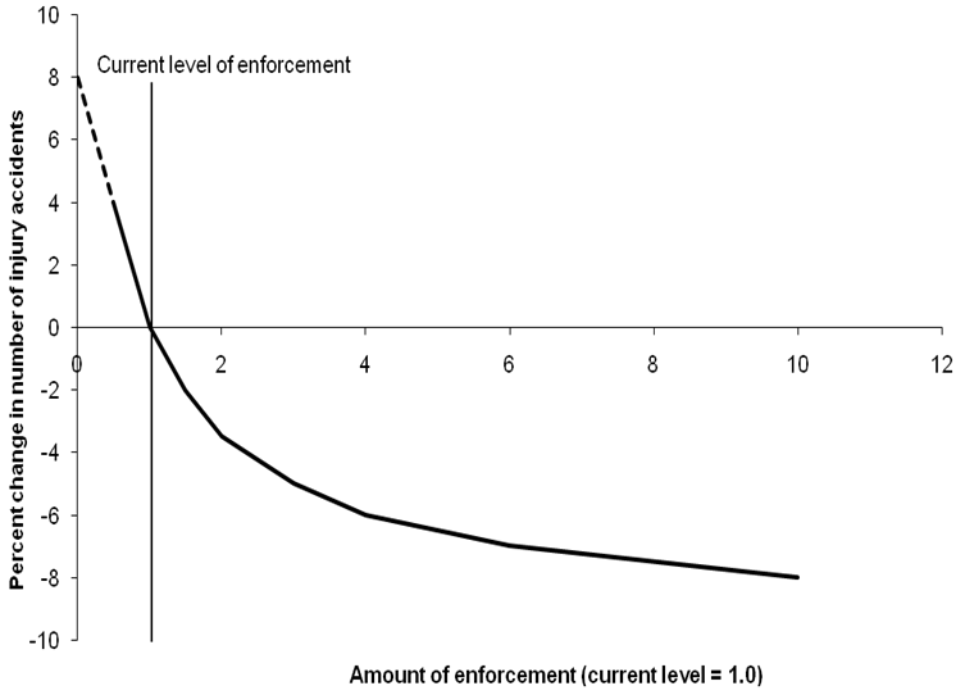
This is the most commonly used method to reduce drink-driving. Police enforcement is only possible when there is a certain legal limit. The police must be able to detect when a driver has exceeded that legal limit and once this is detected, the driver must be punished. The effective element of police enforcement is deterrence and the effectiveness of deterrence depends on the impression the driver has of his chance of getting caught when exceeding the limit and on how severe the punishment is.[18] A distinction can be made between general deterrence and specific deterrence. The aim of general deterrence is to motivate all drivers not to break the rules by creating fear of sanctions and by giving the idea that the chance of getting caught is high. The aim of specific deterrence is to improve the attitudes and behaviour of drivers once they are caught in order to prevent recidivism

[18] See also: Krismann, M., Schoech, H., Knoche, A., Hargutt, V. & Klipp, S. (2011). *Evaluation of legal measures to combat DUI/DUID* DRUID Driving Under the Influence of Drugs, Alcohol and Medicines. Deliverable 1.4.1. www.druid-project

Some European countries allow for random roadside breath testing, in other countries there must be some kind of suspicion (i.e. the smell of alcohol) before a policeman can test a driver. Both systems are effective, but random breath testing was found to be twice as effective as selective testing (i.e. testing only after suspicion) (Henstridge et al., 1997). After each doubling of the number of random breath tests in the Netherlands, the number of drink-driving offenders has decreased by approximately 25% (Mathijssen, 2005).

Elvik (2001) conducted a cost-benefit analysis on police enforcement. Figure 6.1 presents the relationship between enforcement and the number of injury crashes that was found in this study. More recently, Veisten et al. (2013) used the data from the Elvik (2001) study in a cost-benefit analysis to estimate the effect of drug driving enforcement, where one of the scenario's included a 10% decrease of alcohol enforcement. In this study a sensitivity was assumed of 100% for alcohol screening, meaning that all drunk drivers stopped at police checks are caught.

Figure 6.1. Relationship between amount of enforcement and change in the number of accidents



Source: Elvik, 2001.

In another cost-benefit analysis (Elvik, 2006), it was assumed that tripling the random breath testing could lead to a reduction of 3% in the number of fatal crashes and a 1% decrease in the number of injury and damage -only-crashes.

The effectiveness of random breath testing can be enhanced when it is targeted on the vicinity of places where alcohol is consumed and at times when the prevalence of drink-driving is high, i.e. in weekend nights, and when publicity accompanies enforcement campaigns. Research and experience suggest that highly visible road breath testing (to deter) combined with targeted random breath testing that is not clearly visible (to detect) is the most effective (ETSC, 1999).

Elvik et al. (2009) evaluated the results of 40 studies relating to the effect of DUI checkpoints on crashes. After adjustment for publication bias, they found an effect of 14% reduction in the number of crashes.

6.2.3 *The effect of sanctions*

The most common type of sanction for driving under the influence of alcohol is sentencing fines. Fines have some effect, but these effects don't last very long. In a Canadian case-crossover study concerning police enforcement in general (Redelmeier et al., 2003) it was discovered that the fatal crash rate in the month after conviction was about 35% lower than in a comparable month with no conviction. However, 3-4 months after the conviction the drivers drove in as unsafe a manner as they did before the conviction. Fines cause a general deterrent effect if they are high enough to create a financial burden for the offender. Most EU member states have fixed fines for DUI (driving under the influence) offences that are not income related (Finland is the exception). Consequently, these fines are normally not high since they are based on average incomes. This decreases the general deterrence effect of fines. Usually, fines have a higher general deterrent effect among adolescent offenders than among adults. This is mainly due to the financial situation of adolescents, who in general have much less income than adults (Wagenaar et al., 2007).

The special deterrent effect of fines is estimated to be low, since they are not income based. In Europe, fines are generally higher than in the United States, creating a higher specific deterrence effect (Taxman and Piquero, 1998; Voas and Fisher, 2001). A benefit of fines is that they have a higher cost-benefit ratio than jail sentences and that the earned money can be used to support further measures against drink-driving (Krismann et al., 2011).

According to a meta-analysis by Elvik et al. (2009) driving licence suspension leads to a reduction of all crashes by 18%. This makes driving licence suspension very effective. There is however one drawback. If enforcement is rather weak, drivers who have lost their driving licence may start to drive illegally. Another sanction is driving licence withdrawal. Withdrawal of the driving licence can be sanctioned either with or without conditions such as alcohol interlocks, exclusion of specific types of vehicles or medical examinations. After the period of withdrawal, a license is only re-granted after a new application of the driving licence. This is different from suspension where a driver gets his driving licence back at the end of the suspended period. A recent study including a questionnaire and a literature study (Bukasa et al., 2011) concludes that there were significant reductions in recidivism rates in case of driving licence measures with a duration of 3 to 12 months. For driving licence measures with a duration longer than 12 months an increase of recidivism rates was often found. Furthermore, the best effects were visible when driving licence sanctions were combined with treatment or rehabilitation measures.

Penalty point systems for alcohol are included in the legal practices of a number of European countries. However, there are many differences between these systems regarding the number of points collected or deducted and sanctions applied. The effectiveness of penalty point systems in general is estimated as modest. But it can be increased by increasing the general and specific deterrence effect (SWOV, 2011).

In the United States alcohol anklets are being imposed by courts as a measure to reduce recidivism among convicted drivers. The anklet is part of a non invasive alcohol monitoring system that samples an offender's perspiration every 30 minutes to ensure compliance to sobriety. This system is being evaluated at the moment by comparing recidivism rates for offenders sentenced to the monitoring programme to offenders who do not participate in this program.

Imprisonment seems to be less effective, according to Elvik et al. (2009). A change in Norway and Sweden from imprisonment to a graduated tariff of fines and license suspension had lead to reduction of all crashes by 4%.

6.3 Education and information

6.3.1 General education measures and public campaigns

Long before road users get access to the roads in or on motorized vehicles, they should know what the dangers of drink-driving are and develop an attitude against drinking and driving. Besides this they should know what the dangers for drunken pedestrians and drunken cyclists are. The subject of the dangers of alcohol in traffic and what one can do about it should be part of the curriculum in both primary schools and secondary schools. For secondary schools more and more programmes are developed that confront students with the effects of alcohol in as shocking a way as possible.

Traffic informers, for instance, are people that are mostly seriously disabled because of a road crash in which they have been at fault (i.e. they were drunk). They tell the students about their crash and how the consequences of the crash have affected their lives. What are known as 'road shows' are plays. In these plays the destructive consequences of road crashes are presented in an emotionally charged and moving way.

The opposite direction is chosen in an increasing number of high schools in the United States. These programmes are based on the concept of social norms. In these programmes nothing is communicated about the dangers. Instead students are told in a positive manner that the overwhelming majority of the students don't drink and drive. At first, research was carried out to find out if there is a discrepancy between the number of students that students think do drink and drive and how many students actually do. It appears that students mostly overestimate the percentage of students that really do drink and drive. After this, in a very positive manner they are told how many students in reality do not drink and drive. Often these messages are combined with positive strategies to avoid drinking and driving. The assumption is that most students want to conform to what is considered normal in their social environment.

Also in formal driver training for obtaining the driving license, the subject of drinking and driving should be addressed. Within the European research project GADGET a framework was introduced as a starting point when developing traffic education. This framework was called the GDE-Framework (Goals for Driver Education), which was based on within the field of traffic psychology (Peräaho et al., 2003). Figure 6.1 (see next page) provides an overview of the goals of the GDE-Framework. Knowledge about the effects and risks of driving under the influence is part of the column regarding risk increasing factors. Furthermore, attitudes towards alcohol and driving are mentioned as possible subjects for self-evaluation in the GDE-Framework.

Public campaigns using mass media also aim at raising awareness of the dangers of drink-driving and are intended to change attitudes and behaviour. There are very many ways in which this can be done. Some public campaigns only inform about the dangers of drinking and driving. These dangers can be presented in a quite neutral way but they can also be presented in a shocking manner. A more subtle way is not to show people who die in a road crash because of drink-driving, but for instance, the remorse a young driver feels when he has to tell the parents of his girlfriend about the crash in which his girlfriend died and he survived. There are also public campaigns with the explicit intention to raise the impression of the chance of getting caught. Another category of public campaigns is the group of campaigns with a positive message. This can be the message that more and more people don't drink and drive and the promotion of strategies to avoid drinking and driving. Examples of this last type are public campaigns to promote designated driving (i.e. the so-called Bob-campaigns in Belgium and the Netherlands (http://en.wikipedia.org/wiki/Bob_campaign). The Bob-campaign includes different kinds of strategies, ranging from commercials on national television and billboards at road sides, to stands during events and in discotheques. The latter may involve e.g. taking pictures of designated drivers and their passengers.

Figure 6.1 Goals for driver education-framework

Hierarchical level of behaviour (extent of generalisation):	Central content of driver education: Knowledge and skills the driver has to master	Risk increasing factors the driver must be aware of	Self-evaluation
Goals for life and skills for living (global)	**Knowledge about / control over** how general life goals and values, behavioural style, group norms etc. affect driving.	**Knowledge about / control over** risks connected with life goals and values, behavioural style, social pressure, substance abuse etc.	**Awareness of personal tendencies** re. impulse control, motives, lifestyle, values, etc. Developing self-evaluation skills.
Goals and context of driving (specific trip)	**Knowledge and skills** re. trip-related considerations (effect of goals, environment choice, effects of social pressure, evaluation of necessity, etc.).	**Knowledge and skills** re. risks connected with trip goals, driving state, social pressure, purpose of driving, etc.).	**Awareness of personal** planning skills, typical driving goals, driving motives, etc. Developing self-evaluation skills.
Mastery of traffic situations (specific situation)	**General knowledge and skills** re. rules, speed adjustment, safety margins, signalling, etc.	**Knowledge and skills** re. inappropriate speed, narrow safety margins, neglect of rules, difficult driving conditions, vulnerable road-users, etc.	**Awareness of personal** skills, driving style, hazard perception, etc. from the viewpoint of strengths and weaknesses. Developing self-evaluation skills.
Vehicle manoeuvring (specific task)	**Basic knowledge and skills** re. car control, vehicle properties, friction, etc.	**Knowledge and skills** re. risks connected with car control, vehicle properties, friction, etc.	**Awareness of personal** strengths and weaknesses re. basic driving skills and car control (especially in hazardous situations), etc. Developing self-evaluation skills.

The effects of education programmes in schools and in basic driver training

The effect of having the subject of drinking and participating in traffic in the curriculum of primary and secondary schools is very difficult to evaluate. More is known about the effects of driver rehabilitation courses on alcohol for convicted drivers. These mandatory courses are not intended for drivers that are have an alcohol problem with a status of a disease. For these drivers therapy would be more suitable. According to (Bartl et al., 2002) various evaluations of driver rehabilitation courses for drink drivers (not being problem drinkers) indicate that the recidivism rate can be reduced by 50% compared to control-groups without course participation. The variation of recidivism rates is quite large, though. In general it is found that drivers with a high risk of recidivism were of the male gender; young age and had a lower educational level. Furthermore, a positive relation was found between prior offences and recidivism risk (Boets et al., 2008).

In the recently conducted DRUID project a standard was prepared for good practice of rehabilitation courses. This standard includes the existence of a national quality management body, a definition of the operative tasks of this quality management body, a multidisciplinary approach in case of prior driver assessment, objective, valid and reliable tools in driver assessment and evaluation of driver rehabilitation programmes. Out of the 90 Driver Rehabilitation programmes that were validated only 5 met these criteria (Bukasa et al., 2009).

Effectiveness of public campaigns

Overall public campaigns seem to be effective (Delhomme, 1999). However the effects can differ quite substantially. Public campaigns are more effective when first a study is carried out of how the target group can best be addressed, and when the public campaign is linked with other measures (enforcement and education). There are indications that fear-arousing public campaigns regarding drink-driving (i.e. a TV-spot in which a driver who has been drinking crashes into another vehicle and dies) are not so effective. Harré et al (2005) discovered that a group that had watched fear-arousing clips regarding drink-driving afterwards showed more crash-rate optimism than a group that had watched non-fear arousing clips. Crash-rate optimists believe that crashes might happen to others, but not to them.

Despite the fact that some public campaigns may not have been effective, in many industrialized countries the attitude towards drink-driving has substantially changed over the past decades, from something that is not seen as so dangerous to something that is considered to be a crime. This is probably caused by a combination of public campaigns and police enforcement. Elvik et al. (2009) reported that drink-driving campaigns had an average reduction of approximately 14% on the number of injuries, if they were combined with enforcement. The authors reported that campaigns alone did not seem to have any effect.

6.3.2 Designated driver programmes

Another possibility to separate drinking from driving is not offering alcohol to drivers in public places such as restaurants, discos, pubs, and bars. A possible way of doing this is the so-called 'designated driver programme'. Before a group of people decides to drive in one car to a certain place where they are about to consume alcohol, a designated driver is appointed. While the others drink the designated driver has to abstain from alcohol. To compensate for this inconvenience the designated driver is very often offered free soft drinks.

Effectiveness of designated driver programmes

It is very difficult to evaluate the effectiveness of designated driver programmes. Ditter et al. (2005) have carried out a systematic review of the sparse studies that were available on this subject. They only found one evaluation on a designated driver programme that was based on the propagation of this idea via the media, like the Bob-programmes in Europe. This was the "Pick-a-Skipper" campaign in Western Australia. Telephone surveys indicated a 13 percentage point increase in people always selecting a designated driver and these people were also more likely to report awareness of the 'Skipper' concept. However, there was no significant change in self-reported drinking and driving or riding with an alcohol-impaired driver. Ditter et al. found more evaluations of small-scale designated driver programmes (i.e. a particular disco that has a designated driver programme). Some positive effects were found but overall the effects were quite modest.

A third measure in this category is to have good and cheap public transport and/or taxis to and from places where alcohol is consumed. There are no studies known to the authors of this study that have calculated the effect of the use of public transport and taxi's on reducing drink-driving crashes.

6.4 Public support for measures

Public support for tough measures is not so much of a problem. In the SARTRE3-questionnaire (SARTRE, 2004) some of the questions were on alcohol legislation. A large majority of the 24,000 interviewed drivers (88%) would like to have more severe penalties for drink drivers in their country.

The differences on this subject between the EU-member states were small. Of all the drivers, 45% of those who filled in the SARTRE-questionnaire are of the opinion that there should be a BAC-limit of 0 g/l. In Eastern Europe 60% of the respondents are of the opinion that there should be a BAC-limit of 0 g/l, but only 26% of the respondents in Southern Europe are in favour of this. The percentages for northern and western European countries are respectively 47% and 43%. In Eastern Europe more drivers prefer a zero BAC-limit than in other parts of Europe. This is not so surprising as a couple of countries in Eastern Europe already have a BAC-limit of 0 g/l.

The lower the legal BAC-limit in a country is, the more drivers think that they can drink less alcohol to stay under the legal limit. 70% of the drivers of countries with a legal limit of 0 g/l (Czech Republic, Hungary, and Slovakia) state that they may not drink any alcohol at all to remain under the legal limit. In countries with a legal limit of 0.2 g/l (Estonia, Poland, Sweden) it is 33% of the

driver population that think that they cannot drink at all before driving. When the legal limit is 0 g/l, 28% of the drivers nevertheless think that they remain under the legal limit after having consumed the equivalent of one glass of wine (175 ml of wine with an alcohol percentage of 12) or beer (0.5 litre of beer with an alcohol percentage between 3-3.5).

When the legal limit is 0.2 g/l 64% of the drivers have the opinion that they remain under the legal limit after one glass of wine or one glass of beer.

When the legal limit is 0.5 g/l 78% of the drivers think that they remain under the legal limit after having consumed the equivalent of one glass of wine or one glass of beer. In countries with a BAC of 0.8 g/l, 42% of the drivers think that they can legally consume more than one glass of wine or one glass of beer before driving and in Cyprus (legal limit of 0.9 g/l) even 31% of the drivers estimate that they can drink more than one glass of wine or one glass of beer.

82% of all drivers of all countries in the SARTRE-project are 'very' or 'fairly' in favour of a BAC-limit of 0 g/l for novice drivers.

When asked if an alcohol ignition interlock should be installed in all cars, one third of the drivers is 'very much' in favour of this and 25% of the drivers is 'fairly much' in favour of this. In Sweden, France, Portugal, and Greece 70% is 'fairly much' to 'very much' in favour of this but only 30% of the drivers in Germany, Austria, and Greece approve of this technological support.

77% Of the drivers are 'very much' to 'fairly much' in favour of courses like driver rehabilitation courses for offenders. There is not much difference between the countries on this subject although support in eastern countries is a little bit less..

7 Stakeholder consultation

7.1 Stakeholders

As part of the overall study on the road safety benefits of the use of alcohol interlock devices, an online questionnaire was organized from April 1st until May 3rd, 2013. Some 140 stakeholders were invited to take part in the questionnaire[19] . Stakeholders from different disciplines or were invited, grouped into the following clusters:

- transport safety policy organisation;
- enforcement organisation of transport safety rules;
- road/Transport Safety Research institutes;
- type approval institutes;
- national associations of motorists;
- trade unions and employers;
- addiction care organisation;
- European organisations representing the interests of specific group of stakeholders and representatives of the (automotive) Industry.

7.2 Stakeholder Questionnaire

The questionnaire consists of 76 questions, divided into several parts[20] . The first two parts of the questionnaire relate to general information on the respondents (Part A) and in road safety situation in the particular country (Part B). Part C deals with the experience of the responding organization.

