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Areas of interest of potential users for naturalistic observation studies

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Description

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Abstract

Identification of the interests of potential users is crucial for setting up a useful and broadly supported large-scale naturalistic driving (ND) study. This report describes the results of a survey amongst 72 road transport professionals in Europe from different organisation types that aimed at identifying those interests. The survey was presented on the internet. Whereas the size of the sample is small and may be somewhat biased, the results indicate that road transport professionals consider ND studies most useful for studying road safety issues. Many also considered ND studies useful for human-machine interface design. Traffic management and particularly environmental issues were considered less useful by the respondents. Within the area of road safety, risk-taking behaviour, pre-crash behaviour, crash avoidance behaviour, and driver condition were considered the most interesting topics for naturalistic research. There were only minor differences between the interests of respondents from different organisation types and from different groups of countries.

Table of Contents

Executive Summary.....	6
Background	6
The survey	6
The findings	6
The conclusions	7
1 Introduction.....	9
2 Method.....	10
2.1 Recruiting respondents	10
2.2 The sample	10
2.3 Design and content of the questionnaire	12
2.4 Presentation of the questionnaire	13
3 Results.....	14
3.1 General areas of interest	14
3.2 Specific topics of interest	14
3.3 Further specification of the topics of interest	16
3.4 Differences between organisation types	20
3.5 Differences between countries	21
3.6 Additional topics of interest	24
3.7 The willingness of organisations to contribute	25
4 Conclusions.....	27
4.1 The sample	27
4.2 Overall interests of potential users	27
4.3 Differences between organisation type	28
4.4 Differences between countries	28
4.5 Finally	28
References.....	29
Appendix I: The questionnaire.....	30
What is Naturalistic Driving?	30
What is PROLOGUE?	30
Background information	31
Application areas for Naturalistic Driving	32
Appendix II: Detailed description of the topics for Naturalistic Driving studies.....	42
List of Figures.....	56
List of Tables.....	57

Executive Summary

Background

The main objective of the PROLOGUE project is to prove the feasibility and usefulness of a large-scale European naturalistic driving (ND) study and to define the design and scope of such a large-scale ND study. Typically, in an ND study passenger cars, generally the subjects' own cars, are equipped with devices that, for a considerable length of time, continuously monitor various aspects of driving behaviour, including vehicle movements, behaviour of the driver, and characteristics of the environment. Naturalistic observations of pedestrians and cyclists can be effectuated using site-based fixed cameras, preferably in combination with observations from the viewpoint of vehicles.

ND studies are expected to substantially improve our knowledge and understanding of all sorts of road safety issues. ND studies are also expected to provide relevant information about the environmental aspects of driving and traffic management. Backer-Grøndahl et al. (2010)¹ provided an extensive overview of previous and current ND-like studies so far and shows that there is indeed a wide variety of application areas.

A large-scale ND study requires a large amount of resources. Therefore, it is of crucial importance to ensure that such a study is broadly supported and that the results are useful for as many people as possible. It is in this framework that the current report reports on a questionnaire survey amongst potential users with the aim to identify what type of information, to be collected by means of a large-scale ND study, has their interest.

The survey

Almost 140 mainly European professionals in the area of road transport and related areas were invited by e-mail to participate in the survey. A total of 72 people completed the questionnaire. Ten of the respondents represented a national or regional governmental organisation; 6 represented industry, 31 represented a research organisation and 25 represented another organisation type, mainly other non-governmental organisations. The respondents originated from 18 European countries.

The questionnaire was presented at the internet. Depending on the answers, a respondent was automatically linked to the next for him/her relevant questions and irrelevant questions were jumped over. The questionnaire started with some general information about ND as a research method and a few examples of how knowledge gained from ND studies could contribute to various areas. In the next section, respondents were asked to rate the importance of investigating 17 preselected topics in a large-scale European ND study. If respondents rated a topic as important they got two follow-up questions: why they considered that topic as important and what issues within this topic had their particular interest.

The findings

The results showed that almost all respondents were interested in road safety topics, many were also interested in eco-driving and environmental effects of road traffic and traffic management-related topics. Within the area of road safety, risk taking behaviour, pre-crash behaviour, crash avoidance behaviour, and driver condition were considered

¹ Backer-Grøndahl, A., Phillips, R., Sagberg, F., Toulou, K., Gatscha, M. (2010). *Topics and applications of previous and current naturalistic studies*. PROLOGUE Deliverable D1.1. TØI Institute of Transport Economics, Oslo, Norway.

the most interesting topics for naturalistic research. Results from ND studies in those areas were considered mainly useful for road safety purposes, though many considered the results also useful for human-machine interface design, which is closely related to road safety. Respondents considered their usefulness for traffic management and particularly for environmental issues less evident. The three least popular topics were vehicle type, traffic flow and cross country issues. Many respondents also had additional suggestions for interesting topics for a large-scale ND study, such as visual attention of the driver, the effects of platooning, and the validity of performance indicators.

There were only minor differences between the interests of respondents from different organisation types. The percentages indicate that national and regional governments may be a little more interested than the other respondents in the non-road safety topics such as vehicle type, traffic flow/congestion and environmental aspects. As compared to research institutes, industry was also somewhat more interested in environmental aspects.

The differences between countries were also minor. Since most countries only had very few respondents, the countries were grouped according to their mortality rate, i.e. the number of road fatalities per million inhabitants. Two groups were distinguished: higher ($n=31$) and lower ($n=41$) mortality rate countries. The top-five of important topics for an ND study were very similar for the two groups. Four of the five topics were the same: risk taking behaviour, crash avoidance behaviour, pre-crash behaviour and driver condition. The respondents from the lower mortality countries were additionally interested in in-vehicle safety support systems, whereas respondents from the higher mortality countries were interested in normal driving behaviour.

When asked whether the respondent's organisation was interested to contribute to a future large-scale European ND study, over 80% of the respondents indicated that they were interested to participate in such a study; 4% was interested to fund such a project and 10% to fund such a project in kind.

The conclusions

The sample may not be representative for the population of parties that are potentially interested in ND studies. In particular, industry was hardly represented. Therefore, the results have to be considered as an indication only. However, there are only minor differences in the interests between different organisation types and between respondents from different groups of countries. Therefore, these indications can still be considered to give a fairly complete picture.

All in all, it can be concluded that the potential users of ND studies have a broad interest. Almost all topics that were presented in the survey were considered to be (very) important by a majority of the respondents. Road safety issues were somewhat more popular than eco-driving and traffic management issues. This may be partly explained by the overrepresentation of research organisations in the sample and by the fact that, based on experience so far, respondents associate ND studies most with road safety. The broad interest also turned out in the large amount of answers to the open questions and in the willingness to participate in a future large-scale European ND study. A number of respondents were even prepared to fund such a study, at least in kind.

Whereas there seems to be a wide interest, most potential users consider ND studies particularly useful for studying road safety and less so for studying environmental aspects and traffic management issues. It would be a task of the PROLOGUE project to clarify and show that ND studies also would provide very useful information in those areas.

1 Introduction

The main objective of the PROLOGUE project is to prove the feasibility and usefulness of a large-scale European naturalistic driving (ND) study and to define the design and scope of such a large-scale ND study. Typically, in an ND study passenger cars, generally the subjects' own cars, are equipped with devices that, for a considerable length of time, continuously monitor various aspects of driving behaviour, including information about vehicle movements - e.g. acceleration, deceleration, position on the road, driving speed -, about the driver - e.g. eye, head and hand movements -, and about the direct environment - e.g. traffic densities, time headway, road and weather conditions. Naturalistic observations of pedestrians and cyclists can be effectuated using site-based fixed cameras, preferably in combination with observations from the viewpoint of vehicles.

The ND technique allows for observing and analysing the interrelationship between driver, vehicle, road and other traffic in normal situations, in conflict situations and in actual collisions. Since ND studies focus on day-to-day driving in real traffic they are expected to substantially improve our knowledge and understanding of all sorts of road safety issues. In addition to road safety-related information, ND studies are expected to provide information to increase our insight in relevant elements of eco-driving and traffic management. Backer-Grøndahl et al. (2010) provided an extensive overview of previous and current ND-like studies so far and showed that there is indeed a wide variety of application areas.

This wide variety of applications areas makes that the results of ND studies are potentially interesting to many different stakeholders, including road administrations and other authorities, primarily with road safety responsibilities, but also for other aspects of road transport, car industry, insurance companies, road transport operators, road user organisations, driver training and certification organisations, as well as knowledge and research organisations. Since a large-scale ND study requires a large amount of resources, it is of crucial importance to ensure that such a study is broadly supported and that the results are useful for as many as people as possible. Therefore, PROLOGUE aims, among many other things:

- To identify the research topics and research questions related to road safety as well as to other road transport issues such as emissions (eco-driving) and traffic management (e.g. highway capacity) where the ND approach would provide knowledge that is not available by more traditional research methods.
- To identify the interests of potential users of knowledge provided by the ND approach.

The current report reports on a questionnaire survey amongst potential users with the aim to identify what type of information, to be collected by means of a large-scale ND study, has their interest. As such, this survey is meant to help to set priorities for a future European large-scale ND study.

In the next Section we discuss the sampling procedure, the final sample, and the design, content and presentation of the questionnaire. Section 3 presents the main results and Section 4, finally, gives an overview of the conclusions.

2 Method

2.1 Recruiting respondents

A total of 137 mainly European professionals in the area of road transport and related areas were invited by e-mail to participate in the survey. Names and addresses of these professionals were obtained from the network of PROLOGUE's partner institutes, not only the road safety network, but the road transport network in the widest sense of the word. These professionals had also been approached to become a member of the User Forum. Of the invited people 17% represented industry, a similar percentage represented government, 37% represented a research organisation, and 28% represented another type of organisation (See Table 2.1). Two weeks after the first invitation a reminder was sent to all in the original sample, again by e-mail. Another four weeks later, a subsample of those who had not yet responded were approached personally by the partner institutes to stress once more the importance of the survey.

2.2 The sample

Table 2.1: Classification of invitees and respondents into different organisation types.

