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Road Safety Data, Collection, Transfer and Analysis

Deliverable 1.5 Vol.II: Analysis of Road Safety Management in the European countries

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EXECUTIVE SUMMARY

The main objective of the DaCoTA project with respect to road safety management systems was to investigate the road safety management framework in European countries in order to help promote “good practice” and optimize management processes. Within this context, the road safety management investigation model proposed by Muhlrad et al. (2011) is based on several “good practice” criteria, defined by an exhaustive literature review, aiming to address the need for optimized road safety management systems, leading to better road safety performance, in a changing environment.

In this research, road safety management systems have been thoroughly investigated in 14 European countries in 2010, by means of interviews with both governmental representatives and independent experts in each country who filled in an extensive DaCoTA questionnaire on the degree to which the various road safety management systems meet the “good practice” criteria. 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

A shorter version of the DaCoTA questionnaire has also been prepared in collaboration with the European Transport Safety Council (ETSC). This questionnaire includes 11 key questions similar to those of the original DaCoTA questionnaire and was dispatched to the PIN panel of the ETSC, i.e. the 30 high level national experts from ETSC network of member organisations.

The combined use of the two questionnaires allowed on the one hand the coverage of basic road safety management elements for all European countries (DaCoTA/ETSC-PIN questionnaire), and on the other hand the full in-depth analysis for a subset of European countries (DaCoTA questionnaire).

The data was analyzed in two ways:

- **Qualitative analysis**: making a thorough analysis and cross-checking of the questionnaire responses and related comments of both the governmental representatives and the independent experts, in order to draw a reliable and accurate picture or “profile” for each country, and allowing in-depth country comparisons for selected key items.
- **Quantitative analysis**: using statistical methods to identify patterns, correlations and rankings of countries, as regards both the road safety management characteristics, and the relationship between road safety management and road safety performance.

The two types of analyses had therefore different yet complementary objectives, and their combination allowed for full exploitation of the wealth of data gathered by the DaCoTA team. More specifically, the present research contributes the following analyses and results:

- **Road safety management country profiles**: road safety management systems in the 14 European countries are analysed and compared to a reference “good practice” system, meeting all the criteria defined in DaCoTA, on the basis of the extensive DaCoTA questionnaire. Road safety management structures and outputs are described according to the policy-making cycle (agenda setting, policy formulation,

adoption, implementation and evaluation) and set against the background of a typical hierarchical national government organization.

- **Country comparisons**: country comparisons are carried out for all 30 European countries for specific issues within each area of road safety management, in order to understand how the different countries in Europe handle their road safety management systems and whether the model developed under DaCoTA can serve as a useful tool for comparing different national solutions. For this analysis, apart from the DaCoTA questionnaire, the DaCoTA/ETSC-PIN data, as well as additional data sources from the literature, were also exploited.
- **Clustering of countries on the basis of road safety management components**: statistical clustering techniques are used to group and rank the 14 European countries on the basis of their level of availability of the various road safety management "good practice" elements, separately for each one of the five areas of the DaCoTA questionnaire. A final global ranking of countries in terms of their road safety management system as a whole is also presented.
- **Statistical models linking road safety management with road safety performance**: regression models were develop in order to test whether road safety management is associated with road safety performance, within the framework of the SUNflower methodology for road safety management systems. Different road safety outcomes (fatalities, reduction in fatalities, Safety Performance Indicators - the intermediate outcomes) were tested against road safety management indicators and other background variables.

The results of the DaCoTA 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. One clear finding is that similar performance in road safety management can be achieved by means of differing structures and implementation processes. Similarly, similar road safety performance in terms of final outcomes (i.e. fatalities) may be the "result" of substantially different road safety management systems.

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 relation between road safety performance and road safety management in the different countries, there appeared to be little or no effect of road safety management features on safety performance, and background indicators (GDP, level of motorisation) were dominant over road safety management effects. However, road safety management was found to be (weakly) associated with safety performance indicators (SPIs), reflecting the operational level of road safety in each country – these are considered "intermediate" outcomes, affecting in turn the "final" outcomes, i.e. road safety casualties.

The weak relationship between road safety management and road safety performance is attributed to the fact that the European countries do not exhibit big differences in road safety

performance, and no big differences in road safety management overall - a minimum acceptable level exists in both cases. Another factor that should be taken into account is the time of observation. In some countries, road safety management components may be so recent that they hadn't yet had the time to deploy their full potential; or they may have been around for such a long time that their impact has already gradually faded away. Moreover, the evolution of road safety management may be associated with the evolution of road safety performance, but no data was available to examine this temporal dimension.

Another finding concerns the differences observed between expert's and government's responses, the latter tending to be more positive, especially as regards the role of the parliament, the availability of programmes, the resources and funds allocation, the reporting procedures, the information of citizens etc. It was concluded that expert responses may reflect an independent and more objective view and that future analysis might better use experts' opinion as a prime source.

On the basis of the results of the present research, the following key messages and recommendations can be outlined:

- **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

ACKNOWLEDGMENTS

The DaCoTA WP1 group would like to address special thanks to the governmental representatives and the independent experts of the 14 European countries analysed, for filling in the questionnaire and providing useful and insightful comments on the road safety management systems in their countries.