Organizations only responded to questions relevant to them, based on their experience with (implementation of) alcohol interlock devices. When asked for their knowledge of or experience with large scale use of alcohol interlock devices by drivers in their country, either relating to voluntary use by drivers, or relating to a programme aimed at specific groups, such as professional drivers or drink-driving offenders, the breakdown is as follows:

Table 7.1 Level of knowledge or experience with alcohol interlock devices of respondents

Response	Total	% of responses
1 Yes, relating to voluntary use only	12	18%
2 Yes, relating to compulsory rehabilitation programmes for offenders	17	26%
3 Yes, relating to compulsory and preventive use by problem drinkers	10	15%
4 Yes, in relation to programmes aimed a specified group of professional drivers (non offenders)	12	18%
5 None of the above a)	32	48%

a) Some respondents have experience with both a programme for voluntary use next to compulsory use. Thus, the total sum of the percentages is above 100%.

A further breakdown could be made distinguishing between those stakeholders that have experience in the actual implementation (parts E to H), and the situation when measures have only been considered or implementation is still pending (part D).

[19] See annex 4for a complete list of stakeholders.

[20] See annex 3 for a complete list of all questions.

The situation where implementation was considered, but no implemented, was applicable for only three stakeholders.

Additionally, 14 respondents contributed to questions on on-going mandatory programmes relating to offenders or relating to drivers with a drinking problem and a valid driving licence-(prevention). Only 2 organisations provided information regarding mandatory programme for professional drivers (part G) and 10 respondents did so on voluntary use of alcohol interlock devices (part H).

7.3 Respondents

Of the 140 invited stakeholders, some 117 have taken part in the questionnaire; of which 56 have completed the entire list of questions (as applicable given their background), and 61 partially.

Most respondents are active in road transport safety research (32%) or in transport safety policy (21%). This means one third of all contestants have answered part B, but only very little information was provided or available.

18 % of the respondents come from representatives from the (car) Industry. These organisations were asked only to answer the part on opinions (part I).

Ten organisations submitted additional information in the form of comments, online background information or paper references[21].

7.4 Main findings

7.4.1 Data on road safety

Data on road fatalities or accidents attributed to drink-driving vary widely. The majority of organisations mention a figure around 20%, a small minority less than 10% and about 1/5 indicates a number at 30% or higher. A breakdown per (professional) driver group is harder to make, the vast majority cannot present such figures.

7.4.2 Implementation of different systems

Respondents show that a small minority (48%) has no experience with any kind of system of alcohol interlock devices. The majority however indicates that a system has been implemented (either voluntary or compulsory), or is still pending implementation. Reasons for a decision not to implement (yet) vary from a lack of sense of urgency, or other measures (enforcement, education) are deemed more effective. Also the cost-effectiveness plays a role in 33% of the cases.

In a vast majority of the cases where it was decided not to implement (yet) alcohol interlock devices¸ technical problems played a role. Stakeholders mention the different alcohol limits allowed for professional drivers in European countries, and (to a smaller amount) the absence of a legal basis.

If a system has been contemplated, measures regarding drink-driving offenders are the main target, and to a lesser extent measures aimed at a specific group of professional drivers. Problem drinkers with a valid driving licence are generally not considered as the main goal of such programmes.

[21] See References

The overall objective of the foreseen programmes is improved road safety (reduction of casualties), and, in one case a stakeholder added: to assist drink drivers to overcome their problem.

Main obstacles that stakeholders encounter are the lack of a proper legal framework, followed by financial issues. Technical problems like accuracy, reliability, retrofitting of interlock devices take a third place when it comes to obstacles for implementation.

7.4.3 Mandatory programmes for offenders and problem drinkers with a driving license

Respondents who have experience with mandatory programmes, indicate that these programmes have been operational as early as of 1986, but most programmes have been in place for "some years" (up till six), and usually ran for some 2 to 3 years. There seems to be more or less an equal target for first offenders, repeat offenders and high BAC offenders, most programmes tend to all target groups.

The size of the programmes range from 900 to 4000 participants and operate differently with regards to consequences of refusing the programme, reading out data of the devices. The costs of the programmes are more comparable, on average they round between € 1,700 and 2,500, per year or per programme, which drivers usually have to pay for themselves.

Implementing the systems caused for the majority administrative problems (knowledge of staff, unclear specs, certification, software etc.), but very specific problems were also encountered, in addition to financial and technical problems.

Most programmes have been evaluated, including their effects on the driver.

The part on mandatory programmes geared to professional drivers was only answered by two respondents; little representative information can be given. However, 10 respondents provided information on voluntary programmes. These programmes have been in operation since 1999, and vary widely in volume from 250 to 80,000 units. Most of them have been evaluated, and in some cases literature is available (in English or Member State language).

7.4.4 Opinions

Questions 68- 76 were specifically drafted to learn about the respondents´ opinions. They were asked to rate the importance of dealing with the problem of drink-driving for specific groups. Drivers of school buses ranked among the highest in importance for addressing professional drivers, followed by taxi drivers and drivers of dangerous goods vehicles. However, repeated drink-driving offenders scored highest overall, next to heavy drink-driving offenders.

To improve road safety with regards to drink-driving under professional drivers, lorries and truck drivers scored very high, but here, again, the heavy drink-driving offenders scored most important.

Measures for all drivers were considered less urgent.

Reasons for not implementing measures regarding alcohol interlock devices were recognized as technical or legal problems, or even the personal freedom of drivers was acknowledged as an important reason. However, none of the given reasons stood out extremely from the other reasons, nor did any of the specific groups of drivers stand out.

7.4.5 Role for the European Union?

Stakeholders were consulted on a possible role for the EU. Only a very small part (7%) saw no role whatsoever for the EU. There was a large support for measures at EU level stimulating the

exchange of information and best practices between Member States, and for harmonisation of functional specifications for alcohol interlock devices. To a lesser extent, but still counting on a majority support from the consulted stakeholders were harmonisation of technical requirements for retrofitting on one hand, and European legislation concerning installation in coaches/trucks or lorries/ school buses and dangerous goods vehicles on the other.

In several open questions, respondents could air their views and add specific comments on obstacles or challenges, as well on chances they saw adequate or (unjustly) left outside the scope of this consultation.

7.5 Stakeholder meeting

In addition to the questionnaire, a meeting was held in Brussels on 1 July 2013, in which 40 stakeholders were present, representing national governments, private sector (transport organisations, car manufacturers, manufacturers of alcohol interlocks) and road safety and other non-governmental organisations.

In the meeting the findings on the role of alcohol in traffic and experiences with alcohol interlock programmes were presented and discussed. Also the results from the questionnaire were presented. The stakeholders present confirmed theses findings and presented additional evidence and information on specific aspects of drink-driving.

Lastly, a first discussion was held on possible measures to be taken by the European Union, among which the measures described in the following chapter.

8 Policy options, advantages and disadvantages

8.1 Policy options

8.1.1 Introduction

In chapter 2 the role of alcohol in road safety has been analysed. It has been shown that in 20-28% of all road accidents in the European Union drink-driving is a main contributing factor. As this assessment has been partly based on official data, which may give an underestimation, the actual role may even be larger. In addition, it has been shown that the safety risk increases more than proportionally with alcohol use and that an estimated 75% of all drink-driving accidents is being caused by high BAC offenders.

In addition, chapter 3 describes the various compulsory and voluntary programmes in which alcohol interlocks are being used as an instrument to prevent alcohol consumers from driving a passenger car, truck or bus. It has become clear that only a few countries in the EU have adopted such measures, while in other countries, such as the United Sates, Canada and Australia alcohol interlock programmes for drink-driving offenders are quite common.

Thus, the analysis until now has confirmed that there is substantial scope for improving the road safety situation, if alcohol interlocks would be used more widespread in Europe. This could potentially contribute to realising the policy goal of reducing the number of road fatalities in Europe by 50% in 2020.

Given this background, there may be a role for the European Union to stimulate the use of alcohol interlock devices. The present chapter explores possible options for action and identifies their advantages and disadvantages. The policy options have been developed in cooperation with the Commission and have been tested in a stakeholder meeting in Brussels on 1 July 2013. It should be emphasized that the policy options, except the status quo option, are not mutually exclusive. They may be seen as building blocks which can be combined in a broader policy package.

Policy option 0: Status quo

The policy options will be compared to the “status quo”, or business as usual policy option. This policy option would mean that the Union continues its present way of working in this dossier. This involves that the Commission, i.c. DG ENTERPRISE continues to handle the technical aspects of alcohol locks and retrofitting in vehicles via the present channel e.g. the Motor Vehicle Working Group. In this option there is a continuously important role for CENELEC, as industrial platform in which standards are being discussed and agreed.

In this option DG MOVE will not take any additional action to stimulate the deployment of alcohol interlock programmes, either on voluntary basis or as part of rehabilitation of offenders. It is up to Member States to develop their own programmes and, where needed, exchange information on best practices like e.g. the Nordic Alcohol Ignition Interlock meetings involving Sweden, Finland, Norway and The Netherlands. ETSC would continue to play a vital role in disseminating information on the use and advantages of alcohol interlocks.

8.1.2 *Policy options*

Besides this rather passive role, various possible measures can be envisaged that the European Union can take in this area. The following policy options have been developed.

Policy option 1: Exchange of information, identification of best practices

In this policy option the EU takes a more active role than it does presently, in that on top of the actions described under status quo, it would stimulate the exchange of information on alcohol interlocks, offender and preventive programmes between the Member States. This can take various forms, like the organisation of regular meetings between government officials and other professionals of Member States, setting up an electronic platform, identification and exchange of best practices, etc. Individual Member States would have the opportunity to learn from each other and apply these lessons in their own situation.

Policy option 2: Addressing the common technical and operational barriers

Whereas the attitude of the EU is still passive in policy option 1, in this policy option 2 the EU would take an active attitude in overcoming common technical and operational barriers to effective and widespread implementation of alcohol interlock programmes. This could for instance involve taking action for ensuring that retrofitting of vehicles with alcohol interlocks will continue to be possible in the future, also in new car models, and speeding up measures to ensure mutual recognition of driving licence codes.

Policy option 3: Adopting legislation regarding high BAC offenders

Another scenario could be that the EU takes legislative actions on groups of drivers. As high BAC offenders presently play the largest role in alcohol related accidents, injuries and fatalities, a first step could be to focus on this group. In this policy option the Commission would develop legislation in order to stimulate Member States to start compulsory alcohol interlock programmes for high BAC offenders, e.g. those offenders that surpass the highest legal BAC limit used in the EU. This would mean that the use of alcohol interlock devices becomes a mandatory sanction for all BAC offenders above 0.8 g/l.

Policy option 4: Adopting legislation regarding preventive use by professional drivers

Present developments in some Member States, supported by the results of the stakeholder consultation, show that the public support for the use of alcohol interlocks is highest if such uses is required for specific types of vehicles such as school buses, public transport, dangerous goods trucks, all trucks. In this policy option the installation in such vehicles, which may cause the largest damage in case of accidents, would become legally required for all such vehicles operating in the EU. In this policy option a distinction can be made between legislation targeting goods vehicles only, and legislation targeting vehicles moving passengers (buses, coaches).

Policy option 5: Alcohol interlocks in all vehicles

Policy option 5 is the most far reaching option. It involves the mandatory installation of alcohol interlock devices in all (new) motor vehicles on the European roads, so including passenger cars, taxis, buses and goods vehicles. An alcohol interlock device would thus in the longer run become a standard element in a motor vehicle, like similar safety devices as seat belts.

8.2 The various aspects of the policy options

The advantages and disadvantages of the policy options have been reviewed as compared to the status quo scenario, described in policy option 0. In each of the other policy options the role foreseen for the European Union is larger, be it in terms of facilitating, guidance or legislation. In all

of these policy options there will be effects for various groups of stakeholders. They may have to taken actions, or may otherwise feel effects from the respective policy option as compared to the status quo scenario. In this section we describe what aspects have been taken into account, and why, for each of the stakeholder groups.

8.2.1 Impacts for specific stakeholder groups

European Union

The first stakeholder involved is the European Union, including the Commission, Council and/or Parliament. The role of the Union differs from a more passive approach in which this policy field is basically left to the Member States, to a very dominant role in issuing legislation.

The variation in approach is likely to have a main effect on the activities to be taken by the Commission. Such activities may involve hours to be spent by Commission personnel, projects to be described, tendered and monitored and expenses for communication like meetings, websites, publications etc. Rough estimates have been made of the associated costs for each of the policy options.

Member States

Member States bear prime responsibility for the road safety policy. In this they can benefit from actions taken by the Union, in that those actions may facilitate the information gathering that is necessary for policy decisions by Member States. Not only may information be more accessible, the quality of the information may also be better in some of the policy options, increasing the effectiveness of decisions.

Another aspect taken into account are operational issues relating to implementation of alcohol interlocks for specific groups or vehicles. Main issues in this respect deal with the certification of alcohol interlocks, the possibility of retrofitting in vehicles and the harmonisation of codes on driver licenses. Although there may be an investment needed from Member States to enable harmonisation (in terms of attending meetings, changing regulation, etc.), they again may also benefit in the longer run, as the efficiency of policy measures relating to drink-driving may increase.

Drivers

Drivers are the primary target group for any measure relating to drink-driving. The policy options differ in the extent to which alcohol interlocks are enabled, stimulated or legally required. In some cases the requirement may be part of rehabilitation of offenders, in other cases the use may be preventive. In particular in the latter case drivers who do not belong to the (potential) offender groups may feel that their personal freedom is reduced in order to reach public goals.

In contrast, for offenders some of the policy options could be seen as positive, as they give offenders the possibility to continue driving in a situation that they would otherwise not have that choice and would have faced (temporary) suspension of their licence.

As a result of having to use an alcohol interlock, offenders may change their behaviour and reduce consumption of alcohol. In particular when the programme is associated with some kind of (psychological) treatment there may be a longer lasting positive health effect for such offenders.

Another important aspect for drivers, of course, is that policy options may lead to a reduction in the number or road accidents. Thus, in particular for the non-drinking drivers, being the vast majority of drivers, there will be a varying positive effect on the chance to be involved in an accident. If road safety indeed improves, this may not only have a positive effect on the well being of drivers, but in

the long run also have an impact on the insurance costs for vehicles. The latter, though, is an indirect effect which will not be specified separately as it is part of the effects for society overall.

Transport companies

For transport companies there is likely to be a financial effect if some or all of their drivers would be obliged to use alcohol interlock. The may have to adapt their fleet, which, depending on the type of programme (preventive or rehabilitation) may result in extra costs of retrofitting vehicles. In case there emerges a larger market for built in alcohol interlocks, and technological development may result in newer models, such costs may reduce over time.

Alcohol interlock manufacturers

A main effect of some of the policy options may be that demand for alcohol interlocks, be it for retrofitting or built in models, may be stimulated. The emergence of a larger market is of course of commercial interest to them, and may also stimulate the faster development and introduction of models based on new technology.

Health care sector

The last group of stakeholders for which effects may emerge is the health sector, comprising general medical services related to the persons injured in road accidents, as well as the treatment of problem drinkers. Although some experts are convinced that problem drinkers should not be allowed to drive with an alcohol interlock, as their driving behaviour may not necessarily improve, others see positive effects of the use of alcohol interlocks as part of a treatment programme of problem drinkers. The effects of the policy options for the health sector thus depend on the target foreseen (does it include the group of problem drinkers or not) and the effectiveness of the road safety policy (reduction in number of injured people and severity of the injuries).

8.2.2 Impacts to society

Apart from the impacts for specific (groups of) stakeholders as described above, there may, of course, also be effects for society as a whole.

The most important aspect to be affected by the policy options is the road safety situation. A reduction in the number of road accidents and, consequently, in the number of road injuries and road deaths, not only affects the drivers of motor vehicles, but also, and perhaps even more so, slower motorised and non-motorised traffic, including cyclists and pedestrians. In particular slower traffic participants are vulnerable as they are among the groups mostly hit by road accidents.

An possible consequence of a reduction in the number of accidents on European roads will be that there will be less congestion that is caused by accidents. Although accidents are not the main cause of congestion, this usually being the result of temporary excessive demand or the weather situation, a part of the congestion is caused by smaller of larger accidents. As the majority of alcohol related accidents occur at night, when traffic levels are low, the impact on congestion is thought to be limited.
An indirect effect of lower congestion due to fewer accidents is that the traffic flow will be smoother. Smoother traffic flows generally result in less emissions, thereby improving both the air quality situation as well as reducing the amount of green house gases in the atmosphere.

A last aspect of the evaluation of advantages and disadvantages of policy options is the issue of European value added and subsidiarity. Recent history has shown that many Member States see various aspects of road safety as part of their policy domain. Attempts to harmonise the legal BAC levels have failed in the past, with the result that still various legal levels exist. Also other aspects like maximum speed levels and the level of enforcement, are presently not harmonised.

It is clear that the awareness among Member States is rising that some form of harmonisation is needed, also in the field of alcohol interlocks. Proof of this can be found in the rising number of Member States taking some kind of action in this field and the bilateral exchange of information going on between some Member States.

The support among Member States for various types of actions may thus be seen as a proxy for the feeling that some European action is justified. The stakeholder survey carried out as part of this project gives indication for the support among Member States. This is therefore taken into account as part of the evaluation of advantages and disadvantages of policy options in the next section.

8.3 Overview of advantages and disadvantages per policy option and stakeholder

The following tables summarize the advantages and disadvantages of the various policy options, for each of the relevant stakeholders.

Table 8.1 Advantages and disadvantages of Policy Option 1: Exchange of information

Aspect	Advantage	Disadvantage
Policy goals		
Road safety effect	Very low. The effect depends on the speed by which MS take up AIP faster and more efficiently	
Congestion	Negligible	
Environmental	Negligible	
Support stakeholders	Broad support among stakeholders	
Stakeholders		
EU		Additional costs for organising meetings, setting up a website
Member States	Learn from experiences elsewhere (do's and don'ts)	Additional costs for attending information exchange meetings, gathering of information
Drivers		
Transport companies		
Car industry		
Alcohol interlock industry	Limited possibility to develop market	

Table 8.2 Advantages and disadvantages of Policy Option 2: Harmonisation

Aspect	Advantage	Disadvantage
Policy goals		
Road safety effect	Low, depends on the speed by which MS take up AIP faster and more efficiently	
Congestion	Negligible	
Environmental	Negligible	
Support stakeholders	Broad support among stakeholders	
Stakeholders		
EU (MOVE, ENTR)		Costs for information meetings, setting up website Costs for meetings on standardisation
Member States	Learn from experiences elsewhere (do's and don'ts)	Costs for attending meetings, gathering information
Drivers	Lower costs for installing alcohol interlocks for offenders	
Transport companies	Lower costs for installing alcohol interlocks as preventive measure	
Car industry	Lower cost of retrofitting	Costs for attending meetings on standardisation
Alcohol interlock industry	Some market development as demand will rise	Costs for attending meetings on standardisation
Health care sector		

Table 8.3 Advantages and disadvantages of Policy Option 3: AIP for high BAC offenders

Aspect	Advantage	Disadvantage
Policy goals		
Road safety effect	Substantial reduction in road accidents , in particular if taken up by all MS	
Congestion	Negligible	
Environmental	Negligible	
Support stakeholders	Mixed: some in favour, some not	
Stakeholders		
EU (MOVE, ENTR)		Costs for developing legislation
Member States		Costs for developing/implementing legislation
Drivers	Lower accident risk For offenders: the possibility to continue driving	Cost of participation in AIP; negative social aspects of use of alcohol interlock
Transport companies		
Car industry		Need to keep retrofitting possible
Alcohol interlock industry	Substantial market	
Health care sector	Lower number of patients	Cost of participation in AIP

Table 8.4 Advantages and disadvantages of Policy Option 4: Preventive alcohol interlock for professional drivers

Aspect	Advantage	Disadvantage
Policy goals		
Road safety effect	Reduction in road accidents/deaths/injuries	
Congestion	Negligible	
Environmental	Negligible	
Support stakeholders	Mixed, some in favour, some not	
Stakeholders		
EU (MOVE, ENTR)		Costs for developing legislation
Member States		Costs for developing/implementing / enforcing legislation
Drivers	Lower accident risk	
Transport companies	Lower costs due to accidents Improved image	Extra costs for installing interlocks in trucks, buses, coaches
Car industry		Need to keep retrofitting possible
Alcohol interlock industry	Substantial market	
Health care sector		

Table 8.5 Advantages and disadvantages of Policy Option 5: Installation of alcohol interlock in all passenger cars

Aspect	Advantage	Disadvantage
Policy goals		
Road safety effect	Substantial reduction in road accidents/deaths/injuries	
Congestion	Negligible	
Environmental	Negligible	
Support stakeholders	Low	
Stakeholders		
EU (MOVE, ENTR)		Costs for developing legislation
Member States		Costs for developing/implementing / enforcing legislation
Drivers	Lower accident risk	
Transport companies	Lower costs due to accidents, congestion	
Car industry	Substantial additional market	Need to keep retrofitting possible
Alcohol interlock industry	Substantial additional market	
Health care sector		

9 Costs and benefits of policy options

9.1 Methodology

Apart from the qualitative assessment of advantages and disadvantages of each of the policy options, their socio-economic costs and benefits have been assessed in quantitative terms using the cost benefit technique. The effects of the options for individual stakeholders and society at large have been quantified, by comparing their situation in the respective policy options with their situation in the status quo policy option. In other words, the status quo option is regarded as the most likely “do minimum” scenario.