Organisation type	Number of invitees	Number of respondents
Government		
Local government		0
Regional government		1
National Ministry of Transport		4
Other national government		3
National road authorities and operations		2
Total	23	10 (43%)
Industry		
Automotive industry		2
Automotive supplier industry		3
Other industry		1
Insurance companies		0
Total	24	6 (25%)
Research		
Research organisations	51	31 (61%)
Other		
European Commission		1
Police		0
Road user organisations		2
Environmental organisations		1
Other non-governmental organisations		11
Driver training and licensing agencies		0
Other		10
Total	39	25 (64%)

Table 2.1 provides an overview of the number of invitees and respondents by organisation type and the response rate. Overall, 72 people (75% male; 25% female) of the 137 invited people completed the questionnaire. This is a response rate of 53%. As shown in Table 2.1 the response rate is highest for the invited persons from 'other' organisations (64%) and for the researchers (61%). For invitees from governmental bodies (and in particular for invitees from industry and the response rate was substantially lower with 43% and 25% respectively. All together, the absolute number of respondents is somewhat lower than the targeted 100.

Ten of the respondents represented a national or regional governmental organisation. That is 43% of the invited persons from governmental bodies. Six respondents (25% of the invited persons) represented industry, 31 respondents represented a research organisation (61% of the number of invitees) and 25 (66% of the invitees) represented another organisation type, mainly other non-governmental organisations.

Only 17% of the invited people represented industry and a similar percentage represented government. In addition the response rate of these groups was relatively low.

Table 2.2 shows that the respondents originated from 18 European countries. The respondents were not proportionally divided over these countries. By far most respondents were from the Netherlands (16), followed by Spain (7), Israel and Belgium (6 each) and Germany and United Kingdom (5 each). Several countries had just 1, 2 or 3 respondents.

Table 2.2: Country and type of organisation of the sample.

Country	Government	Industry	Research	Other	Total
Austria			3		3
Belgium			1	5	6
Denmark			2		2
France		1	2		3
Germany		1	3	1	5
Hungary			2		2
Israel	1	1	1	3	6
Italy			3		3
Netherlands	4		3	9	16
Norway	3			1	4
Poland			2		2
Portugal				1	1
Slovak Republic			1		1
Slovenia	1				1
Spain	1		4	2	7
Sweden		1	3		4
Switzerland				1	1
United Kingdom		2	1	2	5
Total	10	6	31	25	72

2.3 Design and content of the questionnaire

The full questionnaire can be found in Appendix I.

The questionnaire first provided some background information on PROLOGUE and on ND in general. Subsequently, the respondents were asked for some background information, such as country, and organisation type. Next, more in-depth information was provided on how knowledge gained from ND studies could contribute to various areas:

- Insurance companies
- Automotive (supplier) industry
- Policymaking
- Research
- Non profit organisations
- Driver training and licensing agencies

The respondents could decide to read the areas of interest and/or continue to the next section.

In the next section, respondents were asked about the importance of investigating certain topics in a large-scale European ND study. The selection of topics that could be studied in an ND study was based on an inventory of previous and current ND studies (Backer-Grøndahl et al., 2010) and on expert opinions. This resulted in 17 potentially interesting topics:

- Driver characteristics (e.g. gender, age, etc.)
- Normal behaviour (e.g. gap acceptance, overtaking, gear choice, etc.)
- Risk taking behaviours (e.g. speeding, alcohol use, etc)
- Vehicle type (e.g. size, weight, brand, etc.)
- Roadway design (e.g. road width, line marking, road side, etc)
- In-vehicle safety support systems (e.g. cruise control, ISA, navigation, warning systems, etc.)
- Non-driving related distractions inside the vehicle (e.g. passengers, mobile phone use, eating, etc)
- Non-driving related distractions outside the vehicle (e.g. advertisements)
- Driver condition (e.g. fatigue/drowsiness, stress, use of medication, etc.)
- Situational influences (e.g. weather condition, traffic intensity, time of day, etc.)
- Pre-crash behaviour
- Crash avoidance behaviour
- Vulnerable road users (e.g. pedestrians, cyclists)
- Traffic flow (e.g. traffic jam behaviour, etc.)
- Environmental effects (e.g. eco-driving, gear change behaviour, toxic emission, etc.)
- Driver training
- Cross-country issues

For each of these topics, respondents were asked to indicate on a four-point scale (not at all important – very important) how important they thought it was to address in a future large-scale European ND study. Respondents were also asked for additional topics.

If the respondents rated a topic as 'important' or 'very important', they got two follow-up questions: why they considered that topic as important and what issues within this topic had their particular interest. Generally, a number of alternatives were presented together with the possibility to add your own ideas.

In the final section of the questionnaire respondents were asked to indicate if and how their organisation would be interested to contribute to a possible large-scale European ND study.

2.4 Presentation of the questionnaire

The questionnaire was presented at the internet in English only. Together with the invitation to participate, the respondents got a link to the questionnaire. Depending on the answers, a respondent was automatically linked to the next for him/her relevant questions and irrelevant questions were jumped over. Filling in the questionnaire was expected to take 10 to 15 minutes. In practice, it often took somewhat longer. One important reason was that the respondents generally had a broad interest and hence had to fill in many follow-up questions (see Section 2.3).

3 Results

3.1 General areas of interest

When looking at the general areas of interest of the respondents (Table 3.1) it appears that almost all (92%) were interested in road safety topics, many (61%) were interested in eco-driving and environmental effects of road traffic and least, though still 46%, were interested in traffic management-related topics.

Table 3.1: General areas of interest of respondents from different organisation types.

	Government (n=10)	Industry (n=6)	Research (n=31)	Other (n=25)	Total (n=72)
Road Safety					
Number	10	6	28	22	66
Percentage	100%	100%	90%	88%	92%
Eco driving or environmental effects of road traffic					
Number	9	5	20	10	44
Percentage	90%	83%	65%	40%	61%
Traffic management					
Number	5	1	17	10	33
Percentage	50%	17%	55%	40%	46%

The fact that respondents were most interested in road safety topics for an ND study may be partly explained by a sampling bias. The respondents were selected on the basis of the project partners' network and the project partners are mainly road safety institutes. Whereas partners explicitly included business contacts with road transport in a wide sense, it is not surprising that respondents with a road safety interest were over-represented.

The interest in road safety topics does, however, reflect the application of ND studies so far. By far most studies have focused on road safety topics (see Backer-Grøndahl et al., 2010 for an overview). So it is likely that respondents associate ND studies most with road safety.

3.2 Specific topics of interest

Figure 3.1 shows that four of the seventeen presented topics were considered 'very important' to investigate in an ND study by at least half of the respondents: risk taking behaviour, pre-crash behaviour, crash avoidance behaviour, and driver condition. Least important according to the respondents were the effect of vehicle type, cross country comparisons, and distraction by factors outside the vehicle (e.g. advertising).

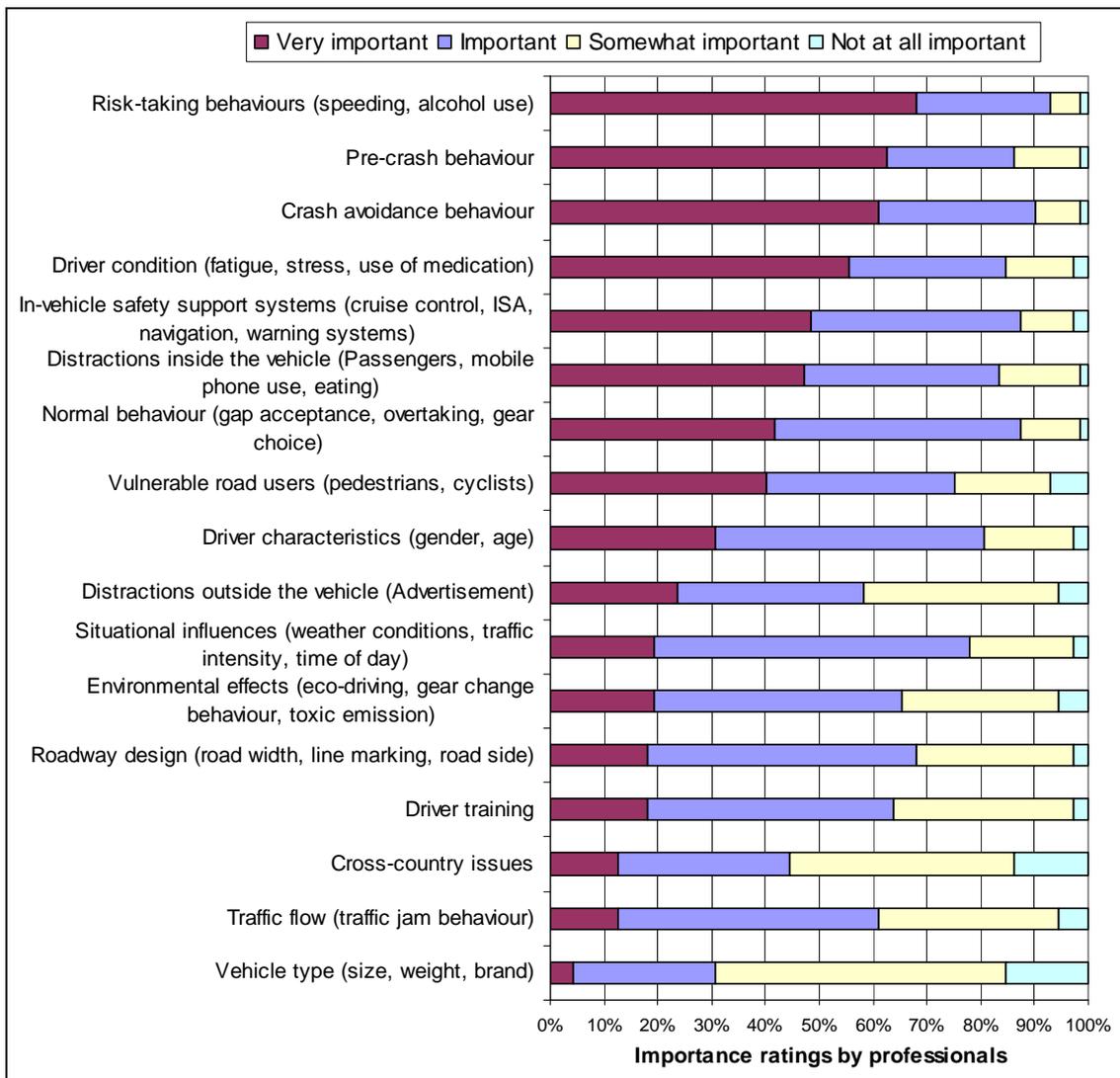


Figure 3.1: Topics for an ND study ordered by importance according to the respondents.