The group is also grateful to Prof.Richard Alsop, Chairman of the ETSC PIN panel, for his useful comments and remarks on the results of this research.

1. BACKGROUND AND OBJECTIVES

In Muhlrad et al. (2011) a road safety management system is defined as “a complex institutional structure involving cooperating and interacting bodies which supports the tasks and processes necessary to the prevention and reduction of road traffic injuries”. By definition, a road safety management system should meet a number of “good practice” criteria spanning the entire policy making cycle, from agenda setting to policy formulation, adoption, implementation and evaluation, and including efficient structure and smooth processes, in order to enable evidence-based policy making.

A basic assumption underlying the present research is that effective organization of road safety management is one of the conditions for obtaining good road safety results at country level. Moreover, as road safety is becoming more and more integrated into broader scoped transport or environment policies, and given the effects of the current economic recession on road safety resources, the need for optimization of road safety management systems becomes even more pronounced.

Within this context, the road safety management investigation model proposed by Muhlrad et al. (2011) is based on several “good practice” criteria, defined by an exhaustive literature review, aiming to address the need for optimized road safety management systems, leading to better road safety performance, in a changing environment.

The main objective of the DaCoTA project with respect to road safety management systems was to investigate the road safety management framework in European countries in order to help promote “good practice” and optimize management processes. More specifically, the research objectives addressed were as follows:

- To formulate hypotheses of “good practice”, to be validated, and criteria to assess “good practice” in each country
- To describe and document the road safety management systems of European countries in terms of institutions, processes, tasks and outputs.
- To identify patterns and particularities of road safety management systems in Europe and group countries on the basis of road safety management systems characteristics
- To investigate the link between road safety management and road safety performance

For that purpose, road safety management systems have been thoroughly investigated in 14 European countries in 2010, by means of interviews with governmental representatives and independent experts in each country who filled in an extensive questionnaire on the degree to which the various road safety management systems meet the “good practice” criteria. 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

A shorter version of the DaCoTA questionnaire has also been prepared in collaboration with the European Transport Safety Council (ETSC). This questionnaire includes 11 key questions similar to those of the original DaCoTA questionnaire, together with some additional items, and was dispatched to the PIN panel of the ETSC, i.e. the 30 high level national experts from ETSC network of member organisations.

The combined use of the two questionnaires allowed on the one hand the coverage of basic road safety management elements for all European countries (DaCoTA/ETSC-PIN questionnaire), and on the other hand the full in-depth analysis for a subset of European countries (DaCoTA questionnaire).

The data was then analyzed in two ways:

- **Qualitative analysis**: making a thorough analysis and cross-checking of the questionnaire responses and related comments of both the governmental representatives and the independent experts, in order to draw a reliable and accurate picture or "profile" for each country, and allowing in-depth country comparisons for selected key items.
- **Quantitative analysis**: using statistical methods to identify patterns, correlations and rankings of countries, as regards both the road safety management characteristics, and the relationship between road safety management and road safety performance.

The two types of analyses had therefore different yet complementary objectives, and their combination allowed for full exploitation of the wealth of data gathered by the DaCoTA questionnaire.

More specifically, in Chapter 2 of the present report the data collection and handling procedures are described, in terms of data sources, data collection processes , data checking and processing etc. Moreover, the dedicated data storage facility, used to code, store and process the questionnaire responses, is described.

Chapter 3 presents the results of the qualitative analysis of the road safety management questionnaire responses. First, "country profiles" are presented on the basis of the in-depth analysis for the 14 countries, according to the road safety management structure and processes in each country, in relation to a "reference" country meeting all the "good practice" criteria proposed by DaCoTA. On the basis of these criteria, a good practice "diagnosis" is carried out for each country, including the good practice elements and the elements needing improvement. Then, country comparisons are carried out, for each area of road safety management, and with particular emphasis on those elements which were revealed as most critical by the individual countries' analysis. The data collected on the basis of the common DaCoTA/ETSC-PIN questionnaire have been used as complementary sources in the country comparisons, as they allow the investigation of a larger set of countries.

Chapter 4 includes the various quantitative analyses carried out, aiming to identify patterns of road safety management and link those to road safety performance. First, a cluster analysis was performed, grouping countries with similar road safety management characteristics, for each one of the five areas of the questionnaire separately, and countries are ranked on the basis of road safety management. This analysis was carried out both for the experts' responses and for the governmental representatives' responses. An overall ranking of countries is finally produced, and a first attempt to establish a statistical link with road safety performance is presented. A more detailed analysis of the possible links between road safety management and road safety performance is then carried out, using a subset of the DaCoTA questionnaire, namely the common DaCoTA/ETSC-PIN questions.

In Chapter 5, an overview of the results of the qualitative and quantitative analyses is provided, and a synthesis of the key finding is made, followed by recommendations for the

improvement of road safety management at national, regional and European level, together with needs for further research.

2. DATA COLLECTION AND HANDLING

2.1. Data Collection

The primary data collection tool for information about Road Safety Management (RSM) was a questionnaire. A thorough report on how this questionnaire was developed and the theory behind it can be found in Muhlrad et al (2011)[1]. A copy of this questionnaire can be found in Appendix I.