Only those effects which have an impact on the welfare of the citizens of the European Union have been taken into account. This means that a reduction in the use of labour or materials are regarded as a benefit to society, even though it may involve less turnover/work for some sectors. According to normal practice in cost-benefit analysis, it has been assumed that those resources can alternatively be used, in producing other products or services.

Costs and benefits have been quantified as much as possible, using information from public sources like Eurostat. In various cases estimates have been made on the basis of partial information or expert judgement. Costs and benefits are expressed as much as possible in price level of 2012. Annex 5 gives details of the assumptions and data used in the cost benefit analysis. The time horizon used in the analysis varies per policy option in relation to the scope of the particular measure.

The present value of costs and benefits has been assessed by using the discount rate prescribed by European guidelines, namely 5%. This rate is in real terms, so without taking into account future inflation.

9.2 Basic data used

The analysis has been based on the data presented in previous chapters as far as it concerns the role of drink-driving in road accidents and the effects of alcohol interlock programmes, including the costs and the effects on road safety. Data on the number of vehicles have been derived from Eurostat.

Estimates of the value of avoided road injuries and road deaths has been based on the HEATCO study of 2006. As these estimates date back to 2002, the values have been updated to 2012 level, with information from Eurostat on income development by Member State over the years 2002-2012. The values for avoided road deaths, avoided severe injuries and avoided slight injuries have been assessed for individual Member States first, and subsequently EU averages have been calculated. These EU averages have been used in the calculation (for more information see Annex 5).

It has further been taken into account that:
For every death on Europe's roads there are an estimated 4 permanently disabling injuries such as damage to the brain or spinal cord, 8 serious injuries and 50 minor injuries[22].

[22] See: http://ec.europa.eu/transport/road_safety/specialist/statistics/

Based on the distribution of alcohol related road deaths and injuries over the various Member States as shown in Chapter 4, a combined safety value has been estimated. This value represents the "pyramid" of accidents, in that it gives the combined value of one avoided road death, 4 avoided permanently disabled, 8 avoided seriously injured and 50 avoided minor injuries. The assumption is thus, that when road safety is increased to such an extent that one road death is avoided, also 4 permanently disabled, 8 serious injuries and 50 minor injuries are avoided. The total value "per avoided road death" has been estimated at € 12 mln. In a sensitivity analysis a lower estimate of € 8 mln has been used.

9.3 Costs and benefits of policy option 1: Exchange of information

In policy option 1 the role of the Commission is restricted to stimulating the exchange of information between Member States and making best practices available. The exchange would allow Member States to learn from the experiences with alcohol interlock programmes in other countries, be it prevention or rehabilitation programmes. The information on the programmes and their effects is expected to reduce the barriers to introduction of alcohol interlock programmes, and may also help to increase their effectiveness. The main effect in this policy option is seen to be that the introduction of alcohol programmes in Europe takes place at a higher speed than in the status quo situation.

Costs

In order to assess costs and benefits of this policy option, various assumptions have been made. With respect to the costs it has been assumed that the Commission will spend some € 600,000 over a two year period, on activities to organise and support the exchange of information. Member States also will need to make some extra costs associated with the exchange of information, which have been assessed to be around € 50,000 per Member State per year. The lead time before any effect will be visible is assumed to be two years.[23]

Benefits

With respect to the benefits of this policy option, it has been assumed that, due to the increased exchange of information in the European Union, **one** Member State will start an alcohol interlock programme for high BAC offenders **two years** earlier than it would have done in the status quo policy option. The alcohol interlock programme will give high BAC offenders the possibility to chose to continue to drive with an alcohol interlock, rather than suspension of their driving licence.

Based on the data in chapter 5, the net effect to the programme is assumed to be a reduction of 18.75 to 37.5% in the number of alcohol related road deaths caused by the group of participants. This means that, taking an 'average' Member State and a net effectiveness of 18.75% to 37.5%, some 1 to 2.3 road deaths can be avoided.

It has further been assumed that 7.5 to 10% of the high BAC offenders are arrested on a annual basis and that their **participation** in the programme ranges from 10 to 70%. Thus, the group that participates in the programme is expected to be responsible for 0.75 to 7% of all alcohol related road deaths. Given that 1% of the driving population potentially is a high BAC offender, the number of participants represents 0.0075% (i.e. 0.75% of 1%) to 0.007% of all drivers in a Member State.

Lastly it has been assumed that, by participating in an alcohol interlock programme, the drivers not only have to bear the costs of the programme (assessed at € 3,000 per annum), but also have the

[23] See Annex 5 for more details on these calculations.

benefit of continuing to drive. This will enable them to continue to be mobile, at lower generalised transport costs compared to the alternative of taking public transport or taxi's. This benefit has been assessed, taking the average number of kilometres driven by an average holder of a driving licence (11,200 km per annum[24]) and the extra cost of an alternative mode of transport (as compared to driving their own the car). The extra cost of course depends on the alternative (cycling, public transport, taxi) and the generalised costs of that alternative. The extra generalised transport cost has tentatively been estimated at € 0,10 per passenger km.

The total mobility benefit is thus assumed to be € 1,120 per annum per driver in the programme. This is a conservative estimate, as this benefit is lower than the cost to the participant of participating in the AIP. A higher estimate would thus be that the mobility benefit equals these costs (i.e. € 3,000 per annum). After all the participant has preferred to pay these costs above the alternative of having to organise his mobility needs differently.

Table 9.1 Assumptions used for CBA of policy option 1- Exchange of information

Extra costs for EU related to information exchange	300,000 Euro p.a.
Extra costs for each Member State for information exchange	50,000 Euro p.a. per Member State
Number of years that introduction of AIP is brought forward	2 years
Number of Member States that introduces AIP earlier	1 Member State introduces AIP two year earlier than in policy option 0
Number of participants in the programme	1,500 in year 1, 3,000 in year 2
Costs the AIP (to be borne by participant)	3,000 Euro per annum per participant
Potential number of alcohol related road deaths avoided (based on 18.75-37.5% net effectiveness)	1.2 to 2.3 road deaths
Mobility benefit to a participant in the AIP	1,120 Euro per annum

This analysis of costs and benefits based on these assumptions shows that the benefits could by far surpass the costs.

Table 9.2 Costs and benefits of policy option 1 – Exchange of information

Total costs for EU and Member States in two year period	3.4 mln Euro
Total annual costs of the AIP in the second year of programme (3,000 participants)	9 mln Euro
Total annual safety benefits (based on 1-2.5 road deaths saved in year 2 of programme)	14 to 28 mln Euro
Total mobility benefits in year 2 (3,000 participants)	3 mln Euro
BC ratio (2 years preparation; 2 years programme)	1.5 to 2.7
IRR	81% to 186%

Of course the result of the CBA depends very much on the assumptions on the effect of this policy option. In order to explore the sensitivity of the result to the assumptions, various sensitivity analyses have been carried out:

[24] The average distance travelled by a passenger car per year is 14,000 (source: ACEA). The ratio between number of driving licences in EU and the number of passenger cars is 1,25 (Source: Eurostat). The average distance driven per driver with a valid driving licence is thus 11,200 km per annum.

- A main assumption relates to the *number of participants* that need to be involved in the programme to get the desired effect. If this number would be 2 times higher than assumed (i.e. 6,000 participants in year 2), the BC ratio would range from 1.0 tot 1.7.
- The main benefit relates to the safety benefits. If the valuation is assumed to be € 8 mln per "avoided road death" the BC ratio would be 1.1 to 1.9.
- Another benefit is the *mobility benefit* to participants. If these are taken to be 3,000 Euro per annum, the Benefit Cost ratio would range from 2.0 to 3.2.
- If the exchange of information would not result in an acceleration of the introduction of alcohol interlock programmes in the EU, there are, of course, no safety benefits. The costs would then be limited to the costs related to the exchange of information (assessed at 3.4 mln Euro).

Given these sensitivity analyses, and assuming some effect of the exchange of information, the benefits of this policy option are likely to surpass costs. The downward risk of this option is limited, as it involves limited investments.

9.4 Costs and benefits of policy option 2: Harmonisation of technical aspects

Policy option 2 describes the situation that the European Union is more active in the field of alcohol interlocks programmes. In this policy option it facilitates their introduction by focusing on harmonisation of all technical and operational aspects in the EU. This harmonisation aims to relieve operational bottlenecks, but may also result in a reduction in the costs of alcohol interlock programmes. In the assessment of costs and benefits of such a policy option the following assumptions have been used.

Costs

Additional meetings will be required in which the technical and operational harmonisation is discussed and agreed upon. This will involve both extra costs to the Commission as well as to Member States (see table). As the harmonisation has several aspects, it has been assumed that it will take three years for the harmonisation to fully materialise.

Benefits

In this option a combination of effects may be expected, in that not only the introduction of alcohol interlock programmes may be brought forward, as in policy option 1, but that also the costs for installation and operation of alcohol interlocks may go down. This effect has been taken into account only for the new programmes, not for existing AIPs.

As a tentative analysis it has been assumed that the effect of this policy option in terms of bringing the introduction of AIPs in the Union forward would be double the effect assumed in policy option 1. In other words, it has been assumed that in this policy option the introduction of AIP for high BAC offenders will be brought forward by **two years** in **two** Member States.

On top of the benefits of bringing the introduction of AIP forward with two years, an additional costs reduction of 20% has been assumed for those Member States.

Table 9.3 Assumptions used for CBA of policy option 2 - Harmonisation

Extra costs EU harmonisation	300,000 Euro p.a.
Extra costs Member States information exchange	100,000 Euro p.a. per Member State
Time needed for harmonisation	3 years
Effect on introduction of AIP in Europe	Two Member States introduce an AIP two year earlier than in Policy option 0
Number of extra participants in AIP's annually	5,000 in year 1, 10,000 in year 2
Costs of participation in an AIP	2,400 Euro per annum per participant
Net-effectiveness of an alcohol interlock (as compared to suspension of driving licence)	18.75-37.5%
Net benefit in terms of road deaths avoided	2-4 first year, 4-8 second year
Mobility benefit to a participant in the AIP	1,120 Euro per annum per participant

As the table below shows, the BC ratio of this option is quite favourable, as the costs are relatively low. The result thus mostly depends on the assumption as to the effect this policy option has on the speed and efficiency by which Member States will implement AIPs for high BAC drink-driving offenders. In this analysis two 'average' EU Member States have been taken.

Table 9.4 Costs and benefits of policy option 2 – Harmonisation

Total costs EU and Member States	9.3 mln Euro
Total annual costs AIP	12 mln (yr 1); 24 mln (yr 2) Euro
Total annual benefits (based on 2-4 road deaths saved) year 1	23 – 46 mln Euro
Total annual benefits (based on 4-8 road deaths saved) year 2	46-92 mln Euro
BC ratio (3 years preparation, 2 years programme	1.8 to 3.3
IRR	77% to 140%

Like for policy option 1, several sensitivity analyses have been carried out:

- If the *number of participants* that need to be involved in the programme to get the desired effect would be 2 times higher than assumed (i.e. 20,000 participants in year 2), the BC ratio would range from 1.2 tot 2.1.
- If the valuation of the safety benefit is assumed to be € 8 mln per "avoided road death" the BC ratio would be 1.4 to 2.3.
- If the *mobility benefit* to participants is taken to be 3,000 Euro per annum, the BC ratio would be between 2.5 to 3.9.
- If harmonisation would not result in an acceleration of the introduction of alcohol interlock programmes in the EU, there are, of course, no safety benefits. The costs would then be limited to the costs related to the exchange of information (assessed at 9 mln Euro).

Given the above range of outcomes of sensitivity analyses, the positive result of the CBA can be deemed to be robust. Also for this policy option the downward risk on costs is low.

9.5 Costs and benefits of policy option 3: Legislation concerning high BAC offenders

In policy option 3 it is assumed that measures are taken at Union level to harmonise the penalty for high BAC offenders in such a way that in all Member States they will be offered the opportunity to enrol in an alcohol interlock programme, as an alternative to suspension of the driving licence. Given the BAC limits that are presently being applied in Member States, this can only apply to

offenders with BAC of 0.8 or higher. In this option we are focusing on the offenders with BAC of 1.3 g/l or higher. As it is not likely that legal measures can be applied to ensure equal treatment, as this involves Criminal Law, the exercise is to a certain extent theoretical in nature. The pre-requisite is that all Member States are willing to accept a common practice with respect to high BAC offenders.

Some assumptions have been formulated to assess the potential effect of such an arrangement. In order to come to such an agreement, it is assumed that a few years of deliberations will be needed. Moreover, Member States will need to adjust their laws to make this option possible. It has been assumed that this whole process may take up to four years, and will involve considerable costs for both the Commission and Member States.

The CBA explores the benefits of this policy option in case of minimum and maximum effects. The various assumptions used in the appraisal of this option are listed below:

Table 9.5 Assumptions used for CBA of policy option 3 – AIPs for high BAC offenders

Costs for EU, of preparing agreement	2 mln Euro
Costs for Member States of preparing agreement	2 mln Euro per Member State
Time needed to prepare agreement	4 years
Total number of high BAC offenders	1% = approximately 3 mln drivers (see chapter 5)
Participation of high BAC offenders	0.75 to 7% (see chapter 5)
Costs of participation in an AIP	3,000 Euro per annum per participant
Net-effectiveness of an alcohol interlock as compared to suspension of driving licence	18.75 to 37.5% (see chapter 5)
Net benefit in terms of road deaths avoided	7 to 137 per annum
Mobility benefit to a participant in the AIP	1,120 Euro per annum per participant

On the basis of these assumptions the annual benefits and costs can be calculated. As the introduction for such a measure will require quite some preparation, the costs of preparing the legislation have been taken into account as an investment cost, assuming a four year period of preparation.

Table 9.6 Costs and benefits of policy option 3 – AIPs for high BAC offenders

Total preparation costs	58 mln Euro
Total annual costs AIP	68 mln to 630 mln Euro
Minimum annual benefits (based on 7 road deaths avoided in yr 2)	88 mln Euro
Maximum annual benefits (based on 147 road deaths avoided in yr 2)	1.6 bln Euro
BC ratio (4 years preparation, 2 year programme)	1.0 to 2.8
IRR	5% to 163%.

Like for policy option 1, several sensitivity analyses have been carried out:

- If the *number of participants* that need to be involved in the programme to get the desired effect would be 2 times higher than assumed, the BC ratio would range from 0.8 to 1.6.
- If the valuation of the safety benefit is assumed to be € 8 mln per “avoided road death” the BC ratio would be 0.8 to 1.3.
- If the *mobility benefit* to participants is taken to be 3,000 Euro per annum, the BC ratio would be between 1.4 to 3.4.

- If a one year longer period would be taken into account to calculate the effects (i.e. three years), the BC ratio would be somewhat higher, at 1.2 to 2.9.

Like the first two policy options, this option, albeit perhaps a theoretical one, shows a favourable ratio between benefits and costs. This would not be the case if the potential share of high BAC offenders in the total driving population would be 2% instead of the 1% assumed, or of the valuation of the safety benefit would be lower.

On the other hand, it is quite likely that the AIP would be used over a longer period. Also, the mobility benefit taken into account is conservative.

9.6 Costs and benefits of policy option 4a: Legislation concerning goods vehicles

Policy option 4 describes the situation that legislation is issued concerning certain groups of professional drivers. In this analysis two groups of professional drivers can be distinguished: drivers of commercial goods vehicles and drivers of passenger vehicles moving 9 persons or more (buses, coaches). The present section deals with drivers of commercial goods vehicles.

This policy options differs from the previous one that an alcohol interlock would be compulsory for all truck drivers, irrespective of their drinking habits. The programme is thus preventive and alcohol interlocks would be installed in all commercial goods vehicles. At the same time the potential reduction in alcohol related road deaths is also largest: in principle drink-driving by truck drivers is no longer possible.

This would not mean that the number of accidents in which drink-driving of a truck driver is involved would completely disappear. As argued in chapter 5, this may result in a reduction of such accidents and road deaths of 50%. This means that it has been assumed that at maximum 50% of 250 alcohol related road deaths can be avoided by this measure.
In the CBA of this option the following assumptions have been used:

Table 9.7 Assumptions used for CBA of policy option 4a – Legislation concerning goods vehicles

Costs of preparing legislation to EU	2 mln Euro
Costs of preparing legislation for Member States	2 mln Euro per Member State
Period of preparation	3 years
Total number of relevant goods vehicles (i.e. excluding light goods vehicles)	5.1 million
Costs of installation of an alcohol interlock	3,000 Euro
Cost of maintenance and operations of an alcohol interlock	3,000 Euro per annum
Lifetime of the alcohol interlock	7 years
Potential reduction in alcohol related accidents involving drink-driving by truck drivers	50%
Net benefit in terms of road deaths saved (at 50%)	125 per annum

On the basis of these assumptions costs and benefits over a 10 year period (three years of preparation, seven years operations of the alcohol interlock) have been assessed as follows:

Table 9.8 Costs and benefits of policy option 4a – Legislation concerning goods vehicles

Total preparation costs (in 3 years)	58 mln Euro
Total investment costs alcohol interlocks	5 bln Euro
Total annual costs alcohol interlocks	0.25 bln Euro
Total annual benefits, based on 125 road deaths avoided	1.5 bln Euro
BC ratio	1.4
IRR	25%

It should be noted that in order to realise a level of 50% effectiveness, the alcohol interlocks need to comply with high standards and intensive monitoring will be required similar to the present rehabilitation programmes. Alternatively, this level may be feasible if a new generation of alcohol interlocks becomes available which are fitted in the trucks in the factory.