We then classified the fourteen road safety-related topics from Figure 3.1 into two categories, based on the results of the literature study of Backer-Grøndahl et al. (2010):

1. Topics that have been or are being investigated by an ND approach;
2. Topics that, so far, have not/hardly been investigated by an ND approach;

It would be particularly interesting if the topics in the latter categories were rated as important, since they could potentially fill a knowledge gap. Apparently, these topics are relevant for road transport professionals, but they have not been investigated previously by ND methods. Table 3.2 shows that, of the topics that have not been studied by ND previously, risk taking behaviour and crash avoidance behaviour were considered most important. These topics were considered even more important than the two most interesting topics that have been investigated previously: pre-crash behaviour and driver condition.

Table 3.2: The importance of topics that have and have not been studied previously by an ND method (frequencies and cumulative percentages are shown).

Topics	Very important	Important	Somewhat important	Not at all important
Road safety topics studied previously by an ND method				
Pre-crash behaviour	45 63%	17 86%	9 99%	1 100%
Driver condition (fatigue, stress, use of medication)	40 56%	21 85%	9 97%	2 100%
In-vehicle safety support systems (cruise control, ISA, navigation, warning systems)	35 49%	28 88%	7 97%	2 100%
Distractions inside the vehicle (Passengers, mobile phone use, eating)	34 47%	26 83%	11 99%	1 100%
Normal behaviour (gap acceptance, overtaking, gear choice)	30 42%	33 88%	8 99%	1 100%
Driver characteristics (gender, age)	22 31%	36 81%	12 97%	2 100%
Distractions outside the vehicle (Advertisement)	17 24%	25 58%	26 94%	4 100%
Driver training	13 18%	33 64%	24 97%	2 100%
Road safety topics not investigated yet by an ND method				
Risk taking behaviours (speeding, alcohol use)	49 68%	18 93%	4 99%	1 100%
Crash avoidance behaviour	44 61%	21 90%	6 99%	1 100%
Vulnerable road users (pedestrians, cyclists)	29 40%	25 75%	13 93%	5 100%
Situational influences (weather conditions, traffic intensity, time of day)	14 19%	42 78%	14 97%	2 100%
Roadway design (road width, line marking, road side)	13 18%	36 68%	21 97%	2 100%
Vehicle type (size, weight, brand)	3 4%	19 31%	39 85%	11 100%

3.3 Further specification of the topics of interest

When a respondent rated a topic as either 'very important' or 'important', they were asked to report in more detail *why* they considered these topics as important and *which issues* within the topics they considered as particularly interesting. The following Paragraphs describe these details for the four topics that were considered most important (Table 3.1): risk taking behaviour, pre-crash behaviour, crash avoidance behaviour and driver condition. The detailed description of the other topics can be found in Appendix II.

3.3.1 Risk-taking behaviour

As is shown in Table 3.3, all of the 67 respondents who considered risk taking behaviour to be an important or very important topic for ND research did so because they believed that such a study would provide relevant insights into road safety; one third believed that it would also provide relevant insights for human-machine interface design; and a quarter supposed that it would lead to relevant insights into traffic management issues. Around 10% of the respondents were of the opinion that studying risk taking behaviour would also provide relevant insights into the environmental effects of traffic.

Table 3.3: Opinion of the 67 respondents as to *why* risk taking is important.

It provides relevant insights into...	Number	Percentage
Road Safety	67	100%
Environmental effects of traffic	8	12%
Traffic management	18	27%
Human-machine interface design	24	36%
Other, namely	1	2%
“Insight into driver attitude”		

When looking at risk taking behaviour in more detail (Table 3.4), speeding was considered particularly interesting by 99% of the respondents, close following by 75% and drink-driving by 66% of the respondents. Around half of the respondents considered the use of drugs and seat belt usage to be particularly interesting. The respondents also came up with a dozen of additional topics of interest in the area of risk taking behaviour. Topics related to driver distraction were mentioned most often, followed by fatigue and the social interaction between road users.

Table 3.4: Specification of the topics of interest in the area of risk taking behaviour.

Issues that are particularly interesting...	Number	Percentage
Speeding	66	99%
Close following / tail gaiting	50	75%
Use of alcohol while driving	44	66%
Use of drugs or other illegal substance while driving	35	52%
Seatbelt usage	34	51%
Use of medicines while driving	30	45%
Other, namely	17	25%
Driver distraction/ secondary tasks/performing non-driver related tasks/use of mobile phone	8	
Wrong steering position	1	
Involvement in conflicts, crash-relevant events, near-crashes	1	
Anti-social behaviour/attitude to other road users/social context	3	
Fatigue/drowsy driving	3	
Ignoring traffic light / way of right	2	

3.3.2 Pre-crash behaviour

Of the 62 respondents who considered pre-crash behaviour a (very) important topic, 92% did so because they expected the results to provide relevant insights into road safety and 36% because of relevant insights into human-machine interface design. Environmental and traffic management issues were considered to benefit less from an ND study in the area of pre-crash behaviour, which seems evident. Driver training, the psychology of the driver and the design of safety systems were mentioned spontaneously by respondents. Table 3.5 summarizes the findings.

Table 3.5: Opinion of the 62 respondents as to *why* pre-crash behaviour is important.

It provides relevant insights into...	Number	Percentage
Road Safety	57	92%
Environmental effects of traffic	1	2%
Traffic management	8	13%
Human-machine interface design	22	36%
Other, namely	4	7%
“It provides relevant insights for driver training courses, for accident avoidance”		
“Psychology of the driver”		
“Gives info on potential improvement / tools at level of driving lessons”		
“Design of safety systems”		

The question of what issues within the topic of pre-crash behaviour the respondents considered to be particularly interesting was a completely open question; it did not contain any answer categories. Unfortunately, the responses were too diverse for a meaningful classification and analysis.

3.3.3 Crash avoidance behaviour

A total of 65 respondents considered crash avoidance behaviour as a (very) important topic for an ND study. Table 3.6 shows that, as for risk taking and pre crash behaviour, an ND study in the area of crash avoidance behaviour would, according to these 65 respondents, mainly be important to provide new insights into road safety and human-machine interface design. Insight into environmental effects and traffic management would benefit less from a ND study about crash avoidance behaviour. The spontaneous responses show that the results could also be helpful in the area of education and (driver) training. Again, the answers to the open question about the interesting topics within the category of crash avoidance resulted in too diverse answers to analyse or summarize.

Table 3.6: Opinion of the 65 respondents as to *why* crash avoidance behaviour is important.

It provides relevant insights into...	Number	Percentage
Road Safety	61	94%
Environmental effects of traffic	3	5%
Traffic management	11	17%
Human-machine interface design	24	37%
Other, namely	2	3%
"Education"		
"Insights for driver training courses"		
"ADAS design"		
"Training"		

3.3.4 Driver condition

There were 61 respondents who considered driver condition av (Very) important topic. Also for driver condition, most respondents expected the results to be most relevant for road safety and human-machine interface design and less for increasing knowledge in the area of the environment and traffic management (Table 3.7).

Table 3.7: Opinion of the 61 respondents as to *why* driver condition is important.

It provides relevant insights into...	Number	Percentage
Road Safety	59	97%
Environmental effects of traffic	5	8%
Traffic management	11	18%
Human-machine interface design	22	36%
Other, namely	2	3%
"Baseline"		
"To educate people"		

Table 3.8 shows that, in case of a driver condition study, respondents reported to be particularly interested in driver fatigue (93%) and health conditions such as stress, sleeplessness and mild anxiety (71%). Between two third and half of the respondents were particularly interested in (other) psychological and physical diseases. Four respondents came up with the additional issue of alcohol and drugs.

Table 3.8: Specification of the topics of interest in the area of driver condition.

Issues that are particularly interesting...	Number	Percentage
Driver fatigue / drowsiness	57	93%
Health conditions (stress, sleeplessness, mild anxiety, etc.)	43	71%
Psychological diseases	27	44%
Physical diseases	22	36%
Other, namely	7	12%
“Distracted; medicated;”		
“Alcohol, drugs”/ “(medicinal) drug use”	4	
“Monotony/underload and potential stimulation from talking on phone, driving related workload, etc”		

3.4 Differences between organisation types

Table 3.9 provides an overview of the interests of the respondents per organisation type, sorted according to the preferences of the largest category, i.e. the research institutes. In general, there are many more similarities than differences.

Table 3.9: Percentage of times a topic was considered 'very important' or 'important' by respondents from the different organisation types.

Topics	Research (n=31)	Government (n=10)	Industry (n=6)	Other (n=25)
Risk-taking behaviours (speeding, alcohol use)	94%	100%	100%	88%
In-vehicle safety support systems (cruise control, ISA, navigation, warning systems)	94%	90%	100%	76%
Crash avoidance behaviour	90%	100%	100%	84%
Normal behaviour (gap acceptance, overtaking, gear choice)	87%	80%	100%	88%
Distractions inside the vehicle (passengers, mobile phone use, eating)	87%	80%	83%	80%
Driver condition (fatigue, stress, use of medication)	87%	90%	83%	80%
Driver characteristics (gender, age)	84%	90%	67%	76%
Pre-crash behaviour	84%	90%	100%	84%
Situational influences (weather conditions, traffic intensity, time of day)	81%	80%	67%	76%
Vulnerable road users (pedestrians, cyclists)	74%	80%	67%	76%
Roadway design (road width, line marking, road side)	68%	70%	50%	72%

Driver training	61%	70%	67%	64%
Environmental effects (eco-driving, gear change behaviour, toxic emission)	58%	90%	83%	60%
Distractions outside the vehicle (advertisement)	55%	60%	50%	64%
Traffic flow (traffic jam behaviour)	55%	80%	67%	60%
Cross-country issues	48%	50%	33%	40%
Vehicle type (size, weight, brand)	29%	40%	17%	32%

The percentages indicate that national and regional governments may be a little more interested than the other respondents in the non-road safety topics such as vehicle type, traffic flow/congestion and environmental issues. Environmental aspects are also of more interest to the industry than to research institutes and other organisations. In addition, industry slightly deviates from the overall picture in that the respondents tend to be less interested in driver characteristics, road design, situational influences and vehicle type. As compared to the other organisation types, they tend to be more interested into information about 'normal' traffic behaviour, pre crash behaviour and in-vehicle safety systems.

