Deliverable 2.3
Risk Exposure Data Common Framework

Contract No: Integrated Project No. 506723: SafetyNet
Acronym: SafetyNet
Title: Building the European Road Safety Observatory

Integrated Project, Thematic Priority 6.2 "Sustainable Surface Transport"

Project Co-ordinator:
Professor Pete Thomas
Vehicle Safety Research Centre
Ergonomics and Safety Research Institute
Loughborough University
Holywell Building
Holywell Way
Loughborough
LE11 3UZ

Organisation name of lead contractor for this deliverable:
NTUA - National Technical University of Athens

Due Date of Deliverable: 31/07/2008

Submission Date: 31/07/2008

Report Author(s):
George Yannis, Eleonora Papadimitriou, Antonis Chaziris **NTUA**
Gilles Duchamp, Philippe Lejeune, Vincent Treny, **CETE-SO**
Stig Hemdorff, **DRD**
Mouloud Haddak, Erik Lenguerrand, **INRETS**
Péter Holló, Miklós Gábor, Mária Cseffalvay, **KTI**
Thomas Leitner, Andrea Angermann, Stefan Hoeglinger, **KfV**
Joao Cardoso, **LNEC**
Frits Bijleveld, Sjoerd Houwing, **SWOV**
Torkel Bjørnskau, **TØI**
Lucy Rackliff, **SafetyNet ICC**

Project Start Date: 1st May 2004 **Duration:** 4 years

Project co-funded by the European Commission within the Sixth Framework Programme (2002 -2006)		
Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (inc. Commission Services)	
RE	Restricted to group specified by consortium (inc. Commission Services)	
CO	Confidential only for members of the consortium (inc. Commission Services)	

Transport
Project co-financed by the European Commission, Directorate-General Transport and Energy

Table of Contents

Transport
Project co-financed by the European Commission, Directorate-General Transport and Energy

Index of Figures

Index of Tables

Executive Summary

This document consists of four parts. **Chapter 1** summarizes the **methods and results** of previous activities of SafetyNet WP2 (first classification of the EU Member States with respect to risk exposure data availability and compatibility, based on a state-of-the-art survey) and outlines the further steps required for a full assessment of risk exposure data compatibility towards a common framework for accident risk analysis in Europe. Moreover, it is devoted to a description of the **methodology** used for the detailed assessment of risk exposure data (RED) availability and comparability in the EU, in terms of variables and values, collection methodologies and data structure.

Chapter 2 concerns an analysis of the Risk Exposure Data (RED) **needs** in the EU, as stated by National Experts of many Member States. The analysis allows for the identification of the indicators, variables and values that are most important to road safety researchers in the EU. This analysis is used as a reference for the development of the common framework of Risk Exposure Data.

The results of this analysis allow for the identification of comparable variables and values per collection method for each indicator. The synthesis is included in **Chapter 3** of this document. More specifically, for each indicator and for each collection method of that indicator, variables, values and definitions are compared among EU countries. Within this framework, **summary tables** are presented and transformation rules are proposed, where possible, for the improvement of the comparability of Risk Exposure Data.

From this process the current common RED framework is identified, for analyses using the CARE data, together with a set of comparable exposure data. These **comparable sets of exposure data are summarized in Chapter 4** of this document. Moreover, these results are combined with those of the analysis of the RED needs, allowing for an overall picture with respect to the current and future potential of RED in the EU.

The **detailed tables** from the analysis of compatibility per indicator and per country are presented in **Annex II**.

Acknowledgements

The authors would like to thank the National Experts from the 27 countries (25 EU member states, Norway and Switzerland) of the CARE Experts Group of the European Commission for providing an important amount of detailed information and for giving valuable feedback on the methods and results of this Deliverable.

The authors would also like to thank Mr. Hans Strelow from Eurostat and Mr Jean-Paul Repussard from DG TREN of the European Commission for their valuable comments, suggestions and assistance throughout the data collection and analysis.

Finally, the authors would like to thank the SafetyNet internal reviewers of this Deliverable for their helpful comments, as well as Ms. Martine Reurings from SWOV, for carrying out a thorough review and quality control of the Deliverable before its submission to internal review.

1. Introduction

1.1. Background

This section summarizes the methods and results of previous activities of SafetyNet WP2 and outlines the further steps required for a full assessment of data compatibility towards a common European framework for risk exposure data.

In particular, Deliverable 2.1 - "State-of-the-art" of SafetyNet WP2 concerned a **state-of-the-art survey**, which was carried out in order to explore the properties of the various exposure measures used in road safety analyses, to identify the collection methods commonly used at national level for this exposure data and to assess the potential for international comparisons through the data published by organizations maintaining International Data Files (SafetyNet, 2005). The exposure indicators examined included:

- Vehicle kilometres
- Person kilometres
- Vehicle fleet
- Driver population
- Road length
- Population
- Number of trips
- Time in traffic
- Fuel consumption

From this survey, it was concluded that each exposure measure has different advantages and limitations in its use, and therefore no standard rule can be formulated as to the applicability of each exposure measure. Moreover, it was found that different countries may use different methods for the collection of a given type of exposure data, or may apply the same method in more or less different ways. Therefore, it is unlikely that the national data published in the International Data Files can be used for reliable comparisons, especially since the data quality control within the data files is limited.

Furthermore, a **first classification of the EU Member States** was carried out, with respect to risk exposure data availability and compatibility, on the basis of the responses of the EU Member States to a questionnaire.

In particular, in SafetyNet Deliverable 2.2 - "First classification of the EU Member States on Risk and Exposure Data" (SafetyNet, 2007), an **overall assessment of the availability and compatibility of exposure data in the EU** took place, on the basis of the responses to the WP2 questionnaire. The analysis concerned a combined assessment of data availability and

compatibility in order to identify currently usable exposure data for EU comparisons.

First, for each indicator, the member states were classified with respect to data availability i.e., whether data is collected and available at national level. Then, the compatibility of the national data was examined. More specifically, compatibility was assessed at two levels, according to the decision tree presented in Figure 1.1:

- Whether the definition of the exposure indicator was compatible with the respective **EUROSTAT definition for this indicator**.
- Whether the set of variables and values available in each country for each exposure indicator was compatible with the respective **variables and values of the CARE accident data**.

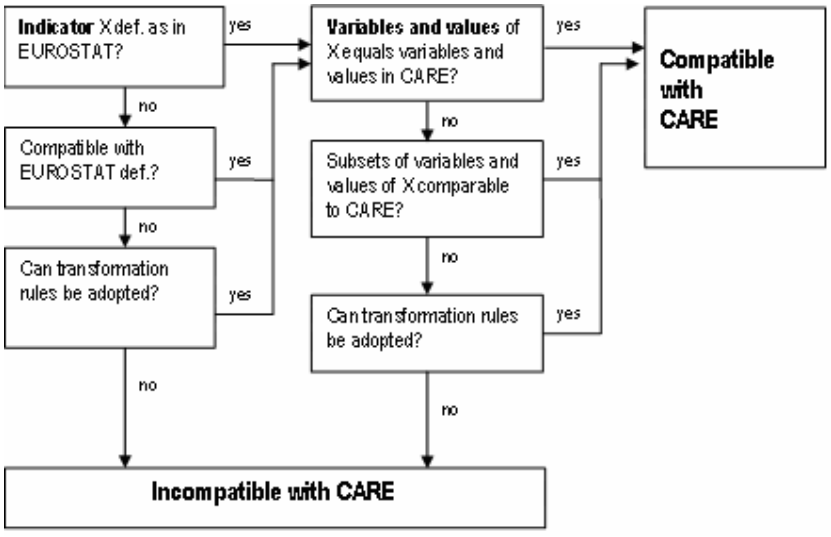

Figure 1.1. *First classification - Decision tree of compatibility with CARE (SafetyNet, 2007)*

In order to assess data usability, this process was implemented for all countries and for the five indicators where data were available for at least 60 per cent of the countries. Countries with usable exposure data were considered to be those countries for which, for each indicator, data were at least partially available and partially compatible. An example of this assessment for vehicle kilometres data is presented in Figure 1.2.

	Data at least partially available	Not available	Not known
Data at least partially compatible	BE, CZ, DK, DE, EE, FR, LV, HU, NL, NO, AT, PT, SI, SK, FI, SE, UK		
Not compatible		EL, CY, LT, LU, MT,	
Not known	ES		IE, IT, PL

Figure 1.2. *First classification - Usability of vehicle kilometres data (SafetyNet, 2007)*

From the results of this first classification, it was concluded that **only five of the indicators mentioned above were regarded as usable**, namely population, road length, vehicle fleet, driver population, and vehicle kilometres. All the other indicators were found to be less than partially available or not compatible with the CARE data. Therefore, these five indicators were regarded as areas where most effort should be devoted to improve comparability with CARE data and where most useful results would be obtained.

It was stressed, however, that this does not mean that the rest of the indicators are useless. The **remaining indicators still provide usable information on national or small-scale international level**, but they are far from suitable for usage with the CARE data. Some of these indicators are of great relevance to road safety research, but achieving comparability with CARE data for all countries would be a too ambitious target for the moment.

These results provided useful insight into the current potential for exploitation of exposure data in the EU Member States. However, in order to fully assess the quality of risk exposure data, **a more in-depth analysis is required**. The first classification concerned a general analysis per country and per exposure indicator, in which variables and values have only undergone a rough assessment. Moreover, the potential for transformation rules was identified, whereas the type and format of the transformation rules was not examined. Furthermore, the methods used in each country to collect the data were not taken into account at that stage, although data quality is largely determined by the features of the collection method. Therefore, there are important additional components that need to be taken into account before concluding on the compatibility of risk exposure data and CARE data:

- the compatibility of **variables and values** of the exposure indicators with the respective CARE variables and values needs to be examined in detail,
- the type of **transformation rules** that may be applied for the improvement of exposure data compatibility needs to be determined,

- the **collection methods** used at national level for each exposure indicator need to be taken into account.

Therefore, the present **common framework** for risk exposure data aims to further develop the efforts made for the 1st classification of the Member States, through an in-depth analysis of all the components related to data compatibility. Furthermore, in the common framework, equal emphasis will be given to qualitative features of the exposure measures examined, so that usability is not only based on availability and compatibility of the data, but also on their importance and usefulness in road safety analyses.

1.2. Objectives of the analysis

The objective of the present analysis is the **development of a Common Framework for Risk Exposure Data in the EU**, taking into account data needs, data availability, and data compatibility, as well as the data transformation rules required, allowing for optimal exploitation of the existing data and improvement of the potential for international risk comparisons. More specifically, the common framework includes the following objectives:

- A **review** of risk exposure data needs and priorities for reliable road safety analyses using risk exposure data.
- An **in-depth analysis** of the availability and compatibility of the existing risk exposure data, in terms of exposure indicators, variables, values and definitions, as well as the respective collection methods, allowing to identify sets of currently comparable exposure data, either directly comparable or comparable through the implementation of appropriate transformation rules.
- A **synthesis** of the needs for exposure data and the usability of the existing data, allowing to assess the current potential for risk comparisons at European level and to identify the priorities in future data collection and harmonization.

1.3. Methodology and structure

In order to achieve the objectives described above, an appropriate methodology was implemented, and the related activities were defined, as shown in Figure 1.3.

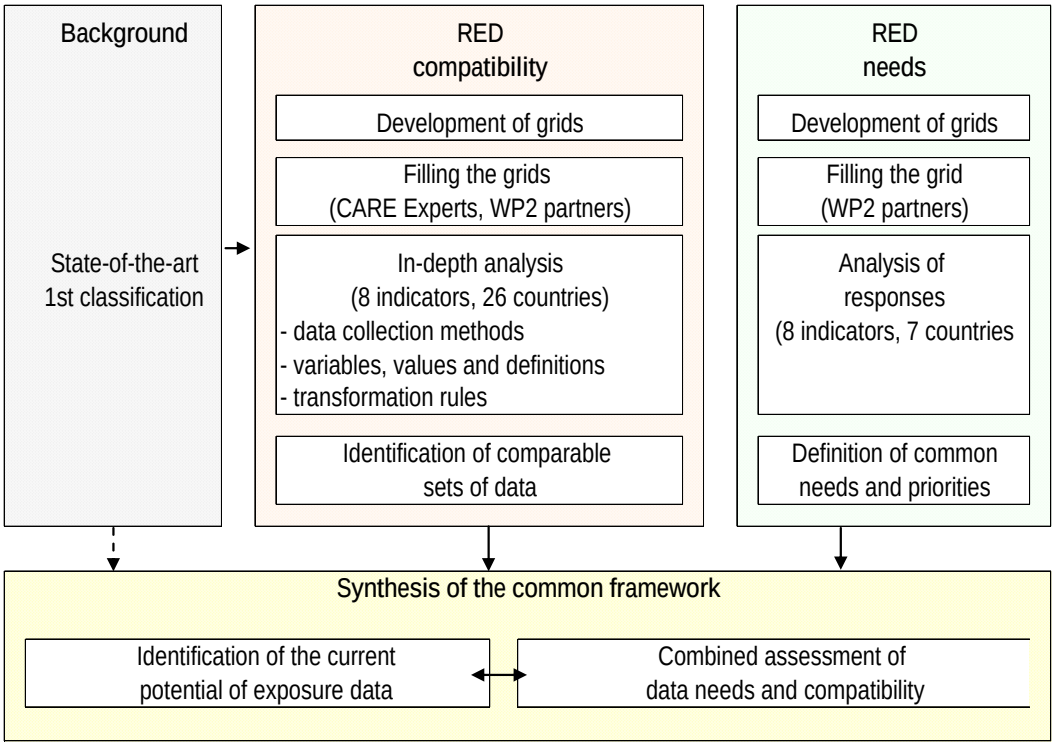

Figure 1.3. *Methodology and structure of activities*

In particular, first the **needs for risk exposure data** are identified according to the exposure data priorities in road safety analysis. An ad hoc survey was carried out among the institutes involved in SafetyNet WP2. In particular, SafetyNet WP2 partners were asked to rank various exposure measures and the related variables and values in terms of importance for different road safety analysis tasks, namely health risk analysis and traffic risk analysis. Partners were asked to indicate exposure data needs with reference to:

- the overall needs for exposure data (data ranked as important or highly important),
- the priority needs for exposure data (data ranked as highly important).