Therefore a sensitivity analysis has been carried out taking higher costs and/or lower effectiveness:

- In case the effectiveness in avoiding alcohol related accidents and road deaths is taken to be 15% the BC ratio is 0.4.
- In case the costs of the interlock would be € 2,000 and annual costs of monitoring would be € 500, the BC ratio is also 0.4 (at 50% effectiveness).

Given the above results it seems that preventive use of alcohol interlocks in commercial goods vehicles throughout Europe is likely to increase overall welfare in Europe, provided that an effectiveness of 50% can be reached and/or new generation interlocks become available that are already installed in the factory..

9.7 Costs and benefits of policy option 4b: Legislation concerning buses and coaches

A similar CBA has been carried out for the policy option involving the compulsory installation of alcohol interlocks in all buses and coaches in the European Union. Below follow the main assumptions for this analysis.

Table 9.9 Assumptions used for CBA of policy option 4b – Legislation concerning buses and coaches

Costs of preparing legislation to EU	2 mln Euro
Costs of preparing legislation for Member States	2 mln Euro per Member State
Period of preparation	3 years
Total number of buses/coaches in EU	820,000
Costs of installation of an alcohol interlock	1,000 Euro
Cost of maintenance and operations of an alcohol interlock	50 Euro per annum
Lifetime of the alcohol interlock	7 years
Potential reduction in alcohol related accidents involving drink-driving by bus/coach drivers	50%
Net benefit in terms of road deaths avoided	5 per annum

Clearly the potential road safety benefit for preventive installation of alcohol interlocks in buses and coaches is, at 4 road deaths per annum, substantially lower than for trucks, This has an impact on the results of the CBA, as shown below:

Table 9.10 Costs and benefits of policy option 4b – Legislation concerning buses and coaches

Total preparation costs	30 mln Euro
Total investment costs alcohol interlocks	0.8 bln Euro
Total annual costs alcohol interlocks	0.04 bln Euro
Total annual benefits, based on road deaths saved	0.06 bln Euro
B/C ratio (2 years preparation, 5 years time horizon)	0.3
IRR	n.a.

The mandatory preventive installation of alcohol interlocks does not generate sufficient socio-economic benefits to cover socio-economic costs. The BC ratio is low, at 0.3. The reason for the unfavourable result lies with the low number of road deaths that can be attributed to drink-driving by professional drivers of buses and coaches. Even, if a 100% effectiveness of the measure is assumed, the BC ratio is still unfavourable, at 0.7.

Only if the costs of (installing) an alcohol interlock in buses and operate it during its lifetime would reduce by 75% the BC ratio could approximate a value of 1.

Despite this unfavourable outcome, the preventive installation of alcohol is a measure which has quite some support among the various stakeholders. The reasons for this may partly be that, whereas the incidence of road accidents involving drink-driving is not high, the public outrage is substantial if it would occur, in particular if young people would be involved.

9.8 Costs and benefits of policy option 5: Legislation concerning all passenger cars

The last policy option involves a Regulation or Guidelines with a view to have alcohol interlocks compulsory installed in all passenger cars. This option reflects a possible future situation in which an alcohol interlock device is as common in a passenger car as a seat belt is now. This means that new generation alcohol interlocks would be a standard feature of new car models.

For this option a CBA has been carried out, assuming that the legal action would in future be 50 to 80% effective in reducing alcohol related road deaths.

Table 9.11 Assumptions used for CBA of policy option 5 – Legislation concerning all passenger cars

Costs of preparing legislation to EU	2 mln Euro
Costs of preparing legislation for Member States	2 mln Euro per Member State
Total number of passenger cars	242 million
Time needed for preparation of legislation	4 years
Costs of an alcohol interlock (build in at factory)	1,000 Euro
Cost of maintenance and operations of an alcohol interlock	50 Euro per annum
Lifetime of the alcohol interlock	7 years
Potential reduction in alcohol related accidents involving drink-driving by passenger car drivers	50 to 80%
Net benefit in terms of road deaths saved	3500 to 5600 per annum

On the basis of the above assumptions the following outcome is derived from the CBA, if a time horizon is taken of 11 years (four years preparation, seven years operations):

Table 9.12 Costs and benefits of policy option 5 – Legislation concerning all passenger cars

Total preparation costs EU and Member States	58 mln Euro
Total investment costs alcohol interlocks	242 bln Euro
Total annual costs alcohol interlocks	12 bln Euro
Total annual safety benefits	42 to 67 bln Euro
BC ratio	0.8 to 1.3
IRR	-3% to 22%

The CBA thus gives a range from negative to positive result under the above specified conditions. The outcome is quite sensitive to the assumptions on the costs of investment and operations of the alcohol interlocks, the effectiveness of the interlocks to reduce the number of road accidents and fatalities and the time horizon.

In order to explore these sensitivity the following situations have been analysed:

- If the investment costs is taken to be 500 Euro per alcohol lock the BC ratio is 1.4 to 2.2.
- If the investment cost is 2000 Euro per alcohol lock the BC ratio is 0.5 to 0.8.
- If the operating costs are taken to € 100 per annum, the BC ratio is 0.7 to 1.1.
- If the preparation period is taken to be five years the BC ratio is still 0.8 tot 1.3.
- In case safety benefits are lower, at € 8 mln “per avoided road death” the BC ratio is 0.6 to 0.9.

The above results show that this option could under certain circumstances in future be quite attractive from a welfare point of view. The potential savings of peoples lives are substantial and, in particular if the costs of installing an alcohol interlock in cars would substantially drop below the present cost level, the benefits to society will surpass the costs to society.

10 Conclusions and Recommendations

The main findings of the present study are:

- Alcohol impairs driving capabilities. Driving capabilities are particularly impaired at higher blood alcohol content (BAC) levels. This relation is exponential, giving increasingly higher accident risk figures at higher BAC levels.

- Drink-driving accounts for 20-28% of all road accidents, deaths and injuries on European roads. The vast majority of the accidents in which drink-driving is involved, namely 75%, is caused by a small group of high BAC offenders. This group of (potential) high BAC offenders is thought to be around 1% of the driving population.

- Available data on drink-driving by professional drivers shows that this is much less prominent. The number of road deaths in accidents in which drink-driving of a truck driver is involved is estimated at 250. The number of road deaths in which drink-driving by a bus driver is involved is estimated to be even less, at 10.

- In order to combat the negative effects of alcohol use in traffic, four Member States (Sweden, Finland, The Netherlands and Belgium) have introduced the possibility for offenders to continue driving once being caught, but only if an alcohol interlock is installed in their vehicle. The alcohol interlock is thus an alternative to suspension of their driving licence. At present about 30% of the drivers that are being offered this opportunity choose this option above having their driving licence being revoked. Participation is higher if the measure is and administrative measure, lower if it is a legal measure.

- International literature shows that an alcohol interlock device is an effective means of avoiding recidivism by high BAC offenders. The effectiveness is 75% higher than that of suspension of the driving licence. However, experience also shows that the effect is not lasting, and reduces to zero, once the alcohol interlock has been removed.

- Apart from installation of an alcohol interlock, various other types of measures have been taken by governments to combat drink-driving, such as restricting the sale of alcohol along roads an on ferries; general education measures; specific campaigns pointing out the negative effects of drink-driving (e.g. the Bob-campaigns).

- Against this background several policy options have been evaluated in this report. Four of these policy options show quite favourable benefit cost ratio's against the status quo policy option, namely:
  - *Stimulating exchange of information* between member states, identification and dissemination of best practices. The Benefit Cost ratio of this policy option has been estimated at 1.5 tot 2.7 (sensitivity range: 1.0 to 3.2).
  - *Harmonisation* of technical (standards, retrofitting) and operational (driving licence codes) aspects that are present barriers to introduction of alcohol interlock programmes within the European Union. This option shows the highest BC ratio, at 1.8 to 3.3 (sensitivity: 1.2 to 3.9).
  - Common agreement, possibly backed by legislation, that all Member States offer the possibility of installation of an AIP to *high BAC offenders* on their roads (i.e. with BAC levels of 1.3 g/l or higher), including a rehabilitation programme. Inclusion of an AIP is than alternative to revocation of the driving licence. The BC ratio of this policy option is estimated at 1.0 to 2.8 (sensitivity range 0.8 to 3.4).

- Issuing legislation in order to prevent all *professional drivers of goods vehicles* in the European Union from driving while having consumed alcohol. This implies a compulsory installation (ex factory) of alcohol interlocks in all freight vehicles on European roads, and associated monitoring. The ratio between benefits and costs for this option is estimated at 1.4. This option has a wide sensitivity range (0.4 to 3.3), though, depending on future costs and effectiveness.

Of these policy options in particular the first two have wide support among stakeholders.

- Other policy options, show less favourable benefit/cost ratio's. The option of having an alcohol interlock device installed in *all passenger cars* shows a BC ratio of 0.8 to 1.3, depending on the effectiveness of the device in avoiding accidents. This option is presently hampered by disadvantages like the intrusiveness of the devices, which contribute to the low acceptance of such devices. However, if in future the devices would become less intrusive and costs of having an alcohol interlock build-in in all passenger cars would reduce substantially, for instance as a result of economies of scale in production or technological development, the option of making an alcohol interlock a compulsory device in all passenger cars could also show a robust net benefit to society.

- The policy option to have an alcohol interlock device installed in all *buses and coaches* in the EU shows the least favourable ratio between benefits and costs (0.3). The reason for this is the low number of road deaths that can be attributed to drink-driving by bus/coach drivers.

Recommendations

Based on the analysis it is recommended that the European Union:

- further stimulates the exchange of knowledge and best practices on the use of alcohol interlocks among Member States;
- together with the stakeholders, focuses on harmonisation of technical and cross border aspects of the use of alcohol interlocks as preventive measure;
- drafts guidelines on the possibility to offer an alcohol interlock programme to high BAC offenders, as an alternative to the revocation of the driving licence, in all Member States;
- closely follows and if necessary stimulates the development of new generation alcohol interlocks, with a view to future compulsory installation ex-factory in specific groups of vehicles, like commercial goods vehicles.

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Annex 1: Terms of Reference

TASK SPECIFICATIONS

to award a Specific Contract under the Framework Contract
MULTIPLE FRAMEWORK SERVICE CONTRACT
WITH RE-OPENED COMPETITION FOR TECHNICAL ASSISTANCE
TREN/R1/350-2008 lot 3
for the assignment:

STUDY ON THE PREVENTION OF DRINK-DRIVING BY THE USE OF ALCOHOL INTERLOCK DEVICES

1. INTRODUCTION

This document provides the specifications for a study to be carried out by a consultant concerning the prevention of drink-driving by the installation of alcohol interlock devices.

The purpose of these specifications is to describe the aim and scope of the study and give instructions and guidance to the companies willing to submit the offers. The specifications will also serve as the contactor's mandate during the implementation of the study, after selection of the successful tenderer. They will become part of the contract that will be concluded following the award of the tender.

The Commission adopted in July 2010 the Policy Orientations on Road Safety for 2010-2020. One of the strategic objectifies identified by the Commission is the enforcement of road safety rules.

One of the Commission's priorities is the prevention of driving under the influence of alcohol. Despite lower alcohol limits, increased enforcement and awareness campaigns, drink-driving is still a major safety problem.

In this context the Commission wants to examine the possibility to make alcohol interlock devices mandatory for certain categories of drivers or vehicles.

Alcohol interlock devices are breath testing devices connected to the starting system of a motor vehicle. They prevent the vehicle from starting if the breath

alcohol concentration exceeds a predetermined threshold, which can be set at different levels. There are devices on the market which continuously check drivers at set intervals during a trip, shutting down a vehicle if appropriate. Some devices are equipped with a logging function of which data must be periodically read-out in order to prevent locking.

A number of Member States have already implemented measures to prevent drink-driving through the installation of alcohol interlock devices for certain categories of drivers, e.g. repeated drink-driving offenders or professional drivers. Also, Member States have implemented other (voluntary) programmes to gain relevant experience with the device.

2. OBJECTIVES

The purpose of the contract is to assist the Commission in deciding whether to propose EU legislative measures requiring the installation of alcohol interlock devices as a means to prevent drink-driving and to determine to which extent vehicle and device standardisation is deemed necessary.

The contractor shall assess the potential benefits for road safety of alcohol interlock devices as well as the cost effectiveness. On the basis of this assessment and on the result of a consultation with stakeholders, recommend measures for their mandatory implementation at EU level, including if appropriate the definition of the categories of drivers and/or vehicles which should be subject to these measures.

The expected output includes

a) Analysis of the potential benefits of alcohol interlock devices
b) Consultation with stakeholders
c) Policy recommendations

3. DESCRIPTION OF THE TASKS

The study shall comprise the following tasks:

1. Collect legislation, studies and other literature dealing with the installation and use of alcohol interlock devices. Collect road accident data related to alcohol as an accident factor.

2. On the basis of the information and data collected under task 1, analyse the role of alcohol as a contributing factor in road accidents.

3. Describe and analyse the experiences in some Member States and third countries with the installation and use of alcohol interlock devices, in which context the device is used (e.g. voluntary or mandatory use, part of a specific rehabilitation programme, means to obtain insurance benefits, field study programme) and in particular providing an assessment of the effects of such measures.

4. Prepare an inventory of the different types of technical solutions for alcohol interlock devices (e.g. single breath sample, multiple breath

sampling, remote sensing). For each of these technical solutions provide a qualitative (and where possible quantitative) evaluation of it advantages and disadvantages, including installation and use, accuracy and precision, technical complexity, reliability, maintenance, cost and the risk of fraud to bypass the system.

5. Determine the need for (additional) specific standardisation of alcohol interlock devices and for enabling the compatibility between vehicles and devices (e.g. facilitating applications with standard vehicle interface).

6. Describe and analyse applied measures with regard to read-out of data, namely who is authorised to do so and the protection of privacy.

7. Organise a stakeholders consultation based on a questionnaire and on a stakeholders meeting. The consultation will collect the view of stakeholders about the potential benefits for road safety deriving from the use of alcohol interlock devices and the possibility to adopt EU measures. The results of the consultation shall be discussed and finalised at the stakeholders meeting to be held in Brussels.

8. Analyse the potential benefits for road safety and the problems posed by the mandatory installation of alcohol interlock devices for all vehicles, for certain categories of vehicles and for certain categories of drivers. Concerning vehicle and driver categories, the assessment shall include at least the use of alcohol interlock devices for dangerous goods trucks, school buses, coach buses, taxis and its use for multiple offender drivers. The analysis of the advantages and disadvantages of alcohol interlock devices shall include the consideration of alternative measures aimed at preventing drink-driving (e.g. stronger enforcement).

9. On the basis of the analysis carried out and on the result of the consultation with stakeholders, prepare recommendations concerning the adoption of EU measures on alcohol interlock devices. In addition to the scope of application, the recommendations should cover the authorisation and accreditation with respect to the installation of alcohol interlock devices and the measures for cross-border application, with emphasis on enforcement (e.g. multiple offenders, annotation on driver's license) as well as the relevant authorisations (e.g. device data read-out).

10. For the measures recommended assess their costs and benefits and comparative advantages and disadvantages.

Annex 2: Information on alcohol interlock programmes in some third countries

Alcohol interlock legislation in United States

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
Alabama	No	If a first time offender has a child of 14 years old or younger, has a BAC of 0.15 or higher, or causes an injury to another person, an ignition interlock device must be installed for 2 years, once their license has been returned to them. Second offenders have the same requirement, regardless of extenuating circumstances. For third-time offenders the period is 3 years, and for fourth and subsequent offenses, the period is 5 years.
Alaska	Yes	The Court shall require anyone who is convicted of DUI to equip any motor vehicle the person operates with an ignition interlock device after the person regains the driving privilege. Minimum of 6 months on first conviction, 12 months upon second conviction and 18 months for third conviction. Criminal sanctions exist for circumventing or tampering devices
Arizona	Yes	The court shall require any persons who are convicted of DUI to equip any motor vehicle the person operates with an ignition interlock device. The court shall also require offenders to equip vehicles operated with ignition interlock devices for 1 year at the conclusion of the license suspension/revocation period or on the date of conviction whichever is later if (1) a second drunk driving offense occurs within 84 months; (2) a third or subsequent drunk-driving offense (aggravated driving under the influence); (3) a drunk-driving offense where the offender is driving on a suspended or revoked license for a prior DWI offense or a prior admin. per se violation (AGDWI); (4) a first or second BAC of 0.15 offense; or, (5) a drunk-driving child endangerment offense. Offenders are eligible for an ignition interlock after 45 days of their license suspension, if they wish to resume driving more quickly. For offenders who were convicted of driving with a BAC of 0.15 to 0.2, a judge may suspend all but 9 days of their jail time if they install an ignition interlock device. For drivers convicted of driving with a BAC greater than 0.2, a judge may suspend all but 14 days of their jail sentence if they install an interlock device.
Arkansas	Yes	A person arrested for a first offense DWI are not entitled to a restricted permit but are allowed an ignition interlock restricted license. In addition to any other sanction for a DWI offense, the court (1) may for a first or second offense and (2) must, for a third or subsequent offense, if the offender can afford it, require only operating a motor vehicle equipped with an ignition interlock device. This requirement continues for up to 1 year after the person's license is no longer suspended or revoked. If restricted licenses have been issued, the required use of an ignition interlock device “shall be for at least the remaining time period of the original suspension” period. Persons arrested for operating a motor vehicle while intoxicated by the use of a controlled substance or refusal to submit to testing are ineligible for an ignition interlock restricted driving permit.
California	No	The court may require that a person convicted of a first DUI offense install a certified ignition interlock device on any vehicle that the person owns or operates and prohibit that person from operating a motor vehicle unless that vehicle is equipped with a functioning, certified ignition interlock device. The court shall give heightened consideration to applying this sanction to a first offense violator with BAC of 0.15 percent or more, or with two or more prior moving traffic violations, or to persons who refused the chemical tests at arrest. If the court orders the ignition interlock device restriction, the term shall be determined by the court for a period not to exceed 3 years from the date of conviction.
Colorado	No	For a first offense, offender's license will be revoked for 9 months, with the option after 1 month, to install an ignition interlock device and receive a limited

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		license. A person with greater than BAC of 0.17 is classified as a “persistent drunk driver” and must use an ignition interlock for at least 1 year. For either (1) an impaired, under the influence or illegal per se offense or (2) a habitual offender offense related to one of these alcohol offenses where there has been a previous alcohol driving offense conviction of any type within a 5-year period, an offender must install ignition interlock devices on the vehicles that person drives and is required to hold a restricted license for at least 1 year prior to full license reinstatement. A person who has had his driving privileges revoked for more than 1 year either for (1) driving while either impaired, under the influence or illegal per se or (2) an admin per se violation, is eligible for early license reinstatement with driving restrictions with the use of an ignition interlock device. The restrictions remain in effect for “the longer of 1 year or the total time period remaining on the license restraint prior to early reinstatement.”
Connecticut	Yes	Any person who has been arrested for a violation may be ordered by the court not to operate any motor vehicle unless such motor vehicle is equipped with an ignition interlock device. The Commissioner of Motor Vehicles shall permit a person whose license has been suspended to operate a motor vehicle if such person has served not less than 45 days of such suspension, and such person has installed an approved ignition interlock device in each motor vehicle owned or to be operated by such person. For a first DUI offense, the driver is prohibited from operating the vehicle for 1 year, after the 45 day suspension period, without the ignition interlock device. For a second offense within 10 years, the driver may not operate a vehicle for 3 years, after the 45 day suspension period, without an approved ignition interlock device.
Delaware	No	The Court shall, for any individual with a BAC of 0.15 or more or who refused a chemical test, prohibit the person convicted from operating any motor vehicle unless such motor vehicle is equipped with a functioning ignition interlock device. Second or subsequent offenders are eligible for a regular Class D license via the licensing agency if they agree to install and use ignition interlock devices on the vehicles they operate. If the original revocation was for 12 months, a person must agree to participate in the program for 14 months whereupon a conditional license is available after 1 month. If the original revocation was for 12 months where there are no prior offenses but there is a refusal to submit to a chemical test, a person must agree to participate in the program for 14 months whereupon a conditional license is available after 2 months. If the original revocation was for 18 months, a person must agree to participate in the program for 20 months whereupon a conditional license is available after 6 months. If the original revocation was for 24 months, a person must agree to participate in the program for 26 months whereupon a conditional license is available after 12 months. Persons who have been convicted for drunk-driving offenses related to death or serious injury or who are under license suspension or revocation are not eligible for this voluntary program. Participation in the ignition interlock program is mandatory for all subsequent offenders.