Given that Road Safety Management is a complex topic, the choice was made to have the questionnaire filled in on the basis of an interview, either face to face or via the telephone. To aid understanding, it was also important for these interviews to be conducted in the native language of the interviewee. Therefore the initial sample of target countries was those where the DaCoTA WP1 partners could converse in the native language. The partners represented 12 countries: Austria, Belgium, Finland, France, Greece, Israel, Italy, Latvia, the Netherlands, Poland, Spain, and the United Kingdom and were able to collect data in the native language of a further 2: Ireland and Switzerland. In order to maximise the representativeness of the sample, questionnaires were sent by email to road safety actors in Latvia and Spain to fill in independently without an interview. However clarifications were sought when necessary.

Two groups of road safety professionals were targeted:

- Government representatives: Road safety practitioners who are or have been directly involved in policy and decision making over a long enough period of time for them to have acquired wide-ranging experience in road safety,
- Independent experts: Road safety researchers or scientists who may contribute to policy but do not have a decision making role and could offer a non-partisan view of the Road Safety Management systems in place.

This approach was taken to try and gain as detailed and accurate an overview of each country's Road Safety Management system as possible.

2.1.1. Completed questionnaires

Completed questionnaires were entered into an on-line data Storage Facility by the partner who conducted the interviews/collected the email responses. This Storage Facility allowed data to be viewed and downloaded for analysis and is fully described in Section 2.4.

Table 2.1 shows the number of questionnaires included in the Storage Facility for each country and whether the Road Safety professionals interviewed were classed as Government representatives, Independent experts, or both.

[1] Muhlrad, N., Gitelman, V., Buttler, I (Eds) (2011) Road safety management investigation model and questionnaire, Deliverable 1.2 of the EC FP7 project DaCoTA. Available from www.dacota-project.eu

Country	Government Representative	Independent Expert	Both	Total
Austria		1		1
Belgium	1	1		2
Finland	1		1	2
France	1	1		2
Greece	1	1		2
Ireland			1	1
Israel	1	1		2
Italy	1	1		2
Latvia	1	1		2
The Netherlands	1		1	2
Poland	2	1		3
Spain		1		1
Switzerland		1		1
United Kingdom	1	1		2
Total	11	11	3	25

Table 2.1: Questionnaires collected by country and road safety professional type

2.2. Data Checking and Handling

Once all questionnaires were entered into the Storage Facility, two data reviews took place. The first, a data consistency check, aimed to identify missing or erroneous data. Each questionnaire was briefly reviewed by the same person and possible errors or omissions were discussed with the partner responsible for entering the data into the Storage Facility. An example of this is when a main question was answered 'no' but sub questions were answered instead of being left blank. The first review identified a number of errors relating to the intended meaning of questions and how questionnaires were answered. It also highlighted a number of cases where 'yes' and 'no' answers were followed by comments suggesting that in reality the answer should be partially yes. Therefore, a second more detailed review of questionnaires was undertaken to ensure consistency across all questionnaires.

The second review involved a detailed examination of all the comments within each questionnaire to identify misunderstandings, fill in missing data that could be safely inferred from comments and identify further inconstancies. Comparisons were not made between questionnaires from the same country and no attempt was made to resolve differences in answers for the same country. For consistency one person, who had not conducted the first review, carried out this second data review. Data changes and additions were proposed for each questionnaire and were agreed by the partner responsible for entering the questionnaires in the Storage Facility. The number of changes/additions varied between questionnaires, but the majority involved entering data in a more complete form or removing erroneous responses. In a few cases answers were changed as a result of comments or

other answers in the questionnaire. Two examples of the type of changes made during the reviews are below:

One sub question asked "Have the targets been defined…" and gave three options:

a. on a purely national political basis?
b. on the basis of the European road safety targets?
c. using a rational process?

In a number of questionnaires "yes" was answered for b. and/or c. in addition to "a. on a purely national political basis". In these cases the answer to a. was changed to 'no' as by selecting another option the respondent was indicating that target definitions were not exclusively ("purely") generated on the basis of national politics.

In one questionnaire "yes" was selected for the question "Is funding allocated to evaluation?", but the respondent's comment stated "very little and sporadically". This was changed to "no" as this was thought to be a better fit for the comment.

These two reviews described above resolved the majority of queries concerning the questionnaire data, however this was not possible in the case of the first question: "Has a high level inter-sectorial decision-making institution been established to prepare policy orientations or directions for Road Safety?". Many countries appear to have institutions that nearly met the full criteria of the question but were not for example 'inter-sectorial' and/or 'decision making' as understood by DaCoTA. The interviewee nevertheless answered "yes" to the question. As a result, some additional codes for analysis were developed to indicate which country's institutions met which aspects of the DaCoTA criteria. The codes and corresponding definitions are described in section 2.2.1.

2.2.1. Additional Road Safety Management questionnaire codes

As a result of the two data reviews, additional codes were generated for the first question:

Q1. Has a high level inter-sectorial decision-making institution been established to prepare policy orientations or directions for RS?

If the answer was 'Yes', the following additional codes were added to the data:

Intersectoral (multiple ministries)	Yes/No/Unknown
Decision making institution	Yes/No/Unknown
Responsible for preparing Policy orientation or direction for RS	Yes/No/Unknown

The following definitions were used to generate the additional codes:

Intersectoral institution: A specific institution for organising the work of selected ministers or ministries

Coding note: 'yes' was used when multiple ministries are represented by the institution

Decision making institution: One institution with the legal competence to issue decisions that other institutions must comply with.