An example of (part of) the complete grid used to collect information on the exposure data needs is presented in Figure 1.4. The complete grid is included in Annex I.

EXPOSURE DATA NEEDS IN ROAD SAFETY ANALYSIS
Variables ranking

Exposure Indicator	VARIABLES	Road Safety Analysis Tasks			
		Health Risk	Traffic Risk		
		Population	Person	Vehicle	Network
Vehicle Fleet	Vehicle type				
	Vehicle age				
	Vehicle engine size				
	Region				
	Mass				
	Fuel type				
Driver Population	Age				
	Gender				
	Driver license age				
	Nationality				
	Region				
	Active driving license				
Road Length	Area type				
	Road type				
	Region				
Population	Age				
	Gender				
	Nationality				
	Region				
Vehicle - Kilometres	Age				
	Gender				
	Nationality				
	Driver license age				

Figure 1.4. *Example of grid for exposure data needs*

Then, the **compatibility of the available exposure data** in the EU Member States was assessed in detail. It is noted that, although the 1st classification of the Member States indicated that only five exposure indicators are currently usable, it was decided to include all indicators in the detailed assessment, so that the previous findings can be confirmed or improved. However, fuel consumption was eventually excluded, not only because it is currently the least usable indicator, but also because its usefulness as measure of exposure is subject to important limitations in general. Consequently, the following indicators are examined:

- Vehicle kilometres
- Person kilometres
- Vehicle fleet
- Driver population
- Road length
- Population
- Number of trips
- Time in traffic

The necessary information was collected by means of a **grid**, in which the Member States were asked to provide information about the following parameters for each exposure indicator used in their country:

- definition of the exposure indicator used,
- variables and values available (and their definitions),
- data structure (possibility to cross-tabulate the data),
- collection methods used (and their main characteristics).

An example of (part of) the grid used for the collection of information on road length is presented in Figure 1.5. The complete grids for all indicators are presented in Annex II.

Country 1 - Road length data

1. Variables and values

Variables	Values	Definition (Eurostat / Other) (if other please define)	Methodology / Source		
			Register	Survey	Other Method*
Area type	Inside urban area				
	Outside Urban area				
Region	NUTS*				
	Other*				
Road type	Motorway (yes/no)				
	Road type groups*				
Other*	Other*				
Other*	Other*				
Other*	Other*				
Other*	Other*				
Other*	Other*				
Other*	Other*				
Other*	Other*				

2. Methodology Questions

Survey

Who is responsible for this survey (organization, contact person)?	
Since when is the survey carried out?	
How often is the survey carried out?	
When were the last two surveys carried out?	
What is the target group number?	
What is the coverage rate of the survey?	

Figure 1.5. *Example of grid for exposure data compatibility*

The grids for exposure data compatibility were **filled out in several rounds**. First, the CARE Experts Group members filled in a first draft of the grids. Then, the draft grids were distributed among partners in SafetyNet WP2, who improved the content of the grids not only through the information gathered in the WP2 questionnaire, but also through additional sources such as national

publications and international literature. The results were gathered, improved and made uniform by the SafetyNet ICC (Information Collection Coordinator). Finally, the filled grids were re-distributed to the Members of the CARE Experts Group, who provided feedback, clarifications and additional input. It is noted that eventually **filled out grids for 8 examined indicators were gathered for 26 countries** (the 25 EU Member States and Norway), resulting in an important amount of detailed information.

From the information gathered by means of the grids, an **in-depth analysis of data compatibility** was carried out, allowing for the common framework for risk exposure data to be determined:

- For each exposure indicator, data compatibility was assessed for each collection method separately.
- For each collection method, variables and values were ranked as compatible or not with the CARE variables and values, according to the following classification:
  - values are compatible with CARE definitions,
  - values are probably compatible but the definitions are not available,
  - values are not compatible with CARE definitions.
- For values not compatible with the CARE definitions, transformation rules were proposed where possible, so that these values can be made compatible with the CARE values.
- In each case, any differences between countries in the application of the collection method used were noted.

The detailed results of this process country by country are included in Annex II, whereas the summary tables comparing all countries are presented in Chapter 3. Finally, the **synthesis of the common framework** for risk exposure data included two components:

- The identification of comparable subsets of data.
- The combined assessment of data needs and existing data comparability.

Comparable subsets of data were defined as variables and values that are compatible with the CARE definitions or that can be made compatible by means of a transformation rule, for those countries which use the same collection method for obtaining this data.

Moreover, the **combined assessment of data needs and compatibility** allowed for an overall assessment of the current situation and future potential of risk exposure data in the EU, providing also useful insight into the priorities in data collection and harmonization process, for more reliable road safety analyses.

Chapter 2 of the present Report presents the analysis of needs for risk exposure data in road safety analysis, on the basis of the responses of WP2

partners. The results presented concern both the overall needs and the priorities in risk exposure data needs.

Chapter 3 concerns the in-depth analysis of the compatibility of the existing risk exposure data in the EU, on the basis of the grids filled by the CARE Experts group members and the WP2 partners. For each exposure indicator, each collection method is examined separately and the compatibility of variables and values available in each country is assessed in relation to the CARE data, and transformation rules are proposed where possible. Moreover, aspects of the collection methodology are compared among countries in each case.

Chapter 4 includes the common framework for risk exposure data in the EU, as a subset of exposure data that are currently either directly comparable, or that can be easily made comparable by means of appropriate transformation rules. Moreover, it presents a synthesis of the results concerning the exposure data needs with the common framework of comparable exposure data, allowing for the assessment of the current potential for risk exposure data exploitation in pan-European analyses. This synthesis allows for the identification of priorities in future actions concerning the collection and use of risk exposure data in the EU.

2. Analysis of Risk Exposure Data needs in the EU

2.1. Background, objectives and methods

In road safety analyses, different exposure measures are used, according to data availability and quality, as well as the particular objective of the analysis. The exposure indicator is selected based on its **theoretical importance as well as its availability**. In cases where the preferred exposure measure is not available, or available in an inadequate level of disaggregation, an alternative exposure measure may be selected.

The exposure measures examined in this Report can roughly be classified into two groups (SafetyNet, 2005):

- Road traffic estimates: road length, vehicle kilometres, vehicle fleet.
- Road user at risk estimates: person kilometres, population, number of trips, time in traffic, driver population.

This categorisation is somewhat arbitrary and some measures can well be considered within the other category. Moreover, these measures may vary significantly in terms of the potential level of disaggregation and the possible underlying bias in their use as estimates of the true exposure.

Therefore, **no strict rule is available concerning the preferred measures of exposure**. Vehicle and person kilometres of travel, as well as the time spent in traffic, are conceptually closer to the theoretical definition of exposure and can be theoretically available to a satisfactory level of detail. However, under certain conditions, other available exposure measures may be equally efficient for the purposes of a particular analysis and / or may be more reliable. These alternative exposure measures may also have other, explanatory or descriptive uses.

Road safety research and analyses during the last decades have provided a lot of experience with respect to the use of different measures of exposure to estimate road traffic risks. The utilization of this experience in terms of **exposure data needs for reliable road safety analyses** is considered to be a key aspect of the proposed common framework. In particular, the analysis aims to provide insight in two distinct yet linked questions that have to be dealt with in most road safety analyses:

- Is the necessary data available?
- Is the available data useful?

For this the experience of **road safety experts from 8 European countries** was investigated. In particular, the partners involved in SafetyNet WP2 were asked to rank the various exposure measures, together with the related variables, in terms of their importance for road safety analysis. The countries (institutes) that contributed were Austria (KfV), France (CETE - INRETS), Greece (NTUA), Hungary (KTI), the Netherlands (SWOV), Norway (TØI), Portugal (LNEC) and Denmark (DRD).

However, as mentioned above, road safety analyses tasks may be diverse, and different exposure measures may be more or less useful in each case. Therefore, two types of analysis tasks were considered:

- **Health risk analyses**, referring to more macroscopic and epidemiological approaches aiming to assess the risk of the entire population.
- **Traffic risk analyses**, referring to more detailed and transport-oriented analyses, aiming to assess the risk of various components of the transportation system (road users, vehicles, road network).

In order to address this complexity in the present analysis, an exhaustive list of exposure measures and the related variables was created, and WP2 partners were asked to indicate whether each combination was useful for each road safety analysis task. This list was presented in the form of a grid (see Figure 1.4 for an example). Furthermore, the grid was filled by each expert by filling in the respective cells as "High" data importance or "Low" data importance, covering thus the overall data needs and the priorities in data needs. The results are discussed in the following sections.

It is noted that the results reflect the views and opinions of a group of experienced road safety researchers from 8 European countries and not necessarily the opinion of the national road safety authorities. It may, nevertheless, be considered to be quite **representative of the exposure data needs at European level**.

2.2. Overall risk exposure data needs

Table 2.1 summarizes the results of the identification of the **overall exposure data needs** for reliable road safety analyses. The first column of the Table lists the examined exposure indicators and the second column lists the variables that may be applicable for each exposure indicator. The four remaining columns concern the four distinct road safety analysis tasks examined, i.e. health risk analyses on one hand, and traffic risk analyses on the other, the latter being further divided into person-, vehicle- or network-oriented analyses. Each cell of the main table includes the acronyms of the countries that have indicated that the corresponding combination of exposure measure and variable is useful for the particular analysis task.

***Table 2.1**. Summary of risk exposure data needs*

Exposure Indicator	VARIABLES	Road Safety Analysis			
		Public Health Risk	Traffic Risk		
		Population	Road User	Vehicle	Network
Vehicle - Kilometres	Vehicle type			DK,EL,FR,HU,NL,NO,AT,PT	DK,FR,HU,NL,PT
	Vehicle engine size			EL,FR,HU,NO,AT,PT	PT
	Vehicle Age			EL,FR,HU,NL,NO,AT,PT	PT
	Area type			DK,FR,NL,PT,	EL,FR,HU,NL,NO,AT,PT
	Road type			DK,FR,HU,NL,PT	EL,FR,HU,NL,NO,AT,PT
	Year/month/day/hour			DK,EL,FR,NL	DK,EL,FR,NL,AT
Person - Kilometres	Person class		DK,EL,FR,NL,AT,PT		
	Age		DK,EL,FR,NL,NO,AT,PT		
	Gender		DK,EL,FR,NL,NO,AT,PT		
	Nationality		EL,FR,NO,AT,PT		
	Driver license age		DK,EL,FR,AT,PT		
	Vehicle type		DK,FR,NL		
	Vehicle engine size				
	Vehicle Age		FR		
	Area type		DK,FR,NO		
	Road type		DK,FR,NO,PT		
	Year/month/day/hour		DK,EL,FR,NL,NO		
	Alcohol/drug use		EL,FR,NO,PT		
	Seat belt use		EL,FR,NO,PT		
Vehicle Fleet	Vehicle type			DK,EL,FR,HU,NL,NO,AT,PT	DK,FR
	Vehicle age			DK,EL,FR,HU,NL,NO,AT,PT	PT
	Vehicle engine size			EL,FR,NO,AT,PT	PT
	Region			DK,EL,FR,HU,NL,NO,PT	DK,EL,FR,AT,PT
	Mass			DK,FR,NL	DK
	Fuel type			FR,NL	
Driver Population	Age	EL,FR,HU,NL,NO,AT,PT	DK,EL,FR,HU,NL,NO,AT,PT		
	Gender	EL,FR,HU,NL,NO,AT,PT	DK,EL,FR,HU,NL,NO,AT,PT		
	Driver license age	AT,FR,NO,PT	DK,FR,NO,AT,PT		
	Nationality	EL,FR,NO,AT,PT	EL,FR,NO,AT,PT		
	Region	EL,FR,NO,PT	DK,EL,FR,NO,PT		FR,AT,PT
	Active driving license	FR,HU,PT	FR,HU,PT		
Road Length	Area type				DK,EL,FR,HU,NL,NO,AT,PT
	Road type				DK,EL,FR,HU,NL,NO,AT,PT
	Region				DK,EL,FR,HU,NL,NO,AT,PT
Population	Age	DK,EL,FR,HU,NL,NO,PT			
	Gender	DK,EL,FR,HU,NL,NO,PT			
	Nationality	EL,FR,NO,PT			
	Region	DK,EL,FR,NL,NO,PT			
Time in traffic	Person class	DK,EL,FR,HU,AT	DK,EL,FR,HU,AT		
	Age	EL,FR,HU,NO,AT	DK,EL,FR,HU,NO,AT		
	Gender	EL,FR,HU,NO,AT	DK,EL,FR,HU,NO,AT		
	Vehicle type	DK,FR	DK,FR	EL,FR,HU,AT	FR,HU
	Vehicle Age	FR	FR	EL,FR,HU,AT	
	Area type	DK,FR	DK,FR	FR	EL,FR,HU,AT
	Road type	DK,FR	DK,FR	FR	EL,FR,HU,AT
	Year/month/day/hour	DK,EL,FR	DK,EL,FR	EL,FR	EL,FR,AT
Number of trips	Person class	DK,EL,FR,HU,AT	DK,EL,FR,HU,AT		
	Age	EL,FR,HU,NO,AT	DK,EL,FR,HU,NO,AT		
	Gender	EL,FR,HU,NO,AT	DK,EL,FR,HU,NO,AT		
	Vehicle type	DK,FR	DK,FR	EL,FR,HU,AT	FR,HU
	Vehicle Age	FR	FR	EL,FR,HU,AT	
	Area type	DK,FR	DK,FR	FR	EL,FR,HU,AT
	Road type	DK,FR	DK,FR	FR	EL,FR,HU,AT

Data importance rated by:

	5 or more countries
	3 or 4 counties
	1 or 2 countries

Moreover, the cells of Table 2.1 are **highlighted** according to the number of countries contained in each cell, i.e. the number of countries that have indicated that the combination is useful. The results may be summarized as follows:

- **Vehicle kilometres** per vehicle type, age engine size, and road type are necessary for vehicle-oriented traffic risk analyses for most of the countries,

and data per vehicle type, road type, area type and year are necessary for network-oriented traffic risk analyses.