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
District of Colombia	No	Available for second or subsequent conviction.
Florida	No	Use of ignition interlock device is mandatory for at least 1 year upon a second conviction if driver qualifies for a permanent or restricted license and for at least 2 years for any third conviction and for other extenuating circumstances. If a first-time DUI offender was accompanied in the vehicle by a person younger than 18 years of age, the person shall have the ignition interlock device installed for 6 months for the first offense and for at least 2 years for a second offense. A DWI defendant who is placed on probation and who is otherwise permitted to operate a motor vehicle shall be required to operate vehicles equipped with ignition interlock devices for not less than 6 months. In addition, the licensing agency may require any person seeking reinstatement of their driving privileges to use an ignition interlock device on their vehicle. This requirement can apply to either occupational restricted or regular driving privileges.
Georgia	No	Second and subsequent offenders on probation must install ignition interlock devices on all of the vehicles they own and only operate vehicles equipped with such devices. Use begins when the offender is issued limited driving privileges and must last for at least 8 months. If habitual offender status is based on two or more drunk-driving offense convictions and the offender is placed on probation, the use of a probationary license is conditioned of the use of an ignition interlock device for 6 months after the probationary license has been issued. An ignition interlock device limited driving permit shall be restricted to allow the holder thereof to drive solely; to work, to school, regularly scheduled sessions or meetings of treatment support organizations, and monthly monitoring visits with the permit holder's ignition interlock device service provider.
Guam (territory)	No	No laws available at this time.
Hawaii	Yes	For first offense: 1 year revocation of license and privilege to operate a vehicle during the revocation period and installation during the revocation period of an ignition interlock device on any vehicle operated by the person. For second offense within 5 years or first conviction if Highly Intoxicated: A 2 year revocation of license and privilege to operate a vehicle during the revocation period and installation during the revocation period of an ignition interlock device on any vehicle operated by the person.
Idaho	No	For any person under 21, a second and subsequent offense requires ignition interlock following the mandatory license suspension period. Ignition interlock installation is mandatory following the mandatory license suspension period for second and subsequent violators who had BAC over 0.20 at time of arrest. Any person who has been found guilty of DUI within the prior 10 years, installation of an ignition interlock is mandatory.
Illinois	No	The court shall require any persons who are convicted of DUI to equip any motor vehicle the person operates with an ignition interlock device during the period of statutory license suspension. Other than offenders that must drive to and from a farm, or operate a tractor while working on a farm, DUI offenders will be automatically issued an ignition interlock device. They may decline the device, but without it, the offender will face increased penalties.
Indiana	No	As a condition for obtaining probationary driving privileges, the court may require a defendant to use only vehicles equipped with ignition interlock devices for a

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		term established by the court with the limitation that such term cannot exceed the maximum prison sentence; violation of this requirement is a Class A infraction. Other provisions of law also provide that a person convicted of an illegal per se/intoxicated offense (within 5 years or within 10 years but more than 5 years of a previous conviction) may be granted probationary (restricted) driving privileges on the condition that the person only operate vehicles equipped with ignition interlock devices.
Iowa	No	A DWI offender may be required to install ignition interlock devices on the vehicles they own. A second or subsequent offender, after the mandatory license revocation period, may be granted restricted driving privileges provided they install ignition interlock devices on all of the vehicles they own. Prior to reinstating the driving privileges to a second or subsequent offender, the State shall require such person to install ignition interlock devices on all of the vehicles they own for 1 year. For either a first or subsequent refusal, a restricted license may be issued by the licensing agency provided the minimum period of license revocation has expired. A person must install an ignition interlock system on the vehicle(s) they operate as a condition for obtaining a restricted license. A person who tampers with or circumvents an ignition interlock device installed as required in this chapter and while the requirement for the ignition interlock device is in effect commits a serious misdemeanour.
Kansas	Yes	First offense, BAC over 0.08: a 30-day suspension followed by 6 months of ignition interlock device if your record is clear OR 12 months of interlock if you have a prior open container violation or three or more moving violations. Failure of a breath test with a result of BAC over 0.15 the first time, or over 0.08 on a second or subsequent occurrence is a 1 year suspension followed by ignition interlock (length of interlock is dependent on priors). Refusal of a breath, blood or urine test is a 1 year suspension, followed by ignition interlock requirement (length of interlock is dependent on priors), regardless of how many prior Kansas DUI occurrences a person has. Those that are required to install ignition interlocks for 10 years may petition the court after 5 years to have it removed. Driver with an ignition interlock can drive vehicle only for the purposes of getting to and from: Work, school or an alcohol treatment program; and the ignition interlock provider for maintenance and downloading of data from the device. Tampering or circumventing the ignition interlock device is a class A, nonperson misdemeanour: first conviction, restriction extended 90 days; second or subsequent conviction, restart the original restriction period.
Kentucky	No	At the conclusion of an offender's license revocation period, the court may require that person to operate only motor vehicles equipped with ignition interlock devices (with the exception of an employer's vehicles). This requirement lasts for the following periods following license revocation: first offense – 6 months; second offense (within 5 years) – 12 months; third or

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		subsequent offense (within 5 years) – 30 months. Second or subsequent offenders must wait at least 1 year from the start of the license revocation period before applying to the court for permission to use an ignition interlock device. This requirement may be used as an alternative to impounding the license plates of a second or subsequent drunk-driving offender. The court may grant hardship driving privileges for the purpose of employment, education, medical care, alcohol/substance abuse education programs or other court ordered counselling programs. This privilege may be conditioned on the offender operating motor vehicles equipped with ignition interlock devices.
Louisiana	Yes	For the offense, upon first or second conviction, or entry of a plea of guilty or nolo contendere, the offender's vehicle must be equipped with a functioning ignition interlock device to be issued a restricted license. First offense with a BAC of 0.20 or more results in suspension for at least 2 years. But a restricted license may be granted during the entire period of suspension with installation of ignition interlock.
Maine	No	As a condition of license reinstatement the Secretary of State may require a person to install in the motor vehicle the person operates for a period of up to 2 years an ignition interlock device. The license of a person with one OUI offense may be reinstated after 30 days of the suspension period has run if the person has installed for a period of 150 days or the length of time remaining for a an ignition interlock device approved by the Secretary of State in the motor vehicle the person operates. The license of a person with 2 OUI offenses, convictions or adjudications may be reinstated after 2 years if the person installs for a period of 9 months an ignition interlock device approved by the Secretary of State in the motor vehicle the person operates. The license of a person with 3 OUI offenses, convictions or adjudications may be reinstated after 3 years if the person installs for a period of 3 years an ignition interlock device. The license of a person with 4 or more OUI offenses, convictions or adjudications may be reinstated after 4 years if the person installs for a period of 4 years an ignition interlock device approved by the Secretary of State in the motor vehicle the person operates.
Maryland	No	As a condition of probation, the court may order a defendant for 1-3 years to operate only vehicles equipped with ignition interlock devices. If defendant registers a BAC of 0.15 or more, the court must order ignition interlock for at least 1 year. The licensing agency may establish an ignition interlock program for persons who have been convicted of alcohol related driving offenses. This program does not apply to persons who have been convicted of driving while under the influence of a controlled substance. A person who is subject to license suspension via the point system for a conviction of DWI may be issued a restricted license by participating in the Ignition Interlock Program. A person who is subject to license revocation following a conviction for either DWI or for DUI may have the license suspended in lieu of revocation by participating in the ignition interlock program. The suspension periods (or restricted license) imposed are the same as for DWI. A fourth or subsequent offender is considered an "habitual offender" and he cannot have his driving privileges restored until he has participated in this program for at least 24 months.
Massachusetts	No	Offenders with more than one drunken-driving conviction are required to install an ignition interlock device on their vehicles for a period of 2 years as a condition of having their licenses reinstated.

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
Michigan	No	A person who has had his license revoked for any drunk-driving offense may, after the mandatory revocation period, be issued a restricted license instead of full driving privileges. If a restricted license is issued, the driver is limited to operating motor vehicles that are equipped with an ignition interlock device. The initial period for the use of such device is 1 year. Interlocks required for first-time DUI offenders convicted with a BAC of 0.17 or above.
Minnesota	No	A judge is not required to sentence a person as provided in this section if the judge requires the person as a condition of probation to drive only motor vehicles equipped with an ignition interlock device meeting the standards described in section 171.306. First offenders may apply for conditional reinstatement of the driver's license, subject to the ignition interlock restriction. Second or subsequent offenders may apply for a limited license, subject to the ignition interlock restriction, if the program participant is enrolled in a licensed chemical dependency treatment or rehabilitation program as recommended in a chemical use assessment, and if the participant meets the other applicable requirements of section 171.30. Tampering or attempting to circumvent the interlock system: 180 days for a first violation; 1 year for a second violation; or 545 days for a third and each subsequent violation.
Mississippi	No	For either an intoxicated or illegal per se drunk driving offense of a first offender, the court may, require such a person to only operate motor vehicles that are equipped with an ignition interlock device for not less than 1 month following license reinstatement. In the case of a second or subsequent offender, the court must require ignition interlock. Such a requirement is mandatory as a condition for granting limited (hardship) driving privileges for subsequent offenders.
Missouri	No	When license is suspended or revoked ignition interlock is required to be maintained on all motor vehicles operated by the person for a period of not less than 6 months immediately following the date of reinstatement. A court may require that any person who is found guilty of or pleads guilty to a first intoxication-related traffic offense, and a court shall require that any person who is found guilty of or pleads guilty to a second or subsequent intoxication-related traffic offense, shall not operate any motor vehicle unless that vehicle is equipped with a functioning, certified ignition interlock device for a period of not less than 6 months from the date of reinstatement of the person's driver's license.
Montana	No	For a first offense, a court may restrict an offender to only operate motor vehicles that are equipped with ignition interlock devices. For either a second or subsequent offense, a defendant who is issued a probationary license is restricted to operating motor vehicles that are equipped with ignition interlock devices. For fourth or subsequent offenses, if an offender is permitted to operate motor vehicles as a condition of probation, such vehicles must be equipped with ignition interlock devices. Licensing action is stayed while participating in the ignition interlock program. The duration of this restriction is equal to the period of license suspension or

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		revocation.
Nebraska	Yes	At the expiration of 30 days (60 days if test refused) after an order of administrative license revocation for 90 days is entered, any person who submitted to a chemical test which disclosed the presence of a concentration of alcohol in violation of the statutory limit is eligible for an order to allow application for an ignition interlock permit to operate a motor vehicle equipped with an ignition interlock device upon presentation of sufficient evidence to the Department of Motor Vehicles that such a device is installed. As an alternative to vehicle disablement, the court shall order the convicted person, in order to operate a motor vehicle, to obtain an ignition interlock permit and install an ignition interlock device on each of the motor vehicles owned or operated by the convicted person if he or she was sentenced to an operator's license revocation of at least 1 year and has completed at least 1 year of such revocation. Those without prior records may operate their ignition interlock equipped vehicle only to work, school, a substance abuse treatment centre, a parole meeting, to a healthcare facility, or to community service. Those with a record may only drive to school, work, or to a treatment facility. Persons under 18 years of age shall not be eligible for an ignition interlock permit. Tampering or attempting to circumvent the interlock shall, in addition to any possible criminal charges, have his or her revocation period and ignition interlock permit extended for 6 months beyond the end of the original revocation period.
Nevada	No	The court may or must require a defendant to install an ignition interlock as a condition for restricted driving privileges as follows: First offense – 3 to 6 months (discretionary); second offense – (no requirement); and, third and subsequent offense – 12 to 36 months (mandatory). The court may require a defendant to install an ignition interlock as a condition for the reinstatement of driving privileges. The period of use is determined by the court.
New Hampshire	No	Aggravated DWI or subsequent DWI offenders may be required to install an ignition interlock device on the vehicles owned or regularly used for 6 months to 2 years following license reinstatement. Interlock device required on any vehicle registered to a person who drives after a suspension or revocation resulting from a DWI offense.
New Jersey	No	A first time offender with a BAC greater than 0.15 must install an ignition interlock device. Installation is mandatory for 6 months after the required period of license suspension has been served. After license suspension period has been completed, a person may be required to install an ignition interlock device on all of the motor vehicles he owns or operates. The device must be installed for the following periods: first offense—discretionary 6 months to 1 year (6 months required usage if ignition interlock use ordered); second or subsequent offense—mandatory ignition usage for 1 (mandatory) to 3 years.
New Mexico	Yes	Persons who have been convicted of a misdemeanour drunk-driving offense shall be required, as a condition of probation, to operate only motor vehicles that are equipped with ignition interlock devices, as follows: a period of 1 year, for a first offender;

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		a period of 2 years, for a second conviction; a period of 3 years, for a third conviction; for life for a fourth or subsequent conviction, except that 5 years from the date of conviction and every 5 years thereafter, the offender may apply to a district court for removal of the Interlock for good cause shown. Good cause may include alcohol screening and proof from the interlock vendor that the person has not had violations of the interlock device.
New York	Yes	Ignition interlock is required for all offenses during period of license revocation or a minimum of 6 months and thereafter by court order.
North Carolina	No	Persons eligible for restricted driving privileges may be required to operate motor vehicles equipped with an ignition interlock device. This requirement is mandatory if the BAC was greater than 0.16 or if the person is a second or subsequent offender (within 7 years). After license restoration, required ignition interlock usage is as follows: 1 year if license revocation was for 1 year; 3 years if license revocation was for 4 years; and 7 years if the license was permanently revoked but can be restored. Tampering or attempting to circumvent the interlock system is a Class 1 misdemeanour.
North Dakota	No	The court or driver licensing agency may order a defendant to install an ignition interlock device on his vehicle. This requirement applies to the issuance of temporary restricted driving privileges.
Ohio	No	If imposed, as a condition of probation by the court, offenders must obtain a specially marked driver's license indicating they may only operate a vehicle equipped with such an ignition interlock device. For first and second offenses, the court may order a person to use ignition interlock devices when using an occupational license; for third and subsequent offenses, the court must require a person to use these devices when using an occupational license.
Oklahoma	No	A person is guilty of Aggravated Driving if convicted of driving under the influence with a BAC greater than 0.15. Such a conviction, or a refusal to take a chemical test, requires ignition interlock use for a minimum of 30 days. After a period of license revocation, as a condition of modification, the driver must agree, except in certain circumstances, to only operate motor vehicles that are equipped with an ignition interlock device. The motor vehicles department will issue a new driver's license with the words "Interlock Required" on it. For a first time offender, with a BAC greater than 0.15, or chemical test refusal, once their initial license revocation period is finished, they will be required to have an ignition interlock device for 1.5 years, or until their driving privileges would normally be reinstated, whichever is longer. For a second time offender, the interlock period is 4 years, or until driving privileges are to be reinstated, whichever is longer. For a third or subsequent offense, the period is 5 years or until their license would be normally reinstated, whichever is longer.
Oregon	Yes	Persons convicted of DWI offenses shall have an ignition interlock device installed in their vehicles prior to being issued a hardship license. First offenders must operate motor vehicles equipped with ignition interlock devices for 1 year after the end of the license suspension or revocation period;

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		second or subsequent offenders must operate with an interlock device for 2 years after the ending date of the suspension or revocation caused by the conviction. When a person is convicted of a crime or multiple crimes, the department shall require that the person install and use an approved ignition interlock device in any vehicle operated by the person for 5 years after the ending date of the longest running suspension or revocation caused by any of the convictions (crimes include driving under the influence and: Any degree of murder; manslaughter in the first or second degree; criminally negligent homicide; assault in the first degree; aggravated vehicular homicide) The court may require the use of an ignition interlock device as part of a diversion agreement.
Pennsylvania		All vehicles owned by offenders may for a first offense and must for a subsequent one be equipped with ignition interlock devices for at least 1 year following license reinstatement.
Puerto Rico (territory)	No	No laws available at this time.
Rhode Island	No	Any second offender may be required to operate motor vehicles equipped with ignition interlock devices from 1 to 2 years. Third or subsequent offender may be required to use these devices for 2 years. Requirements begin following the completion of any incarceration period.
South Carolina	No	The Department of Motor Vehicles must require the person, if a subsequent offender, to install an ignition interlock device. The DMV may waive the requirements of this section if it finds that the offender has a medical condition that makes him incapable of properly operating the installed device. The length of time that an interlock device is required to be affixed to a motor vehicle following the completion of a period of license suspension imposed on the offender is 2 years for a second offense, 3 years for a third offense, and the remainder of the offender's life for a fourth or subsequent offense. Notwithstanding the pleadings, for purposes of a second or a subsequent offense, the specified length of time that an interlock device is required to be affixed to a motor vehicle is based on the Department of Motor Vehicle's records for offenses.
South Dakota	No	The Attorney General, may promulgate rules for the administration of and provide for procedures and apparatus for testing including electronic monitoring devices and ignition interlock devices.
Tennessee	Yes	A person convicted of any DUI offense, when applying for and the court orders the issuance of a restricted motor vehicle operator's license, must operate only a motor vehicle that is equipped with a functioning ignition interlock device. The order is a condition of probation if at the time of the offense, the defendant: (1) Has a blood or breath alcohol concentration of 0.08 percent or higher; (2) Is accompanied by a person under 18 years of age; (3) Is involved in a traffic accident for which notice to law enforcement is required under present law and the accident is the proximate result of the person's intoxication; or

