



Road Safety Data, Collection, Transfer and Analysis

Deliverable 1.6: Final Report of WP1 – Road Safety Policy

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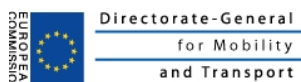
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EXECUTIVE SUMMARY

The 'Policy' Work Package of DaCoTA was designed to fill in the gap in knowledge on road safety policy making processes, their institutional framework and the data, methods and technical tools needed to base policy formulation and adoption on scientifically-established evidence. More specifically, in the DaCoTA project, research on road safety policy had two objectives:

1. Identifying the needs for data and decision-support tools of road safety decision-makers, managers and other key stakeholders in order to develop the European Road safety Observatory, ERSO, and make it as relevant as possible for all the tasks involved in policy-making.
2. Developing knowledge on road safety management systems at the national level, both from a theoretical point of view (defining "good practice" criteria and testing them) and from a practical point of view (describing and assessing existing road safety management systems in European countries and laying the grounds for a European observatory of road safety management to be integrated into ERSO).

This report summarises the methodologies developed in order to achieve these objectives and the main results of the analyses.

Both **quantitative and qualitative methodologies**, most of them new, were designed to reach the objectives. In particular:

- As results on the actual needs for data and decision-support tools were expected at an early stage of the DaCoTA project to support new developments of ERSO, a **consultation of a panel of experts** was organized. Two consultation methods were implemented: semi-directive interviews and requests for written contributions.
- A **broader-scale consultation of road safety stakeholders** including decision-makers, managers and other professionals as well as researchers and representatives of the private sector, took place on the basis of an on-line questionnaire. The stakeholders were asked to rank a number of elements concerning road safety data and tools in terms of their needs and priorities, as well as in terms of the availability of these data and tools.
- A **road safety management investigation model** was developed based on several "good practice" criteria, defined by an exhaustive literature review. The model was tested in 14 European countries, by means of interviews with both governmental representatives and independent experts who filled in an extensive DaCoTA questionnaire. The questions related to five main areas of Road Safety Management:
 - Institutional organisation, coordination and stakeholders' involvement
 - Policy formulation and adoption
 - Policy implementation and funding
 - Monitoring and evaluation
 - Scientific support and information, capacity building

The data and information collected were analysed by both **quantitative and qualitative analysis methods**. In particular, the results of DaCoTA WP1 include the following:

- **Analysis of the experts panel data and stakeholders data:**

- *Descriptive analyses of needs and priorities* in data and tools for evidence-based policy making
- *Components of needs / priorities and of data availability*, as well as combined analysis of priorities vs. data availability
- *Grouping of stakeholders* on the basis of their needs and priorities and analysis by stakeholders' background characteristics
- Dedicated analysis of *the needs and priorities of the 'policy-makers' group* among the stakeholders
- **Analysis of the road safety management data:**
 - *Road safety management country profiles* of the 14 European countries analysed and compared to a reference "good practice" system, meeting all the criteria defined in DaCoTA.
 - *Country comparisons* carried out for all 30 European countries for specific issues within each area of road safety management (on the basis of the DaCoTA questionnaire and additional data sources from the literature).
 - *Clustering of countries on the basis of road safety management components*, separately for each one of the five areas of the DaCoTA questionnaire, as well as overall.
 - *Statistical models linking road safety management with road safety performance*, within the framework of the SUNflower methodology for road safety management systems.

The **results of the stakeholder survey** may serve as a basis for forming a common picture of the demands of stakeholders (policy-making as well as non-policy-making) for data and knowledge in road safety. One of the main findings was that policy-makers and non-policy-makers (e.g. researchers) do not appear to have significantly different needs and priorities. Moreover, regional effects were identifiable, in the sense that stakeholders from Northern, Eastern and Southern European countries expressed different priorities on several issues. The specific analysis performed on the policy-makers' group is useful to identify where there are gaps in data and tools for this particular group of decision makers.

The **results of the analyses on road safety management systems** suggest that, although a number of "good practice" elements can be established as regards road safety management structures, processes and outputs, it is not possible to identify one single "good practice" model at national level. Best performing countries are not always ranked best in terms of road safety management components. On the other hand, the proposed "good practice" criteria seem to work as regards the worst performing countries. Moreover, similar performance in road safety management can be achieved by means of differing structures and implementation processes.

Despite the differences in European road safety management systems, there have been several elements that emerged as more critical "good practice" criteria, such as the presence of a strong lead agency, the efficiency of the implementation – monitoring – evaluation part of the policy making cycle, the embedding of programmes in sustainable and results-focused structures and processes, and the distribution and coordination of responsibilities between federal, regional and local levels. Especially the implementation, funding, monitoring and evaluation elements showed the lowest level of availability in the European countries and appear to be the most problematic sections of the road safety management systems.

When examining the relationship between road safety performance and road safety management in the different countries, there appeared a weak effect of road safety

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management features on safety performance, and in particular on the 'intermediate outcomes' (i.e. Safety Performance Indicators).

On the basis of the results of DaCoTA WP1, a number of **recommendations** are made for the enhancement and future development of the ERSO in order to address the stakeholders' needs, as well as recommendations for the improvement of road safety management both at national / local and European level.

1.OBJECTIVES

In the DaCoTA project, research on road safety policy had two purposes:

3. Identifying the needs for data and decision-support tools of road safety decision-makers, managers and other key stakeholders in order to develop the European Road safety Observatory, ERSO, and make it as relevant as possible for all the tasks involved in policy-making.
4. Developing knowledge on road safety management systems at the national level, both from a theoretical and logical point of view (defining “good practice” criteria and testing them) and from a practical point of view (describing and assessing existing road safety management systems in European countries, collecting practical ways to achieve elements of “good practice” and laying the grounds for a European observatory of road safety management to be integrated into ERSO).

As development of a “data warehouse”, of in-depth accident data collection processes, and of decision-support tools were other objectives of DaCoTA, some results addressing the first objective had to be obtained rapidly so as to be put into use immediately as a framework for the other research efforts.

2.METHODOLOGIES

Both quantitative and qualitative methodologies, most of them new, were designed to reach the objectives. The following figure provides an overview of the methodological developments and application.