Coding note: If the above is only theoretical and never occurs in practice this was coded 'no'.

Responsible for preparing Policy orientation or direction for RS: An institution which by law or under a government decision is responsible for preparing a draft road safety programme or propose priority road safety actions

2.3. Alternative Data Sources

As it was only possible to collect detailed data on the Road Safety Management structures of 14 countries, alternative data sources were examined to see whether data could be collected for additional countries. DaCoTA collaborated with the European Transport Safety Council (ETSC) to collect additional questions through the ETSC Road Safety Performance Index (PIN) panel members. 11 questions, comparable to the DaCoTA questions, were answered by the PIN panel members (these are summarised in section 4.3, Table 4.9 of this report). This gave a general overview of the Road Safety Management system in 29 countries, although in much less detail than the DaCoTA data. This additional data allowed a quantitative analysis to be attempted that linked Road Safety Management with Road Safety Performance in that country.

2.4. Online Data Storage Facility

In order to store and analyse the questionnaires filled in by the national experts and easily exchange the information among the DaCoTA partners a storing facility was developed. Another possible future use of the Storing facility is related to monitoring the Road Safety management procedure development in the member states in order to assess how the modifications in RSM structure effect Road safety outcomes.

The Application is composed of three main components (Figure 2.1):

- a web application, to input, modify and browse the data;
- a database to store the data;
- a server to host the web application and the database.

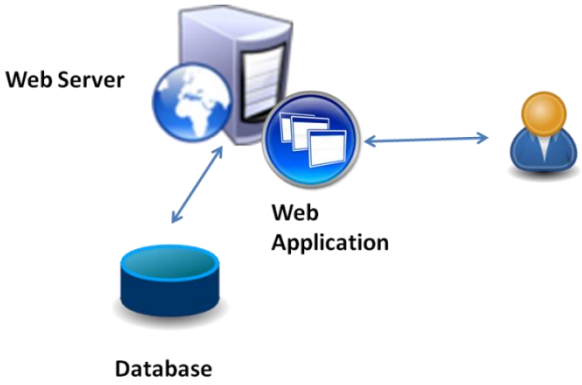


Figure 2.1: Application components

The web application is the user interface. It was partially developed using C Sharp programming language and partially developed and installed in the Dot Net Nuke (DNN) Community Edition Content Management System. A specific module, called "helferlein_form", has been used to implement the questionnaires.

The access to the web application is restricted only to accredited users. There is a login section to access in a private area (Figure 2.1) where the following tasks can be performed:

- insert a new interview (each user can insert one or more questionnaires for the same member state, for the same year or different years);
- modify a stored interview (this operation is allowed only for the user that created the interview). This option is useful if an user wants to start an interview, save some answers and recover his work later to complete filling operations;
- browse one or all the stored interviews by all the users;

- download the stored interviews in a file (txt file that can be imported in an excel sheet).

since the questionnaires were revised for the same questionnaire it is possible to download the original one or that revised by DaCoTA project partner.

The credentials, during the DaCoTA project, have been provided by CTL.

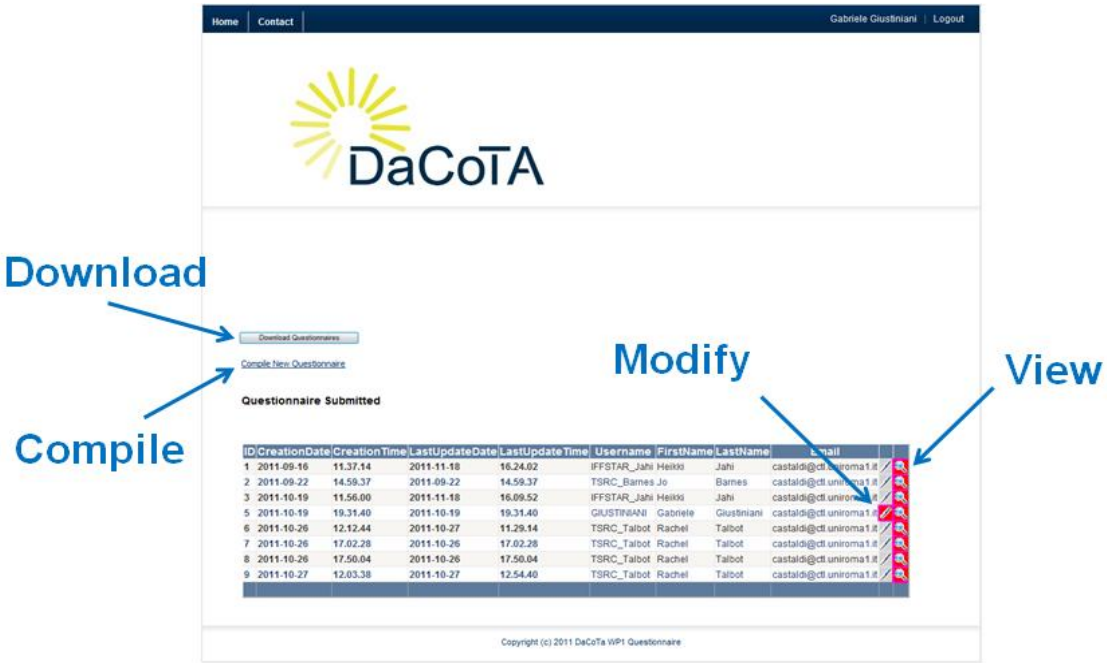


Figure 2.1: Private area functionalities

In a generic data insertion session, a user can choose to save inserted data (data are then saved on the database) and continue data insertion or save and exit or exit without saving. User can restore a saved questionnaire to make any modifications or add new data.