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		(4) Is in violation of the implied consent law, and has a conviction or juvenile delinquency adjudication for a violation that occurred within five years of the instant implied consent violation, for implied consent, underage driving while impaired, the open container law, or reckless driving if the charged offense was DUI. If a person convicted of a DUI has a prior DUI conviction within the past five years, then, after the revocation period, the person may only operate only a motor vehicle that is equipped with a functioning interlock device for one year and such requirement is a condition of the person's probation. No geographic restriction requirements for restricted licenses.
Texas	No	For second or subsequent offenses or BAC greater than 0.15: The court must order offender to install ignition interlock devices on all of the motor vehicles he owns for 1 year following a period of license suspension. When applying for an occupational license, the court may require a first offender and must require subsequent offenders within 10 years to only operate vehicles that are equipped with ignition interlock devices. Unless the interests of justice indicate otherwise, a magistrate shall require an offender (Intoxicated Assault, Intoxicated Manslaughter or a subsequent DWI offense), after release from confinement, to only operate vehicles that are equipped with ignition interlock devices.
Utah	Yes	An offender is required, as a condition of probation, only to operate motor vehicles that are equipped with ignition interlock devices. The person's license will be suspended pending completion of the period with the interlock device. If the defendant had a BAC of 0.16 or higher, the court shall order the following (or describe on record why the order or orders are not appropriate): Treatment and one or both of the following: ignition interlock system as a condition of probation, and home confinement through the use of electronic monitoring.
Vermont	No	First offender may be eligible for ignition interlock restricted driver's license after 30 days of a 90 day suspension. For second offense, the offender may be eligible for an ignition interlock restricted driver's license after 90 day of the 180 day sentence. Persons who elect to obtain an ignition interlock RDL following a conviction under this subchapter when the person's BAC is 0.16 or more shall be required to install an ignition interlock device with a Global Positioning System feature. Tampering or attempting to circumvent the interlock is a criminal offence and if convicted the period of use is extended by 6 months.
Virginia	Yes	For first offense and subsequent offenses, the court shall require a DWI offender who has been granted either restricted driving privileges or full driving privileges on condition to operate only motor vehicles that are equipped with ignition interlock devices for any period of time not to exceed the period of license suspension and restriction, not less than 6 consecutive months without alcohol-related violations of the interlock requirements. Tampering or attempting to circumvent an interlock is a Class 1 misdemeanour.
Washington	Yes	The court shall order any person convicted of an alcohol-related violation or an equivalent local ordinance to apply for an ignition interlock driver's license and to have a functioning ignition interlock device installed on all motor vehicles operated by the person. The court may also order the installation of an interlock device for a driver that is convicted of reckless or negligent driving within 7 years of an alcohol related driving offense. An ignition interlock may be required for

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		reckless or negligent drivers without a prior DUI conviction. An ignition interlock device will be required for any driver convicted of vehicular homicide while driving under the influence. The court may waive the requirement that a person obtain an ignition interlock driver's license and operate only vehicles equipped with a functioning ignition interlock device if the court makes a specific finding in writing that the devices are not reasonably available in the local area, that the person does not operate a vehicle, or the person is not eligible to receive an ignition interlock driver's license. For a person who has not previously been restricted, the device shall be installed for a period of 1 year; for a second restriction, a period of 5 years; for a third or subsequent restriction, a period of 10 years. The driver may apply for day-for-day credit towards the period of license revocation for use of an interlock device, as long as the device is installed in all non-exempt vehicles the driver operates. A person receiving an ignition interlock driver's license waives his or her right to a hearing or appeal under RCW 46.20.308.
West Virginia	No	The driver licensing agency may reduce the mandatory and regular revocation periods of certain implied consent, admin per se and DWI law offenders if they agree to operate motor vehicles equipped with ignition interlock devices. First admin per se violation/DWI offense: The ignition interlock must be used for 5 months. First refusal: The ignition interlock must be used for 9 months. Second admin per se violation or DWI offense: The ignition interlock must be used for 18 months. Subsequent admin per se violation or DWI offense and second or subsequent refusal: The ignition interlock must be used for 2 years.
Wisconsin	No	For a second or subsequent offense (within 5 years), a person's vehicles must be immobilized or equipped with an ignition interlock device for not less than 1 year nor more than the maximum period of license revocation. Ignition interlock usage starts 1 year after the revocation period. The DOT must limit the occupational license of a person who has 2 or more prior violations to operating only vehicles equipped with an ignition interlock device, regardless of whether a court has ordered every vehicle that is titled or registered in the offender's name to be equipped with such a device. Interlocks mandatory for a minimum of 1 year if the person has a BAC of 0.15 or more.
Wyoming	No	For a first conviction where the conviction is based on the person having BAC of 0.15 or more, operate only vehicles equipped with an ignition interlock device for a period of 6 months from the date of conviction; For a second conviction, operate only vehicles equipped with an ignition interlock device, for a period of 1 year from the date of conviction; For a third conviction, operate only vehicles equipped with an ignition interlock device, , for a period of 2 years from the date of conviction; For a fourth or subsequent conviction, operate only vehicles equipped with an ignition interlock device, for the remainder of the offender's life, except 5 years from the date of conviction and every 5 years thereafter, the offender may apply to the court for removal of the ignition interlock device required by this paragraph. The court may, for good cause shown, remove the ignition interlock device requirement if the offender has not been subsequently convicted of driving a motor vehicle in violation of this section or other law prohibiting driving while under the influence.

State / District / Territory	Mandatory for all DUI offences? [1]	Summary of legislation
		If a person fails to submit to all required chemical tests requested by the peace officer shall result in the suspension of his Wyoming driver's license or his privilege to operate a motor vehicle for a period of 6 months for a first offense or 18 months for a second or subsequent offense and he may be required to drive only vehicles equipped with an ignition interlock device.
West Virginia	No	The driver licensing agency may reduce the mandatory and regular revocation periods of certain implied consent, admin per se and DWI law offenders if they agree to operate motor vehicles equipped with ignition interlock devices. First admin per se violation/DWI offense: The ignition interlock must be used for 5 months. First refusal: The ignition interlock must be used for 9 months. Second admin per se violation or DWI offense: The ignition interlock must be used for 18 months. Subsequent admin per se violation or DWI offense and second or subsequent refusal: The ignition interlock must be used for 2 years.

[1]: Requires ignition interlock installation for all DUI offenses, including first time offenses

Summary of alcohol interlock legislation in Canada

Province	Mandatory	Criteria	Voluntary	Criteria
Alberta	Yes	Any alcohol-related Criminal Code impaired driving offence [1]	No	
British Columbia	Yes	Any alcohol-related Criminal Code impaired driving offence [1]	No	
Manitoba	Yes	Any alcohol-related Criminal Code impaired driving offence [1]	No	
New Brunswick	No		Yes	Impaired driving offenders other than novice drivers may apply
Newfoundland and Labrador	No		Yes	Impaired driving offenders and those convicted of refusing a test may apply
Nova Scotia	Yes	"High -risk first offenders" ; drivers convicted of impaired driving causing death or bodily harm; or of offenders with a prior impaired driving, refusing/ failing a test or driving while disqualified conviction	Yes	First impaired driving offenders can apply
Ontario	Yes	Any alcohol-related Criminal Code impaired driving offence [1]	No	
Prince Edward's Island	Yes	Impaired driving or refusing/failing a test	No	
Quebec	Yes	Drivers convicted of any alcohol-related Criminal Code impaired driving offence who did not apply or were ineligible for the voluntary program	Yes	Impaired driving offenders not in mandatory program
Saskatchewan	Yes	Judges can order offenders convicted of impaired driving or refusing/failing a test to participate in an interlock program	Yes for impaired, no for refusing	Impaired driving offenders and those convicted of refusing/failing to take a test may apply
Territories:				
Northwest Territories	No		Yes	Impaired driving offenders other than novice drivers may apply
Nunavut	No		No	

Province	Mandatory	Criteria	Voluntary	Criteria
Yukon	No		Yes	Drivers whop receive a mandatory territorial license disqualification for a federal impaired driving offence

[1]: "The federal Criminal Code sets out impaired driving offences, enforcement procedures and penalties. These laws are based on the .08% BAC legal limit. While the Criminal Code offences are established federally, enforcement, apprehension, prosecution and application of penalties fall within provincial and territorial authority." Source: www.madd.ca

Summary of alcohol interlock legislation in Australia

Queensland: Alcohol ignition interlock laws came into effect on 6 August 2010. Alcohol ignition interlocks apply to people who are convicted of high-risk drink-driving offences. These include people who commit and are convicted of any of the following offences on or after 6 August 2010:

•a drink-driving offence with a breath/blood alcohol concentration of 0.15 or more, driving under the influence of liquor, or failure to provide a breath/blood specimen for analysis

•dangerous driving while affected by alcohol

•two or more drink-driving offences of any kind within a 5 year period.

New South Wales The Alcohol Interlock Program is a court based penalty for drink drivers that commenced in 2003. The program enables drivers convicted of certain major alcohol-related offences to continue driving after a reduced disqualification period if they obtain an interlock driver licence and participate in the program. Participation in the program is voluntary. Those who do not obtain an interlock driver licence will be required to serve their full disqualification period.

Australian Capital Territory: Alcohol ignition interlocks will be fitted to the vehicles of repeat and high range drink drivers in the Territory, under reforms to drink-driving laws passed today. Interlocks will be mandatory for all drivers convicted of having a blood alcohol concentration (BAC) of 0.15 or higher, three times the legal limit.

Victoria: In May 2002, Victoria implemented alcohol interlock legislation which requires that an interlock is fitted to a car whose drive has been convicted of serious drink offences.

- A driver who records a BAC offence more than once (including failure to provide a blood or breath sample)
- has committed a serious single offence: a BAC of .15 or higher
- one offence and under 26 at the time of offence which involves a BAC of .07 or more
- one offence and probationary driver at the time of offence which involves BAC of .07 or more

Tasmania: Tasmania's Mandatory Alcohol Interlock Program (the program) will apply to people who are convicted of drink-driving offences after serving their disqualification. You will be required to participate in the program if you are convicted of any of the following offences:

•a drink-driving offence recording a BAC of 0.15 or more

•two or more drink-driving offences in a five year period

•driving under the influence of liquor

•failing to provide a breath/blood specimen for analysis

Northern Territory: The Alcohol Ignition Lock (AIL) program for convicted drink drivers has been introduced and commenced in the NT in December 2009. The AIL Program only affects repeat drink drivers convicted of a relevant offence on a second or subsequent occasion

Annex 3: Stakeholder Questionnaire

Introduction

The Directorate General for Mobility and Transport of the European Commission has commissioned a study with the aim to assess the road safety benefits of alcohol interlock devices (also known as “alcolocks” or “ignition interlocks”; in this questionnaire we use the term alcohol interlock devices for this).
The results of the study will help the European Commission to decide whether it would be appropriate to envisage EU measures concerning these devices and eventually to define the scope of such measures.

The study includes a stakeholders' consultation, where manufacturers, users and authorities will be invited to provide their views on this matter. The present questionnaire is part of this stakeholders' consultation process.

The questionnaire is aimed at both stakeholders in Member States which have already taken measures requiring the use of alcohol interlock devices, as well as at stakeholders in Member States which have not (yet) done so.

From stakeholders in those Member States that have already implemented measures, the questionnaire aims to collect information on the various aspects of these measures, including costs and benefits. From stakeholders in Member States that have not implemented measures, the questionnaire aims at deriving information on the various barriers to such measures.

Study team

The study is carried out by a consortium of three companies from the Netherlands, notably Ecorys, SWOV and ADV Leiden. The consortium would very much appreciate your contribution.

If you have any questions on the questionnaire please contact us at: alcohol-interlock@ecorys.com

Set up of questionnaire

The questionnaire consists of 7 parts, and totals 54 questions. However, depending on you situation, you will need to fill in only 2 to 4 parts of the questionnaire (10 to 25 questions).

Completing the full questionnaire will take some 10 to 30 minutes of your time, depending on your actual experience with alcohol interlock device programmes.

Your contact details

In order to improve understanding of your contribution, we would like to ask you to complete the following contact details. The presentation of the results will, of course, be wholly anonymous.

Name organisation:……...
Contact person:……
Position:……
E-mail:……..
Telephone:……
Country:……
Definitions

Alcohol interlock devices

Alcohol interlock devices (also known as “alcolocks” or “ignition interlocks”) are breath testing devices connected to the starting system of a motor vehicle. They prevent the vehicle from starting if the breath alcohol concentration exceeds a predetermined threshold.

Professional drivers

Drivers who earn a living from driving certain types of vehicles, including the following categories of vehicles:

- All kinds of light and heavy freight vehicles
- Freight vehicles specifically designed for the movement of dangerous goods
- Taxis
- Public buses
- School buses
- Coaches

General driving population

All drivers of passenger and freight vehicles with a valid driving license

Drink driving offenders

Drivers who have been caught driving while having a blood alcohol concentration (BAC) above the applicable limit (note: the BAC limit may differ by member state, age of the driver and type of vehicle)

Problem drinkers with a valid driving license

Problem drinkers who are in a rehabilitation programme, but who avail themselves of a valid driving license as they have not been found violating BAC limit rules.

PART A - GENERAL INFORMATION

1. What is the main activity of your unit or organisation?

a. Transport safety policy
b. Enforcement of transport safety rules
c. Road/Transport Safety Research

<if answer is a-c: GO TO PART B

d. Type approval
e. Association of motorists
f. Trade union
g. Employers
h. Addiction care

<if answer is d-h: GO TO PART C

i. European organisation representing the interests of specific group of stakeholders
[Please forward this questionnaire also to your members in EU member states]
j. Industry

<if answer is i or j: GO TO PART I

PART B – ROAD SAFETY DATA

2. What percentage of all road accidents in your country can be attributed to drink driving?

….% (in year: …….)

3. What percentage of all road deaths in your country can be attributed to drink driving?

….% (in year: …….)

4. What percentage of all road deaths in your country can be attributed to drink driving by professional drivers?

….% (in year: …….)

5. What percentage of road accidents in your country is attributed to drink driving by truck drivers?

….% (in year: …….)

6. What percentage of road accidents in your country is attributed to drink driving by taxi drivers?

….% (in year: …….)

7. What percentage of road accidents in your country is attributed to drink driving by bus/coach drivers?

….% (in year: …….)

8. Is information available on the share of the seriously and/or fatally injured professional drivers in the total number of seriously and/or fatally injured drivers?

a. Yes, Information available, and can be found in
(please give reference)…….
b. No information available
c. Don't know

PART C - ALCOHOL INTERLOCK DEVISES

9. Does your organisation have knowledge of or experience with large scale use of alcohol interlock devices by drivers in your country, either relating to voluntary use by drivers, or relating to a programme aimed at specific groups, such as professional drivers or drink driving offenders?

a. No
(proceed with question 10)
b. Yes, relating to voluntary use only
(go to PART H)
c. Yes, relating to compulsory rehabilitation programs for offenders
(go to PART F)
d. Yes, relating to compulsory and preventive use by problem drinkers
(go to PART F)
e. Yes, in relation to programmes aimed a specified group of professional drivers (non offenders)
i. Taxi's
ii. Public Buses
iii. Coaches
iv. School buses
v. All trucks/lorries
vi. Dangerous goods vehicles
(go to PART G)

In case more than one option applies to the situation in your country, please fill in both relevant parts.

10. Has introduction of alcohol interlock devices been contemplated in your country?

a. Yes, it is presently being contemplated, no decision has yet been taken
(go to PART D)
b. Yes, it has been contemplated but a decision was made not to proceed
(go to PART E)
c. No

If answer to Q10=C:

11. Why has introduction of alcohol interlock devices not been contemplated in your country?

a. Road safety is not seen as an urgent problem
b. No major road safety effect is expected from alcohol interlock devices
c. Other measures are deemed more effective for reduction of drink driving, such as
i. Enforcement
ii. Education
iii. Preventive measures, such as (please explain)……..
iv. Other measures
d. Alcohol interlocks are deemed too expensive
e. Alcohol interlocks are deemed too complicated/cumbersome for users
f. Legal problems, such as (please explain)……..
g. Technical problems
i. Reliability

ii. Retrofitting
iii. Other (please explain)…….
h. Socially not acceptable
i. Time needed before vehicle can be started
ii. Stigmatisation of users
iii. Other (please explain)……..

GO TO PART I

PART D – MEASURES INVOLVING USE OF ALCOHOL INTERLOCK DEVICES ARE BEING CONTEMPLATED

If answer to Q10= A:

12. What type of measures regarding the introduction of alcohol interlock devices are being contemplated?

a. rehabilitation program for drink driving offenders
b. preventive use by problem drinkers with a valid driving license
c. interlock programmes aimed a specified group of professional drivers, namely:
i. Taxi's
ii. Public Buses
iii. Coaches
iv. School buses
v. All trucks/lorries
vi. Dangerous goods vehicles

13. What impact is expected of the interlock programme?

a. Improved road safety
b. Other, (please explain)……

If information on the expected impact is available, please attach the document or a reference to the document ……

14. What bottlenecks need to be solved in order to start a programme?

a. Financial: money needs to be made available for a programme
b. Legal: the law needs to be changed
c. Technical problems need to be solved, like accuracy, reliability, retrofitting of interlock devices
d. Public acceptance of alcohol interlock devises is presently low
e. Other (please explain)……..
f. Other (please explain)……..

GO TO PART I

PART E – MEASURES HAVE BEEN CONTEMPLATED, BUT A DECISION WAS MADE NOT TO IMPLEMENT

If answer to Q10= B:

15. What type of measures regarding the introduction of alcohol interlock devices have been contemplated?

a. rehabilitation programs for offenders
b. preventive use by problem drinkers with a valid driving license
c. programmes aimed a specified group of professional drivers
i. Taxi's
ii. Public Buses
iii. Coaches
iv. School buses
v. All trucks/lorries
vi. Dangerous goods vehicles

16. What impact had been expected

a. Improved road safety
b. Other, (please explain)……

If information on the expected impact is available, please attach the document or a reference to the document ……

17. Why has a programme not been implemented in your country?

a. Road safety is not seen as an urgent problem
b. No major road safety effect is expected from alcohol interlock devices
c. Other measures are deemed more effective in order to reduce drink driving, such as
i. Enforcement
ii. Education
iii. Preventive measures, such as (please explain)……
iv. Other measures (please explain)……..
d. Alcohol interlocks are deemed too expensive
e. Alcohol interlocks are seen to be too complicated/cumbersome for users
f. Legal problems, such as (please explain)……
g. Technical problems, such as (please explain)……..
i. Reliability
ii. Retrofitting
iii. Other (please explain)…….
h. Alcohol interlocks are deemed to be socially not acceptable
i. Time needed before vehicle can be started
ii. Stigmatisation of users
iii. Other (please explain)……...

GO TO PART I

PART F – QUESTIONS ON ON-GOING MANDATORY PROGRAMMES RELATING TO OFFENDERS OR RELATING TO DRIVERS WITH A DRINKING PROBLEM AND A VALID DRVING LICENSE (PREVENTION)

18. Since when is the alcohol interlock programme operational?

…….. (year)

19. What is the type of alcohol interlock programme?

a. Administrative
b. Criminal sanction

20. What is the duration of the programme for a participant?

…… years

21. Which drivers are included in the alcohol interlock programme?

a. repeated drink driving offenders
please describe the minimum number of offences and times span over which the offences are made: ……. offences in ……year
b. high BAC offenders
c. drivers with a valid driving license and a drinking problem (preventive)

22. What is the BAC-limit for offenders to be included in the programme?

a. Novice drivers ……..
b. Experienced drivers……
c. Professional drivers……..

23. What is the present total number of participants in the programme?

……participants in the programme

24. How many new participants entered the programme last year?

……new participants in 2012

25. How many drivers were sentenced to the programme since its start?

……sentenced to follow the programme

26. How many drivers were sentenced to the programme last year?

……sentenced to follow the programme in 2012

27. When is a driver deemed to have failed to programme?
Please describe: ……
……

28. What are the consequences for failing the programme?

a. Driving license withdrawn
b. Other (please explain)……

29. What are the consequences of refusing the programme?

a. Driving license withdrawn
b. Other (please explain)……

30. Who is doing the read out of data of the interlocks?

a. Doctor
b. Rehabilitation officer
c. Police
d. Other (please explain)……
e. Don't know

31. Who else has access to the data?

a. Doctor
b. Rehabilitation
c. Police
d. Other (please explain)……
e. Don't know

32. What are the costs of total programme per participant?

…… Euro/participant/annum

33. Who pay(s) the costs of the programme?

a. Drivers
b. Government
c. Partly paid by the driver, partly by the government
d. Other (please explain)……
e. Don't know

34. Are there any administrative problems in implementing the programme?

a. No
b. Yes (please explain)……
c. Don't know

35. Has the programme already been evaluated?

a. Yes

Please attach documents or links to documents in which the information can be found.

b. No

GO TO PART I

c. Don't know

GO TO PART I

36. Has the impact on behaviour of driver been evaluated?

a. Yes

Please attach the document or a link to the document in which the information can be found.

b. No

c. Don't know

37. What are the main problems in the programme? (More than one answers possible)

a. Financial: costs of interlock too high
b. Financial: no financing available from government
c. Legal: no legal basis yet
d. Legal: privacy and data protection
e. Technical: accuracy of interlocks
f. Technical: retrofitting
g. Public acceptance: time needed before start
h. Public acceptance: mouthpiece needed
i. Other (please explain)……..:
j. Other (please explain)……..:

If information is available on the programme and the various aspects please attach it electronically or via an internet link.