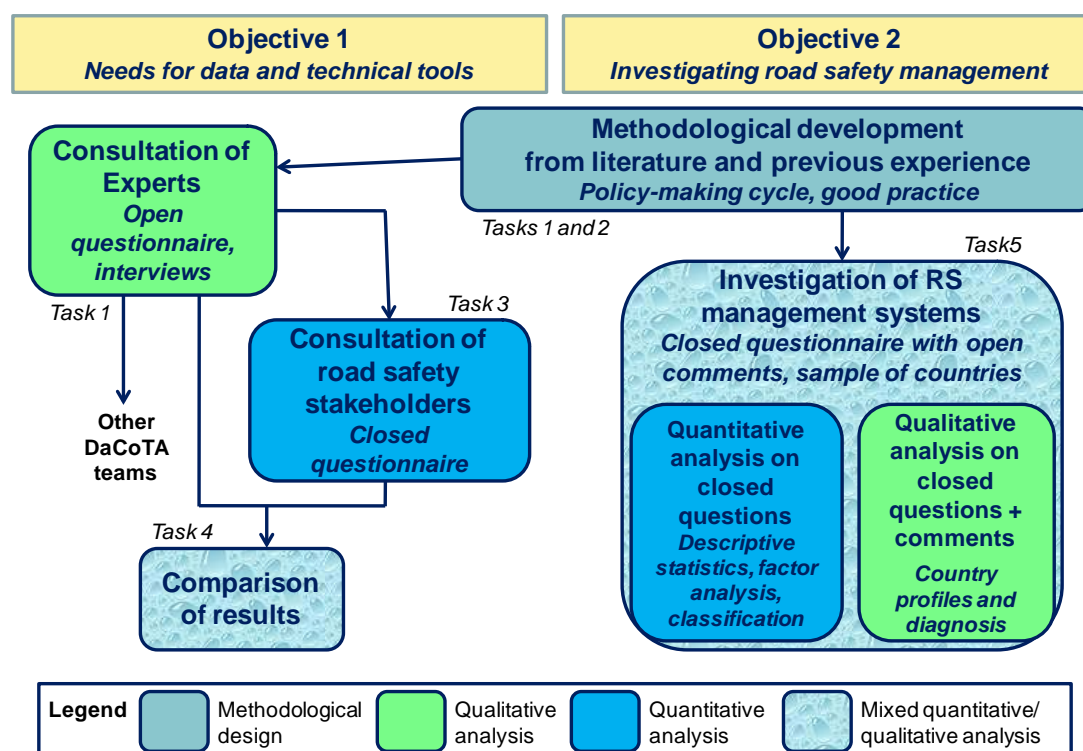


Figure 1: Overview of methodologies

2.1. Consultation of a panel of experts

Scientific support is necessary for road safety management to produce optimal results as only road safety interventions based on facts and knowledge can succeed in efficiently reducing the number of road casualties. However, road safety management is a complex process involving numerous steps, some of which may not be obvious to the scientific community. A description of the key tasks involved in this process was therefore needed to investigate the needs for scientific input felt by those working at the interface of road safety research and management.

As results on the actual needs for data and decision-support tools were expected at an early stage of the DaCoTA project to support new developments of ERSO, a consultation of a panel of experts was organized. The experts were to have in-depth knowledge of road safety management processes and needs in their country and to be, either directly involved in decision making, or working closely with decision makers as advisors. The National Expert Group of the European Commission, that represents all EU member states as well as non-member Schengen countries

(Norway, Switzerland, Iceland), formed the core of the panel; a number of other qualified experts suggested by some of the EU experts and by DaCoTA team members were added to enlarge it.

Two parallel consultation methods were implemented: semi-directive interviews were carried out by members of the DaCoTA WP1 partners (mainly with panel members from their own countries) while a request for written contributions was sent through the EC to all panel experts. Three open questions were formulated, allowing the experts to describe their own experience, views and messages and to put emphasis on the issues they considered most important.

As a support to interviews and written opinions, a two-dimensional matrix was built up, describing some key steps of policy-making in which knowledge is crucial (fact finding, programme development, preparing implementation, monitoring and evaluation) and cross-tabulating them with the needs for scientific information (data, technical tools for data treatment, other decision-support tools, training tools). The matrix was also used as guideline for the text analysis of the information gathered.

More details can be found in Muhlrad, N, Dupont, E (Eds.) (2010): Consultation of a panel of experts on the needs for data and technical tools in road safety policy-making, Deliverable 1.1/4.1 of the EC FP7 project DaCoTA.

2.2. Consultation of road safety stakeholders

Experience and findings from the consultation of the panel of experts was used as a basis to perform a broader-scale consultation of road safety stakeholders including decision-makers, managers and other road safety professionals as well as researchers and representatives of the private sector and the civil society (businesses, non-governmental organizations). The aim of the consultation was both to validate the results obtained on the needs for data and decision-support tools and to assess priorities. The availability of the data and tools which were found useful or necessary was also investigated.

In view of the large number of stakeholders to be approached, it was decided to set up an on-line questionnaire and to make use of a standard survey tool. The bulk of the multiple-answer questionnaire was developed from the synthesis of the assessments provided by the panel of experts and structured according to the matrix crossing policy-making tasks and needs for scientific support. This core was complemented by questions such as country of origin of the stakeholder, field of work or previous experiences with national/international data or information sources. The questionnaire was tested by working colleagues of the research team who had no previous knowledge of its aim or contents, and all remarks from this pilot study were taken into account to prepare the final online version.

Circa 3150 stakeholder contacts from European and other OECD countries were collected from the European Commission, from the ETSC (European Transport Safety Council) as well as its PIN Panel members, and from FERSI (Forum of European Road Safety Research Institutes). The European Commission, DG MOVE, sent a cover letter to all respondents by e-mail, introducing the questionnaire and providing a web link to the survey. The survey was open for a month and a reminder was sent by the European Commission halfway through. Undelivered messages were excluded from the original list of recipients and the final answering rate was 16%, which is satisfactory for this kind of survey method.

Results of the survey were analysed through basic statistical methods to identify priorities and find out how stakeholders viewed the availability of the data and technical tools they wished to use. Furthermore, Principal Component analyses and Cluster analyses were performed on two sets of information (data needs, data availability) in order to identify groups of stakeholders sharing both similar priorities and similar problems as regards data and tools for knowledge-based policy-making.

For more details on the questionnaire survey, see: Machata, K, Barnes, J, Jahi, H (Eds.) (2011): Stakeholder's contribution, Deliverable 1.3 of the EC FP7 project DaCoTA.

2.3. Investigation of road safety management systems in European countries

The methodology was designed in four steps.