- **Person kilometres and driver population** per age, gender, nationality and experience are necessary for person-oriented traffic risk analyses for most countries.
- **Population** per age and gender was ranked as necessary for health risk analyses by most countries.
- **Vehicle fleet** per vehicle type, age, engine size and region is necessary for vehicle-oriented traffic risk analyses for all countries. Vehicle fleet per region is necessary for network oriented traffic risk analyses for most of the countries.
- **Road length** data per road type, area type and region were ranked as necessary for network-oriented traffic risk analyses by all countries.
- **Number of trips and time in traffic** per person class, age and gender are necessary for both health and person-oriented traffic risk analyses for most countries, whereas a few countries indicated that these indicators are also necessary per vehicle characteristics.

Overall, the table provides an interesting view, since most cells that are applicable in each case include more than 3 countries. Moreover, **all exposure indicators and all variables were ranked as necessary** for some type of analysis by some countries. It can be deduced that all exposure indicators and variables are necessary for road safety analysis, whereas some combinations are more useful in specific analysis tasks. This is considered a most useful finding, given that researchers often have to limit their analyses due to data availability, whereas their exposure data needs to comprise a very exhaustive list. Therefore, it is important to identify the priorities in exposure data needs.

2.3. Priorities in risk exposure data needs

Table 2.2 summarizes the results of the identification of the **priorities in exposure data needs** for reliable road safety analyses. The structure of the Table is the same as in Table 2.1, and each cell of the main table includes the acronyms of the countries that have indicated each combination of exposure measure and variable to be highly useful for a particular analysis task.

Table 2.2. *Priorities in risk exposure data needs*

Exposure Indicator	VARIABLES	Road Safety Analysis Tasks			
		Public Health Risk	Traffic Risk		
		Population	Person	Vehicle	Network
Vehicle - Kilometres	Vehicle type			DK,EL,FR,NL,NO,AT,PT	DK,FR,NL,PT
	Vehicle engine size			EL,FR,AT,NO	
	Vehicle Age			EL,FR,HU,NL,NO,AT	
	Area type			DK,FR,NL,PT	EL,FR,HU,NL,NO,PT
	Road type			DK,FR,HU,,NL,PT	EL,FR,HU,NL,NO,PT
	Year/month/day/hour			DK,EL,FR,,NL,AT	DK,EL,FR,,NL,AT
Person - Kilometres	Person class		DK,EL,FR,NL,AT,PT		
	Age		DK,EL,,FR,NL,NO,AT,PT,		
	Gender		DK,EL,,FR,NL,NO,AT		
	Nationality		EL,NO,AT,PT		
	Driver license age		DK,El,FR,AT		
	Vehicle type		DK,NL		
	Vehicle engine size				
	Vehicle Age				
	Area type		DK,NO		
	Road type		DK,FR,NO,PT		
	Year/month/day/hour		DK,EL,FR,NL,NO		
	Alcohol/drug use		El,FR,NO,PT		
	Seat belt use		EL,FR,NO		
Vehicle Fleet	Vehicle type			DK,FR,HU,NL,PT	DK,FR
	Vehicle age			DK,FR,HU,NL	
	Vehicle engine size			FR	
	Region			FR,PT	DK,FR,PT
	Mass			DK,FR,NL	DK
Driver Population	Age	DK,EL,FR,HU,AT,PT	DK,EL,FR,HU,AT,PT		
	Gender	DK,EL,FR,HU,AT	DK,EL,FR,HU,AT		
	Driver license age	DK,AT,PT	DK,AT,PT		
	Nationality	EL,AT,PT	EL,AT,PT		
	Region	DK,EL,PT	DK,EL,PT		
	Active driving license	HU,PT	HU,PT		
Road Length	Area type				DK,FR,HU,NL,AT,PT
	Road type				DK,FR,HU,NL,AT,PT
	Region				DK,FR,NL,PT
Population	Age	DK,EL,FR,HU,NL,AT,PT			
	Gender	DK,EL,FR,HU,,AT,PT			
	Nationality	EL,FR,PT			
	Region	DK,EL,FR,NL,PT			
Time in traffic	Person class	EL,FR	EL,FR		
	Age	El,FR,NO	El,FR,NO		
	Gender	El,FR,NO	El,FR,NO		
	Vehicle type	FR	FR	EL,FR	FR
	Vehicle Age			EL	
	Area type				EL,FR
	Road type				EL,FR
	Year/month/day/hour	EL,FR	EL,FR	EL,FR	EL,FR
Number of trips	Person class	EL,FR	EL,FR		
	Age	EL,FR,AT	EL,FR,AT		
	Gender	EL,FR,AT	EL,FR,AT		
	Vehicle type	FR	FR	EL,FR,AT	FR
	Vehicle Age				
	Area type				EL,FR
	Road type				EL,FR
	Year/month/day/hour	EL,FR	EL,FR	EL,FR	EL,FR

Data importance rated "High" by:

	5 or more countries
	3 or 4 counties
	1 or 2 countries

As in Table 2.1, the cells of Table 2.2 are **highlighted** according to the number of countries contained in each cell, i.e. the number of countries that have indicated each combination of being highly useful. The results may be summarized as follows:

- **Vehicle kilometres** per vehicle type, age, road type and year are priorities for vehicle-oriented traffic risk analyses, and data per road type and area type and year are priorities for network-oriented traffic risk analyses, for most countries.
- **Person kilometres** per person class, age, gender and year are priorities for person-oriented traffic risk analyses for most of the countries, whereas several countries indicated that person kilometres per experience, nationality, vehicle type and vehicle age, road type, alcohol and drugs use and seat belt use, are also priorities for person-oriented traffic risk analyses.
- **Driver population** per driver age and gender are priorities for health risk analyses and person-oriented traffic risk analyses for most countries.
- **Population** per age, gender and region was ranked as priority for health risk analyses by most countries.
- **Vehicle fleet** per vehicle type and vehicle age is priority for vehicle-oriented traffic risk analyses for most countries.
- **Road length** data per road type, area type and region were ranked as priority for network-oriented traffic risk analyses by most of the countries.

It is interesting to note that number of trips and time in traffic were not ranked as priorities by more than 3 countries in any case. An overall view of Table 2.2 reveals that **there are clear and specific priorities in exposure data needs**; these are highlighted in the dark red cells, and summarized in the list above. Therefore, current and future efforts should focus on these specific priorities.

Keeping that in mind, it is interesting to investigate whether the current potential of the existing exposure data is in accordance with the needs for reliable road safety analyses. For that purpose, the **comparability of existing exposure data** has to be assessed in detail. The results of the related in-depth analysis carried out within the work package are presented in the Chapter 3.

3. Current potential for Risk Exposure Data in the EU

3.1. Introduction

The current potential of risk exposure data across the EU is investigated in this chapter. For that purpose, summary tables concerning exposure data availability and compatibility across the EU as well as the type of transformation rules required in each case are presented (when possible) for each indicator and collection method, for all EU countries (and Norway). More analytical information concerning RED availability, compatibility and transformation rules split by country, as well as analytical Tables containing each country's answers on the respective methodology questions, distributed by indicator and collection method are provided in Annex II.

The value compatibility between CARE and each country, for each variable, indicator and collection method, had to be assessed by using an appropriate coding which would allow for general and straightforward comparisons to be made. This coding is given in Table 3.1.

***Table 3.1**. Classification of variables and values according to compatibility with CARE*

Compatible values (compatible definition)
Probably compatible values (unknown country definition)
Incompatible values or incompatible country definition with CARE
The value is not available

Values indicated with dark green colour are compatible with the respective CARE values. Moreover, their definitions are also compatible; therefore they can be used without any transformation. Light green cells indicate that additional information is needed in order to assess compatibility, as the set of values might be equal to (or compatible with) CARE but the value definitions are missing therefore it is not possible to assess compatibility. Light green is also used when the value set is not known for one variable but compatibility can be assumed (i.e. a country collects the person's age in age groups but the groups are unknown). Yellow cells indicate that the set of values used differ between the country and CARE, or a value is used with a different definition. In such cases, a transformation rule should be adopted, if possible.

3.2. Population

(Responsible partner: KfV)

3.2.1. Population registers

Population is a common exposure measure used in road safety related analyses. The availability of population data is relatively high and in most cases data from different sources are compatible and can be compiled together without transformations, as no significant inconsistencies are observed (see Table 3.2). All 26 European countries (EU-25 and Norway) collect population data in national registers, updated on a regular basis by nation wide population censuses.

The **most common variables** included in the examined registers are the person's age (in single years, although a few countries also collect it in specific age groups), the person's gender, the person's nationality (by country name) and the country's region (mostly by using the Eurostat NUTS (Nomenclature of Territorial Units for Statistics) classification, other classifications are also used, however only in a few national registers).

All variables and values included in the population registers have a straightforward meaning (i.e. gender, age) therefore their definitions and their compatibility could easily be assessed. However, some **incompatibility issues** may be observed in countries using specific groups (for age and nationality), more specifically:

- For some countries no detailed information concerning these groups was provided therefore the compatibility with the respective CARE/Eurostat groups could not be assessed.

Moreover, some additional incompatibilities were identified and transformation rules were proposed when possible. More specifically:

- The variable concerning person nationality in Cyprus is only available for the census year (and not every year is a census year); therefore an appropriate coefficient could be developed in order to obtain the respective figures for the rest of the years.

- Cyprus as well as Latvia collects population data by region, using NUTS as well as a different classification that does not match with the respective Eurostat classifications (see Annex II for details). A transformation of these data can not be foreseen at the present time, but the NUTS classification can still be used.

***Table 3.2**. Population data collected by registers - Compatibility with CARE*

Variable	Value	BE	CZ	DK	DE	EE	EL	ES	FR	IE	IT	CY	LV	LT	LU	HU	MT	NL	NO	AT	PL	PT	SI	SK	FI	SE	UK
Person age	0-99																										
	Age groups																										
Person gender	Male																										
	Female																										
Person nationality	Country names											C															
Region	NUTS																										
	Other (see Annex II)																										

A: Aggregations
C: Coefficient

According to the **RED needs** (presented in Tables 2.1 and 2.2), population data are useful to European countries for the assessment of public health risk on a population level. The variables considered as most important were the person age and gender as well as the country's region. Finally, fewer countries reported that the person nationality could prove useful in such analyses. All the above data are generally available and compatible among European countries, although some minor issues (also described in D.2.2, concerning foreigners and illegal immigrants residing in each country and accidents involving tourist and transit traffic) should be taken into account.

According to the answers to the **methodological questions**, population data are generally available for long time series; it is remarkable that some countries maintain the respective registers from the 19th century. Population censuses are carried out on a regular time basis (every 10 years in most cases) while data on intermediate years are estimations, based on the results of the censuses, therefore the population registers are updated annually. No limitations in the collected data were reported. In most countries no retrofit corrections to the data take place. Nevertheless, in Estonia, a known systematic error occurs as a result of the lack of migration data. Currently, no calculations of the magnitude of this systematic error are made. In Cyprus, adjustments to the enumerated census population take place based on the post enumeration survey (resulting in an undercount of 1,98%). Moreover, at the district level estimates are based on an assumed share of the population of each district to the total. Finally, the United Kingdom reported retrofit corrections on the estimated population data, as an initial difference of 1.2 million people between the 2001 census and the annual rolled forward estimate was observed. Subsequent work reduced this difference to 209,000.