For each question it is also possible to insert the comments that are stored together with the question answers, which can be seen by a browsing user and downloaded together with the other data.

There are some support functions (Figure 2.2) to help user in compilation, for example:

- E- mail form: this function allows an user to receive an email with all the answers entered (including the respondent' comments)
- Reset button: this button clears an Yes/No/ Unknown entry for a given question;
- Spell checker: to check the spelling of a text area of the comments.

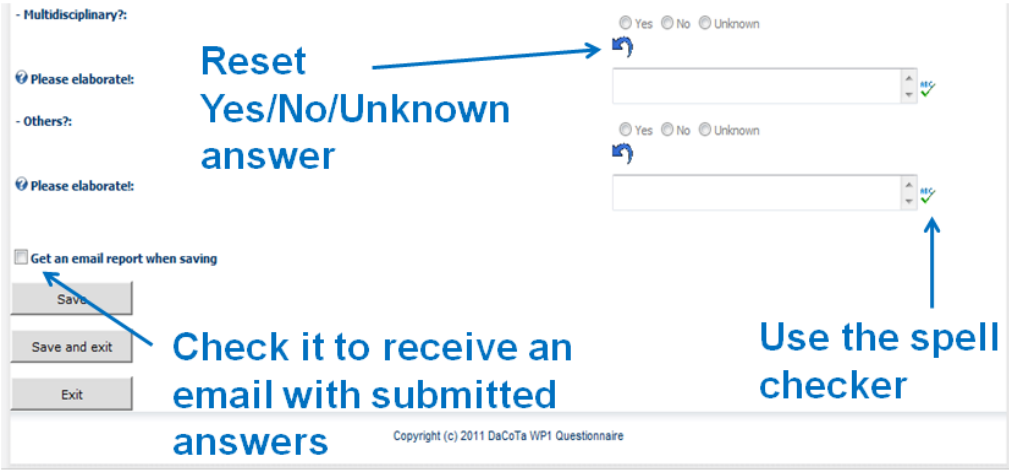


Figure 2.2: Support functions

In the database is stored not only questionnaires data (the answers to the questionnaire and the related comments), but also all data used to manage access policy and to handle the dynamic creation of web application pages. We used Microsoft SQL 2005/2008 Express Edition to support the database where data of the questionnaire will be saved.

The web application and the database are published on a CTL Server and are reachable through a public IP address using a common client web browser (Internet Explorer or Mozilla Firefox).

3. QUALITATIVE ANALYSIS:

3.1. Methodological description:

The questionnaire prepared for the assessment of road safety management (see Appendix I for the complete questionnaire and Muhlrad et al., 2011, for a detailed description) was particularly intended and shaped for quantitative analysis. However, as explained in the previous section, special attention was also given to providing opportunities for explanations and comments for use in qualitative analysis. The results described in this section are thus based on both the coded answers to the questionnaire and those comments from the experts interviewed.

In most of the fourteen countries included in our study sample, at least two experts were interviewed, one as a scientist with some practice of working with policy-makers, another personally involved in the road safety management system. In a number of cases, the answers provided by each type of expert seemed to lack consistency, which became an issue for quantitative analysis. For qualitative analysis on the contrary, the points of disagreement identified provided additional information: interpretation of the road safety management situation is bound to be different for somebody whose duty is to defend the system he is a part of, and for an external scientific expert whose job it is to be critical about what exists with a view to improve the system. Cross-analysing comments from both sides proved to clarify the final picture of the country's situation. In one case, the UK, real contradictions could not be eliminated and appeared to be due to a changing road safety management system about which the government expert had more information than the scientific one. In all cases, getting interviews from several country specialists was found very useful to get the full picture of road safety management at the national level.

Qualitative analysis was carried out in two complementary ways: first, country by country to describe the existing RS management systems in Europe and compare them to a typical "good practice" system; in that case a "*country profile*" was established for each country where interviews were conducted (14 countries). This analysis is presented in Section 3.2. Second, on the basis of question by question comparisons performed for items in the questionnaire concerning specific issues. Note that, for this comparison of countries, additional data sources (DaCoTA/ETSC-PIN questionnaire) have been consulted, so that in total 30 countries are examined.

The country profiles describe road safety management structures and outputs according to the policy-making cycle (agenda setting, policy formulation, adoption, implementation and evaluation) set against the background of a typical hierarchical national government organization (Figure 3.1). Because such a typical organization is not suited to managing road safety policies which involve most government sectors, specific structures have been set up in most countries, modifying or short-circuiting the typical hierarchical administration. For each country, these structures as well as the working processes were charted to provide a graphic picture of the road safety management situation ("country profile"). Focus was on the national organization and the relations between national and regional/local structures and not on road safety management at the decentralized level, as it was agreed at an earlier stage of methodology building that this aspect could not be tackled in the time-frame of the DaCoTA project. Looking at the various country profiles, it is necessary to bear in mind that some countries are now undergoing an evolution process, and that the current situation may already be different from what was described by the experts interviewed before the beginning of 2012. This indicates that country profiles will need to be up-dated at reasonably short intervals.