2.3.1. Development of a road safety management investigation model

An extensive review of the literature was performed, which showed that, although very little research had been carried out on road safety management systems, there was a consensus of experts as to what such a system should be for "good practice". However, there was no indication that the consensus model was actually implemented in European countries. The qualitative investigation model developed in DaCoTA thus aimed both at describing in a consistent way what road safety management systems are in the field and at defining criteria of "good practice" to assess their good points and their negative aspects.

The structure of the model and the "good practice" criteria were based on literature and on the research and practical experience of the DaCoTA team members. To describe road safety management systems, a policy-making cycle (from agenda setting to policy implementation and evaluation) and the tasks to perform in order to get the desired policy outputs (including those in the matrix previously used) were defined as well as some transversal processes which were found essential to the performance of these tasks (such as inter-sectoral coordination, monitoring, or consultation of stakeholders). The "good practice" criteria were identified at each step of the policy-making cycle and for each transversal process (Fig. 2). It was assumed that "good practice" implies knowledge-based policy-making.

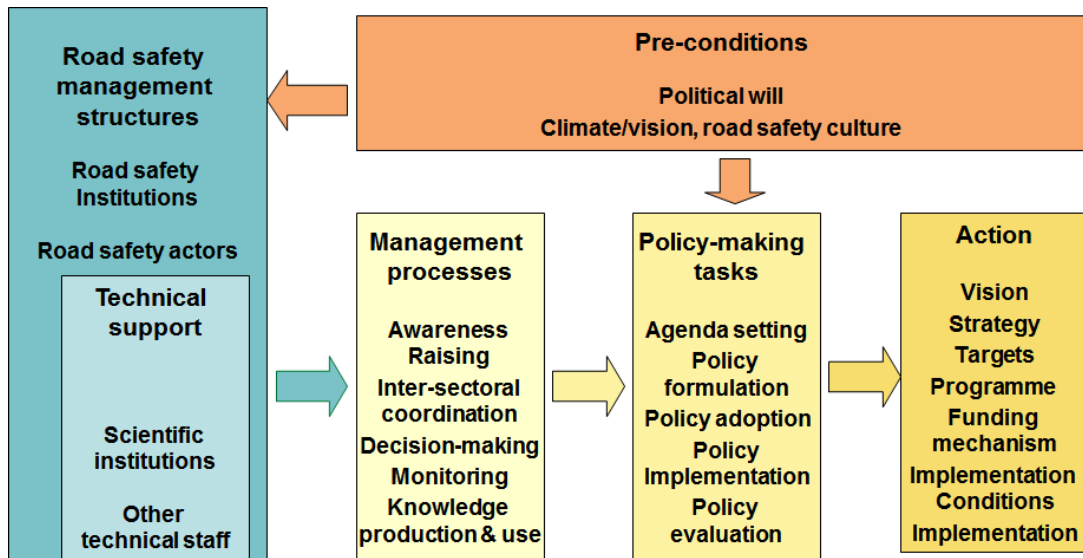


Figure 2: The components of the road safety management investigation model

2.3.2. Development of a questionnaire and an investigation process

Fact-finding on road safety management systems is not an easy task as few persons are fully familiar with the complex organization of road safety in their own country. It was found that the desired information could only be obtained from road safety experts. As in the panel consulted earlier, experts were defined as professionals with long experience and in-depth knowledge of road safety management processes in their country; they were divided into two categories: managers (directly involved in policy-making), and scientific experts (senior researchers or technical specialists having worked closely with managers). At least one manager and one scientific expert were identified in each country investigated.

Based on the investigation model, a detailed questionnaire was built up, including fifty questions structured in four parts (institutional organization, policy formulation and adoption, policy implementation and funding, monitoring and evaluation, scientific support and capacity building). As both quantitative and qualitative analysis of the information was to be performed, each question was divided in sub-questions calling for yes/no answers, but open comments were encouraged to qualify the answers given. As the vocabulary used in road safety to define policy-making tasks and processes has never been standardized, a glossary of terms was provided. However, as the questionnaire had to be prepared in the language used by the multi-national research team (English), it was feared that misunderstandings would perhaps occur if experts were not entirely fluent in this language: the questionnaires were thus filled in by each expert during a face-to-face or a telephone interview with one of the team members speaking the same mother tongue and translating when necessary. This unfortunately limited the sample of countries that could be investigated in the time span and with the resources of the DaCoTA project.

2.3.3. Development of a storage facility for road safety management data

The combination of yes/no data and of comments in open text required a specific tool for data storing and data treatment. A data storage facility with a friendly interface was thus designed and put on line, enabling the team members to enter each of the questionnaires filled in by the experts they interviewed and providing access to all

information for all team members. The information entered was double-checked to identify missing data, inconsistencies or possible misunderstanding of a question and the final “cleaned” data set was made available under Excel format for quantitative analysis.

2.3.4. Development of methods for data analysis

A first step of qualitative analysis was performed in order to provide a full description of the road safety management systems in each country investigated and an assessment as objective as possible of the fulfillment of “good practice” criteria. To this purpose, full use was made of the open comments provided by the experts to qualify the yes/no answers. Both the questionnaires filled in by managers and scientific experts were included in the analysis as they were found to complement each other: a more comprehensive viewpoint usually came from the managers while the scientists were often more critical. The analysis provided individual country profiles for road safety management as well as “good practice” diagnoses, performed by comparing each country to the profile of a “reference” country that would fulfill all “good practice” criteria (Fig. 3).

A second step of qualitative analysis was performed on a sub-sample of key questions with the purpose to compare European countries and get a more in-depth understanding of how they handle their road safety management systems. The analysis was also meant to check whether the model developed under DaCoTa can serve as a useful tool for comparing different national solutions.

For these purposes, the data gathered in the DaCoTA investigation was complemented with data from a PIN survey carried out by ETSC (Jost G. et al.:2012) which did not cover all issues of road safety management considered in DaCoTA but included all countries from the European Union. Information was cross-checked as much as possible through international and national reports (in spite of a language problem as most of the latter are not translated into English). The areas of road safety management analysed included key policy-making tasks and management processes such as institutional organization, inter-sectoral coordination, stakeholders’ involvement, policy formulation and adoption, implementation and funding, monitoring and evaluation. A detailed overview of how countries fared in each of these areas was produced, and a critical analysis of the situation in Europe and of the information available to describe it was performed.