3.5 Differences between countries

We also looked at differences in response patterns between countries. Since most countries only had very few respondents, the countries were grouped according to their mortality rate, i.e. the number of road fatalities per million inhabitants. This classification (Table 3.10) is based on data from IRTAD/CARE/Eurostat as cited in SWOV (2009).

Table 3.10: Classification of the different countries by mortality rate, 2005-2007.

Country	Mortality rate	Number of respondents
Lower mortality rate		
Netherlands	43.3	16
Norway	49.6	4
Switzerland	51.1	1
United Kingdom	51.8	5
Sweden	53.8	4
Israel	55.1	6
Germany	60.2	5
Total		41
Higher mortality rate		
France	72.9	3
Denmark	74.7	2
Austria	83.3	3
Spain	85.9	7
Portugal	91.9	1
Italy	96.5	3

	Belgium	104.2	6
	Slovak Republic	116.2	1
	Hungary	122.2	2
	Slovenia	145.7	1
	Poland	146.4	2
	Total		31

As can be concluded from Table 3.11, both groups considered road safety to be the most interesting topic for ND studies. However, in contrast with some respondents from countries with the lower mortality rates, *all* respondents from countries with the higher mortality rates were interested in studying road safety with an ND approach. Subsequently, both groups were more interested in environmental aspects than traffic management.

Table 3.11: General areas of interest for respondents from countries with different mortality rates.

	Lower mortality (n=41)	Higher mortality (n=31)	Total (n=72)
Road Safety			
Number	41	31	66
Percentage	85%	100%	92%
Eco driving or environmental effects of road traffic			
Number	27	17	44
Percentage	66%	55%	61%
Traffic management			
Number	18	15	33
Percentage	44%	48%	46%

Figures 3.2 and 3.3 show for both groups of countries the five most popular topics for a ND study. One finding is that the higher mortality countries considered the topics more important. For example, both in the higher and the lower mortality group risk taking is considered the most important topic for an ND study. However, in the lower mortality group, 60% of the respondents considered this very important, while this was the case for over 80% in the lower mortality group.

The top-five of important topics for an ND study are very similar for the two groups. Four of the five topics were the same: risk taking behaviour, crash avoidance behaviour, pre-crash behaviour and driver condition. The respondents from the lower mortality countries were additionally interested in in-vehicle safety support systems, where respondents from the higher mortality countries were interested in normal driving behaviour.

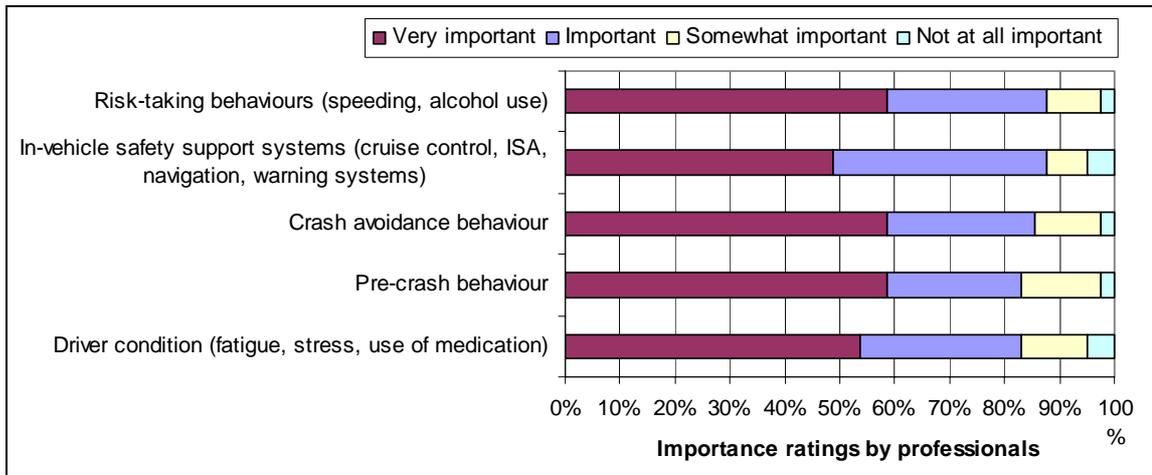


Figure 3.2: Five most popular topics for an ND study according to the respondents from countries with the **lower mortality rates**.

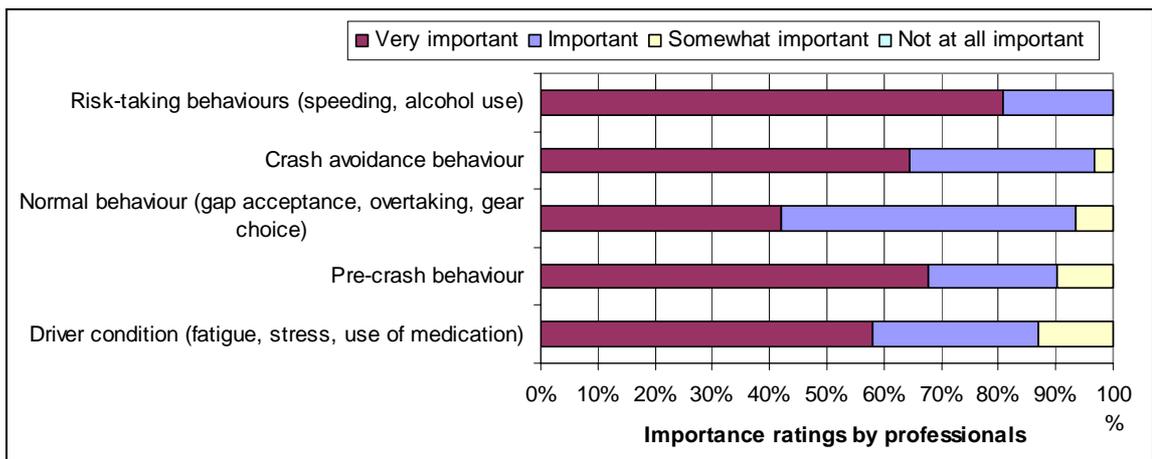


Figure 3.3: Five most popular topics for a naturalistic driving study according to the respondents from countries with the **higher mortality rates**.

An overview of the importance of all selected 17 topics (Table 3.12) also shows that there was a high degree of agreement between the two groups of countries. Respondents from the higher mortality countries were generally more interested in all topics compared to respondents from lower mortality countries. There are two exceptions: respondents from higher mortality countries seem to be less interested in environmental effects and more in cross-country issues than the respondents in the lower mortality countries.

Table 3.12: Percentage of times a topic was considered 'very important' or 'important' by respondents from countries with different mortality rates.

Topics	Lower mortality (n=41)	Higher mortality (n=31)
Driver characteristics (gender, age)	76%	87%
Normal behaviour (gap acceptance, overtaking, gear choice)	83%	94%
Risk-taking behaviours (speeding, alcohol use)	88%	100%
Vehicle type (size, weight, brand)	27%	35%
Roadway design (road width, line marking, road side)	63%	74%
In-vehicle safety support systems (cruise control, ISA, navigation, warning systems)	88%	87%
Distractions inside the vehicle (Passengers, mobile phone use, eating)	80%	87%
Distractions outside the vehicle (Advertisement)	54%	65%
Driver condition (fatigue, stress, use of medication)	83%	87%
Situational influences (weather conditions, traffic intensity, time of day)	76%	81%
Pre-crash behaviour	83%	90%
Crash avoidance behaviour	85%	97%
Vulnerable road users (pedestrians, cyclists)	71%	81%
Traffic flow (traffic jam behaviour)	61%	61%
Environmental effects (eco-driving, gear change behaviour, toxic emission)	76%	52%
Driver training	63%	65%
Cross-country issues	37%	55%

3.6 Additional topics of interest

The respondents were also asked if they could think of additional topics that would be possible and important to investigate in a future large-scale ND study. The responses included the following suggestions for further research:

- Visual attention of the driver
- Low speed manoeuvres, as parking
- The influence of new co-operative systems on driver's behaviour
- eSafety effectiveness
- Distraction from children and other passengers
- The validity of performance indicators
- Definition of extreme driver behavioural groups (e.g. teenage driver) and passive methods to reduce their risk (e.g. forgiving roads)

- Effects of platooning
- Cost-Benefit Analyses
- Motorcycles, e.g. driver- machine- roadway interaction and car drivers' detection of and accommodation to motorcycles
- Speed changes as a function of the speed of other vehicles, e.g. overtaking cars, cars ahead
- Collision partner of cars, in particular vulnerable road users
- The influence of parents on the driving behaviour of their children in a car
- The effect of information/education on driving styles and the duration of the effect
- Feedback on driving (experience) by video. Circuit experience on curve speed, ABS , ESP. Circuit experience on brake distance
- Human errors and violations; identification of their leading factors and the set-up of a proactive safety system / towards a resilient transport system

Furthermore, a few respondents came with an advice for a future large-scale ND study.

One respondent mentioned that "because the dataset is so huge, it is highly advisable to include research topics of a more technical or methodological nature dealing with optimizing the analysis itself, i.e. doing research on how best to do research. For example, research on how to best prepare data, create easy to use analysis structures, use of data mining techniques, etc."

Another respondent pointed out that it would "be necessary to focus on selected items and issues to secure an effective process and useful results in the end".