It is to be noted that, as English had to be used as the common language for the analyses, the comments and observations provided by the persons interviewed had to be translated

from their home language, so the names or titles of the national structures described may not be entirely accurate; more attention has been given to their position, role and activities than to their denomination.

The most complete RS management system which would be obtained for a country fulfilling all the "good practice" criteria identified in our methodology was used as a *reference* (Fig. 3.2). For each country, "good practice" elements, lack of such elements and peculiarities were summarised in a diagnosis table including structures, processes, policy-making tasks and outputs according to the investigation model developed in deliverable 1.2. The analysis work was performed by four members of the WP1 team and cross-checked by the whole team.

Finally, countries were compared both on their global RS management system and on specific questions.

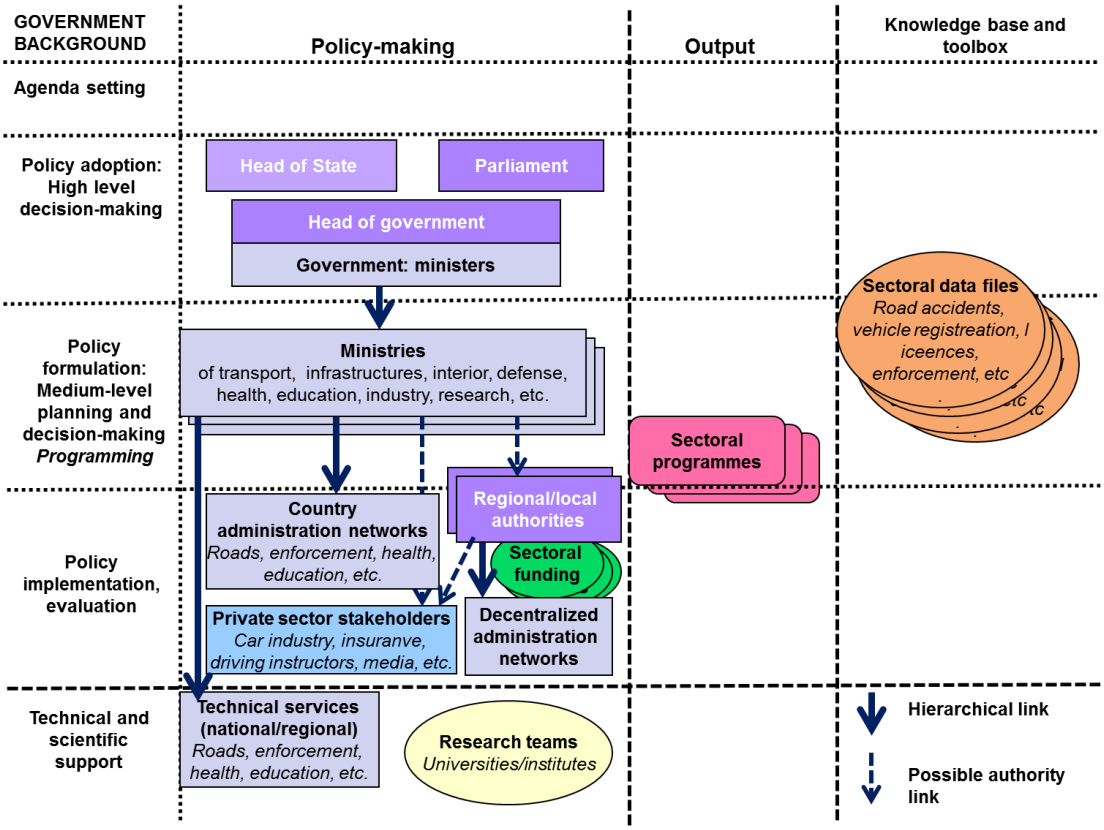
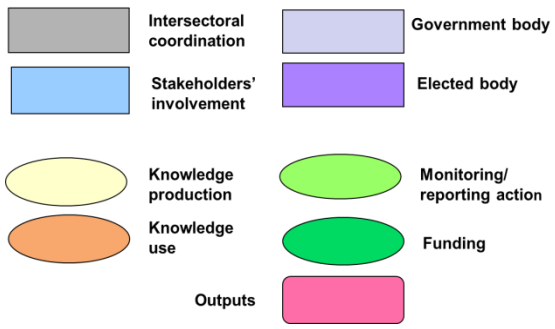


Figure 3.1: Government organization background

Legend:



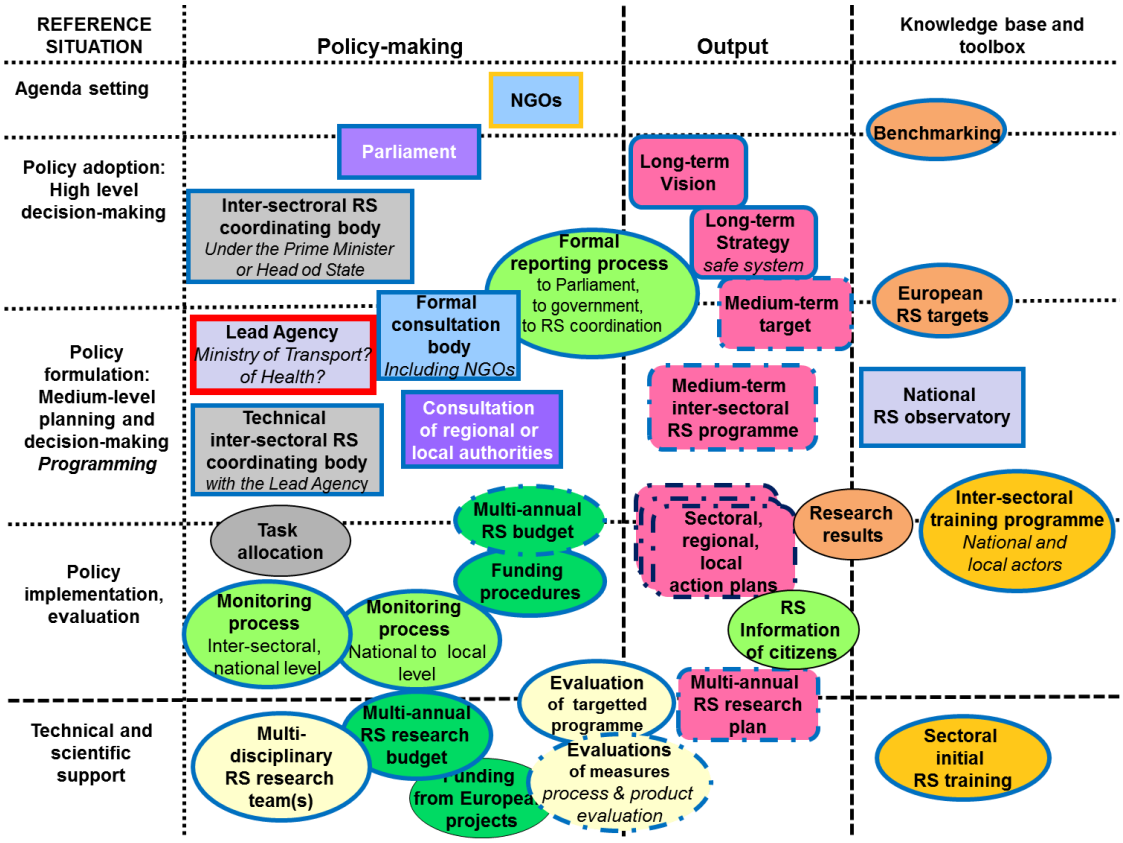
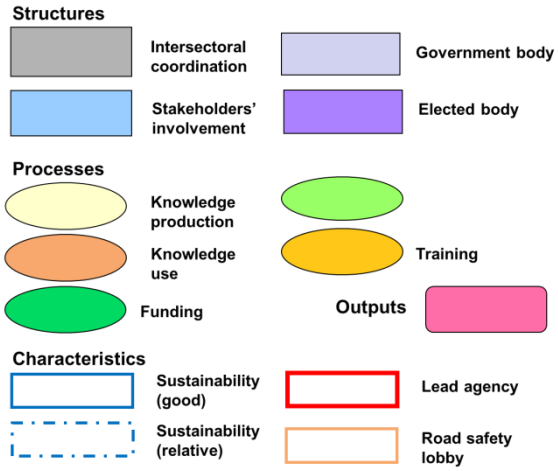


Figure 3.2: Reference country profile

Legend:



3.2. Country profiles:

The 14 European countries selected in our sample are examined below in alphabetical order. For each of them, a summary of the road safety management system is provided, together with the graphical picture of the country's profile, on the basis of the extensive DaCoTA questionnaire (see Appendix I).

3.2.1. Austria

In Austria where RS management has been fairly centralized until now, the Lead Agency is the Ministry of Transport, Innovation and Technology (bmvit) which is responsible for road safety at the national level, adopts the multi-annual RS programme and gets it adopted by the government. Bmvit also publishes an annual RS report which covers accident and injury figures and a limited number of policy issues.

Under bmvit, the Austrian Road Safety Advisory Council established in 2006 serves as the institutional platform for cooperation of partners in the Road Safety Programme. Its members are transport spokespersons for the parliamentary political parties, safety experts for all modes of transport and representatives of government ministries, local and regional authorities, automobile clubs, chambers of commerce and industry, trade and labour associations, interest groups and research institutions.

Within the Advisory Council, a sub-group of members form the Roads Task Force whose tasks are to prepare the national RS programme, offer support to regional/local authorities involved in its implementation and monitor the implementation process. In particular, The Road Task Force should make sure that regional RS programmes take account of the philosophy, approach and objectives of the national road safety programme.

There is no formal inter-sectoral coordination structure, so horizontal coordination is performed by the bmvit with other ministries on a cooperation basis.

Road safety policies are essentially knowledge-based: scientists and experts are involved in the work of the Road Task Force and consulted by politicians when decisions are made, and comprehensive RS reviews (accident statistics, behavioural characteristics, institutional framework, international comparison, etc.) have been the basis for road safety programmes so far. However some political decisions are not based on scientific evidence.