Although it has been widely assumed that effective road safety management systems are a pre-condition to road safety action and therefore to road safety improvement at country level, this has never been scientifically proven. For the first time, quantitative analyses of issues related to road safety management systems were carried out, based on the answers provided by the country experts in the DaCoTA investigation. Different sets of analyses were aimed at identifying groups of countries sharing similar road safety management components, exploring the statistical link between road safety management clusters and fatality rates, and linking road safety management and road safety performance in terms of outputs (road fatalities) and of intermediate indicators.

A lot of effort was devoted to finding the most appropriate statistical methods to treat the data collected, as the relatively small sample of countries investigated coupled with the large amount of variables documented raised some technical problems. Road safety management data was separated into four sub-samples according to the structure of the questionnaire and the non-discriminatory variables were set aside. In the analysis of the relationship between road safety management and road safety performance, the answers to common questions in the PIN survey and in the

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DaCoTA questionnaire were used to increase the sample size. Different statistical tools were tested and the battery of statistical methods finally applied included factor analyses (Common Factor analysis, Principal Component analysis, Categorical Principal Component Analysis), cluster methods (Hierarchical, Ward and k-means), Spearman's rank correlation, Pearson correlation, Poisson and other Generalized Linear Models, and Beta regression models.

The intermediate and final road safety outcome indicators selected were those developed by the decision-support research group in DaCoTA WP4 (Road Safety Management Indicator, Road Safety Performance Indicator, Road Safety composite indicator) with reference to the SUNflower model.

It is to be noted that the two sets of information provided by the questionnaires filled in by managers and by scientists somewhat differed as the road safety management situation was viewed from different vantage points. As a result, they had to be separated for quantitative analysis. In the final outcome, particular attention was given to the managers' point of view as a matter of principle.

For more details on the road safety investigation model and questionnaire, see Muhrad, N., Buttler, I., Gitelman, V. (Ed) (2011): Road safety management investigation model and questionnaire, Deliverable 1.2 of the EC FP7 project DaCoTA. For detailed information on quantitative and qualitative analysis methods, see Papadimitriou, E., Yannis G., Muhrad N., Gitelman V., Buttler I., Dupont E. (Eds) (2012): Analysis of road safety management in the European countries, Deliverable 1.5 Vol.II of the EC FP7 project DaCoTA.



Figure 3: Profile of a “reference” country for road safety management

3.MAIN RESULTS

Over the three years of the DaCoTA project, a wealth of research results on road safety policy was obtained. Only a summary is provided below.

3.1. Needs for data and decision-support tools for knowledge-based road safety policy-making

Following the preliminary consultation of a panel of experts, an extensive survey was carried out through an online questionnaire among more than 3000 road safety stakeholders in Europe and beyond. Over 500 responses were obtained, including 394 from the European region. Most responses were received from the United Kingdom, Belgium, Germany and Spain. Response rates were specifically high for national statistics bureaus, research institutes and consultancies. The health sector, NGOs and European (umbrella) organizations also responded at rates above the average. Response rates were on the contrary particularly low for Public Enterprises, the European Commission and the European Parliament. From more than 120 questionnaires that were personally sent to representatives in the European Parliament only one response was received.

Stakeholders expressed high demand for data and knowledge in road safety related decision making. They also expressed discontent about the current poor availability of such information.

3.1.1. Priority rankings

The following issues scored highest with regard to priority for road safety work:

a) *Fact finding and diagnosis*

Information on crash causation factors (high priority for 67% of respondents), information on road users' behaviour and attitudes (63%), a common definition of a fatality (60%), exposure data (53%), crash databases that link police and hospital data (52%), Information on the under-reporting of road traffic crashes (49%).

b) *Development of safety programmes*

Information on the costs and benefits of road safety measures (56%), information on the safety impacts of combined measures (54%), common methods to perform evaluations of road safety measures (52%), a "good practice" catalogue of measures (50%), information on the public acceptance of specific road safety measures (45%).

c) *Implementation*

A common methodology for identifying high risk sites (46%), a "good practice" collection on implementation (43%), digital road maps for mapping crashes (41%), detailed information from road safety audits and road safety inspections (39%), a common methodology for in-depth crash analysis (38%).

d) *Monitoring and evaluation*

Serious injury counts, in addition to fatality counts (55%), methods to evaluate the safety impacts of road safety measures (54%), a common methodology for the evaluation of costs and benefits of road safety measures (44%), statistical methods for following trends (39%), a comprehensive monitoring of implemented measures across Europe (32%).

3.1.2. Misjudgement about availability

Most of the data and decision-support tools emerging as priorities are currently poorly available. It must be noted, however, that comparatively low availability scores were reported even for items which are already available - such as definitions of a fatalities or severe injuries for national statistics. Improving knowledge about the steadily growing portfolio of available data should therefore be one of the prime concerns of future public relations work in relation with ERSO.

3.1.3. Low scores but high stakes

Other technical tools such as in-depth investigations, naturalistic driving and simulator studies reached low priority scores but will be at the heart of European research for the coming years. Research thus anticipates on future needs, which is one of its functions, but the needs will be felt only if road safety stakeholders are made aware of the meaning and usefulness of the knowledge developed. Hence, one of the future functions of ERSO should be to present stakeholders with updated results from recent European research.

3.1.4. Components of priority and availability

Further statistical analysis was carried out in order to group the elements of the stakeholders' survey (more than 50 items of data and tools) into 'factors' or components, bringing together elements with similar priority and availability level. Table 1 summarises the results of principal component analysis and factor analysis that was carried out for three cases:

- Priority ratings
- Availability ratings
- Combined priority and availability ratings: in this case, a new composite scale was created, in which elements of highest priority but lowest availability were assigned the highest importance, while elements of low priority but high availability were assigned the lowest importance.

It observed that, working with priority ratings exclusively, with availability ratings exclusively, or with a combination of the two ratings, resulted for a large part in the identification of "similar" components. Some dimensions, on the other hand, seem to emerge more specifically when analysing availability ratings or the scale combining priority and availability ratings. This is the case, for example, for "Exposure and behaviour data", and "Road safety policies, rules and regulations".