According to the above, population data collected by registers appear to be **fully usable** for European comparisons, for the following variables:

- person age
- person gender
- person nationality
- region (NUTS classification)

3.3. Road length

(Responsible partner: LNEC)

3.3.1. Road registers

Eighteen European countries in total reported collecting road length data in road registers (it is likely that other countries have road registers as well, however the rest of the countries did not respond to this section of the grids). The **availability and compatibility** of road length data among these countries is presented in Table 3.3. In several cases data are obtained through questionnaires directed to road administrations or local road authorities, which rely on their own registers for filling in the requested data. That seems to be the case for Denmark for instance. Mention is made to the fact that answers for ES and IT were collected by the SafetyNet consortium, as no answers were provided. In both cases, information on variables and values was available in the related documentation, but the collection methods was not explicitly mentioned; it was assumed that road length was collected using road registers, as is the common practice. Also, some items for Norway were modified by the Norwegian partner of the consortium. There was no explicit reference to an alternative method to collect the data on registers.

The only distinction concerning accident data per road type in CARE is made between motorways and non motorways, thus in countries where motorway segments can be distinguished, data are considered to be compatible. More specifically:

- Seventeen countries (all except LU) collecting road length data in registers distinguish between motorways and non motorways. Nevertheless, according to information provided through the grids, only a few countries provided a complete definition of motorways, therefore in most cases data compatibility could not be assessed with absolute certainty.

- Sixteen countries (all except IT and PL) reported collecting road length by specific road type groups. Analytical information on these road type groups (carriageway group, number of lanes, road markings, speed limit and junction type and control) though was not obtained through the grids therefore in most cases the compatibility could not be assessed.

- In Denmark, the road register contains information about all national roads. Several municipalities are about to add their information into the system as well. For the remaining municipalities, information is gathered through a yearly questionnaire which is filled according to information included in local road registers. The length of private roads with public access is not included.

Fourteen out of the eighteen European countries collect road length data by region **using the NUTS** classification. In most cases, this classification

provides a compatible data set; nevertheless many countries did not report the level of detail in which these data are collected (NUTS 1,2 or 3). Moreover some countries (PT) only partially dispose road length data by NUTS. One country (UK) did state lack of knowledge as regards NUTS definition; as a result, variable Region was considered as non compatible.

Road length data by area type are also available for several countries but a definition of an urban and rural area is missing for a considerable number of countries, for which compatibility could not be fully assessed. One country (BE) declared lack of knowledge as regards area type; this variable was considered as non compatible. For one country (ES) road length by area type is available for 1995 only. No information could be gathered as concerns variable “area type” for IT and “other region” for IT and PL.

The two cases of information partially available (PT and PL) were marked with a “P”. One country (PT) has road length data just for some of its NUTS regions, and only for the National Road Network. The other (PL) has an incomplete timeline of values available; in fact, for this country, road length data by region and type of road is available since the year 2000 and inside and outside urban area since 2007. For one country (MT) motorways length data were considered fully compatible with CARE database in spite of it having no motorways at all.

According to the answers on the grid on **RED needs** (presented in Tables 2.1 and 2.2), all countries consider road length data as useful for the estimation of traffic risk on the network level. Moreover these countries consider that Area type, Road type and Region variables are the most useful for such analyses. All these variables are at least partially available and compatible across the EU.

Therefore, road length data collected by registers are considered to be **very usable** in the above 18 countries, for the following variables:

- motorway (yes / no)
- region (NUTS classification)

Moreover, road length data collected by registers are considered to be fully or probably compatible for 8 countries (EE, ES, DK, FR, PL, SK, UK and NO) for area type (inside/outside urban area). Belgium reports incompatible definition of urban areas, however no more information is available and therefore a concrete transformation rule can not be proposed.

Only seven countries (EL, FR, MT, AT, PL, PT and SK) provided information concerning the methods used for collecting the register data. Generally, data collection is made annually, except in two countries (EL and SK) where they are continuously updated, whenever a new road is opened to traffic. No country reported known errors.

Table 3.3. *- Road length data collected by registers - Compatibility with CARE*

Variable	Values	BE	CZ	DK	EE	EL	ES	FR	IT	LU	HU	MT	NL	NO	AT	PL	PT	SK	UK
Area type	Inside urban area						P		Na							P			
	Outside Urban area						P		Na							P			
Region	NUTS*					3	3		3				3	3	1,2	P	P	3	
	Other*								Na							Na			
Road type	Motorway (yes/no)															P			
	Road type groups*															P			
	Other* - National															P			
	Other* - Regional															P			
	Other* - Provincial															P			

Na – No answer available; P – Partially available (only an incomplete timeline or subsets of values are available)
NUTS 3 is the most detailed territorial classification
Unknown was considered as incompatible definition.

3.4. Vehicle fleet

(Responsible partner: KTI)

All twenty six European countries (EU-25 and Norway) reported data availability on vehicle fleet. The data are collected within national road registers while in France statistical models are also considered. The availability and compatibility of vehicle fleet data is summarized in the following Tables.

3.4.1. Vehicle registers

Vehicle fleet data are collected using a wide range of variables and values that differ among the various national registers. The respective degree of compatibility also differs significantly for each variable. More specifically:

- The degree of compatibility for the "**vehicle type**" variable is generally high. More specifically, passenger cars, buses or coaches and motorcycles are compatible between CARE and most of the European countries.
- The degree of compatibility for the "**vehicle age**" variable appears to be generally high, although in most cases the specific definition was not available.
- Specific vehicle types in Estonia and France can be compatible by the use of appropriate coefficients.

Other variables, such as **vehicle engine size**, are also compatible between CARE and specific countries, nevertheless these variables cannot be fully exploited for a pan-European common framework due to their limited availability among European countries.

Several countries can provide the number of registered vehicles per region (NUTS classification). However, due to the fact that the number of registered vehicles per region is a very rough approximation of the actual exposure per region (i.e. it is very difficult to know the extent to which these vehicles travel within or beyond the specific region), this data is not considered to be currently usable for the common framework.

According to the **RED needs**, the vehicle type, vehicle age, vehicle engine size and region variables seem to be the most important for the assessment of the traffic risk on a vehicle level. In contrast to these needs, it seems that only one of the variables mentioned above (vehicle type) could be exploited for risk assessment at the present time.

***Table 3.4**. - Vehicle fleet data collected by registers - Compatibility with CARE*

Variable	Value	BE	CZ	DK	DE	EE	EL	ES	FR	IE	IT	CY	LV	LT
Vehicle	Passenger car								Coefficient					
type	Lorry < 3,5t								Coefficient					
	Lorry > 3,5t								Coefficient					
	Bus or coach								Coefficient					
	Moped													
	Motorcycle													
	Road / Agricul. tractor								Coefficient					
	Other													
Vehicle	0-99					Coefficient								
age	Age groups					Aggregations			Aggregation					
Vehicle	Administrative power													
engine size	0-5000 cc													
	Engine size groups													
	Unknown													
Region	NUTS													

Table 3.4.(continued) *- Vehicle fleet data collected by registers - Compatibility with CARE*

Variable	Value	LU	HU	MT	NL	NO	AT	PL	PT	SI	SK	FI	SE	UK
Vehicle	Passenger car				?									
type	Lorry < 3,5t								Coefficient?					
	Lorry > 3,5t								Coefficient?					
	Bus or coach				?									
	Moped													
	Motorcycle													
	Road / Agricul. tractor													
	Other													
Vehicle	0-99								?					
age	Age groups							Aggregation						
Vehicle	Administrative power													
engine size	0-5000 cc													
	Engine size groups													
	Unknown													
Region	NUTS							?						

Concerning the **methodological part** of the data collection, European countries reported various methods in order to update their vehicle registers. Some countries use an on-line system in order to update the register automatically, while most of the countries update them on a regular basis (monthly, quarterly or annually). Some European countries maintain national registers since long (i.e. 1922 in Finland and 1923 in Sweden) while other countries only recently started collecting vehicle fleet data (i.e. 2004 in Poland). Generally, as long as the vehicle fleet data are inserted to the database, no retrofit corrections take place. Scrapped vehicles are normally deleted from the register (in France, Norway and Hungary) but this is not always the case (not deleted in Estonia and Poland).

Therefore, vehicle fleet data collected by registers are considered to be **usable** for most countries for the following variables:
- vehicle type (passenger car, bus or coach, lorry, motorcycle)

Moreover, vehicle fleet data are **partially usable** for the following variables:
- vehicle age
- vehicle engine size

3.4.2. Vehicle fleet estimated by statistical models

France is the only country that reported the use of **a statistical model** for the estimation of vehicle fleet (see Table 3.5). Unfortunately, due to lack of analytical information on this statistical model the variable and value compatibility with the respective CARE data could not be assessed.

Table 3.5. *Vehicle fleet data collected by statistical models - Compatibility with CARE*

Variable	Value	FR
Vehicle type	Passenger car	Coefficient
	Lorry < 3,5t	Coefficient
	Lorry > 3,5t	Coefficient
	Bus or coach	Coefficient
	Moped	-
	Motorcycle	-
	Road tractor / Agricultural tractor	Coefficient
	Other	Aggregation
Vehicle engine size	Engine size groups	Aggregation

However, the type of **transformation rules** that should be established could be identified. Most of the values concerning vehicle type may require an appropriate coefficient in order to be compatible with the respective CARE

data (as France collects data only for vehicles under a specific age). As far as vehicle engine size is concerned, an aggregation seems to be appropriate in order to establish a compatible value set with CARE. More detailed information concerning the French variables and values can be found in Annex II.

3.5. Driver population

(Responsible partners: SWOV, ICC)

3.5.1. Driver population registers

Eighteen out of the twenty-six European countries examined maintain driver population data in national registers. The information included in these registers is available by basic demographic variables such as the driver's age and gender. Information on the driver's license age is also considered (in less countries though). Finally, fewer countries maintain information on driver population by region, mostly by using the NUTS classification.

As demonstrated in Table 3.6, all 18 countries collect information on the **driver's gender** in a way compatible with CARE; therefore this variable is already usable for related analyses. Moreover, 17 out of the 18 countries collect **driver age** in disaggregated ways making them compatible with the age groups used in CARE.

Most of the countries also collect driver population data by **driver's license age**, in disaggregate years. Many national registers also contain driver's license age by age groups, although these groups are unknown for most of these countries, therefore they cannot be compared to the respective CARE age groups. However it is possible to create compatible age groups from the respective disaggregate data.

Only a few **incompatibilities** are observed in a number of variables and more specifically:

- The Swedish data on the driving license age are incompatible with the respective CARE data, while no transformation rule can be foreseen.

A small number of countries collect driver population data by region, while only a subset of these uses the Eurostat NUTS region classification for that purpose. More specifically, concerning the incompatibilities observed:

- Driver population is available by region both in the Czech Republic and Latvia but in an incompatible way compared to the NUTS classification.

Because of these incompatibilities, as well as of the fact that the number of driving licenses per region is a very rough approximation of the actual exposure per region, this data is not considered to be currently usable for the common framework.

As demonstrated in the **RED needs** (Tables 2.1, 2.2), driver population data seem to be of high importance when available by driver age, gender and nationality. Moreover, driver license age, region and active driving license data were also reported as important for the estimation of risk exposure.

All the above variables can serve as risk exposure data both for the estimation of **public health risk on a population level, as well as for the estimation of traffic risk on a person level**. A few countries reported that these variables are considered to be important for the estimation of traffic risk on vehicle and network level. This information is fully or partially present in each countrys' national data (except fro active driving license, where no information was gathered).

According to the **methodology questions** presented in Annex II, most of the countries collecting driver population data by registers report that their registers are regularly updated, the frequency of the updates however varies significantly (daily for Cyprus, continuously for Portugal and Norway). Most of the countries reported no retrofit corrections to the data take place. Moreover, deceased drivers are mostly not deleted from the national registers, and the same is the often the case for elderly drivers that have not renewed their licenses. This results in a higher number of registered drivers than the true number of drivers. In any case it should be taken into account when driver population data from national registers are to be exploited as a risk exposure estimate.

In conclusion, driver population data collected by national registers are considered to be **usable** for European road safety analyses for almost all countries, and in particular for the following variables:

- driver age
- driver gender
- driving license age

***Table 3.6**. Driver population data collected by registers - Compatibility with CARE*

Variable	Value	BE	CZ	EE	EL	ES	IE	CY	LV	HU	MT	NO	AT	PL	PT	SK	FI	SE	UK
Driver age	0-99																		
	Age groups																		
Driver gender	Male																		
	Female																		
Driver license age	0-99																		
	Age groups																		
Region	NUTS																		
	Other																		
Driver Nationality	Country names																		
	Nationality groups																		

3.5.2. Driver population estimated by surveys

As demonstrated in Table 3.7, only three countries (Germany, France and the Netherlands) use surveys for the estimation of driver population. The driver age, gender and driving license age are the main data obtained through these surveys, while data on region and foreign driver nationality are not collected.

Table 3.7. *Driver population data collected by surveys - Compatibility with CARE*

Variable	Value	DE	FR	NL
Driver age	0-99			
	Age groups			
Driver gender	Male			
	Female			
Driver license age	0-99			
	Age groups			
Region	NUTS			NUTS 3
	Other			
Driver Nationality	Country names			Dutch only
	Nationality groups			

According to the answers to the **methodological questions**, Germany obtains driver population figures from an annual national travel survey (German Mobility Panel MOP) that is carried out since 1995. Apart from driver population, data on driver license ownership, car ownership etc are obtained through this survey. The sample size of the survey is approximately 2000 persons, therefore extrapolation methods based on socio-economic data are applied to obtain the national driver population figure from the results of the survey. Further information or answers to the methodological questions concerning the French survey were not available.

Although data collection on driver population through surveys is not widely used through Europe, **the potential to use these data in combination** with the respective data from national registers should be examined, as these surveys might provide reliable national estimates, as well as estimates of the same variables that are collected by countries with driver population data in national registers.