GO TO PART I

PART G – QUESTIONS ON ON-GOING MANDATORY PROGRAMMES RELATING TO PROFESSIONAL DRIVERS

38. Since when is the alcohol interlock programme operational?

……. (Year)

39. What is the type of alcohol interlock programme?

a. Voluntary
b. Required by law

40. Which drivers are included in the alcohol interlock programme?

a. Taxi's
b. Public Buses
c. Coaches
d. School buses
e. All trucks/lorries
f. Dangerous goods vehicles

41. What is the present total number of participants in the programme?

……participants in the programme

42. How many new participants entered the programme last year?

……new participants in 2012

43. How many professional drivers were sentenced to the programme since its start?

……sentenced to follow the programme

44. How many professional drivers were sentenced to the programme last year?

……sentenced to follow the programme in 2012

45. Who is doing the read out of data of the interlocks?

a. Doctor
b. Rehabilitation officer
c. Police
d. Other (please explain)……
e. Don't know

46. Who else has access to the data?

a. Doctor
b. Rehabilitation
c. Police
d. Other (please explain)……
e. Don't know

47. What are the costs of total programme per participant?

…… Euro/participant/annum

48. Who pay(s) the costs of the programme?

f. Companies
g. Government
h. Partly paid by the companies, partly by the government
i. Other (please explain)……..
j. Don't know

49. Are there any administrative problems in implementing the programme?

a. No
b. Yes (please explain)……
c. Don't know

50. Is information available on the share of fail tests among professional drivers?

a. Yes
Please attach documents or links to documents in which the information can be found.
b. No
GO TO PART I
c. Don't know
GO TO PART I

51. Has the programme already been evaluated?

a. Yes
Please attach documents or links to documents in which the information can be found.
b. No
GO TO PART I
c. Don't know
GO TO PART I

52. Has the impact on behaviour of participating professional drivers been evaluated?

a. Yes, it has been evaluated
Please attach documents or links to documents in which the information can be found.
b. No, it has not been evaluated
c. Don't know

53. What are the main problems in the programme? (More than one answers possible)

a. Financial: costs of interlock too high
b. Financial: no financing available from government
c. Legal: no legal basis yet
d. Legal: privacy and data protection
e. Technical: accuracy of interlocks

f. Technical: retrofitting
g. Public acceptance: time needed before start
h. Public acceptance: mouthpiece needed
i. Other (please explain)……:
j. Other (please explain)……:

If information is available on the programme and the various aspects please attach it electronically or via an internet link.

GO TO PART I

PART H – VOLUNTARY USE OF ALCOHOL INTERLOCK DEVICES

54. When were alcohol interlocks on a voluntary basis first introduced in your country?

…… (year)

55. Do you know the approximate number of vehicles with an alcohol interlock device?

a. Yes, approximately (please add)……
b. No
c. Don't know

56. Has an evaluation been carried out on the impact of voluntary use by drivers?

a. Yes
b. No
c. Don't know

If information is available on the programme and the various aspects please attach it electronically or via an internet link.

PART I: OPINIONS

57. In your opinion, how adequate are alcohol interlock devices to deal with the problem of drink driving, for the following groups
(on a scale from 1 to 10:- 1 not/least important, 10 most important):

a. Taxi drivers……..
b. Drivers of public transport buses……
c. Drivers of coaches……
d. Drivers of school buses……
e. Drivers of all trucks/lorries……
f. Drivers of dangerous goods vehicles……..
g. Heavy drink driving offenders ……..
h. Repeated drink driving offenders……
i. Drivers with an alcohol problem (preventive measure)……
j. All drivers……

58. In your opinion, how adequate are mandatory alcohol interlock devices for the following groups to improve road safety?
(on a scale from 1 to 10:- 1 not/least important, 10 most important):

a. Taxi drivers……..
b. Drivers of public transport buses……
c. Drivers of coaches……
d. Drivers of school buses……
e. Drivers of all trucks/lorries……
f. Drivers of dangerous goods vehicles……..
g. Heavy drink driving offenders ……..
h. Repeated drink driving offenders……
i. Drivers with an alcohol problem (preventive measure)……
j. All drivers……

59. In your opinion, how important are the following possible reasons for not implementing alcohol interlock device programmes relating to drink driving offenders?
(on a scale from 1 to 10:- 1 not/least important, 10 most important)

a. Drink driving is not a huge problem ……
b. No effect is expected from alcohol interlock devices……
c. Other measures are more effective to improve road safety, such as e.g. road side checks……
d. Alcohol interlock devices are too expensive……
e. Implementation is legally not possible……
f. Technical problems prevent implementation, such as (please explain)……
g. Socially not acceptable, they stigmatize their users……
h. Alcohol interlock devices interfere with individual freedom of drivers…
i. Other (please explain)……
j. Other (please explain)……

60. In your opinion, how important are the following possible reasons for not implementing alcohol interlock devices as preventive measures in taxi's, public buses or coaches?

(on a scale from 1 to 10:- 1 not/least important, 10 most important)

a. Drink driving by these professionals is not a huge problem ……..
b. No effect is expected from alcohol interlock devices for these groups…….
c. Other measures are more effective to improve road safety, such as e.g. road side checks……..
d. Alcohol interlock devices are too expensive……..
e. Implementation is legally not possible……..
f. Technical problems prevent implementation, such as (please explain)……..
g. Socially not acceptable, they stigmatize these drivers……
h. Alcohol interlock devices interfere with individual freedom of professional drivers…
i. Other (please explain)……..
j. Other (please explain)……..

61. In your opinion, how important are the following possible reasons for not implementing alcohol interlock devices as preventive measures in school buses?
(on a scale from 1 to 10:- 1 not/least important, 10 most important)

a. Drink driving by these professionals is not a huge problem ……..
b. No effect is expected from alcohol interlock devices for these groups…….
c. Other measures are more effective to improve road safety, such as e.g. road side checks……..
d. Alcohol interlock devices are too expensive……..
e. Implementation is legally not possible……..
f. Technical problems prevent implementation, such as (please explain)……..
g. Socially not acceptable, they stigmatize these drivers……
h. Alcohol interlock devices interfere with individual freedom of professional drivers…
i. Other (please explain)……..
j. Other (please explain)……..

62. In your opinion, how important are the following possible reasons for not implementing alcohol interlock devices as preventive measures in all types of trucks and lorries, including dangerous goods vehicles?
(on a scale from 1 to 10:- 1 not/least important, 10 most important)

a. Drink driving by these professionals is not a huge problem ……..
b. No effect is expected from alcohol interlock devices for these groups…….
c. Other measures are more effective to improve road safety, such as e.g. road side checks……..
d. Alcohol interlock devices are too expensive……..
e. Implementation is legally not possible……..
f. Technical problems prevent implementation, such as (please explain)……..
g. Socially not acceptable, they stigmatize these drivers……
h. Alcohol interlock devices interfere with individual freedom of professional drivers…
i. Other (please explain)……..
j. Other (please explain)……..

63. In your opinion, is there a role for the European Union when it comes to stimulating the use of alcohol interlock devices?

a. No role for EU

b. Yes, namely

i. Stimulating exchange of information and best practices between Member States

ii. Providing technical assistance in implementing interlock programmes

iii. Harmonisation of functional specifications for alcohol interlock devices

iv. Harmonisation of technical requirements for retrofitting

v. European legislation concerning drink driving offenders, as an alternative for withdrawing license

vi. European legislation concerning installation in:

1. Taxi's
2. Public transport buses
3. Coaches
4. School buses
5. All trucks/lorries
6. Dangerous goods vehicles

If you have any additional information, or e.g. a position paper, please provide a reference:
……

YOU HAVE REACHED THE END OF THE QUESTIONNAIRE.

THANK YOU VERY MUCH FOR TAKING YOUR TIME TO COMPLETE THE QUESTIONNAIRE

Annex 4: List of stakeholders approached for the questionnaire

Nr	Stakeholder	Acronym	Country
1	Bundesministerium für Verkehr, Innovation und Technology	BMVIT	AT
2	Fraunhofer Austria Research	FAR	AT
3	Austrian Road Safety Board KfV, Vienna, Austria	KFV	AT
4	Guardian Interlock Systems		AU
5	Centre for Accident Research & Road Safety - Queensland (CARRS-Q), Queensland University of Technology		AU
6	SPF Mobilité et Transports	SPF	BE
7	Rauwers Controle NV, Brussel, België		BE
8	Belgian Road Safety Institute BIVV/IBSR, Brussels, Belgium	BIVV/IBSR	BE
9	sectie Verslavingspsychiatrie binnen de VVP (Vlaamse vereniging voor psychiatrie)	VVP	BE
10	Belgian Road Safety Institute BIVV/IBSR, Brussels, Belgium	BIVV/IBSR	BE
11	European Integration Directorate Ministry of Economy and Energy	MEE	BG
12	Smart Start, Inc., Alberta, Canada		CAN
13	Traffic Injury research Foundation TIRF, Toronto, Canada	TIRF	CAN
14	Swiss Council for Accident Prevention	BFU	CH
15	Federal Department of the Environment, Transport, Energy and Communications	DETEC	CH
16	Department of Road Transport		CY
17	Czech Transport Research Center (CZ)		CZ
18	Ministry of Transport of the Czech Republic		CZ
19	GVS Gesamtverband für Suchtkrankenhilfe		DE
20	Bundesministerium für Verkehr, Bau- und Stadtentwicklung		DE
21	German Road Safety Council (Deutscher Verkehrssicherheitsrat) (DVR) (D)	DVR	DE
22	VdTÜV	VdTÜV	DE
23	VDE Prüf-und Zertifizierungsinstitut	VDE	DE
24	Federal Highway research Institute BASt, Bergisch Gladbach, Germany	BAST	DE
25	German Motor Vehicle Inspection Association (DEKRA Automobil GmbH), Stuttgart, Germany	DEKRA	DE
26	German Association for Traffic Psychology DGVP, Berlin, Germany	DGVP	DE
27	Physikalisch-Technische Bundesanstalt PTB (National Metrology Institute), Brunswick/Berlin, Germany	PTB	DE
28	Danish Ministry of Transport		DK
29	Danish Ministry of Justice		DK
30	Danish Road Safety Council (Rådet for Sikker Trafik)		DK
31	Danish Road Authority Trafikstyrelsen		DK
32	Danish Technical University	DTU	DK

Nr	Stakeholder	Acronym	Country
33	Ministry of economic Affairs and Communications transportation and traffic division of the road and railway department	MKM	EE
34	Asociación de Prevención des Accidentes de Trafico	PAT	ES
35	Dirección General de tráfico - Ministerio del Interior	DGT	ES
36	Automotive Safety Technology Foundation, Alcobendas, Madrid, Spain	FITSA	ES
37	European Association of Traffic Police Forces	TISPOL	EU
38	European Committee for Standardization, European Committee for Electrotechnical Standardization	CEN-CENELEC	EU
39	European Automobile Manufacturers Association	ACEA	EU
40	ARC Europe	ARC	EU
41	European Monitoring Centre for Drugs and Drug Addiction	EMCDDA	EU
42	European Transport Safety Council ETSC, Brussels, Belgium	ETSC	EU
43	Finnish Transport Safety Agency Trafi	TRAFI	FI
44	Unit for Transport Safety and the Environment Ministry of Transport and Communications		FI
45	Finnish Motor Insurers' Centre, Traffic Safety Committee of Insurance Companies VALT (FIN)	VALT	FI
46	Ministry of transport and communications	MINTC	FI
47	VTT	VTT	FI
48	Centres for Economic Development, Transport, and the Environment, Finland		FI
49	Espoo Treatment and Rehabilitation Center, A-Clinic Foundation, Espoo, Finland		FI
50	Ass. prévention routière	APR	FR
51	Ministère de l'Ecologie, du Développement durable, des Transports et du Logement		FR
52	Ministère de l'Ecologie, du Développement durable, des Transports et du Logement	UTAC	FR
53	Setra		FR
54	CERMT, France	CERMT	FR
55	Hellenic Institute of Transport (HIT) (GR)	HIT	HE
56	Ministry of Transport and Communications		HE
57	TUVV NORD	TUVV NORRD	HU
58	KTI	KTI	HU
59	Ministry of National Development, Department for Road and Rail Transport regulation, Unit of Road Transport and Logistics		HU
60	Centre for Transport and Logistics (CTL), University of Rome "La Sapienza"	CTL	IT
61	Centro Studi Città Amica (CeSCAm), University of Brescia	CESCAM	IT
62	Fondazione ANIA per la Sicurezza Stradalre (ANIA foundation for road safety)	ANIA	IT
63	Ministry of Infrastructure and Transport	MIT	IT
64	Road Safety Authority	RSA	IE
65	Ministry of the Interior		IS
66	Road Traffic Directorate		IS
67	Alcohol Countermeasure Systems Corp	ACS	int

Nr	Stakeholder	Acronym	Country
68	PFK Electronics (PTY) Ltd, Durban, South Africa	PFK	int
69	Confederation of Organisations in Road Transport Enforcement (CORTE) (Int)	CORTE	int
70	World Health Organisation	WHO	int
71	United Nations - Economic Commission for Europe	UNECE	int
72	Global Road Safety Partnership	GRSP	int
73	La Prévention Routière Internationale	PRI	int
74	International road transport union	IRU	int
75	International Organization of Motor Vehicle Manufacturers	OICA	int
76	Nissan		JAP
77	transport and road research institute		LT
78	Lithuanian Road Administration		LT
79	Ministère des Transports	Snch	LU
80	Ministry of Transport and Communications		LV
81	Road Traffic Safety Directorate	CSDD	LV
82	Malta Standards Authority	MSA	MT
83	Malta Transport Directorate		MT
84	Veilig Verkeer Nederland	VVN	NL
85	Ministry of Infrastructure and the Environment, The Hague, The Netherlands		NL
86	SWOV	SWOV	NL
87	ADV	ADV	NL
88	Transport en Logistiek Nederland	TLN	NL
89	Koninklijk Nederlands Vervoer (Royal Dutch Transport Federation)	KNV	NL
90	FNV Bondgenoten and CNV	FNV/CNV	NL
91	National Vehicle Authority RDW, Zoetermeer, The Netherlands	RDW	NL
92	Central Driving Test Organization CBR, Rijswijk, The Netherlands	CBR	NL
93	Dräger Safety Nederland BV, Zoetermeer, Netherlands	draeger	NL
94	Tactus instelling voor verslavingszorg	TACTUS	NL
95	Trimbos Institute, Utrecht, The Netherlands	TRIMBOS	NL
96	Trygg Trafikk - The Norwegian Council for Road Safety		NO
97	Norwegian Public Roads administration	Traffic Safety Road department	NO
98	Norwegian Ministry of Justice and Public Security, Department for Prison and Probation, Oslo, Norway		NO
99	Norwegian Ministry of Health and Care Services		NO
100	Norwegian Committee, NEK/NK “Alcohol Interlocks for Motor Vehicles”, Oslo, Norway	NEK/NK	NO
101	Norwegian Ministry of Transport		NO
102	Transport Economic Institute TØI, Oslo, Norway	TØI	NO
103	Norwegian Institute of Public Health		NO
104	Norwegian Police		NO
105	Norwegian Public Roads administration		NO
106	Norwegian Transport Workers’ Union, Oslo, Norway		NO

Nr	Stakeholder	Acronym	Country
107	National Road Safety Council	KRBRD	PL
108	Ministry of Transport, Construction and Maritime Economy		PL
109	Ministry of Infrastructure		PL
110	Ministry of Transport		PL
111	Motor Transport Institute of Poland ITS, Warsaw, Poland	ITS	PL
112	Instituto da Mobilidade e dos Transportes Terrestres. I.P	imtt	PT
113	Laboratório Nacional de Engenharia Civil	LNEC	PT
114	Autoridade Nacional de Segurança Rodoviária (ANSR)	ANSR	PT
115	Romanian Automotive Register	rarom	RO
116	National Road Administration		RO
117	DIGNITA		SE
118	Alcolock Sweden		SE
119	Autoliv		SE
120	Swedish Ministry of Enterprise		SE
121	Swedish Transport Administration		SE
122	Swedish Transport Agency		SE
123	Swedish Abstaining Motorists' Association	MHF	SE
124	Swedish National Road and Transport research Institute	VTI	SE
125	Volvo	Volvo	SE
126	Swedish Transport Administration Trafikverket, Borlänge, Sweden	TRAFIKVERKET	SE
127	Swedish Transport Agency Transportstyrelsen, Borlänge, Sweden		SE
128	Swedish Abstaining Motorists Organisation MHF, Stockholm, Sweden	MHF	SE
129	Alkolås i Skandinavien AB, Haninge, Sweden		SE
130	Slovenian Traffic Safety Agency	AVP	SI
131	Slovenian Electric Vehicles Association		SI
132	Ministry of Transport		SI
133	Institute for Forensic Medicine, University of Ljubljana, Slovenia		SI
134	Ministry of transport post and communications		SK
135	VÚD Transport Research Institute Inc		SK
136	Road Traffic Safety Agency, Republic of Serbia		RS
137	TUGAM (Traffic Transportation Research Center)	TUGAM	TR
138	Turkey / OSD – Automotive Manufacturers Association	OSD	TR
139	Turkey / Permanent Representation of Turkey to the EU		TR
140	FUELCELL		UK
141	Department for Transport, Governmental Vehicle Certification Agency		UK
142	Department for Transport, Safety		UK
143	Parliamentary Advisory Council for Transport Safety	PACTS	UK
144	Safer Roads Foundation		UK
145	Transport Safety research Centre, University of Loughborough (UK)		UK
146	Transport Research Laboratory (TRL)	TRL	UK
147	Lion Laboratories Ltd, Vale of Glamorgan, UK	lion	UK

Nr	Stakeholder	Acronym	Country
148	RSN Associates, Birmingham, United Kingdom	RSN	UK
149	Driver Alcohol Detection System for Safety DADSS	DADDS	USA
150	Pacific Institute for research and Evaluation, Calverton, MD, USA	PIRE	USA

Annex 5: Background to CBA of policy options

In the CBA the following general assumptions have been used:

Drink-driving related road deaths

On the basis of the analysis presented in chapter 2, the number of alcohol related road deaths in EU27 has been estimated at 20 to 28% of all road deaths. The average of this lower and upper estimate has been the starting point for the analysis, i.e. 24% or 7,260 road deaths (base year 2012).

According to the analysis in chapter 2, 75% of the alcohol related road deaths are assumed to be caused by high BAC offenders, 250 road deaths are truck related fatalities and 10 to drink-driving by professional bus/coach drivers.

Effectiveness of the alcohol interlock

The effectiveness of the alcohol interlock device in reducing the number or road deaths differs per policy option. In Policy options 1, 2 and 3 the alternative situation is that the driving licence of offenders is being suspended. In these cases only the net effect of the alcohol interlock has been used, i.e. a reduction of 18.75 to 37.50 %.