	<i>PCA : Priority ratings</i>	<i>PCA : Availability ratings</i>	<i>FA : Combined priority and availability ratings</i>
Component/Factor 1	"Implementation of measures"	"Costs and safety impacts of measures"	"Implementation of measures"
Component/Factor 2	"Statistical models"	"Statistical models"	"Accident and infrastructure analysis for the implementation of measures"
Component/Factor 3	"Costs and safety impacts of measures"	"Implementation of measures"	"Statistical models"
Component/Factor 4	"Road infrastructure and accident analysis"	"Road infrastructure and accident analysis"	"Exploring implementation frameworks"
Component/Factor 5	"Common definitions and under-reporting"	"Exposure and behaviour"	"Crash causation"
Component/Factor 6	"Crash causation"	"Policies, rules and regulations"	"Evaluation of measures"
Component/Factor 7	"Advanced research methods"	-	"Common definitions"
Component/Factor 8	-		"Information on safety impacts"
Component/Factor 9	-		"Improving data collection"

Table 1: Overview of the components/factors selected on the basis of the separate and combined analysis of priority and availability ratings

3.1.5. Grouping stakeholders

The components shown in Table 1 were used to identify "groups" (clusters) among the stakeholders, sharing common priorities in terms of data and tools, and common data availability concerns. In this case as well, three analyses were carried out:

- Grouping stakeholders on the basis of priority ratings
- Grouping stakeholders on the basis of availability ratings
- Grouping stakeholders on the basis of the combined priority and availability ratings

Working exclusively on the priority ratings, 4 different clusters (groups) of stakeholders were identified:

- Cluster 1: stakeholders with "low priority for everything";
- Cluster 2: stakeholders considering that data and models are specifically important,

- Cluster 3: stakeholders that tend to assign “high priority for everything, but especially implementation”,
- Cluster 4: stakeholders assigning high priority to in-depth data mostly

On the basis of availability ratings, 3 clusters of stakeholders were identified:

- Cluster 1: stakeholders who declare that information on costs and benefits of measures are available, but that models are not.
- Cluster 2: stakeholders declaring that models are available, but that data and definitions are needed.
- Cluster 3: stakeholders who lack information about the costs and benefits of measures.

Finally, when working with the combined scale of priority and availability, 6 clusters of stakeholders are identified:

- Cluster 1 “needs for most items, especially accident and infrastructure analysis”;
- Cluster 2 “moderate needs for all”,
- Cluster 3 “High needs for models, moderate needs in other, implementation unimportant”,
- Cluster 4 “No needs for models, moderate needs in implementation”
- Cluster 5 “Low importance of implementation and models, moderate needs in crash causation”
- Cluster 6 “High needs for implementation but no use of accident and infrastructure analyses

The investigation of background characteristics of the stakeholders in the various clusters reveals little association with the countries the stakeholders work in, but a stronger relationship with the type of organisation they work for. Interestingly, researchers and policy makers are equally represented in clusters, indicating that they have similar needs and priorities, although the opposite is often assumed in road safety analyses.

3.1.6. A particular sub-group of road safety stakeholders: the policy-makers

A sub-sample of 150 policy-makers was identified in the sample of respondents to the stakeholders’ survey. Belgium and the UK were over-represented in this Policy-Makers’ Group, which can be partly explained by the number of European organizations based in Belgium and the original survey only being in English. The majority of Policy Makers had worked in Road Safety for many years. 57% had worked 11 years or more in Road Safety with only 18% having worked less than 5 years.

Over 50% of Policy Makers stated that 13 data/tool items were of high priority: A common definition of a serious injury, information on crash causation factors, a common definition of a fatality, information on road user behaviour and attitudes, exposure data, statistical methods for priority setting, crash databases that link police and hospital data, information on the costs and benefits of road safety measures, information on the safety impacts of combined road safety measures, “good practice” catalogue of measures - including implementation conditions, standardised procedures and methods for carrying out evaluations of road safety measures,

focusing on seriously injured counts in addition to fatality counts, and methods for evaluating the safety impacts of road safety measures.

However only 2 of these, “*A common definition of a serious injury*” and “*A common definition of a fatality*” were stated as having both high priority and high availability. The remainder of items were found as having low priority and low availability.

The results suggest that Policy Makers particularly focus on information related to the efficiency of road safety programmes and, in other words, on evidence guiding the choice of appropriate measures. Another group of tools emphasised by the Policy Makers concerned more detailed and comprehensive information on accident data and characteristics such as information on crash causation factors, on frequent crash scenarios and patterns, on road user behaviour and attitudes, as well as a need for crash databases that link police and hospital data. Policy Makers’ responses clearly demonstrated insufficient availability of the majority of tools needed at various levels of decision-making.

As the Policy Makers included in the sample are from a diverse range of organizations and from many different European countries, it was thought that the data/tools priorities and availability may differ between subgroups. Thus, two comparative analyses were carried out.

When examining the difference in priorities and availability of data and tools between the Policy Makers who feel that they are influential of the National Government and the Local/regional government, only small differences could be identified. One of the bigger differences in priorities related to “*Good practice collection on how countries have implemented specific road safety measures*”. Those who claimed to influence the National Government assigned a higher priority to this (58%) than those who influenced local/regional government (38%). A probable explanation for this is that National Governments are more likely to compare themselves to other countries while Local/regional governments focus instead on Road Safety measures adopted by other localities or regions within the country.

The priorities and availability of data and tools stated by those influential of the European Commission were also examined; however very small numbers reduced the reliability of the comparisons. What may be noteworthy is that the Policy Makers who regard themselves as influential of the European Commission, rank “*Results from naturalistic driving studies*” as a high priority whereas very few Policy Makers of the overall Group were of that opinion.

The needs for road safety data and tools expressed in high and low performing countries differed. In general, the high priority items as selected by the high performing countries were considered to have a greater availability than those assigned high priority by the low performing countries. For some items there were relatively large differences in priorities assigned between the high and low performing groups. “*Information on road user behaviour and attitudes*” and “*Exposure data*” were considered to be a high priority by the Policy Makers from high performing countries (75% and 76% respectively), whereas fewer Policy Makers from low performing countries consider these items to be high priority (19% and 28% respectively). In contrast, “*Comparisons of safety rules and regulations*” and “*Detailed road databases providing descriptions of road layouts, signing and marking, etc.*” were assigned the lowest priority by the high performing countries (14% and 17% respectively) but were considered high priority by the low performing countries (70% and 55% respectively).

This finding may reflect the evolution in road safety management thinking: at an early stage of dealing with road safety problems, priority is given to more common and immediate interventions, such as those related to road safety regulations or

infrastructure inventory, whereas later, at a more advanced stage, a need for deeper understanding of factors and processes leading to road accidents becomes more of a priority. This reflected, for example, in the introduction of the notion of road safety performance indicators to measure current safety conditions of the transport system (ETSC, 2001; OECD, 2008).