3.7 The willingness of organisations to contribute

Finally, the respondents were asked whether they would be interested to contribute to a large-scale European ND study if such study would take place and if it would include the topics they had indicated to be interested in. As shown in Table 3.13, over 80% of the respondents indicated that they were interested to participate in such a study; 4% was interested to fund such a project and 10% to fund such a project in kind. The additional comments indicate that such funding in kind would mainly consist of technology.

Table 3.13: Number and percentage of respondents wanting to contribute.

	Number	Percentage
Interested in participating	59	82%
Interested to fund the project	3	4%
Interested to fund the project in kind	7	10%
Not interested to contribute	5	7%
Interested to...	16	22%
connect the findings to our investigation		
be informed about the project results	2	
encourage local FOT in cooperation with		
provide technology		
give moral support, learn, interact		

use the results in education projects		
carry out research		
get information on the project		
help in designing study and use results		
supply sensors and data loggers		
propose software for data logging		
compare results of euroFOT		

4 Conclusions

The aim of the survey was to get an overview of the interests of different potential user groups for the results of a large-scale Naturalistic Driving (ND) study. To get that information, around 140 professionals in road transport and related areas were invited to participate in an internet survey. Almost 50% completed the questionnaire.

4.1 The sample

One must realise that the final sample of 72 respondents cannot be considered as representative of the European road transport professionals and the supposed stakeholders of an ND study. In particular, there were only a few industrial organisation represented in the sample, while there were relatively many research organisations. This unbalanced distribution is likely to be attributed to the sampling procedure where the consortium partners, mainly non-profit research institutes, nominated people from their own network to be invited to participate in PROLOGUE's User Forum, and subsequently in the survey. Only 17% of the invited people represented industry and a similar percentage represented government. In addition, the response rate of these groups was relatively low. Another factor that might have contributed to this unbalance is the fact that the questionnaire was presented in English only. Research people may better master the English language than for instance people working in industry or for a regional government. The distribution over countries is not very representative either with the home country of the co-ordinator institute and one of the partners being substantially overrepresented. With 18 countries included, the sample does, however, cover a very wide range of countries.

Since the sample is not representative for the population of parties that are potentially interested in ND studies, the results have to be considered as an indication only. However, there are only minor differences in the interests between different organisation types and between respondents from different groups of countries. Therefore, these indications can still be considered to give a fairly complete picture.

4.2 Overall interests of potential users

Having said that, let's go to the main conclusions about the interests of potential users of ND knowledge. Almost all respondents hold the opinion that ND studies would provide relevant knowledge about road safety issues. According to around one third of the respondents it could also help to improve our insight in human-machine interface design. Its usefulness for traffic management and particularly for environmental issues was less clear to the respondents. This assessment coincides with the way that ND studies have been applied so far. As concluded by Backer-Grøndahl et al. (2010) the vast majority of the previous and current ND studies have addressed road safety issues; only a few have addressed environmental or traffic management aspects. Since ND studies seem to be a very suitable method for collecting relevant information for those topics as well, it should be one of the additional objectives of PROLOGUE's dissemination work to clarify this more explicitly to the future user groups.

From the current study it can be concluded that, overall, many topics are 'important' or 'very important' to investigate in a large-scale European ND study. According to the respondents, the four most popular topics are:

- Risk-taking behaviour, in particular speeding, close following and drink driving
- Pre-crash behaviour
- Crash avoidance behaviour

- Driver condition, in particular fatigue and various health conditions.

The three least popular topics, still considered important by 30 to 60% of the respondents, are:

- Vehicle type
- Traffic flow
- Cross country issues

4.3 Differences between organisation type

The sample consisted of respondents of national and regional government, industry, research organisations and a wide category of other organisations. As already indicated there is very little difference between the opinions of different organisation types. The similarities are more salient. If specifically looking for differences, there are indications that national and regional governments, as compared to the other groups, have somewhat more interest in vehicle type, traffic flow/congestion and environmental issues. Industry also tends to be more interested in environmental issues as well as in 'normal' traffic behaviour, pre crash behaviour and in-vehicle safety systems. Industry tends to be less interested in driver characteristics, road design, situational influences and vehicle type. It has to be noted that the groups were very small, in particular the industry, so these conclusions have to be treated with care.

4.4 Differences between countries

The differences between countries seem to be minor as well. When grouping the countries on the basis of their mortality rate, there are indications that the countries with a comparatively high mortality rate are somewhat more interested in roadway design and somewhat less in environmental effects. Driver training is a topic that is considered more important in the countries with a comparatively low mortality rate than in the other groups. But again, the groups are small, and the conclusions indicative.

4.5 Finally

All in all, it can be concluded that the potential users of ND studies have a broad interest. Almost all topics that were presented in the survey were considered to be (very) important by a majority of the respondents. The broad interest also turned out in the large amount of answers to the open questions and in the willingness to participate in a future large-scale European ND study. A number of respondents were even prepared to fund such a study, at least in kind. A task of the PROLOGUE project should be to clarify and show that ND studies not only provide very useful information in the area of road safety, but also in the areas of traffic management and environmental aspect of road transport. Furthermore, it would be useful to address traffic management organisations and environmental organisations directly to derive additional research questions in these areas.

References

Backer-Grøndahl, A., Phillips, R., Sagberg, F., Toulou, K., Gatscha, M. (2010). *Topics and applications of previous and current naturalistic studies*. PROLOGUE Deliverable D1.1. TØI Institute of Transport Economics, Oslo, Norway.

SWOV (2009) Factsheet: *Dutch road safety in international perspective*. SWOV Institute for Road Safety Research, Leidschendam.

Appendix I: The questionnaire

Thank you for your interest in being a member of the User Forum of the PROLOGUE project.

As a first act, we want to ask you to fill in this very short (10 to 15 minutes) questionnaire.

Naturalistic observation could generate essential data for understanding all kind of behaviours in traffic relevant for different disciplines. PROLOGUE is a feasibility study on the setting up of a large-scale European Naturalistic Driving Study. In the questionnaire we ask about your views on what topics you think are most interesting to address in such a future large-scale European Naturalistic Driving Study. Your opinion will be used for setting priorities.

What is Naturalistic Driving?

Naturalistic Driving Observation is a new observational method that allows for objective, unobtrusive observation of road user behaviour in a natural setting for a longer period of time. By using this method, one obtains good insight into natural behaviour during daily driving. A wide variety of information is collected while people drive their day-to-day routes using their own car. Compared to controlled studies, naturalistic driving studies better account of the full effects of driver behaviour in relation to perceived risk during complete immersion in actual traffic conditions.

Naturalistic driving observations will permit us to observe drivers at the wheel of their own vehicle during a sufficient time period to record their behaviours. The observational equipment installed in the car of the test drivers could be very sophisticated, including cameras inside and outside the car, microphones, GPS, speed, CAN-bus data, radar and all kind of other sensors to monitor driving behaviour and the driving environment.

This observational technique allows analysing the interrelationship between road user, vehicle, road and other traffic in normal situations, in conflict situations and in actual collisions. An increased understanding of driving behaviour could reveal new insights not only on road safety, but also related to eco-driving and traffic flow and probably many other relevant areas.

Naturalistic driving studies have been conducted in the USA by various teams of researchers and currently a large-scale study, SHRP2, is being set up. For more information, see:

http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/Public/Pages/Safety_153.aspx

What is PROLOGUE?

PROmoting real Life Observations for Gaining Understanding of road user behaviour in Europe

The main objective of PROLOGUE is to explore the feasibility and usefulness of a large-scale European naturalistic observation study.

The project aims at road safety researchers and other stakeholders including car industry, insurance companies, driver training and certification organisations, road authorities, and governments. Whereas road safety is the main motive, the project will also

look at the relevance for environmental issues, e.g. CO2 emissions, and traffic management.

Based on inventory studies, a series of small-scale field trials, and close involvement of user groups and stakeholders, PROLOGUE will result in recommendations and an outline for a large-scale naturalistic study, dealing with research questions, methodology and technology for data collection, data storage, data reduction, data mining and data analysis.

The objective of the recommended study is to obtain a better understanding of road safety and help to realise an intrinsically safe road transport system, including in-car technology, self-explaining roads, driver training, etc.

Background information

In order to develop a good database of members of the user forum of Prologue, we ask you to provide us a bit of background information about your organization. Your name and institution affiliation will only be used to build a database of the members of the User Forum. The reporting about this survey will only present results at the level of 'organisation types' or countries, not connected to individual organisations or individuals. Thus, your answers will not be traced back to you individually.

Q1. Could you please provide us your name and email address?

Name Mr/Mrs

Email address

Q2. Where is your organization based in?

City

Country

Q3. What is the name of the organization you work for?

Full name (in English)

Abbreviation (in English)

Q4. Could you please give a short description of your organization? (1-2 lines)

.....
.....
.....

Q5. How would you classify the organization you work for?

[Please indicate what fits best]

- Local government
- Regional government
- National ministry of transport
- Other national government

- National road authorities and operators
- European Union policy and research unit
- Automotive industry
- Automotive supplier industry
- Other industry
- Insurance company
- Police
- Research organization
- Road user organization
- Environmental organizations
- Other Non governmental organization
- Driver training and licensing agencies
- Other, namely

Application areas for Naturalistic Driving

Knowledge gained from using naturalistic driving studies can be applied in various areas. If you are interested you can read more about the potential of ND below, or you can go directly to the next page by clicking on “next”.

Insurance companies

It is said that insurance industry will be among the ones which will benefit the most from implementing Naturalistic Driving methods. For insurance companies, a large-scale European Naturalistic Driving Study could provide information on the accident and injury risk for different groups of road users. The Naturalistic Driving study could provide insight into the risk-taking behaviour among different driver groups (age, gender, area of residence, driving experience, etc.). Also the study could provide insight into the risk of different behaviours (e.g. distraction, fatigue, speeding or alcohol) as well as the risk of different situations (e.g. weather, time of day, etc) or different driving styles (aggressive, gentle, etc.)