3.6. Vehicle kilometres

(Responsible partner: NTUA)

The number of vehicle kilometres travelled is probably one of the most valid exposure indicators, in the sense that it is a direct measure of traffic volume, not a proxy variable like vehicle fleet, road lengths etc. Another important practical advantage in using vehicle kilometres is that in principle it may be available at disaggregate levels (i.e. by time of day, vehicle type, road type, driver characteristics etc.) Most of the other exposure measures do not give this level of detail.

On the other hand, different collection methods, or even combinations of collection methods are used in different countries. It is not always clear exactly how the national estimate is calculated. Consequently, in this section, the methods to collect the "raw" data are examined first (travel surveys and traffic counts systems), followed by the methods to produce national estimates (statistical models or other combination of methods, using the "raw" data together with other data).

3.6.1. Vehicle kilometres estimated by surveys

Ten European countries use surveys for the estimation of vehicle kilometres. The variables and values used in each survey vary significantly. A small number of countries collect vehicle kilometres by **road type** (motorway - non motorway) while some countries (Austria, Portugal and Slovenia) also use additional road type groups.

- In Slovenia only public roads are included in the survey (although no definition of a public road could be obtained) therefore the respective data may not be compatible with the respective CARE accident data.

- In Austria vehicle kilometres are available for the Austrian classification of roads which does not fit to other countries classification.

Vehicle types are often covered in such surveys and especially passenger car, lorry >3.5t and lorry <3.5t are vehicle types commonly available. Other variables such as vehicle and driver age, area type, time related variables and seat belt use are also used in a few national surveys. A few **incompatibilities** were observed, more specifically:

- In Germany vehicle kilometres are available by fuel type (gasoline or diesel). However, this variable is not currently available for the CARE accident data.

Table 3.8. *Vehicle kilometre data estimated by surveys - Compatibility with CARE*

Variable	Value	DK	DE	EE	FR	NO	AT	PT	SI	SE	SK
Road type	Motorway										
	Road type groups								Public roads		
Vehicle type	Passenger car										
	Lorry < 3,5t										
	Lorry > 3,5t										
	Bus or coach										
	Moped										
	Motorcycle										
	Road tractors										
	Others										
Vehicle age	Years										
Driver age	0-99										
	Age groups										
Driver gender	Male										
	Female										
Driver nationality	Nationality										
	Nationality groups										
Area type	Inside urban area										
	Outside urban area										
Fuel type	Gasoline										
	Diesel										
Year/month/day/hour	1-12/1-31/0-23						Year only				
Day of week	Day of week										
Seat belt use	Yes/no										

According to the **RED needs** (presented in Tables 2.1 and 2.2) vehicle kilometre data are most useful for traffic risk analyses related to the vehicle and the road network. Countries reported that the vehicle type, vehicle age, vehicle engine size and road type are the most important variables for the estimation of traffic risk on vehicle level, while the vehicle type, area type, road type and region variables are most important for the estimation of traffic risk on network level. Currently, the vehicle type is the only variable that could be used for the exploitation of vehicle kilometre data on traffic risk related analyses as the rest of the variables are not widely included in national surveys or they are included in a way that is incompatible with CARE.

According to the answers to the **methodological questions**, European countries have been using surveys for the estimation of vehicle kilometres for many years, for instance, France uses this method since 1966 (although the latest version of the survey is for 1993/1994). The frequency of the surveys varies according to the country (i.e. yearly in Estonia and Slovakia, every four years in Norway, not specified in other countries). The most frequent survey types are telephone interviews and questionnaires.

Consequently, vehicle kilometres collected by surveys are considered to be currently **usable** for a few countries, for the following variables:

- motorway (yes / no) in FR, AT, PT, SI
- vehicle type (DK, DE, FR, NO, AT, SI, SK)

3.6.2. Vehicle kilometres estimated by traffic counts

Apart from surveys, traffic counts are common for the collection of vehicle kilometre data across Europe. Eleven European countries collect vehicle kilometre data by traffic counts alone, while some use both methods (surveys and traffic counts) for this estimation. Vehicle kilometre data collected by traffic counts across Europe are available approximately at the same level of disaggregation as those collected by surveys (except for variables concerning driver characteristics such as age and gender).

More specifically, the **vehicle type** variable which is widely used for the data collection is also the most useful for traffic risk analyses as in most cases each country's and the CARE definitions are compatible. Eight out of the eleven countries collecting vehicle kilometre data by traffic counts use this variable.

The **road type** variable is widely used among EU countries for the collection of vehicle kilometre data. More specifically, vehicle kilometres are in most cases available for motorways and non-motorways, as well as for other road type groups. Nevertheless, the compatibility between the motorway definition

used in CARE and the respective national definitions could not be assessed; therefore the usability of this variable could not be determined. Moreover, in most cases, information on the specific road type groups in each country was not provided. The only incompatibilities observed were for:

- Poland and Slovenia, the road type groups are different than the respective values used either in CARE or by Eurostat.

Traffic counts can not give the total picture of vehicle kilometres in Norway. The reason is basically that such counts are not conducted on the smallest roads. They can give good estimates of traffic volume on national and regional roads, and in particular of traffic changes, for example from one month to the next, but not of the total traffic volume in Norway. The Norwegian traffic count system can also distribute traffic counts by vehicle size; length and weight. The system does not give reliable estimates by area type.

A comparison between the current vehicle kilometre data availability by traffic counts and the **RED needs** on vehicle kilometre data reported by the EU countries, shows that the vehicle type is the only variable that could be used for the exploitation of vehicle kilometre data on traffic risk related analyses. The rest of the variables are either incompatible or their compatibility could not be determined. The vehicle age and vehicle engine size variables which are also considered as important for the estimation of traffic risk, as well as the area type and road type variables, do not seem to be available and/or usable at a European level at the present time.

***Table 3.9**. Vehicle kilometre data estimated by traffic counts - Compatibility with CARE*

Variable	Value	CZ	DK	EE	FR	HU	NO	PL	SI	FI	SE	UK
Vehicle type	Passenger car											
	Lorry < 3,5t											
	Lorry > 3,5t											
	Bus or coach											
	Moped											
	Motorcycle											
	Road tractors											
	Other											
Road type	Motorway											
	Road type groups											
Driver nationality	Nationality groups											
Vehicle registration country	National											
	Foreign											
Year	Year											
Month/day/hour	1-12 / 1-31 / 0-23					Month	Month	Month				
Area type	Inside urban area											
	Outside urban area											
Day of week	Day of week											
NUTS	Levels 1,2,3											

As far as the **methodological part** is concerned, vehicle kilometre data collection by traffic counts is used since long (e.g. 1969 in Poland). Traffic counts are typically used to compute average annual daily traffic (AADT), which is further exploited to estimate vehicle kilometres. More specifically, the ADT of each road is multiplied by the respective road length and the days of a year in order to calculate the annual vehicle kilometres travelled on that road. In the United Kingdom every major road link is counted in principle, therefore total traffic on major roads can be obtained by summing the traffic figures for every link. For minor links which are not counted, the traffic flows are derived from adjacent links using suitable formulae (derived links) or using the flow of the adjacent link as a proxy (dependent links). Countries seem to use both manual and automatic traffic count systems and the coverage rate of the respective road network seems to vary significantly according to the type of network and the area type. Some countries collect data only for rural areas (i.e. Hungary) while in other countries urban roads are also included (Poland, Slovenia and the United Kingdom). The total number of counting stations (permanent, non permanent, manual or automatic) varies significantly between countries, as well as the number of stations of each type.

3.6.3. Vehicle Kilometres by Statistical models

Four European countries use statistical models for the estimation of vehicle kilometres, namely Belgium, Estonia, Finland and the United Kingdom (the last three countries also use traffic counts). All four countries except Belgium use these models in order to estimate vehicle kilometres by vehicle type, while Belgium uses this model in order to calculate vehicle kilometres by road type groups.

Information on the **methodology** is available only for Finland. Simple regression models are used in order to calculate annual changes of vehicle kilometres of passenger cars, vans, lorries and buses, using 1998 as a base year. Detailed information on the methodology behind the rest of the statistical models could not be obtained.

***Table 3.10**. Vehicle kilometre data estimated by statistical models - Compatibility with CARE*

Variable	Value	BE	EE	FI	UK
Vehicle type	Passenger car				
	Lorry < 3,5t			?	
	Lorry > 3,5t				
	Bus or coach				
	Van				
	Moped				
	Motorcycle				
	Other				
Road type	Motorway				
	Road type groups				

3.6.4. Vehicle Kilometres by combinations of methods

Eight countries use a combination of methods in order to estimate vehicle kilometres. These methods are used to obtain vehicle kilometre data mainly by vehicle type, while some countries also calculate vehicle kilometres by vehicle age groups. Estonia is the only country using a combination of methods in order to obtain vehicle kilometre data by area type. In The Netherlands data are obtained mainly from a travel survey, although information from other sources is added to the survey results. Concerning the incompatibility observed for the Dutch driver age variable, the age groups used for the classification of the driver's age are different than the respective CARE age groups, nevertheless, these groups can be compatible with appropriate aggregations.

Information on **methodological aspects** behind these methods was obtained only for Czech Republic and Estonia and Norway. In Czech Republic, data from various transport operators for all public transport modes as well as estimations of vehicle kilometre data for passenger cars are brought together in order to calculate a national estimate of vehicle kilometres. In Estonia traffic data are used in order to create models for the estimation of vehicle kilometres. Data are based on traffic counts for main and secondary roads, while estimations are made for the local and private road network. Finally, data for urban areas are obtained through models. In Norway, vehicle numbers obtained from registers are combined with numbers for yearly driving distances (from national travel surveys or other methods) in order to calculate vehicle kilometres.

***Table 3.11**. Vehicle kilometre data estimated by combinations of methods - Compatibility with CARE*

Variable	Value	BE	CZ	EE	FR	LV	NL	NO	UK
Vehicle type	Passenger car								
	Lorry < 3,5t								
	Lorry > 3,5t								
	Bus or coach								
	Moped								
	Motorcycle								
	Others								
Vehicle age	Years								
	Age groups								
Driver age	Age groups						Aggregations		
Driver gender	Male								
	Female								
Driver nationality	Country names						Dutch only		
Year/month/day/hour									
Day of week									
Area type	Inside urban area								

3.6.5. Vehicle kilometres by other methods

Apart from surveys, traffic counts, statistical models and combinations of methods presented in the previous paragraphs, four European countries use additional methods for the estimation of vehicle kilometres. More specifically, Belgium, Denmark, Finland and Sweden calculate vehicle kilometres by using other methods.

Vehicle kilometres are calculated for various **vehicle types** that differ between countries. However, the indicator is always calculated for passenger cars. Other vehicle types such as taxis, lorries, buses and coaches, vans and powered two wheelers are also considered. Other variables such as road type, vehicle age, driver age and gender, year, vehicle weight and fuel type are included but cannot be considered as usable for analyses at European level.

Table 3.12. *Vehicle kilometre data estimated by other methods - Compatibility with CARE*

Variable	Value	BE	DK	FI	SE
Vehicle type	Passenger car				
	Taxi				
	Lorry				
	Lorry				
	Lorry < 3,5t				
	Lorry > 3,5t				
	Bus				
	Bus or coach				
	Van				
	Moped				
	Motorcycle				
Road type	Motorway				
	Road type groups				
Vehicle age	Years				
	Age groups				
Driver age	Age groups				
Driver gender	Male				
	Female				
Year	Year				
Vehicle weight	Weight groups	n/a in CARE			
Fuel type	Petrol	n/a in CARE			
	Diesel	n/a in CARE			

The method used to obtain vehicle kilometre data in Belgium uses the five-year traffic census vehicle kilometre estimates (obtained by traffic counts). National estimates are available every five years since 1970. Regional estimates are available every five years since 1985.

In Denmark, vehicle odometer readings are used in order to calculate national vehicle kilometre estimates. The method has been used since 2001 and the type of information obtained through this method concerns traffic volumes and yearly traffic figures per type of vehicle. Firstly, the amount of kilometres driven since the previous inspection is calculated for each inspected vehicle. For all vehicles in the same category (or “strata” - defined by the type, year of first registration, vehicle weight, fuel and the use of the vehicle) the average daily traffic is calculated. This figure is multiplied by the number of days in one year and by the number of registered vehicles in this category. The total road traffic volume is determined by adding up all road traffic volume of the approximately 600 “strata” which the data material has been divided into. However, Denmark also uses travel surveys, and it is not known how the two methods relate as per the national estimate.

In Sweden the method for obtaining vehicle kilometres is also based in single **vehicle inspections** as well as additional administrative data. More specifically, the statistics are produced by calculating a yearly driving distance for each vehicle registered in Sweden. The driving distances are calculated for a certain calendar year. The data sources from which Statistics Sweden uses data from are:

1) The compulsory annual inspections made by the Swedish Vehicle Inspection Company (SBP);
2) Administrative data for each registered vehicle in Sweden from the Swedish Road Administration (VV).

The two sources are combined by using the unique registration (license plate) number which exists for all registered vehicles in Sweden. Based on the combined data, the yearly driving distance for each vehicle is calculated.

Analytical information concerning the methods used for the calculation of vehicle kilometres in **Finland** could not be obtained (the section "other method" of the grid was filled, but the methodology questions were not replied).