3.1.7. Some conclusions

The results of the stakeholder survey should serve as a basis for forming a common picture of the demands of stakeholders (policy-making as well as non-policy-making) for data and knowledge in road safety. The specific analysis performed on the Policy-makers' Group is useful to identify both where there are gaps in data and tools and where there is a need for greater publicity so that Policy Makers know where to find the data/tools which they require. The development of data and tools for supporting road safety management tasks should take the differences in priorities found for various groups of policy-makers into account, i.e. such a development should not be general but certain policy-maker group oriented.

3.1.8. Current and future role of ERSO

Knowledge and use of the European Road Safety Observatory (ERSO, www.erso.eu) was found unequally distributed between countries and across categories of road safety stakeholders. Values for new Member States of the EU were generally higher than for EU15.

With regard to type of organization, road safety organisations and research institutes or universities reported the highest use rates. Lowest rates were observed for representatives of automotive and supplier industries as well as for national and regional administrations. Care should therefore be taken to make ERSO the standard tool suitable for a majority of road safety stakeholders across EU countries and across all road safety related professions.

On the basis of the analysis of the stakeholders' priorities, and the related availability of data and tools, a comprehensive set of recommendations for the enhancement of the ERSO is outlined, including short-term improvements (e.g. inclusion of additional existing data sources and tools) as well as medium-term actions for eventually addressing all the needs expressed by the stakeholders.

More information on the results of the stakeholders' survey can be found in Machata, K, Barnes, J, Jahi, H (Eds.) (2011): Stakeholder's contribution, Deliverable 1.3 of the EC FP7 project DaCoTA.

For details on the statistical analysis and grouping of stakeholders, as well as detailed recommendations for the enhancement of the ERSO, see Papadimitriou, E, Yannis, G. Gitelman V., Doveh, E., and Dupont, E., (Eds.) Analysis of the stakeholder survey: perceived priority and availability of data and tools and relation to the stakeholders' characteristics. Deliverable 1.5 (Vol. 1) of the EC FP7 project DaCoTA.

For details of the analysis performed on the Policy-Makers' Group, see Talbot, R., Dupont, E., Gitelman, V., Thomas, P. (2012): An investigation of Policy Makers' priorities for data and tools and their availability, Deliverable 1.4 of the EC FP7 project DaCoTA.

3.2. Description and assessment of road safety management systems in European countries

3.2.1. Road safety management systems in Europe: patterns and particularities

3.2.1.1. Institutional organization, coordination and stakeholders' involvement

Most road safety management elements related to institutional organization and coordination had a medium level of availability across the 14 countries investigated, revealing a large variation in the structures and processes at the higher level of road safety management.

Although it is widely acknowledged that effective road safety management can be achieved with lead agencies of various structural and procedural forms (Bliss & Breen, 2009), the results of DaCoTA suggest that road safety management systems based on strong departments of ministries, or on government agencies specifically established for this purpose, with clear responsibility for the government's road safety policy, are the most effective.

On the other hand, when road safety is oriented or represented by bodies such as inter-ministerial committees or road safety councils, the effectiveness is more likely to suffer. A possible reason for this is that their roles and relationship are not always clear, creating uncertainty and or overlaps in responsibilities and procedures. Another reason appears to be that inter-ministerial committees and road safety councils are typically assigned a coordination mission, and are seldom involved in implementation, while a strong, governmental Lead Agency will be responsible for both. Furthermore, no matter what type of Lead agency is established, the lack of dedicated budget observed in most countries is a major limitation.

The effectiveness of road safety management systems can also be largely affected by the degree to which regional authorities, NGOs, businesses or the public at large are involved via systematic consultation at all stages of the policy making process. Very few countries demonstrate such routine and fruitful consultation processes.

It is finally underlined that the currently changing economic environment is leading to modifications and even to a down-grading of the road safety management system in several countries. This makes it difficult to evaluate the effectiveness of structures as the present road safety performances are related to the previous higher involvement level of the national authorities.

3.2.1.2. Policy formulation and adoption

Road safety policy formulation showed the largest degree of "consensus" between countries, especially as regards the presence of a road safety strategy with specific quantitative targets for fatality reduction. Nevertheless, some differences and uncertainties are involved in the adoption of road safety programmes and the participation or consultation of regional and local authorities.

Road safety visions and targets appear to be strongly influenced by either European Union proposals or road safety "leader" countries in Europe. The vast majority of countries have adopted the EU target for 2020, as they had also adopted the previous one of 2010. "Vision Zero", "Sustainable Safety" and "Safe Systems" are the main visions endorsed by several countries.

Almost all European countries have road safety strategies and programmes. However, there is no unique procedure for preparing them. For instance, the drafting of a programme may be coordinated by inter-ministerial committees, or by road safety councils, and the degree of involvement of the scientific communities varies. It is not always clear why a country adopted a specific orientation or how the measures included in the road safety programme have been selected, how the implementation was prepared, and how the various responsibilities for the implementation have been assigned to different bodies or organizations. As a result, there is a lot of inconsistency in the design of the programmes and the setting of priorities and of the implementation schedule. In such conditions, it is quite unlikely that all programmes and strategies will perform to the same high level.

Proposals coming from regional or local authorities are hardly ever integrated into national road safety programmes – with the possible exception of urban programmes in the large metropolitan areas. The same goes for the allocation of resources, so that the regional or local budgets are seldom adequately allocated or even defined at all.

Information is particularly scarce concerning the finalisation of the programmes in the ministries and in the government. This process typically consists of changes in some proposals, in the priorities and in the implementation plan, for political or other reasons, and these are in most cases unknown. Finally, the procedure followed for formal adoption of road safety strategies and programmes differs according to countries; in several of them, the last programme designed has remained pending and, either has been ignored, or serves as informal guidelines for day-to-day road safety work.

3.2.1.3. Policy implementation and funding

In general, implementation of programmes and measures appears to be the weakest component of road safety management systems in Europe.

Compared to other road safety management components, policy implementation and funding had consistently lower scores in the examined European countries, especially as regards the establishment of formal resource allocation procedures, the allocation of funding to evaluation, the sufficiency of funds and human resources and the drafting of plans to support implementation.

The problem of providing stable economic foundations for implementing and managing road safety programmes is the key to improved effectiveness and efficiency of road safety work. First of all, the budget needed to move towards a long-term vision is not estimated in most countries. In addition, a decision is seldom taken to ensure the availability of a budget for road safety activities from the national budget. Finally, the lack of information on implementation costs at the national and international levels, combined with a lack of knowledge on the methods appropriate to calculate these costs, makes for unreliable estimates of implementation costs. As a consequence, even if a provisional budget has been established to implement a road safety programme, the funding actually allocated is usually lower.