This information could be used for setting of insurance premiums by user group and could be used as a marketing instrument. Examples might be discounts for females, for administrative officials, for vehicles parked in garages, for family cars, etc. What is justified? Calculation of insurance premium based on engine displacement, engine power, number of seats, total mass, etc. What is best? ND is a method that can provide a sound background for making such choices. Dedicated studies based on existing ND data would be possible.

Automotive (supplier) industry

For (automotive) industry a Large-scale European Naturalistic Driving Study could provide new and breakthrough information on people’s day to day use of their vehicles. The enormous value of Naturalistic Driving is in the unobtrusive nature of the observation, which allows observing natural behaviour. The uses of Naturalistic Data are multi-fold;

Safety and Crash Prevention

Most interesting and useful information can be learned just by studying the driving posture during normal vehicle operation. We may know details about the 'driver envelope' in a 'static' condition but not necessarily in the 'dynamic' driving condition which are thought to be different. This information could help for example with ensuring that drivers do not drive too close to the steering wheel which may be a problem for the deploying airbag.

Another very useful purpose of naturalistic driving information is the typical driving posture in the context of the seat. For example, it is thought that as the distance between the driver head and head restraint increases, so the risk of whiplash injury increases accordingly. Therefore ND data could examine this issue and see what the reality is.

ND data can also be used to study issues such as driver fatigue and could therefore help to determine where fatigue warning intervention may be required and the type of intervention that may be needed.

During any large-scale ND trial, there are always likely to be traffic conflicts, incidents and near-miss situations. Such situations, although not welcomed, do provide an opportunity to study the casual factors in great detail and to look for trends and common pre-incident behaviours. This information can be used in system development for the prevention of such incidences and can therefore ultimately lead to a reduction in crashes and resultant road casualties.

Driver Operation

The ND data can also help in looking at reach envelopes for controls for driving, information entertainment and safety/security. We could learn every detail, from how they steer and how they sit in their seat, to the use of new and traditional in-vehicle support systems (e.g. cruise control, radio, navigation, warning systems, etc.). When, how and how often are these systems being used? How does this influence driving behaviour? What are the safety effects? What other systems could be of support for the driver? More advanced data collection scenarios may be able to infer eye gaze direction and therefore provide valuable information regarding the amount of time drivers spend looking away from the road as well as where they are looking during this time, assisting with the design of dashboard layouts, heads-up displays and the like.

Driver Information

Driver information systems are becoming more prevalent and more sophisticated. In many respects, they facilitate the driving task (in the case of navigation systems) and may increase driver efficiency (traffic information) and personal mobility. However, there is still a requirement to look at driver information systems from an HMI perspective. ND could assess issues such as distraction, inattention and eyes-off-road and could help to discriminate between good and bad information systems from an HMI perspective.

Human Machine Interaction

Ultimately, ND data can be used to look at the driver-vehicle-road interaction and to detect where deficiencies are evident. This use of data encompasses all of the above but looks at the system interaction as a whole rather than the individual elements. Good HMI suggests safe, reliable and efficient operation of the vehicle. The data can therefore be studied from a holistic point of view to distinguish good and bad examples of driver-vehicle HMI.

Policy

For policy a Large-scale European Naturalistic Driving Study could provide new and important information for the development of policy measures. The study would provide a better understanding of current behaviour in relation to safety, traffic flow and emissions, which could be the basis for development of new measures or change of existing measures. The study could lead to recommendation for road and road-side design. A better understanding of use of new and existing in-vehicle technology, is crucial for the development and enforcement of effective measures.

Research

There is a range of highly relevant topics in the area's of road safety, eco-driving and traffic management which are very hard to investigate with existing methods. Topics like fatigue and distraction (inside or outside the vehicle) are considered as increasingly contributing factors to crashes. So far, experimental research has provided some understanding; however, naturalistic driving observation would allow for unobtrusive observation of real driving behaviour and as such much more reliable and valid result on exposure to those risks as well as understanding of those behaviours.

Non profit organizations

Road user organizations, environmental organizations and other non-governmental organizations could benefit from the insights for a large-scale European Naturalistic Driving Study. The knowledge could provide them better insight in the interests of the users they represent and could help to argue for certain measures or other changes.

Driver training and licensing agencies

A large-scale European Naturalistic Driving Study could provide better understanding of driver behaviour, learning process and development of driving skills. The crash risk of young novice drivers drops substantially in the first years after licensing. However, it is still unclear what and how a driver learns in these first few years of independent driving. A study like this would allow observing drivers during their training but also afterwards and monitor their learning curves. Also it would allow identification of driver characteristics that are related to different driver and risk taking behaviour. Knowledge from this study could be used to improve driver training and/or licensing.

Q6. Which of the following areas would you consider to be interesting to investigate with the use of a large-scale European Naturalistic Driving Experiment?

[more than one answer possible]

- Road safety
- Eco driving or environmental effects of road traffic
- Traffic management
- Other, please specify.....

Now we want to ask your opinion on the importance of investigating certain topics in a large-scale European Naturalistic Driving Study. The selection of topics is based on a literature review and expert opinions, and all topics are possible to investigate by naturalistic driving observation. For each of the topics listed below, please indicate how im-

portant you think this would be to address in a potential large-scale European Naturalistic Driving Study.

Q7	Topics	Not at all important	Somewhat important	Important	Very important
1	Driver characteristics (e.g. gender, age, etc.)				
2	Normal behaviour (e.g. gap acceptance, overtaking, gear choice, etc.)				
3	Risk-taking behaviours (e.g. speeding, alcohol use, etc)				
4	Vehicle type (e.g. size, weight, brand, etc.)				
5	Roadway design (e.g. road width, line marking, road side, etc)				
6	In-vehicle safety support systems (e.g. cruise control, ISA, navigation, warning systems, etc.)				
7	Non-driving related distractions inside the vehicle (e.g. Passengers, mobile phone use, eating, etc)				
8	Non-driving related distractions outside the vehicle (e.g. Advertisement)				
9	Driver condition (e.g. fatigue/drowsiness, stress, use of medication, etc.)				
10	Situational influences (e.g. weather condition, traffic intensity, time of day, etc.)				
11	Pre-crash behaviour				
12	Crash avoidance behaviour				
13	Vulnerable road users (e.g. pedestrians, cyclists)				
14	Traffic flow (e.g. traffic jam behaviour, etc.)				
15	Environmental effects (e.g. eco-driving, gear change behaviour, toxic emission, etc.)				
16	Driver training				
17	Cross-country issues				

Q8. Could you think of any other topic that would be possible and important to investigate in a future large-scale Naturalistic Driving Study?

.....

You have indicated before that you think [*insert topic*] would be in your view important to investigate in a future large-scale European Naturalistic Driving Study.

Q9. Why do you consider this topic as important?

[*more than one answer possible*]

- It provides relevant insights into Road safety
- It provides relevant insights into Environmental effects of traffic
- It provides relevant insights into Traffic management
- It provides relevant insights into human-machine interface design
- It provides other relevant insights, please specify

Please explain below

.....
.....
.....
.....

Q10. What issues within this topic do you consider as particularly interesting?

1. Driver characteristics

[*more than one answer possible*]

- Gender
- Novice drivers
- Teen drivers
- Elderly drivers (65+)
- Aggressive drivers
- Sensation seekers
- Other, please specify:

2. Normal behaviours

[*more than one answer possible*]

- Overtaking behaviour
- Gap acceptance behaviour
- Gear choice
- Speed choice
- Homogeneity of speed
- Other, please specify:

3. Risk-taking behaviours

[more than one answer possible]

- Speeding
- Use of alcohol while driving
- Use of drugs or other illegal substances while driving
- Use of medicines while driving
- Seat belt usage
- Close following/ tail gaiting
- Other, please specify:

4. Vehicle type (e.g. size, weight, brand, etc.)

[more than one answer possible]

- Relation between vehicle type and driving behaviour
- Interaction between heavy and light vehicles in conflict situations
- Involvement of specific vehicle types in accidents and near-accidents
- Lane change behaviour of light vehicles and heavy vehicles
- Other, please specify:

5. Roadway design

[more than one answer possible]

- Road width
- Line markings
- Road side design
- Median treatment
- Road shoulder
- Lighting
- Pavement type
- Intersection design
- Interaction with vulnerable road users (bicycles, pedestrians)
- Effect of rumble stripes (e.g. as countermeasures for fatigue/drowsiness)
- Other, please specify:

6. In-vehicle safety support systems

A) Which of the following in-vehicle support systems do you consider interesting:

[more than one answer possible]

- Cruise control
- Navigation systems
- Intelligent speed adaptation (ISA)
- Forward collision warning

- Side blind zone alert
- Lane departure warning
- Other, please specify:

B) Which of the following effects of those in-vehicle support systems do you consider interesting:

[more than one answer possible]

- Intended effects of in-vehicle safety systems on behaviour and safety
- Unintended side effects of use of in-vehicle safety systems
- Unintended side effects of other in-vehicle support systems
- Risk compensation when using in-vehicle safety systems
- Other, please specify:

7. Non-driving related distractions inside the vehicle

A) Which of the following in-vehicle distractions do you consider interesting?

[more than one answer possible]

- Adjusting radio, CD, or ipod
- Other occupant in vehicle
- Moving object in vehicle
- Smoking related
- Talking or listening on hand-held mobile phone
- Talking or listening on hands-free mobile phone
- Dialling or texting on mobile phone
- Using other nomadic device brought into vehicle
- Using integral in-vehicle device
- Adjusting climate controls
- General inattention
- Other, please specify:

B) Which of the following effects of the in-vehicle distractions do you consider interesting:

[more than one answer possible]

- Influence of those distraction factors on behaviour
- Exposure to those distractions
- Learning effect related to in-vehicle distraction devices
- Pattern of use of these systems
- Understanding the degree and type of distraction (e.g. Eyes off the road, hand position on the steering wheel)
- Relation to driver characteristics (age, gender, sensation seekers etc.)

- Understanding when and where drivers engage in distractive activities
- Other, please specify:

8. Non-driving related distractions outside the vehicle

A) Which of the following in non-driving related distractions outside the vehicle do you consider interesting?