As in Finland, Sweden and The Netherlands AIPs with considerable participation are already running, policy options 3 does not have additional effect on the road safety situation in these three countries.

In the case of the rehabilitation programmes evaluated in policy options 1, 2 and 3, it has further been assumed that it takes 2 years to build up the maximum number of participants, as most programmes have a duration of two years.

In policy options 4a, 4b and 5 the installation of alcohol interlocks is preventive for some types of vehicles. The base case situation for these policy options is taken to be the present safety situation. The effectiveness in reducing the number of accidents is taken to be 50 to 80% of all accidents in which alcohol plays a role is. By taking this range it has been taken into account that, although the number of road fatalities with drink-driving involved has been established, not all of these accidents might perhaps be solely contributed to alcohol, they might be caused by a mixture of reasons: bad sight, slippery roads, etc.

In contrast to policy options 1,2 and 3, the safety effect in policy options 4a, 4b and 5 is likely to be realised fully as soon as all vehicles have been equipped.

Road safety benefit

In assessing the road safety benefit of alcohol interlocks it has been assumed that reduction in drink-driving not only avoids road deaths, but has an impact on road accidents in general and thereby equally affects the number of serious and light injuries, as well as the number of accidents in which only material damage is involved.

Taking the ‘pyramid’ of road injuries (one road death being accompanies by eight severe injuries and 50 light injuries), and also taking into account material damage, the benefit of avoiding “one

road death" is assessed at € 12 mln. This unit benefit thus represents not only the avoided fatality, but also the 8 severe and 50 light injuries, as well as material damage in those accidents in which there only is material damage.

This estimate is based on the data provided by HEATCO in 2006 (based on data from 2002), as shown in the table below. The table gives the values of avoided fatalities or injuries, expressed in purchase power parity and Euro in 2002.

Country	Fatality	Severe injury	Slight injury
Austria	1,685,000	230,100	18,200
Belgium	1,603,000	243,200	15,700
Bulgaria			
Czech Republic	932,000	125,200	9,100
Denmark	1,672,000	206,900	16,200
Estonia	630,000	84,400	6,100
Finland	1,548,000	205,900	15,400
France	1,548,000	216,300	16,200
Germany	1,493,000	206,500	16,700
Greece	1,069,000	139,700	10,700
Hungary	808,000	108,400	7,900
Ireland	1,836,000	232,600	17,800
Italy	1,493,000	191,900	14,700
Latvia	534,000	72,300	5,200
Lithuania	575,000	78,500	5,700
Luxembourg	2,055,000	320,200	19,300
Malta	1,445,000	183,500	13,700
Netherlands	1,672,000	221,500	17,900
Poland	630,000	84,500	6,100
Portugal	1,055,000	141,000	9,700
Slovakia	699,000	96,400	6,900
Slovenia	1,028,000	133,500	9,800
Spain	1,302,000	161,800	12,200
Sweden	1,576,000	231,300	16,600
United Kingdom	1,617,000	208,900	16,600

Source: HEATCO, Developing Harmonised European Approaches for Transport Costing and Project Assessment, February 2006 (http://heatco.ier.uni-stuttgart.de/)

The above figures have been updated to the 2012 purchase power situation in individual Member States, by taking into account the absolute development in purchase power parity in each Member State. The values for Bulgaria and Romania have been estimated by using data from a group of comparable countries.

The resulting values per Member State and fatality/type of injury have subsequently been **weighted** with the number of alcohol related road deaths as presented in chapter 2, to come to an average EU value per road death, severely injured slightly injured person.

As a last step the ***safely pyramid*** has been taken into account. This means that it has been assumed that by avoiding alcohol related road fatalities, the total number of alcohol related accidents will be reduced and consequently also severe and slight road injuries will be avoided. This has been taken into account by adding the benefits of avoiding 4 permanently disabled road participants, 8 severe injuries and 50 minor injuries. It has further been assumed that also the number of accidents involving only material damage will be lower.

Unfortunately, the HEATCO report does not give a value for avoiding permanent disability. To approach this value, taking into account the loss of productivity and extra medical costs, it has been assessed that the value to society of an avoided disability is close to the value of an avoided road death. The value has tentatively been put at 70% of the value of an avoided road death.

From this analysis the following figures emerged:

- EU average value of avoided road death: 1.7 mln Euro
- EU average value of avoided permanent disability: 1.2 mln Euro
- EU average value of avoided severe injury: 0.2 mln Euro
- EU average value of avoided severe injury: 0.02 mln Euro

Taking into account another 30% of material damage in accidents in without deaths or injuries, the unit benefit “per avoided road death”” has been assessed to be:

(1 death at € 1.7 mln + 4 permanently disabled at € 1.2 mln + 8 severe injuries at € 0.2 mln + 50 minor injuries at € 0.02 mln) x (1 +30% material damage) = € 12 mln

Mobility benefit

In the evaluation of policy options 1, 2 and 3 a mobility benefit has been taken into account for the participant in the AIP. This benefit represents the benefit associated with the ability to continue to drive. The reasoning behind this benefit is that, when choosing suspension of the driving licence above an alcohol interlock device, the driver would need other means of transport. He would need to take public transport, a taxi or to share a ride with others. All of these choices are suboptimal to the driver (as it was not his original choice in the situation without restrictions). He/she thus avoids these additional costs when enrolling in an AIP.

This mobility benefit has been calculated by taking the average number of kilometres driven by an average driver in the EU (assessed at over 11,000 km) and a proxy for the additional generalised costs of the alternative mode of transport (assessed at € 0,10 per km). This reflects the longer time needed to travel in case of public transport and/or the higher costs in case of taking a taxi.

It may be argued that for many participants the actual benefit is higher than the costs they need to pay to be involved in the AIP (i.e. higher than € 3,000 per annum). However, not all drivers that have the choice between an AIP or suspension of the driving licence choose to enrol in an AIP. Apparently, for them the costs of an AIP are higher than the alternative means of mobility. As 30% of those who have the option now choose to enrol in an AIP, the assumed average benefit is at least € 900 per average driver per year (i.e. 30% of € 3,000 per annum).

Costs of alcohol interlocks

The costs of an alcohol interlock is presently around € 1,000. The annual maintenance costs are assumed to be 5% of the investment costs per annum.

Costs of alcohol interlock programmes

The cost of operation of an alcohol interlock programmes are in all four countries charged to the offender. These costs are on average € 3,000 per participant per year. This has been taken as the unit cost of the programme per participants. It has been assumed that, apart from the preparatory costs, there are no additional costs associated with the programme.

Costs to EU and governments of Member States

In various policy options the costs to the EU and Member States' administrations have been taken into account. These costs relate to the effort needed to come to agreement, legislation, for information exchange and/or for harmonisation. As there are no data known on this, some estimates have been made.

The background to these are the following assumptions:

Policy option 1: it has been assumed in this policy option that the EU will contract a consulting company to carry out an information exchange project, involving a website and meetings in several countries. Such projects typically have a size of € 300,000 per annum. It has been assumed that the project runs two years.
Member States will have costs as their officials will visit these meetings. The costs involved per Member State (expenses like travel; time costs of officials) are roughly put at € 50,000 per Member state per year (500 hours).

Policy option 2: the expenses related to harmonisation are assessed to be higher than that of exchange of information. In this option the Commission will need to organise several meetings to come to an agreement on harmonisation, which will take considerable time of EU officials. This time has been roughly put at 3,000 hours and travel costs per annum, over a three year period, at an all inclusive cost of 100 Euro per hour.
Also Member States need to devote time and costs to these meetings, as well as for implementation of the harmonisation. The time involved has been assessed at 1,000 hours per Member State, per annum.

Policy options 3,4 and 5 involve discussions on harmonisation of laws and regulations. This is expected to take some time, depending on the scope perhaps 3 to 4 years. A rough assessment of the time involved for administrations is some 10 man years, both for the Commission and for each individual Member States.

Cash flows

The following pages show the cash flows for evaluation of the policy options at minimum and maximum effectiveness of the programme.

Policy Option 1 - Information	cost in 1000 Euro		**Minimum scenario**			Cashflow						
COSTS	unit cost	total cost					EU	MS	Comp	safety	mobility	net cash
EU	600	600		yr1-2		1	-300	-1400	0	0	0	-1.700
governments	100	2.800		yr1-2		2	-300	-1400	0	0	0	-1.700
nr participants		3000				3			-4.500	6.919	1.680	4.099
alcohol locks	3	4.500		yr3		4			-9.000	13.838	3.360	8.198
alcohol locks	3	9.000		yr 4 ev		5						
BENEFITS						6						
Maximum nr road deaths avoided		6,15				7						
Effectiveness		18,75%				8						
Road safety	12.000	6.919		yr 3		9						
Road safety	12.000	13.838		yr 4		10						
Driving benefits	1,12	1.680		yr 3		11						
Driving benefits	1,12	3.360		yr 4		12						
							€ -558	€ -2.603	€ -11.292	€ 17.361	€ 4.216	81%
										1,5		

Policy Option 1 - Information	cost in 1000 Euro		**Maximum scenario**			Cashflow						
COSTS	unit cost	total cost					EU	MS	Comp	safety	mobility	net cash
EU	600	600		yr1-2		1	-300	-1400	0	0	0	-1.700
governments	100	2.800		yr1-2		2	-300	-1400	0	0	0	-1.700
nr participants		3000				3			-4.500	13.838	1.680	11.018
alcohol locks	3	4.500		yr3		4			-9.000	27.675	3.360	22.035
alcohol locks	3	9.000		yr 4 ev		5						
BENEFITS						6						
Maximum nr road deaths avoided		6,15				7						
Effectiveness		37,50%				8						
Road safety	12.000	13.838		yr 3		9						
Road safety	12.000	27.675		yr 4		10						
Driving benefits	1,12	1.680		yr 3		11						
Driving benefits	1,12	3.360		yr 4		12						
							€ -558	€ -2.603	€ -11.292	€ 34.722	€ 4.216	186%
										2,7		

Policy Option 2 -Harmonisation	cost in 1000 Euro		**Minimum scenario**			Cashflow						
COSTS	unit cost	total cost		timing			EU	MS	Comp	safety	mobility	net cash
EU	900	900		yr1-3		1	-300	-2.800	0	0	0	-3.100
Member States	300	8.400		yr1-3		2	-300	-2.800	0	0	0	-3.100
nr participants		10000				3	-300	-2.800	0	0	0	-3.100
Costs alcohol interlocks	2,4	12.000		yr 4		4			-12.000	22.982	5.600	13.482
Costs alcohol interlocks	2,4	24.000		yr 5		5			-24.000	45.963	11.200	33.163
						6						
BENEFITS						7						
Max nr road deaths avoided		20,43				8						
Net effectiveness		18,75%				9						
Road safety benefit	12.000	22.982		yr 4		10						
Road safety benefit	12.000	45.963		yr 5		11						
Driving benefits	1,12	5.600		yr 4		12						
Driving benefits	1,12	11.200		yr 5			€ -817	€ -7.625	€ -28.677	€ 54.920	€ 13.383	77%
										1,84		

Policy Option 2 -Harmonisation	cost in 1000 Euro		**Maxmum scenario**			Cashflow						
COSTS	unit cost	total cost		timing			EU	MS	Comp	safety	mobility	net cash
EU	900	900		yr1-3		1	-300	-2.800	0	0	0	-3.100
Member States	300	8.400		yr1-3		2	-300	-2.800	0	0	0	-3.100
nr participants		10000				3	-300	-2.800	0	0	0	-3.100
Costs alcohol interlocks	2,4	12.000		yr 4		4			-12.000	45.963	5.600	36.463
Costs alcohol interlocks	2,4	24.000		yr 5		5			-24.000	91.927	11.200	79.127
						6						
BENEFITS						7						
Max nr road deaths avoided		20,43				8						
Net effectiveness		37,50%				9						
Road safety benefit	12.000	45.963		yr 4		10						
Road safety benefit	12.000	91.927		yr 5		11						
Driving benefits	1,12	5.600		yr 4		12						
Driving benefits	1,12	11.200		yr 5			€ -817	€ -7.625	€ -28.677	€ 109.841	€ 13.383	141%
										3,32		

Policy Option 3 - High BAC offernders	cost in 1000 Euro		**Minimum scenario**			Cashflow						
COSTS	unit cost	total cost		timing			EU	MS	Comp	safety	mobility	net cash
EU	2000	2.000		yr1-4		1	-500,0	-14000	0	0	0	-14.500
governments	2000	56.000		yr1-4		2	-500,0	-14000	0	0	0	-14.500
nr drivers EU		300.298.927				3	-500,0	-14000	0	0	0	-14.500
Perc high bac offenders		1,00%	22.522			4	-500,0	-14000	0	0	0	-14.500
participation rate yr 1		0,75%				5			-33.784	44.092	12.613	22.920
participation rate yr 2 onw		0,75%				6			-67.567	88.183	25.225	45.841
alcohol locks	3	33.784		yr5		7						
alcohol locks	3	67.567		yr 6		8						
						9						
BENEFITS						10						
Max nr road deaths avoided		5226				11						
Max net effect		18,75%				12						
Max net effect yr 2 onw		18,75%					€ -1.773	€ -49.643	€ -76.890	€ 100.350	€ 28.706	5%
Road safety	12.000	44.092		yr 5						1,01		
Road safety	12.000	88.183		yr 6								
Driving benefits	1,12	12.613		yr 5								
Driving benefits	1,12	25.225		yr 6								

Policy Option 3 - High BAC offernders	cost in 1000 Euro		**Maximum scenario**			Cashflow						
COSTS	unit cost	total cost		timing			EU	MS	Comp	safety	mobility	net cash
EU	2000	2.000		yr1-4		1	-500,0	-14000	0	0	0	-14.500
governments	2000	56.000		yr1-4		2	-500,0	-14000	0	0	0	-14.500
nr drivers EU		300.298.927				3	-500,0	-14000	0	0	0	-14.500
Perc high bac offenders		1,00%	22.522			4	-500,0	-14000	0	0	0	-14.500
participation rate yr 1		0,75%				5			-33.784	88.183	12.613	67.012
participation rate yr 2 onw		0,75%				6			-67.567	176.366	25.225	134.024
alcohol locks	3	33.784		yr5		7						
alcohol locks	3	67.567		yr 6		8						
						9						
BENEFITS						10						
Max nr road deaths avoided		5226				11						
Max net effect		37,50%				12						
Max net effect yr 2 onw		37,50%					€ -1.773	€ -49.643	€ -76.890	€ 200.701	€ 28.706	45%
Road safety	12.000	88.183		yr 5						1,79		
Road safety	12.000	176.366		yr 6								
Driving benefits	1,12	12.613		yr 5								
Driving benefits	1,12	25.225		yr 6								

Policy Option 4a - Goods vehicles	cost in 1000 Euro					Cashflow						
COSTS	unit cost	total		timing			EU	MS	Comp	safety	mobility	net cash
EU	2000	2.000		yr1-3		1	-667	-18.667	0	0		-19.333
governments	2000	56.000		yr1-3		2	-667	-18.667	0	0		-19.333
nr vehicles	15%	5.100.000				3	-667	-18.667	0	0		-19.333
alcohol locks	1	5.100.000		yr4		4			-5.100.000	1.500.000		-3.600.000
alcohol locks	0,05	254.854		yr 5 onwards		5			-254.854	1.500.000		1.245.146
						6			-254.854	1.500.000		1.245.146
BENEFITS						7			-254.854	1.500.000		1.245.146
Maximum road deaths avoided		250				8			-254.854	1.500.000		1.245.146
Effectiveness		50%				9			-254.854	1.500.000		1.245.146
Road safety	12.000	1.500.000		yr 4 onwards		10			-254.854	1.500.000		1.245.146
						11				\		
						12						
							€ -1.815	€ -50.834	€ -5.259.998	€ 7.497.730	€ 0	25%
										1,41		

Policy Option 4b - Buses, coaches	cost in 1000 Euro					Cashflow						
COSTS	unit cost	total cost		timing			EU	MS	Comp	safety	mobility	net cash
EU	2000	2.000		yr1-3		1	-667	-18.667	-	-		-19.333
governments	2000	56.000		yr1-3		2	-667	-18.667	-	-		-19.333
nr vehicles		820.000				3	-667	-18.667	-	-		-19.333
cost alcohol locks	1	820.000		yr4		4			-820.000	60.000		-779.333
cost alcohol locks	0,05	41.008		yr 5 onwards		5			-41.008	60.000		18.992
						6			-41.008	60.000		18.992
BENEFITS						7			-41.008	60.000		18.992
Maximum road deaths avoided		10				8			-41.008	60.000		18.992
Effecitveness		50%				9			-41.008	60.000		18.992
Road safety	12.000	60.000		yr 4 onwards		10			-41.008	60.000		18.992
Mobility						11						
						12						
							€ -1.815	€ -50.834	€ -845.857	€ 299.909	€ 0	#NUM!
										0,33		

Policy Option 5 - All passenger cars	cost in 1000 Euro		**Minimum scenario**			Cashflow						
COSTS	unit cost	total cost					EU	MS	Drivers	safety	mobility	net cash
EU	2000	2.000		yr1-4		1	-500	-14000	0	0	0	-14.500
governments	2000	56.000		yr1-4		2	-500	-14000	0	0	0	-14.500
nr pass cars		242.000.000				3	-500	-14000	0	0	0	-14.500
alcohol locks	1	242.000.000		yr 5		4	-500	-14000	0	0	0	-14.500
alcohol locks	0,05	12.100.000		yr 6 onwards		5			-242.000.000	41.805.300	-	-200.209.200
BENEFITS						6			-12.100.000	41.805.300	-	29.690.800
Maximum nr road deaths avoided		6968				7			-12.100.000	41.805.300	-	29.705.300
Effectiveness		50%				8			-12.100.000	41.805.300	-	29.705.300
Road safety	12.000	41.805.300		yr 5 ev		9			-12.100.000	41.805.300	-	29.705.300
Driving beneftis	0	0		yr 5 ev		10			-12.100.000	41.805.300		29.705.300
						11			-12.100.000	41.805.300		29.705.300
						12						
							€ -1.773	€ -49.643	€ -237.734.277	€ 199.012.614	€ 0	-3%

Policy Option 5 - All passenger cars	cost in 1000 Euro		**Maximum scenario**			Cashflow						
COSTS	unit cost	total cost					EU	MS	Drivers	safety	mobility	net cash
EU	2000	2.000		yr1-4		1	-500	-14000	0	0	0	-14.500
governments	2000	56.000		yr1-4		2	-500	-14000	0	0	0	-14.500
nr pass cars		242.000.000				3	-500	-14000	0	0	0	-14.500
alcohol locks	1	242.000.000		yr 5		4	-500	-14000	0	0	0	-14.500
alcohol locks	0,05	12.100.000		yr 6 onwards		5			-242.000.000	66.888.480	-	-175.126.020
BENEFITS						6			-12.100.000	66.888.480	-	54.773.980
Maximum nr road deaths avoided		6968				7			-12.100.000	66.888.480	-	54.788.480
Effectiveness		80%				8			-12.100.000	66.888.480	-	54.788.480
Road safety	12.000	66.888.480		yr 5 ev		9			-12.100.000	66.888.480	-	54.788.480
Driving beneftis	0	0		yr 5 ev		10			-12.100.000	66.888.480		54.788.480
						11			-12.100.000	66.888.480		54.788.480
						12						
							€ -1.773	€ -49.643	€ -237.734.277	€ 318.420.182	€ 0	22%
										1,34		

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