Moreover, formal procedures for budget allocation to the various actors are seldom in place. As a consequence, the agency responsible for implementation as well as all other stakeholders involved (regional/local authorities, NGOs) have to rely on their own current budget, for which road safety competes with other policy issues.

Only few countries have an efficient coordination structure and procedures to implement their programmes. In most countries, implementation is still dispatched between government sectors without any further control to ensure the consistency of

interventions with the original programme. A lack of coordination at the operational level is clearly identifiable, resulting in some sectors being more efficient than others in performing the road safety interventions they have been assigned.

3.2.1.4. Monitoring and evaluation

In most countries, sustainable systems to collect and manage data on road accidents, fatalities and injuries are in place. A satisfactory level of availability was identified with respect to "benchmarking" for monitoring progress in the road safety situation in relation to other countries, and to the collection of behavioural data (typically through a national Observatory centralizing the data systems for road safety).

Nevertheless, most elements related to monitoring and evaluation had a medium or lower level of availability across the countries. In the majority of cases, monitoring is limited to collecting information when a programme ends; only a couple of countries monitor programmes while they are still in progress. Moreover, it is never quite clear what the scope of the monitoring is and how the results of the monitoring are exploited.

Only in few countries, evaluation of safety measures is part of the culture and a routine within the road safety programme, with a dedicated budget. In several countries, evaluation is very rare and adjusted to the available budget. Even when evaluation is consistently performed, it is usually limited to infrastructure and enforcement measures, or to specific behaviours targeted by specific measures. Formal efficiency assessment techniques are not always implemented.

As regards the evaluation of the overall road safety programme, it is mostly limited to a "checklist" of the specific measures foreseen, rather than an actual evaluation. Only one country has been systematically evaluating its entire programme.

e) Scientific support, information and capacity building

In most countries, a higher than medium level of availability is observed for a number of elements related to scientific support and information, such as the use of research results for formulating road safety policies, the systematic information of citizens on the national road safety policy and interventions and their effects, and the presence of articles or programmes in the media which review, criticize or challenge current road safety policies. Moreover, in most countries, there is at least one research institute or university department performing multi-disciplinary road safety research, although sustainability of national funding for research is currently highly questioned. Thus in some countries, survival and development of the research teams has been made possible only through their participation in European projects.

It is interesting to note that, while national road safety observatories exist in most countries, there is great variation in their type, role and operation. In a few countries, road safety observatories are part of the lead agency, while in most cases, road safety data collection and storing is taken over by research centres, statistical offices or the police.

Capacity building and training of road safety actors is seldom a systematic procedure with a dedicated budget, and very little is known about the amount of training actually performed, the content of the training courses or the degree to which graduates are later involved in practical or scientific work to improve road safety. Multi-disciplinary courses on road safety at university level are scarce.

Overall, it can be said that the scientific potential is there and may support road safety policies in the future. Currently, however, there appears to be a lack of

cooperation or coordination between research and policy making, especially as regards the formulation of road safety programmes and the methods of monitoring and evaluation and interpretation of results. Making better use of the existing scientific capacity appears to be one of the major challenges for knowledge-based road safety policy making in the European countries.

3.2.2. Can countries be ranked on the basis of road safety management?

According to our investigation model, we can expect that countries meeting more “good practice” criteria in their road safety management system will be found in the group of good performing countries in terms of road safety outcomes. Similarly, one may assume that countries meeting fewer “good practice” criteria will be consistently found in the group of poorly performing countries. However, the qualitative analyses, confirmed by the cluster analysis, showed the complexity and variability of road safety management systems, so that the task of ranking the countries in terms of road safety management was bound to be very demanding.

Cluster analysis proved countries to be completely different when road safety management systems were considered as a whole, so that overall ranking was impossible; so ranking had to be tried for each of the five components of the road safety management systems as defined in the structure of the questionnaire. In doing this, however, no two countries were found to belong to the exact same ranking for all components. Across all the analyses, a number of countries with a consistently higher level of availability of some road safety management components could be identified, and others with a consistently lower level of the same features.

Interestingly, the countries that were ranked systematically at the top of road safety management components were not always those known as the best road safety performing countries (such as the Netherlands and the U.K.). Moreover, for the countries' group with seemingly higher overall (i.e. average) level of availability of the road safety management components corresponding to “good practice” criteria, the availability level was not consistently the best across all specific analyses. In fact, a similar overall ‘score’ on a part of the road safety management system (e.g. monitoring and evaluation) could be obtained with different scores on the individual “good practice” elements concerning that part of the system.

On the other hand, the countries that were consistently ranked at the lower end of the scale were also the countries with the lowest performances in terms of fatality rates.

Overall, the rankings carried out for the five distinct parts of the questionnaire were quite – although not fully – consistent, especially as regards the “best” and “worst” performing countries according to the DaCoTA “good practice” criteria. However, the inconsistencies that emerged when comparing the rankings of road safety management with road safety performance, especially for the “good” performing countries, brought forward the need for a dedicated analysis on the potential links between these two.

3.2.3. Is road safety management linked with road safety performance?

The dedicated analysis of road safety management and road safety performance was based on the SUNflower pyramid, tackling the entire hierarchy from structure and culture, to programmes and measures, to safety performance indicators (intermediate outcomes), and to road safety final outcomes (i.e. fatalities and injuries). Due to the complexity of road safety management systems, this analysis

was based on a shorter version of the questionnaire, namely the common DaCoTA/ETSC-PIN questions.

The results suggested no direct relationship between road safety management and the final outcomes of the RS systems (be it mortality rate, fatality rate, the evolution of the number of fatalities between 2001 and 2010 or a composite index combining these indicators with others, such as the proportion of vulnerable road users in the total number of fatalities). However, they did suggest a relationship between road safety management and road safety performance indicators (composite index combining variables such as the number of annual alcohol checks per 1000 inhabitants, the rate of renewal of the car fleet, and more). This is in accordance with the SUNflower model which assumes that the policy context and input will first affect the intermediate outcomes, i.e. the operational level of road safety, which corresponds to the level of road infrastructure, the maturity of road user behaviour, the protection offered by vehicles etc. These operational conditions are thought to be the result of policies and interventions, and the final outcomes result from these operational conditions. The findings of DaCoTA thus confirmed that the effect of road safety management on road safety performance is indirect, and conditional to the operational level of road safety.