[more than one answer possible]

- Advertisements in urban areas
- Advertisements in rural areas
- Commercial advertising
- Road safety advertising
- Traffic (flow) information
- Other, please specify:

B) Which of the following effects of the Non-driving related distractions outside the vehicle do you consider interesting:

[more than one answer possible]

- Influence of those distraction factors on behaviour
- Exposure to those distractions
- Understanding the degree and type of distraction (e.g. Eyes off the road, hands off the wheel)
- Relation to driver characteristics (age, gender, sensation seekers etc.)
- Understanding when and where drivers engage in distractive activities
- Other, please specify:

9. Driver condition

[more than one answer possible]

- Driver fatigue/drowsiness
- Health conditions (stress, sleeplessness, mild anxiety etc)
- Physical diseases
- Psychological diseases
- Other, please specify:

10. Situational influences

[more than one answer possible]

- Weather conditions
- traffic intensity
- time of day
- Other, please specify:

11. Pre-crash behaviour

(open question)

12. Crash avoidance behaviour

(open question)

13. Vulnerable road users

[more than one answer possible]

- Interaction between various road users at intersections
- Bicyclists
- Pedestrians
- Motorcyclists
- Mopeds
- Other, please specify:

14. Traffic flow

[more than one answer possible]

- Lane change behaviour
- Following headway
- Congestion
- Behaviour at different levels of congestion
- Response to dynamic advisory speeds to avoid congestion
- Response to dynamic advisory routes to avoid congestion
- Other, please specify:

15. Environmental effects

[more than one answer possible]

- Identification of different driving styles in terms of environmental friendliness (eco-driving)
- Gear change behaviour
- Toxic emissions
- Driver characteristics and eco-driving behaviour
- Do drivers who look at themselves as “eco-drivers” drive more economically than drivers who don’t look at themselves as “eco-drivers”?
- Other, please specify:

16. Driver training and Graduated Driver Licensing (GDL)

(open question)

17. Cross-country issues

[more than one answer possible]

- Differences in driving behaviour between European countries
- Differences in crashes and critical incidents between European countries
- Attribution of potential differences between countries to differences in driving culture, infrastructure, laws etc.
- Differences in eco-driving between European countries
- Other, please specify:

You have indicated before that you think [insert topics indicated as 'important' or ' very important'] would be important to investigate in a future large-scale European Naturalistic Driving Study.

Q11. If such a study would be conducted, do you think your organisation would be interested to contribute?

[more than one answer possible]

- I think we would be interested to participate in the project
- I think we would be interested to fund the project
- I think we would be interested to fund the project in kind
- Other, I think we would be interested to
.....
- I don't think my organisation would be interested to contribute

Q12. As a final question, could you think of any other research topics – not yet addressed in this questionnaire - that would be interesting to investigate in a large-scale European Naturalistic Driving Study?

Please describe below

.....
.....
.....
.....

Thank you very much for completing this questionnaire and for contributing to the PROLOGUE project!

Your opinion will be taken into account in the development of the design for a large-scale European Naturalistic Driving Study.

As a member of the User Forum, we will keep you posted on the progress on PROLOGUE and we will invite you for further activities. In spring 2010 there will be a European workshop in Brussels with face-to-face communication and discussions and later in 2010 regional workshops will be held in Norway, Netherlands, Austria, Spain and Greece.

If you have any questions related to this questionnaire, please contact Nicole.van.Nes@SWOV.nl

Appendix II: Detailed description of the topics for Naturalistic Driving studies

This Appendix provides the results of the responses to the questions *why* they considered a topic as important and *which issues* within that topic they considered as particularly interesting. This is done for each of the 17 predefined topics (see Section 2.3).

1. Driver characteristics

Table II. 1: Opinion of 58 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	51	88%
Environmental effects of traffic	18	31%
Traffic management	21	36%
Human-machine interface design	35	60%
Other, namely	5	9%
Gender differences are interesting, especially in educating young drivers	2	
Level of performance as a measure of driver competence		
It is important to explain and verify driver models		
who to address to improve driving behaviour (and how)		
info on profile risk accepting vs. risk avoiding		

Table II.2: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Gender	24	41%
Novice drivers	46	79%
Teen drivers	35	60%
Elderly drivers (65+)	49	85%
Aggressive drivers	35	60%
Sensation seekers	20	35%
Other, namely	15	26%
Professional drivers (trucks, busses, taxis - etc)	2	
Heavy travellers		
All the characteristics are essential . Middle ages should be considered as well.		
Age, medical conditions/pathologies, offence/accident history, professional/young drivers		

Comparisons with expert or good drivers is very useful		
Fleet drivers: van drivers, truckers, lease car drivers		
Attitude towards technology in general and driver assistance systems in particular		
Cultural differences		
Drivers being busy doing other things		
Different behaviour according to the group of age.		
Drivers seeking comfort and safety		
Commercial drivers		

2. Normal behaviour

Table II.34: Opinion of 63 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	53	84%
Environmental effects of traffic	25	40%
Traffic management	24	38%
Human-machine interface design	35	56%
Other, namely	5	8%
It provides a baseline for all other studies.		
Important know-how for driver training courses		
Into fitness to drive (standards / assessment methodology)		
ADAS design		

Table II.4: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Overtaking behaviour	46	72%
Gap acceptance behaviour	48	75%
Gear choice	17	27%
Speed choice	51	80%
Homogeneity of speed	34	53%
Other, namely	13	20%
Normal driving of people who are and are not involved in incidents, and what distinguishes them		
Distractors		
Acceleration and deceleration behaviour, anticipation of events and situations		

Concentration level		
Driver's position behind the wheel, operation of the car		
All normal driving actions - reference to test ride investigation protocols (e.g. TRIP)		
Driver attitude and strategy		
Engineering gaps of infrastructure		
Lane change, attention to traffic signs, safety distances, mistake corrections		
Looking behaviour by driver		
Time management, planning		
Identification of unsafe acts and the driver's intention: intended and unintended acts		

3. Risk-taking behaviour

Table II.5: Opinion of the 67 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	67	100%
Environmental effects of traffic	8	12%
Traffic management	18	27%
Human-machine interface design	24	36%
Other, namely	1	2%
Insight into driver attitude		

Table II.6: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Speeding	66	99%
Close following / tail gaiting	50	75%
Use of alcohol while driving	44	66%
Use of drugs or other illegal substance while driving	35	52%
Seatbelt usage	34	51%
Use of medicines while driving	30	45%
Other, namely	17	25%
Driver distraction/ secondary tasks/ performing non-driver related tasks/use of mobile phone	8	
Wrong steering position	1	
Involvement in conflicts, crash-relevant events, near-crashes	1	
Anti-social behaviour/attitude to other road users/social context	3	
Fatigue/drowsy driving	3	
ignoring traffic light / way of right	2	

4. Vehicle type

Table II.7: Opinion of 22 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	17	23%
Environmental effects of traffic	8	36%
Traffic management	4	18%
Human-machine interface design	10	46%
Other, namely	2	9%
A necessary variable to be taken out of the equation		
Does size matter? Does weight matter? Does the right of the strongest counts?		

Table II.8: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Relation between vehicle type and driving behaviour	20	91%
Interaction between heavy and light vehicles in conflict situations	13	59%
Involvement of specific vehicle types in accidents and near-accidents	15	68%
Lane change behaviour of light vehicles and heavy vehicles	7	32%
Other, namely	4	18%
eSafety elements & euroNCAP grade are key issues.		
fast-slow; 2-/4-/more wheeled; driving license category; (non-)motorised ...		
white van drivers		
Relation between vehicle type and CO2-emissions		

5. Roadway design

Table II.9: Opinion of 49 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	41	84%
Environmental effects of traffic	12	25%
Traffic management	23	47%
Human-machine interface design	9	18%

Other, namely	2	4%
It provides relevant insight into human-road interface design		
Efficiency		
It influences driver behaviour		

Table II.10: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Road width	31	63%
Line markings	33	67%
Road side design	30	61%
Median treatment	14	29%
Road shoulder	16	33%
Lighting	25	51%
Pavement type	14	29%
Intersection design	39	80%
Interaction with vulnerable road users (bicycles, pedestrians)	35	71%
Effect of rumble stripes (e.g. as countermeasures for fatigue/drowsiness)	23	47%
Other, namely	5	10%
Universal road design		
Depends on research question		
Traffic lights, intersection rules, traffic signs, ...		
Risk factors of all of the above issues		

6. In-vehicle safety support systems

Table II.11: Opinion of 63 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	58	92%
Environmental effects of traffic	12	19%
Traffic management	21	33%
Human-machine interface design	46	73%
Other, namely	1	2%
Baseline for usage etc.		

Table II.12: Issues within the topic that are considered particularly interesting

A: Issues that are particularly interesting...	Number	Percentage
Cruise control	31	48%

Navigation systems	40	63%
Intelligent speed adaptation (ISA)	49	77%
Forward collision warning	48	75%
Side blind zone alert	40	63%
Lane departure warning	50	78%
Other, namely	9	14%
Plus ACC, brake assist, lane keeping assist, seatbelt reminders		
ACC, Collision Avoidance Systems, ADAS in general		
IVDR - black box		
The effect of real time information such as travel time, traffic jams		
All systems, the list is much longer and more nuanced than what is shown here!		
Drowsiness warning		
Lane keeping, ESP, collision mitigation systems		
adaptive cruise control		

Table II.13: Issues within the topic that are considered particularly interesting

B: Effects that are particularly interesting...	Number	Percentage
Intended effects of in-vehicle safety systems on behaviour and safety	55	86%
Unintended side effects of use of in-vehicle safety systems	4	69%
Unintended side effects of other in-vehicle <i>support</i> systems	33	52%
Risk compensation when using in-vehicle safety systems	54	84%
Other, namely	3	5%
Which particular characteristics of the varying implementations of safety systems are most effective		
Loss of self-regulation; not using higher order skills and wait for the car to react.		