In conclusion, vehicle kilometres (mostly by surveys and traffic counts, secondarily by statistical models and combinations of methods) can be considered as **usable** by:

- vehicle type

Moreover, vehicle kilometres by traffic counts can be **partly usable** by:

- road type (motorway - non motorway)

Finally, vehicle kilometres are **less usable** (due to availability only in a small number of countries) by:

- Year
- Month
- Area type

3.7. Person kilometres

(Responsible partner: TØI)

European countries collect person kilometres either by travel surveys or by traffic counts and occupancy rate estimates. Travel surveys provide more detailed data than other methods. Moreover, data on person kilometres for non-motorized road users (bicycles and pedestrians) as well as cross tabulated data for age/gender groups of road users (both motorized and non-motorized) can be obtained only through surveys.

3.7.1. Person kilometres estimated by surveys

The countries conducting travel surveys are Denmark, Germany, The Netherlands, Norway, Poland, Slovakia, Finland, Sweden and the United Kingdom. All surveys target the population residing in the country, thus person kilometres of foreigners are not included.

The **most common variables** and values used in these surveys are the person class, the vehicle type, the year and the person's age and gender. However, the set of variables and values used in each national survey varies. More specifically:

- The person class (driver, passenger) variable is included in most national surveys but in most cases its compatibility cannot be fully assessed.
- In the Netherlands, the compatibility of the indicator can not be assessed.
- In Poland person kilometre data cover only urban areas in the Warsaw region and cannot be considered as usable as the sample is not representative for the whole country.
- In the UK person kilometres data are collected only for Great Britain.
- Slovakia has only survey data for bus, coach and tram. It is collected through enterprises and thus covers only people employed. It is accordingly not representative for the whole population.
- Based on information from Statistics Finland, it seems that the Finnish travel survey is concerned with tourism and business trips, and accordingly does not cover daily small trips to/from work or school etc. If so, it can not produce person kilometre data that are representative. The grids indicate that also bicycle trips are covered, indicating that perhaps daily trips are covered.
- Sweden conducts travel surveys more or less in the same fashion as Norway and Denmark. Person class variables should all be dark green, but passenger car trips are not distinguished by type of car. However, in

publications from the national travel survey, “passenger car” is used as a travel mode/vehicle type. Results for moped and motor cycles are not published, but exist in the data set. As most travel surveys, area type and road type are not given. Travel surveys are conducted every fourth year. Data for month/date/hour are available for that year.

- In Norway vehicle types are not distinguished. The survey concerns private trips by travel mode (and most car trips will thus be by passenger car). It is possible to acquire information about area type and road type, but only by detailed analyses of the data set. These are data that normally are not produced.

- The vehicle type variable is also used in the surveys, but the values are often crude and not clearly defined. For instance, car travels are seldom specified according to car type.

- Often travel surveys only cover private transport (e.g. Germany) and thus the travel conducted by professional drivers and driving as part of work is not included. Thus compatibility with CARE can be difficult to obtain.

- The area type variable is, in most cases, not specifically defined in order to be compared to the respective CARE values.

- Most of the countries collecting the person’s age, collect it only for a specific age range. This is however not a major problem given the possibility to restrict accident data in CARE to specific age groups.

- In the United Kingdom, it seems that professional driving is not included. That is the reason for light green cells. In addition, mopeds and motorcycles are not specified in the published results, but they probably exist in the data set. Area type is recorded for where respondents live, but not for person kilometres travelled.

According to the answers to the questionnaire on **high RED data needs**, the most important variables (those reported by three or more countries) for the estimation of traffic risk on person level by which person kilometres should be available are: the person’s class, the person’s age, gender and nationality, the driver’s license age, the type of road, the date (year/month/day/hour), the alcohol/drug use and the seat belt use.

For the estimation of traffic risk on network level based on person kilometre, area type, road type and date are considered to be of high importance. Comparing the person kilometre data needs with the respective person kilometre data availability, it is concluded that only a subset of these variables is partially available for some countries, although the compatibility between the respective values in most cases cannot be easily assessed.

As far as the **methodological part** is concerned, European countries conduct surveys on a regular basis although the frequency differs between countries.

- Travel surveys are either conducted continuously (The Netherlands, UK), monthly (Denmark, Slovakia, Finland), annually (Germany) or throughout a year, or at specific intervals (every fourth year in Sweden and Norway). Typically, respondents are asked about the travels and trips they have conducted the day previous to the interview.
- Sample size varies significantly from country to country, from 1.500 persons in Germany to 40.000 in Sweden while the respective response rates vary from 50-70%.
- The most common type of survey is telephone interviews. In Denmark internet surveys are used apart from telephone interviews. Paper questionnaires are also considered in Poland.
- The only sample limitations were reported by Denmark, Finland, Sweden and Norway where the survey covers a specific age range. More specifically, children (people under a specific age ranging from 6-15 years old) and persons over a specific age (ranging from 74 to 99) are not included in the surveys.
- No geographical limitations on the surveys were reported, except from Poland, where the survey covers only urban areas and the UK where the survey is carried out only in Great Britain. Finally, in Slovakia the survey covers trips by tram and coach only, while in the UK and Norway professional travels are not included.

Some additional known errors in the exposure estimates were also reported and more information is provided in Annex II.

Table 3.13. *Person kilometre data estimated by surveys - Compatibility with CARE*

Variable	Value	DK	DE	NL	NO	PL	SK	FI	SE	UK(GB only)
Person class	Driver									
	Passenger									
	Pedestrian									
Vehicle type	Passenger car									
	Lorry < 3,5t									
	Lorry > 3,5t									
	Bus or coach									
	Moped									
	Motorcycle									
	Bicycle									
Area type	Inside urban area									
	Outside urban area									
Road type	Motorway									
	Road type groups									
Year	Year									
Month/day/hour	1-12/1-31/0-23									
Day of week	Weekday/weekend									
Person age	0-99	10-84 from 1998			13-99			15-74	6-84	6-84
	Age groups									
Person gender	Male									
	Female									

In conclusion, person kilometres data collected by survey, although largely available in European countries, are not considered as currently usable in the common framework.

3.7.2. Person kilometres estimated by combination of methods

Six European countries use a combination of methods to estimate person kilometres. In order to perform this calculation, various data sources are exploited. In general, data from traffic counts, travel surveys, statistical models, as well as other official traffic data (traffic injury data, data from transport operators etc) are brought together in order to combine vehicle kilometre data and estimated occupancy rates for the calculation of person kilometres.

Table 3.14. *Person kilometres data estimated by combinations of methods - Compatibility with CARE*

Variable	Value	BE	CZ	DE	PL	SE	NO
Person class	Driver						
	Passenger						
	Pedestrian						
Person age	0-99						
	Age groups						
Person gender	Male						
	Female						
Vehicle type	Passenger car						
	Bus or coach						
	Lorry<3,5t						
	Lorry>3,5t						
	Motorcycle						
	Moped						
	Bicycle						
Area type	Inside urban area						
	Outside urban area						
Road type	Motorway						
	Road type groups						
Year/Month/Day/Hour	Year/1-12/1-31/ 0-23	Year				Year	Year

Person kilometres data are available for numerous person, vehicle and road characteristics, nevertheless these variables as well as their compatibility to the respective CARE variables varies significantly between countries, more specifically:

- Person kilometres for drivers and passengers are either compatible (Germany and Norway) or the compatibility is unknown (Belgium, Czech Republic, Poland and Sweden).

- Data by the person's age are incompatible for Belgium, Poland (age collected in groups only), Sweden and Norway, while the compatibility for Germany cannot be assessed.
- Data by vehicle type are available for passenger cars, buses or coaches, powered two wheelers and bicycles however, these data are compatible only for Norway.
- Data by area type are incompatible for Belgium, Poland, Sweden and Norway, while the compatibility for Germany cannot be assessed, moreover data by road type are incompatible for Belgium and Norway, while the compatibility for Germany, Poland and Sweden cannot be assessed.

The most common **methods** used in order to obtain the necessary information for the estimation of person kilometres include data collection from various transport operators (for public transport modes), traffic counts as well as mobility surveys. These data are combined with expected occupancy rates in order to perform the person kilometre calculation. More specifically:

- In Belgium vehicle kilometre data are multiplied by the number of persons in each vehicle, which is essentially based on the records of the road traffic injuries.
- In Germany, the results rely on model calculation; their empirical basis consists of official statistics, road performance calculation of the DIW Berlin (Deutsches Institut für Wirtschaftsforschung), a national survey on behaviour in traffic and a mobility panel running since 1994.
- In Poland person kilometre data are based on traffic counts, manual observations, automatic traffic registrations and mobility surveys. In Sweden, measures of vehicle kilometres aggregated to national figures based on a model as well as input data from odometer readings and traffic counts are exploited, while the average number of passengers is based on estimates.
- Finally, in Norway, concerning vehicle kilometres estimated by combination of methods, occupancy rates are estimated with data from the national travel surveys and linear developments in rates are assumed between travel survey years.

Therefore, person kilometres data collected by combination of methods are not considered as currently usable in the common framework, due to the large differences in the estimation methods and the data sources used in the different countries.

In conclusion, person kilometre data estimated by surveys are **usable** for the following variables:

- person class
- person age
- person gender

and are **less usable** for:

- vehicle type
- year

Person kilometres by combination of methods are in general less usable than by surveys, and can hardly be considered as usable for the establishment of a common framework.

3.8. Number of trips

(Responsible partner: CETE-SO, INRETS)

3.8.1. Number of trips estimated by surveys

Nine countries reported to collect number of trips in the initial questionnaire sent by WP2. After futher investigations, it appeared that two countries, France and Belgium, have only general figures, collected in old surveys (more than ten years) therefore these data can hardly be considered as usable.

Generally speaking about the definition of a trip, a remark of Germany – mentioning that a trip involving several means of transports (among five) may not be split in several trips – pointed out that one has to be very cautious when using that indicator as a risk exposure.

Concerning the methods, some points may be highlighted:

- Number of trips are collected by surveys, except for Norway that uses counts partially on motorways.
- The sizes of the target groups of the surveys are very different (2.000 to 46.000).
- Important differences in duration (1 day to 1 year) and periodicity (permanent to every 15 years).
- Telephone is the main support of survey.

Table 3.15. *Number of trips estimated by surveys - Compatibility with CARE*

Variable	Value	DE*	MT	NL	NO	PL	FI	SE
Person class	Driver							
	Passenger							
	Pedestrian							
Person age	0-99							
	Age groups							
	Unknown							
Person gender	Male							
	Female							
Person nationality	Country names							
Driver license age	0-99							
Vehicle type	Passenger car							
	Lorry<3,5t							
	Lorry>3,5t							
	Bus or coach							
	Moped							
	Motorcycle							
	Bicycle							
	Tram							
	Others							
Area type	Inside urban area							
	Outside urban area							
Road type	Motorway (yes/no)							
	Road type groups							
Year/Month/Day/Hour	Year/1-12/1-31/0-23							
Alcohol/drug use	yes/no							

*distribution among consecutive different means not specified

Concerning the availability and compatibility of data, general tendencies are the following:

- Three countries mentioned young people are not taken into account.
- In several cases, data are available with cross tabulation.

Consequently, number of trips **seems really to suffer several limitations**, first of all concerning the number of countries where it is usable (available and compatible). The indicator usability is low even in the countries providing it, due to above mentioned limitations and still remaining questions.

3.9. Time in traffic

(Reponsible partners: CETE-SO, INRETS)

Ten European countries collect time in traffic data by using surveys. A large set of variables is used by European countries for this indicator; nevertheless, this set differs significantly between countries. Moreover, the compatibility with the respective CARE variables is generally low resulting, overall, in low indicator usability.

3.9.1. Time in traffic estimated by surveys

Time in traffic data collected by surveys are mostly available for various **road user characteristics** and more specifically, for the person class, age, gender and nationality. Nevertheless, these data are in many cases incompatible with the respective CARE data, more specifically:

- The person class variable is either incompatible (DK, DE, FR) or the compatibility with the respective CARE variable cannot be assessed (MT,NL, PL, FI, UK).
- Information concerning the person's age is, in most cases, incomplete (BE, DK, FR, MT, FI, SE) as young ages are frequently excluded from the surveys; however transformation rules could be possible.
- The gender is available and compatible in all countries (except PL).

Other variables such as the vehicle type, age and engine size, the area type and the region, the driving license age are less frequently collected and their compatibility is very limited.

A small number of countries reported **high data needs** on time in traffic; however, the person's age and gender were more frequently reported as important for the estimation of traffic risk on person level. Moreover, by taking into account the reported high needs (reported by five or more countries) it occurs that the person class, the age and gender are mostly needed for the assessment of the traffic risk as well as the public health risk on person and population level respectively. Finally, the vehicle type and age are needed for the assessment of the traffic risk on vehicle level as well as the area and road type and date are needed for the assessment of the traffic risk on network level. In respect to these data needs, only a small proportion of data is compatible and usable among European countries, mostly concerning time in traffic data by the person class, age and gender.