Of course, the fact that European countries constitute a small sample, does not allow for the identification of strong relationships, but rather for the indication of the presence of relationships. Moreover, some confounding factors could not be accounted for, such as mobility, economy developments, weather, long traditions etc.

Two additional reasons for the difficulty of linking road safety management with road safety performance have to be considered. First, the DaCoTA analyses concerned a “snapshot” of the road safety management systems in 2011 which did not account for their evolutions or, in several cases, was even biased by recent changes. The evolution of road safety management may be a strong determinant of the evolution of road safety performance. The DaCoTA investigation should thus be repeated at intervals to update the information and make it possible to introduce the time dimension in the analyses.

Second, it should be acknowledged that European countries have an overall good level of road safety performance and an overall good level of road safety management compared, for instance, to emerging countries, which makes it difficult to establish a relationship between these two parameters within their relatively narrow scales. It is also possible that managers in better performing countries are more ‘strict’ on providing information, which may lead to underestimating the level of their road safety management.

Detailed results can be found in Papadimitriou, E., Yannis G., Muhlrud N., Gitelman V., Buttler I., Dupont E. (Eds) (2012): Analysis of road safety management in the European countries, Deliverable 1.5 Vol.II of the EC FP7 project DaCoTA.

3.2.4. Some conclusions

The results of the DaCoTA analyses on road safety management systems suggests that, although a number of “good practice” elements can be established as regards road safety management structures, processes and outputs, it is not possible to identify one single “good practice” model at the national level. Best performing countries, are not always ranked best in terms of road safety management components and there is strong indication that economic and cultural elements may be key determinants of both road safety management and road safety performance,

and of the link between those two. However, the proposed “good practice” criteria seem to work as regards the worst performing countries. One clear finding is that similar performance in road safety management can be achieved by means of differing structures and implementation processes.

Despite the differences in European road safety management systems, several elements have emerged as critical “good practice” criteria, such as the presence of a strong lead agency, the efficiency of the implementation – monitoring – evaluation part of the policy making cycle, the embedding of programmes in sustainable and results-focused structures and processes, and the distribution and coordination of responsibilities between national (or federal), regional and local levels. Especially the implementation, funding, monitoring and evaluation elements showed the lowest level of availability and appear to be the most problematic sections of the road safety management systems in European countries. The scientific potential present in each country was also found to be generally under-used for policy-making.

The DaCoTA results confirm the fact that the existence of an organisation or function does not necessarily imply that it works well; indeed, several countries have structures, lead agencies, strategies and plans, which are very partially if at all implemented, mainly due to lack of political will and motivation, lack of funding and coordination, lack of clarity in roles and responsibilities etc. This is often the case for poor performing countries, which scored high on institutional organisation and policy formulation, but very low on policy adoption, implementation, funding, monitoring and evaluation.

Little or no direct relationships between road safety management features and road safety performance was identified, and background indicators (GDP, level of motorisation) were dominant over road safety management effects. However, road safety management was found to be associated with intermediate safety performance indicators reflecting the operational level of road safety in each country. The weak relationship between road safety management and road safety performance was attributed to the fact that the European countries do not exhibit big differences in road safety performance, and that a minimum acceptable level of road safety management exists almost everywhere. Moreover, the time dimension could not be introduced retrospectively in the DaCoTA investigation, so that, in some countries, road safety management components were so recent that they hadn't yet had the time to deploy their full potential, while in others, they may have been around for such a long time that their impact had already gradually fading away.

From a methodological point of view, differences were observed between scientific experts' and managers' responses, the latter tending to be more positive, especially as regards the role of the parliament, the availability of programmes, the resources and funding processes, the reporting procedures, the information of citizens etc. It was concluded that experts' responses may reflect an independent and more objective view while managers are in a better position to provide up-to-date information. However, it is likely that neither the scientific experts nor the governmental managers could provide the complete picture of road safety management, which may explain some of the discrepancies in the quantitative analyses.

Overall, it can be said that the extent to which the road safety management “good practice” criteria are met is a pertinent measure for identifying a country's road safety management profile and peculiarities. The extent and level of detail of the DaCoTA questionnaire was proved necessary for capturing the many important differences between countries, as well as the more subtle ones, and allowed for the magnitude and complexity of road safety management systems to be revealed.

Qualitative and quantitative analysis of this large amount of detailed data allowed for several conclusions to be drawn, and also for revisiting the original criteria in order to identify those elements which appear to be more crucial.

3.2.5. Recommendations

On the basis of the results of the analysis carried out within DaCoTA WP1, a number of key messages and recommendations can be outlined for the improvement of road safety management systems in Europe:

- **Recommendations at national and local level**
 - Develop objective knowledge of RSM within countries
 - Decentralisation with care
 - Establishment of an Independent Lead Agency
 - Inter-sectoral and vertical coordination
 - Continuous stakeholders consultation
 - Vision and strategy is crucial for creating a road safety culture, but implementation is the critical step towards road safety improvement
 - Strengthen the link from policy formulation to policy adoption
 - Regular monitoring and evaluation
 - Resources and funding
 - Knowledge-based policies
 - Capacity building & training
 - Handle road safety management in times of recession
- **Recommendations at European level**
 - Adopting the safe systems approach
 - Exploiting the synergies of road safety and environmental policies
 - Adoption of serious injury reduction targets
 - Focusing on the essentials, leaving the details to the individual countries
 - Strengthening the role of ERSO
 - Publication of a Road Safety Management Good Practice Manual
 - Building on the existing framework and improving where necessary
 - Political will and commitment from all stakeholders

Detailed recommendations for practice and for future research can be found in Papadimitriou, E., Yannis G., Muhlrad N., Gitelman V., Buttler I., Dupont E. (Eds) (2012): Analysis of road safety management in the European countries, Deliverable 1.5 Vol.II of the EC FP7 project DaCoTA.

4. THE RESEARCH TEAM

Although task leaders coordinated the different research tasks, the methodological developments and the results obtained were very much collective work and all team members were involved in all steps of work.

Task leaders were Nicole Muhlrاد, Ifsttar, France (general coordination, consultation of experts, methodological development), Emmanuelle Dupont, IBSR, Belgium (consultation of experts), Klaus Machata, KfV, Austria (consultation of stakeholders), Rachel Talbot, University of Loughborough, U.K. (road safety management data collection), Gabriele Giustiniani, University of Roma, CTL, Italy (road safety management data storing facility), and Eleonora Papadimitriou, NTUA, Greece (road safety management data analysis and synthesis of results).

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