7. Distractions inside the vehicle

Table II.14: Opinion of 60 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	57	95%
Environmental effects of traffic	1	2%
Traffic management	10	17%

Human-machine interface design	26	43%
Other, namely	3	4%
The social roles that drive people to distraction e.g. mother turning to screaming child		
Baseline		
Driver distraction can cause accidents		
System location in the vehicle avoiding driver distraction during driving		

Table II.15: Issues within the topic that are considered particularly interesting

A: Issues that are particularly interesting...	Number	Percentage
Adjusting radio, CD, or ipod	42	69%
Other occupant in vehicle	24	39%
Moving object in vehicle	20	33%
Smoking related	20	33%
Talking or listening on hand-held mobile phone	50	82%
Talking or listening on hands-free mobile phone	48	79%
Dialling or texting on mobile phone	50	82%
Using other nomadic device brought into vehicle	35	57%
Using integral in-vehicle device	25	41%
Adjusting climate controls	16	26%
General inattention	30	49%
Other, namely	5	8%
Talking to other passengers		

Table II.16: Issues within the topic that are considered particularly interesting

B: Effects that are particularly interesting...	Number	Percentage
Influence of those distraction factors on behaviour	53	87%
Exposure to those distractions	31	51%
Learning effect related to in-vehicle distraction devices	33	54%
Pattern of use of these systems	29	48%
Understanding the degree and type of distraction (e.g. Eyes off the road, hand position on the steering wheel)	48	79%
Relation to driver characteristics (age, gender, sensation seekers etc.)	38	62%
Understanding when and where drivers engage in distractive activities	36	59%
Other, namely	3	5%
Understanding the relation of quantitative, performance-related distraction measures with crash risk		

8. Distractions outside the vehicle

Table II.17: Opinion of 42 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	40	95%
Environmental effects of traffic	3	7%
Traffic management	9	21%
Human-machine interface design	4	10%
Other, namely	2	5%
Baseline		

Table II.18: Issues within the topic that are considered particularly interesting

A: Issues that are particularly interesting...	Number	Percentage
Advertisements in urban areas	33	77%
Advertisements in rural areas	21	49%
Commercial advertising	22	51%
Road safety advertising	21	49%
Traffic (flow) information	26	61%
Other, namely	8	19%
Waypoints, street signs, landmarks and other signals used to navigate		
Electronic road screens		
Unexpected events, road signs in general		
Road signs in general, unexpected events		
Road engineering like turbo roundabouts		
Everything that is not driving related, what is it, how does it work, what do we do when we drive		

Table II.19: Issues within the topic that are considered particularly interesting

B: Effects that are particularly interesting...	Number	Percentage
Influence of those distraction factors on behaviour	5	12%
Exposure to those distractions	23	54%
Understanding the degree and type of distraction (e.g. Eyes off the road, hands off the wheel)	36	84%
Relation to driver characteristics (age, gender, sensation seekers etc.)	26	61%
Understanding when and where drivers engage in distractive activities	27	63%
Other, namely	1	2%

9. Driver condition

Table II.20: Opinion of the 61 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	59	97%
Environmental effects of traffic	5	8%
Traffic management	11	18%
Human-machine interface design	22	36%
Other, namely	2	3%
Baseline		
To educate people		

Table II.21: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Driver fatigue/drowsiness	57	93%
Health conditions (stress, sleeplessness, mild anxiety, etc.)	43	71%
Psychological diseases	27	44%
Physical diseases	22	36%
Other, namely	7	12%
Distracted; medicated		
Alcohol, drugs"/ "(medicinal) drug use	4	
Monotony/underload and potential stimulation from talking on phone, driving related workload, etc.		

10. Situational influences

Table II.22: Opinion of the 56 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	51	91%
Environmental effects of traffic	9	16%
Traffic management	25	45%
Human-machine interface design	14	25%
Other, namely	1	2%
baseline, trip planning		
Road environment design and equipment		

Table II.23: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Weather conditions	48	84%
traffic intensity	46	81%
time of day	35	61%
Other, namely	10	18%
The types of other vehicles that the driver is interacting with e.g. motorcycles versus trucks		
Lighting conditions, road type, time of year (seasonal effects)		
Daylight / darkness		
Permanent and temporary road and traffic conditions including road attributes		
Everything that can be measured		
Time of year, seasonal effect on drivers.		
Roadside happenings that (may) distract the driver		
Planning & time management		
Infra-structure design and equipment		

11. Pre-crash behaviour

Table II.24: Opinion of the 62 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	57	92%
Environmental effects of traffic	1	2%
Traffic management	8	13%
Human-machine interface design	22	36%
Other, namely	4	7%
It provides relevant insights for driver training courses, for accident avoidance		
psychology of the driver		
Gives info on potential improvement / tools at level of driving lessons		
Design of safety systems		

The question of what issues within the topic of pre-crash behaviour the respondents considered to be particularly interesting was a completely open question; it did not contain any answer categories. The responses were too diverse for a meaningful classification.

12. Crash avoidance behaviour

Table II.25: Opinion of the 65 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	61	94%
Environmental effects of traffic	3	5%
Traffic management	11	17%
Human-machine interface design	24	37%
Other, namely	2	3%
Education		
Insights for driver training courses		
ADAS design		
Training		

The question of what issues within the topic of crash avoidance behaviour the respondents considered to be particularly interesting was a completely open question; it did not contain any answer categories. The responses were too diverse for a meaningful classification.

13. Vulnerable road users

Table II.26: Opinion of the 54 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	50	93%
Environmental effects of traffic	4	7%
Traffic management	15	28%
Human-machine interface design	11	20%
Other, namely	2	4%
Road design		
Typical behaviours and related users needs		

Table II.27: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Interaction between various road users at intersections	42	76%
Bicyclists	44	80%
Pedestrians	45	82%
Motorcyclists	36	66%
Mopeds	30	55%
Other, namely	9	16%
Trucks		

Heavy traffic		
Not only at intersections.		
Electric wheelchairs and "scootmobielen" for elderly people		
The relative risk of walking along roads without footways versus walking across roads		
Youth between 15 and 24 years		
Older drivers; commercial drivers		

14. Traffic flow

Table II.28: Opinion of the 44 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	31	71%
Environmental effects of traffic	25	57%
Traffic management	32	73%
Human-machine interface design	5	11%
Other, namely	1	2%
Insights for driver training programmes		

Table II.29: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Lane change behaviour	31	69%
Following headway	21	47%
Congestion	27	60%
Behaviour at different levels of congestion	32	71%
Response to dynamic advisory speeds to avoid congestion	35	78%
Response to dynamic advisory routes to avoid congestion	27	60%
Other, namely	5	11%
Driver perception of dynamic advisory, relation of traffic efficiency and fuel consumption		
Traffic volume		
Interested in crash-flow relationships		

15. Environmental effects

Table II.30: Opinion of the 47 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	11	23%
Environmental effects of traffic	40	85%
Traffic management	13	28%
Human-machine interface design	6	13%
Other, namely	1	2%
For driver training course		
Transport planning policy		

Table II.31: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Identification of different driving styles in terms of environmental friendliness (eco-driving)	39	81%
Gear change behaviour	19	40%
Toxic emissions	17	35%
Driver characteristics and eco-driving behaviour	34	71%
Do drivers who look at themselves as “eco-drivers” drive more economically than drivers who don’t look at themselves as “eco-drivers”?	22	46%
Other, namely	3	6%
Optimal driving strategy, driver response to eco-advice (e.g. gear change indicators)		
What aspects of Eco driving contribute most to Eco outcomes (style, vehicle, trip, TCD on route etc)		

16. Driver training

Table II.32: Opinion of the 46 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	42	91%
Environmental effects of traffic	15	33%
Traffic management	13	28%
Human-machine interface design	15	33%
Other, namely	2	4%
education		
ITS related training needs		

The question of what issues within the topic of driver training the respondents considered to be particularly interesting was a completely open question; it did not contain any answer categories. The responses were too diverse for a meaningful classification.

17. Cross-country issues

Table II.33: Opinion of the 32 respondents as to *why* this topic is important

It provides relevant insights into...	Number	Percentage
Road Safety	28	88%
Environmental effects of traffic	7	22%
Traffic management	14	44%
Human-machine interface design	11	34%
Other, namely	1	3%
Comparability of studies across countries, baseline country wise		
Insights into road design		

Table II.34: Issues within the topic that are considered particularly interesting

Issues that are particularly interesting...	Number	Percentage
Differences in driving behaviour between European countries	30	94%
Differences in crashes and critical incidents between European countries	20	63%
Attribution of potential differences between countries to differences in driving culture, infrastructure, laws etc.	24	75%
Differences in eco-driving between European countries	13	41%
Other, namely	5	16%
Evaluation of all kind of road safety measures		
Infrastructure-related differences		
European standard of driving competence		
Religion		

List of Figures

Figure 3.1: Topics for an ND study ordered by importance according to the respondents.....	15
Figure 3.2: Five most popular topics for an ND study according to the respondents from countries with the lower mortality rates	23
Figure 3.3: Five most popular topics for a naturalistic driving study according to the respondents from countries with the higher mortality rates	23

List of Tables

Table 2.1: Classification of invitees and respondents into different organisation types.....	10
Table 2.2: Country and type of organisation of the sample.....	11
Table 3.1: General areas of interest of respondents from different organisation types.	14
Table 3.2: The importance of topics that have and have not been studied previously by an ND method (frequencies and cumulative percentages are shown).....	16
Table 3.3: Opinion of the 67 respondents as to why risk taking is important.	17
Table 3.4: Specification of the topics of interest in the area of risk taking behaviour.	17
Table 3.5: Opinion of the 62 respondents as to why pre-crash behaviour is important.	18
Table 3.6: Opinion of the 65 respondents as to why crash avoidance behaviour is important.....	19
Table 3.7: Opinion of the 61 respondents as to why driver condition is important.	19
Table 3.8: Specification of the topics of interest in the area of driver condition.....	20
Table 3.9: Percentage of times a topic was considered 'very important' or 'important'.....	20
Table 3.10: Classification of the different countries by mortality rate, 2005-2007.	21
Table 3.11: General areas of interest for respondents from countries with different mortality rates.....	22
Table 3.12: Percentage of times a topic was considered 'very important' or 'important' by respondents from countries with different mortality rates.....	24
Table 3.13: Number and percentage of respondents wanting to contribute.	25