***Table 3.16**. Time in traffic data estimated by surveys - Compatibility with CARE*

Variable	Value	BE	DK	DE	FR	MT	NL	PL	FI	SE	UK
Person class	Not defined										
	Driver		Cyclists should be added	Only for cars							
	Passenger			Only for cars							
	Pedestrian										
	Motorcycle rider				Aggregation						
	Moped rider				Aggregation						
	Cyclist		Should be added to drivers		Aggregation						
Vehicle type	Pedestrian										
	Passenger car										See detailed tables
	Lorry < 3,5t										See detailed tables
	Lorry > 3,5t										
	Car (as driver)			Aggregation							
	Car (as passenger)			Aggregation							
	Bus or coach										See detailed tables
	Moped										
	Motorcycle										See detailed tables
	Bicycle										
	Moped, motorcycle			Separation required							
	Bus										
	Other (see Annex II)										

***Table 3.16 (continued)**. Time in traffic data estimated by surveys - Compatibility with CARE*

Variable	Value	BE	DK	DE	FR	MT	NL	PL	FI	SE	UK
Vehicle age	0-99										
	Age groups										
Vehicle engine size	Engine size groups										
Area type	Inside urban area										
	Outside urban area										
Road type	Motorway										
	Road type groups										
Year	Year										
Month/day/hour	1-12/1-31/0-23										
Person age	0-99	Incompl. 6-99	Incompl. 0-15		Incompl. (6-99)	Incompl. (10-99)			Incompl. 0-5		
	Age groups	Incompl.	Incompl. 0-15	Year of birth						Incompatible	
	Unknown										
Person gender	Male										
	Female										
	Unknown										
Person nationality	Country names						Only Dutch				
	Nationality groups										
Driver license age	No license										
	Year										
	0-99										
	Age groups										
Region	NUTS										

According to the answers to the **methodological questions**, time in traffic data (based on national travel surveys) have been collected for more than twenty years in most of the European countries examined.

- The frequency of the surveys varies significantly between countries (the survey is carried out continuously in the Netherlands and the UK while in France it is carried out every 10 years).
- The size of the sample also varies significantly (200.000 persons in the Polish survey in contrast to 1500 persons in the German survey) while the response rate of the surveys varies from 50% in Malta and Norway to 72% in France.
- The most common type of surveys are the telephone interviews (6 out of the 10 countries use this method) while paper questionnaires are also considered, mostly in the form of personal travel diaries within a specified time period.
- Sample limitations were also reported; more specifically people under a specific age are not included in the surveys (6 years in Belgium, Finland, France and Sweden, 10 years in Germany, 11 in Malta while in Denmark only people over 16 and less than 80 years old are included).
- In general neither geographical limitations nor any limitations on the number of trips were reported, nevertheless, in Norway only private travels are covered while in Sweden only passengers are taken into account and trips in goods vehicles are excluded.
- The length of time covered by most surveys is one day (DK, FR, MT, NL, NO) while in some countries this length is up to one week (DE, UK). Finally, the duration of the surveys varies from one year (DE, FR, UK) to one day (MT, FI).

More information on the calculation as well as on known errors in the exposure indicator can be found in Annex II.

However, data on time spent in traffic collected by surveys are **not considered as currently usable** in the common framework, due to the large differences in the variables and values definitions, as well as in the methodological features of the surveys used in the different countries.

4. A Common Framework for Risk Exposure Data in the EU

4.1. Identification of the Risk Exposure Data Common Framework

In the previous chapter, the availability and compatibility of risk exposure data was examined in detail, on the basis of the information gathered by the CARE Experts and found in the international literature and processed by means of the grids. Although the information is in some cases incomplete or difficult to confirm, a comprehensive **overall assessment** was possible and was carried out for an important number of countries and for all indicators. The results complete the first assessment presented in SafetyNet Deliverable 2.2, which was used not only as a methodological starting point, but also as a guide on the main problems and particularities identified for certain countries and certain indicators.

In this chapter, the results of the detailed assessment of exposure data availability and compatibility are summarised, in order to identify comparable sets of exposure data among countries. These comparable data sets correspond to the current potential for **a common framework of risk exposure data** in Europe. Due to the factors mentioned above (missing information, unconfirmed information etc.), the common framework is presented in two ways:

- a set of data that is comparable or that can be made comparable by means of transformation rules,
- a set of data that is comparable or that can be made comparable by means of transformation rules, including data that is probably comparable but this needs to be confirmed.

The first set of data corresponds to the data highlighted as green in chapter 3 and to the data highlighted as yellow in chapter 3, but for which a concrete transformation rule was identified. The second set of data also includes the data highlighted as light green in chapter 3. It is noted that the summary obviously concerns only the countries that did respond to the grids survey. The two comparable data sets are presented in Table 4.1.

The proposed common framework is based on a number of **synthesis considerations**. First of all, a "raw data" approach was opted for. Therefore, only the collection methods that provide the raw exposure data were included in the common framework, given that data resulting from complex calculations or combinations of methods and sources are unlikely to be comparable. In any case, assessing the comparability of such data would be a very complex task.

Moreover, only the variables for which a common CARE definition is available are examined, given that the final objective of this work is the identification of data that can be usable with CARE. Of course, all variables available can be found in the summary Tables of chapter 3 and in the Annex. Finally, cases of CARE variables available in only one country are not presented here, as no comparisons can be made in this case.

In most cases, overall variable compatibility is summarised. However, in a couple of cases the values are examined separately (for instance, different vehicle types).

***Table 4.1**. Summary of comparable sets of data (common framework)*

Exposure indicator	Variable (or value)	Comparable data (directly or by transformation rules)	Probably comparable data
Population	Person age	BE, CZ, DK, DE, EE, EL, ES, FR, IE, IT, CY, LV, LU, HU, NL, NO, AT, PL, PT, SI, SK, SE, UK	LT, MT, FI
	Person gender	BE, CZ, DK, DE, EE, EL, ES, FR, IE, IT, CY, LV, LT, LU, HU, MT, NL, NO, AT, PL, PT, SI, SK, FI, SE, UK	
	Nationality	BE, CZ, DK, DE, EE, EL, ES, FR, IE, IT, LV, LT, LU, HU, MT, NL, NO, AT, PL, PT, SI, SK, FI, SE, UK	
	Region	BE, DE, EE, EL, ES, FR, IE, IT, CY, LT, LU, HU, MT, NL, NO, AT, PL, PT, SI, SK, FI, SE	
Road length	Inside / outside urban area	FR, PL, SK, UK, NO	BE, DK, EE, ES, FR, NO, PL, SK, UK
	Region	EL, ES, IT, NL, SK, NO	BE, CZ, DK, EE, FR, AT, PL, PT
	Motorway	BE, CZ, DK, EE, EL, ES, FR, IT, HU, MT, NL, AT, PL, PT, SK,	UK

Exposure indicator	Variable (or value)	Comparable data (directly or by transformation rules)	Probably comparable data
		NO	
Vehicle fleet	Passenger car	BE, CZ, DK, DE, EE, EL, FR (coef.), IE, IT, CY, LV, LT, LU, HU, MT, NO, AT, PT, SI, SK, FI, SE, UK	ES, NL
	Lorry <3.5t or Lorry >3.5t	EE, FI, FR (coef.), HU, NO, PL, PT (coef.), FI, SI	BE, CZ, DE, DK, EL, ES, IE, IT, CY, LV, LT, LU, MT, NL, AT, SK, SE, UK
	Bus or coach	BE, DK, DE, EE, EL, ES, FR (coef.), HU, IE, IT, CY, LT, MT, NO, AT, PL, PT, SI, SK, FI, SE, UK	CZ, LV, LU, NL
	Moped	CZ, DE, EL, FR, CY, NO, AT, PL, FI, SE, UK	IT, LU, NL, SK, SI
	Motorcycle	BE, CZ, DK, DE, EE, EL, ES, FR, HU, IE, IT, CY, LV, LT, LU, NL, NO, AT, PL, PT, SI, SK, FI, SE, UK	MT
	Vehicle age	NO, PL, UK	BE, CZ, DK, DE, EL, HU, IE, IT, CY, LV, LU, NL, AT, PT, SI, FI, SE
	Region	NO	PL
Driver Population	Driver age	BE, CZ, DE*, EE, EL, ES, IE, FR*, CY, LV, HU, MT, NO, AT, PL, PT, SK, FI, SE	NL, UK
	Driver gender	BE, CZ, DE*, EE, EL, ES, IE, FR*, CY, LV,	UK

Exposure indicator	Variable (or value)	Comparable data (directly or by transformation rules)	Probably comparable data
		HU, MT, NL*, NO, AT, PL, PT, SK, FI, SE, UK	
	License age	BE, CZ, DE*, EE, EL, IE, FR*, CY, LV, HU, MT, NO, AT, PL, PT, SK, FI, UK	ES
	Region (NUTS)	ES, MT, NL*, NO, AT, PL, SK, UK	
Vehicle kilometres collected by surveys	Motorway		FR, AT, PT, SI
	Passenger car	DK, DE, FR, AT, SI, SE	NO
	Lorry <3.5t or Lorry >3.5t	DK, DE, FR, AT, SI, SK	
	Bus or coach	DK, DE, SI, SK	
	Moped	DK, DE, SI	NO
	Motorcycle	DK, DE, SE, SI	NO
	Area type	DK, SI	
Vehicle kilometres collected by traffic counts	Passenger car	CZ, EE, FR, HU, NO, PL, SI, UK	
	Lorry <3.5t or Lorry >3.5t	CZ, EE, FR, HU, NO, PL, SI, UK	
	Bus or coach	CZ, EE, HU, PL, SI, UK	NO
	Moped	CZ, HU, PL, SI, UK	
	Motorcycle	CZ, HU, PL, SI, UK	
	Motorway	DK, FI	CZ, HU, NO, PL, SI,

Exposure indicator	Variable (or value)	Comparable data (directly or by transformation rules)	Probably comparable data
			SE, UK
	Area type	EE, SI, UK	
	Month	EE, HU, NO, PL	
Vehicle kilometres collected by combinations of methods	Passenger car		BE, CZ, FR, LV, NL, NO, UK
	Lorry <3.5t or Lorry >3.5t		BE, CZ, EE, FR, LV, NO, UK
	Bus or coach		BE, CZ, EE, LV, NL, NO, UK
	Moped		NL, NO
	Motorcycle		NL, NO
Person kilometres collected by surveys	Person class	DK, DE, NL, NO, SE	FI, UK (GB only)
	Passenger car		DK, DE, NL, NO, FI, SE, UK(GB only)
	Bus or coach	NL, NO, SE	DK, DE, SK, FI, UK(GB only)
	Moped	NL, NO	DK, DE, FI, SE, UK(GB only)
	Motorcycle	NL, NO	DK, DE, FI, SE, UK(GB only)
	Area type		DK, FI, UK(GB only)
	Person age (15-74 only)	DK, DE, NO, FI, SE, UK(GB only)	
	Person gender	DK, DE, NL, NO, FI, SE	UK(GB only)

Exposure indicator	Variable (or value)	Comparable data (directly or by transformation rules)	Probably comparable data
Number of trips collected by surveys	Person class (pedestrians not included)	DE, MT, NO, FI	NL
	Person age		DE, NO, FI
	Person gender	DE, MT, NL, NO, FI, SE	
	Passenger car		DE, MT, NL, NO, PL
	Moped and motorcycle		DE, NL, NO**, PL
	Area type	DE, PL	
	Motorway		NO, PL
Time in traffic collected by surveys	Person class		BE, DE***, MT, NL, PL, FI, UK
	Passenger car	DE, FR, NL	PL
	Bus or coach	FR, NL	PL
	Moped and motorcycle	DE****, FR, NL	PL
	Area type	DE,	PL, UK
	Person age (only 15 and older)	BE, DE, MT, FI	
	Person gender	BE, DE, MT, NL, FI, SE, UK, FR	

** data is collected by means of a survey*
***motorcycle only*
****passenger cars only*
***** total of mopeds and motorcycles*
Note: vehicle and person kilometres obtained by statistical models or other combinations of methods are not considered to be comparable due to large methodological differences.

Transport
Project co-financed by the European Commission, Directorate-General Transport and Energy

Table 4.1 shows that **population** data are available in all countries that responded to the grid survey.

As regards **road length** data, data concerning motorways are comparable among an important number of countries. On the contrary, road length data per area type or region were confirmed as comparable only for a few countries. For a number of additional countries comparability for these two variables needs to be confirmed, however the respective data can be used with caution until confirmation is possible.

Vehicle fleet data are also comparable for a satisfactory number of countries, at least for the basic vehicle types available in CARE. This number is increased when including the data that still need confirmation as regards the definitions. In a few cases a correction coefficient needs to be developed (e.g. FR, PT). Rather surprisingly, vehicle age data were found to be comparable only for a limited number of countries and will not be very usable in the common framework.

The comparability of **driver population** data is very satisfactory, as almost all countries that provided information indicated comparable data per driver age, gender and license age. Given the limited availability of alternative (or more sophisticated) exposure data per person characteristic, it is thereby indicated that it will be extremely useful to collect this data at an international level (it is reminded that previous SafetyNet research showed that driver population data are not collected / published by any International Data File).

When examining the more sophisticated exposure measures, the results are less encouraging. **Vehicle kilometres** collected by surveys are only comparable for about 6-7 countries, for specific vehicle and road types and only when including the data whose compatibility was not confirmed. It is also quite remarkable that no compatible data is available per person characteristics, although travel surveys are designed to have persons (or in this case drivers) as measurement unit. The same image is obtained when examining data collected by traffic counts. It is interesting to note that a couple of countries use both methods. Overall, only data for motorways and vehicle types can be considered as (at least partly) comparable.

Concerning **person kilometres**, only 6-7 countries can be considered to have comparable data, although this comparability can be confirmed for fewer countries in general (in a couple of cases comparability can not be confirmed for any country). For some countries, comparisons per person characteristic are possible. Other partly usable variables concern passenger cars and two-wheelers.

Finally, **number of trips and time in traffic** are considered as hardly usable indicators; in each case, variables' comparability can not be confirmed for

more than 3-6 countries. The only variables that could be currently exploited in international comparisons of an adequate number of countries would be person age and gender.

Summarizing, Table 4.1 is an **overall guide** for international risk comparisons using CARE data and risk exposure data. An important amount of detailed information was gathered and analysed on that purpose. This guide concerns the number of countries that can be reliably compared in terms of risk exposure, for each indicator and each variable, whereas the type of data transformation rule is provided when possible for data not directly comparable. The specific transformation rules should then be developed by the competent national administrations. The in-depth assessment of chapter 3 provides a more detailed view of the information presented in Table 4.1; in chapter 3, the reader can also see the related information for the cases (countries, variables etc.) that were not included in the common framework (or in a specific part of the common framework) and an overview of methodological differences in data collection between countries. For the full information, with detailed description of all data features, collection methodologies features, data definitions etc., the Annex should be consulted.

4.2. Risk Exposure Data needs and the Common Framework

Following the identification of the current common framework for risk exposure data in Europe, a **final synthesis** of the present analysis concerns a combined assessment of the existing data needs and the current potential for reliable road accident risk analyses on the basis of the common framework. On that purpose, Table 4.2 gives an overall picture of the degree to which the existing usable data meet the road safety analysis needs.

In particular, the right column of Table 4.2 includes a summary of the **overall data needs** presented in chapter 2; in this case, the classification per road safety analysis task is omitted and only summary results are presented, as the number of countries that indicated each specific combination of exposure indicator and variable as being necessary. Then, the cells are highlighted as in chapter 2, according to the number of countries indicating the data as necessary in each case.

In order to achieve a similar representation for the existing data, the left column of Table reproduces the **common framework** of comparable or probably comparable exposure data per variable presented in the previous section; in this case, the broader common framework, which includes the information that needs to be confirmed is examined, i.e. the countries for which exposure data are (probably) comparable with CARE for each variable. Then, the cells are highlighted according to the number of countries in each case. A couple of simplifications were applied for practical reasons, i.e.

collection methods are not examined separately (e.g. for vehicle kilometres) and values are also not examined separately (e.g. for vehicle type); in these cases, the results shown correspond to the best case i.e. the highest number of countries. It should be therefore kept in mind that there may be sub-cases (e.g. for motorcycles) where data comparability is significantly lower.

This comparative assessment shows that **for the basic indicators the data meet the needs** to an acceptable degree. In particular, population data per age and gender are comparable in almost all countries; so is the case for vehicle fleet per vehicle type and age, although for certain vehicle types data compatibility is limited (see Table 4.1). However, a lot of additional data was indicated as necessary, and these are not included in the current common framework (e.g. vehicle engine size). The usability of road length data per motorway (yes / no), area type and region, as well as of driver population data per driver age, gender and license age, are also in accordance with the data needs. All the exposure data mentioned above are available and comparable for more than 15 countries.

However, for the remaining exposure indicators in the bottom part of Table 4.1, the picture becomes abruptly less satisfactory. For instance, vehicle kilometres data are comparable for more than 8 countries only per motorway and (some) vehicle types, although several additional variables were indicated as necessary. When considering that even the comparable data may come from different collection methods, it can be seen that any risk analysis with this data should be carried out with caution. Finally, person kilometres, number of trips and time in traffic are seldom comparable for more than 4-5 countries, and only for a few basic variables, although the data needs include several variables. Overall, it appears that **for the more sophisticated indicators, the existing data hardly meet the data needs**.

***Table 4.2**. Comparative assessment of exposure data needs and current potential*

Exposure indicator	Variable	Comparable or probably comparable data	Data Needs
Population	Person age	BE, CZ, DK, DE, EE, EL, ES, FR, IE, IT, CY, LV, LU, HU, NL, NO, AT, PL, PT, SI, SK, SE, UK	HU,FR,PT,NL,EL,NO,DK
	Person gender	BE, CZ, DK, DE, EE, EL, ES, FR, IE, IT, CY, LV, LT, LU, HU, MT, NL, NO, AT, PL, PT, SI, SK, FI, SE, UK	HU,FR,PT,NL,EL,NO,DK
	Nationality	BE, CZ, DK, DE, EE, EL, ES, FR, IE, IT, LV, LT, LU, HU, MT, NL, NO, AT, PL, PT, SI, SK, FI, SE, UK	FR,PT,EL,NO
	Region	BE, DE, EE, EL, ES, FR, IE, IT, CY, LT, LU, HU, MT, NL, NO, AT, PL, PT, SI, SK, FI, SE	FR,PT,EL,NO,NL,DK
Road length	Area type	BE, CZ, DK, EE, EL, ES, FR, IT, LU, HU, MT, NL, AT, PL, PT, SK, UK, NO	HU,AT,FR,PT,NL,EL,NO,DK
	Region	BE, CZ, DK, EE, EL, ES, FR, IT, NL, AT, PL, PT, SK, NO	FR,PT,NL,EL,NO,HU,AT,DK
	Motorway	BE, CZ, DK, EE, EL, ES, FR, IT, HU, MT, NL, AT, PL, PT, SK, UK, NO	HU,AT,FR,PT,NL,EL,NO,DK
Vehicle fleet	Vehicle type*	BE, CZ, DE, DK, EE, EL, ES, FR, HU, IE, IT, CY, LV, LT, LU, MT, NL, NO, AT, PT, SI, SK, FI, SE, UK	HU,AT,FR,PT,NL,EL,NO,DK
	Vehicle age	BE, CZ, DK, EE, EL, HU, IE, IT, CY, LV, IE, IT, CY, LV, LT, LU, NL, NO, AT, PL, PT, SI, FI, SE, UK	HU,AT,FR,NL,EL,NO,PT,DK
	Vehicle engine size		AT,FR,EL,NO,FR,PT
	Region		FR,PT,EL,NL,NO,HU,DK
	Mass		NL,FR,DK
	Fuel type		NL,FR
Driver Population	Driver age	BE, CZ, DE*, EE, EL, ES, IE, FR*, CY, LV, HU, MT, NO, AT, PL, PT, SK, FI, SE, UK	HU,AT,FR,PT,EL,NL,NO,DK
	Driver gender	BE, CZ, DE*, EE, EL, ES, IE, FR*, CY, LV, HU, MT, NL*, NO, AT, PL, PT, SK, FI, SE, UK	HU,AT,FR,EL,NL,NO,PT,DK
	License age	BE, CZ, DE*, EE, EL, ES, IE, FR*, CY, LV, HU, MT, NO, AT, PL, PT, SK, FI, UK	AT,FR,PT,NO,DK
	Nationality		AT,PT,EL,NO,FR
	Region	ES, MT, NL*, NO, AT, PL, SK, UK	FR,PT,EL,NO,DK
	Active driving license		HU,FR,PT
Vehicle kilometres**	Vehicle type	DK, DE, FR, NO, AT, SI, SE, CZ, EE, FR, HU, NO, PL, SI, UK	NO,AT,FR,PT,NL,EL,HU,DK
	Vehicle engine size		NO,AT,FR,EL,HU,PT
	Vehicle Age		NO,HU,AT,FR,EL,NL,PT
	Area type	DK, SI, EE, UK	NO,HU,FR,PT,NL,EL,AT, DK
	Motorway	FR, AT, PT, SI,CZ, DK, FI, HU, NO, PL, SI, SE, UK	NO,HU,FR,PT,NL,EL,AT, DK
	Month	EE, HU, NO, PL	FR,EL,AT,NL,DK
Person kilometres	Person class	DK, DE, NO, NL, FI, SE, UK (GBonly)	AT,FR,NL,EL,PT,DK
	Person age	DK, DE, NO, FI, SE, UK(GB only)	NO,AT,FR,PT,NL,EL,DK
	Person gender	DK, DE, NO, FI, SE, UK(GB only)	NO,AT,FR,NL,EL,PT,DK
	Nationality		NO,AT,PT,EL,FR
	Driver license age		AT,FR,EL,PT,DK
	Vehicle type	DK, DE, NL, NO, FI, SE, UK(GB only)	FR,NL,DK
	Area type	DK, FI, UK(GB only)	NO,FR,DK
	Road type		NO,PT,FR,DK
	Year/month/day/hour		NO,FR,NL,EL,DK
	Alcohol/drug use		NO,FR,PT,EL
	Seat belt use		NO,FR,EL,PT
Number of trips	Person class	DE, MT, NL, NO, FI	FR,EL,HU,AT,DK
	Person age	DE, NO, FI	AT,FR,EL,NO,HU,DK
	Person gender	DE, MT, NL, NO, FI, SE	AT,FR,EL,NO,HU,DK
	Vehicle type	DE, MT, NL, NO, PL	AT,FR,EL,HU,DK
	Vehicle Age		AT,FR,EL,HU,DK
	Area type	DE, PL	AT,FR,EL,HU,DK
	Motorway	NO, PL	AT,FR,EL,HU,DK
	Vehicle Age		FR,EL,DK,AT
Time in traffic	Person class	BE, DE***, MT, NL, PL, FI, UK	FR,EL,HU,AT,DK
	Person age	BE, DE, MT, FI	NO,AT,FR,EL,HU,DK
	Person gender	BE, DE, MT, NL, PL, FI, SE, UK	NO,AT,FR,EL,HU,DK
	Vehicle type	DE, FR, NL, PL	AT,FR,EL,HU, DK
	Area type	DE, PL, UK	AT,FR,EL,HU, DK
	Vehicle Age		AT,FR,EL,HU, DK
	Road type		AT,FR,EL,HU, DK
	Year/month/day/hour		FR,EL,AT,DK

** comparability varies for different vehicle types; results here mainly refer to passenger cars*

*** data may be collected by different methods in different countries (travel surveys / traffic counts)*

In more than 14 countries	In more than 4 countries
In more than 8 countries	In more than 2 countries
In less than 8 countries	In less than 2 countries

It is thereby indicated that reliable road accident risk analysis **using CARE data and exposure data** should currently be based on the basic exposure indicators. A lot of effort is still required to improve the quality of vehicle kilometres and person kilometres. From the present analysis it was demonstrated that the poor availability and comparability of this data is largely due to the different national practices in terms of the collection methods used and their characteristics, the data definitions etc. The lack of European

guidelines or some other kind of framework for performing travel surveys and implementing traffic counts systems has further complicated the comparability of the national exposure data. However, guidelines could also be implemented for the collection of basic exposure data (driver population, road length etc.) which are mostly collected within national registers, possibly in the form of an indicative administrative routine.

It should be stressed, however, that the present research showed that **a lot of data is available at national level**, given that most countries have systems for the collection of most exposure indicators. However, the proposed common framework includes only the comparable sets of data and leaves out a number of variables for several countries in each case, because of some incompatibility. In general, **incompatibilities** concern the definitions of variables and values, the collection methods used and their specific features. It is also noted that in several cases it was not possible to consider or propose transformation rules on the basis of the available information. In most cases, transformation rules could be currently only produced by the national authorities collecting and having access to the data itself, as more complex calculations than simple aggregations or correction factors may be required.

In summary, the present analysis provides **a tool for optimal exploitation of the existing exposure data**, through the proposed common framework of comparable data. More specifically, comparable sets of data (in terms of variables, values and collection methods) were identified, and transformation rules were proposed where possible to improve the comparability of the data by aligning the national definitions on the CARE definitions. However, a lot of effort is still needed for full exploitation of the existing data and for meeting the data needs, especially for the more advanced exposure indicators.

In this research, an important amount of information on data was gathered and used. However, a primary step of future research should be the **full harmonization of the existing data**, and a prerequisite for this task is the gathering of the data itself and the meta-data. In this way, the existing transformation rules will be improved, new transformation rules will be developed and tested with the actual data. Moreover, gathering the existing data and applying a full common framework of variables, values and definitions will allow for the calculation of risk rates providing an overview of road safety in Europe.

A second long-term step concerns the **collection of new harmonized data**. The results of this work, as well as of the entire WP2 of SafetyNet, can assist in the identification of future data needs, the development of appropriate common European methodologies, data definitions and data structure, and eventually lead to the collection of harmonized exposure data. From the international experience, as well as from the experience gained from the present analysis, this future framework should be based on a number of key components:

- Collection of disaggregate **time series of exposure data by road user, mode and network characteristics** in a consistent and systematic way.
- Focus on **vehicle and person kilometres of travel**.
- Use of both **travel surveys and traffic counts** systems.
- Harmonisation of the national **registers** of road length, vehicle fleet and driving licenses.

The development and implementation of such a future framework would be an extremely complex and demanding task, given the number and importance of features that need to be combined. This **future framework** would also involve a significant effort and cost, both at national and international level. However, given its importance for European road accident risk comparisons, the above proposals need to be considered at European level. Moreover, these proposals can also be considered by individual countries wishing to establish or upgrade their exposure data collection systems.

References

SafetyNet (2005). State of the art Report on Risk Exposure Data. Deliverable 2.1 of the SafetyNet IP. European Commission, Brussels.

SafetyNet (2007). A fist classification of the EU Member States on Risk Exposure Data. Deliverable 2.2 of the SafetyNet IP. European Commission, Brussels.