Austria has a vision referring to benchmarking ("to be one of the five safest countries in Europe"). The current national road safety programme (2011-2020) includes a strategy based on Safe Systems and stating nine guiding principles, a long term target (2020) and a medium term one (2015), some sectoral sub-targets and an action plan of 250 measures. The implementation tasks have been allocated to a number of key actors, including local/regional authorities and some NGOs.

However, no budget has been estimated for programme implementation, and funding must be drawn from the budget of the key actors with a complement from the Road Safety Fund, established on the basis of motorists' contributions (fees for personalized number plates). Since 2010, the Road Safety Fund has issued invitations to tender twice a year on funding priorities aligned with Road Safety Programme targets. In addition, 20% of the income from fines is allocated to road safety enforcement (staff & equipment). Overall, funding is found insufficient and interventions have to be tailored to what is available.

Austria has scientists (e.g. in KFV, Technical Universities, Austrian Institute of Technology) who can run multi-disciplinary research, but their work depends on the funding available. There is no special research budget although some of the money accumulated by the Road Safety Fund can be used for this purpose. Research is also funded under EU projects. In such conditions, there can be some doubts as to the sustainability of the scientific support.

There is no global training plan for road safety decision-makers or the actors involved in implementation. The offer of training solutions is scarce. Existing road safety courses apply only to selected groups (e.g. urban planners, road engineers, , road safety auditors and inspectors).

Diagnosis: Austria	
"Good practice" elements	✓ A Lead Agency acting as inter-sectoral coordinator at medium policy-making level (programming and implementation). ✓ A formal structure for stakeholder consultation (including regional/local authorities, NGOs and businesses). ✓ A "Task Force" preparing the action programme, offering technical support to local stakeholders, and acting as "vertical" coordinator (between the national and regional levels) for policy-making and implementation. ✓ A long term target (or "vision"). ✓ Mostly knowledge-based policy-making, good interaction between managers and scientists, use of benchmarking and international knowledge. ✓ A targeted national road safety programme based on "Safe Systems" and including allocation of tasks to key stakeholders. ✓ Road Safety Fund based on motorists' contributions, to supplement institutional funding. ✓ Availability of multi-disciplinary research teams.
Elements needing improvement	✓ No formal inter-sectoral coordination structure at the medium policy-making level. ✓ No integrated road safety observatory ✓ Very limited monitoring and reporting of road safety activities. ✓ No budget estimate for the action programme. ✓ No global road safety budget identifiable, interventions tailored to the funds available, insufficient funding overall. ✓ No systematic evaluation of the measures implemented ✓ No steady research budget, insufficient funding. ✓ No training plan for road safety actors. ✓ Low offer of training solutions.

Table 3.1: Good Practice Diagnosis – Austria

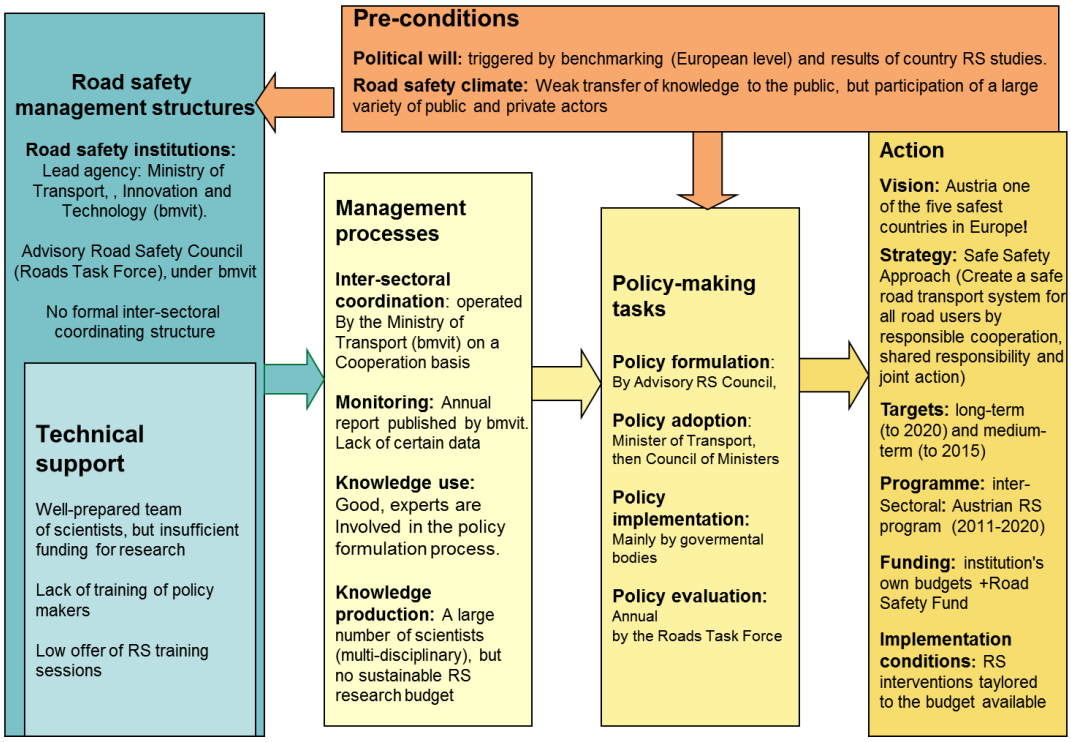


Figure 3.3. Overview of road safety management good practice elements in Austria

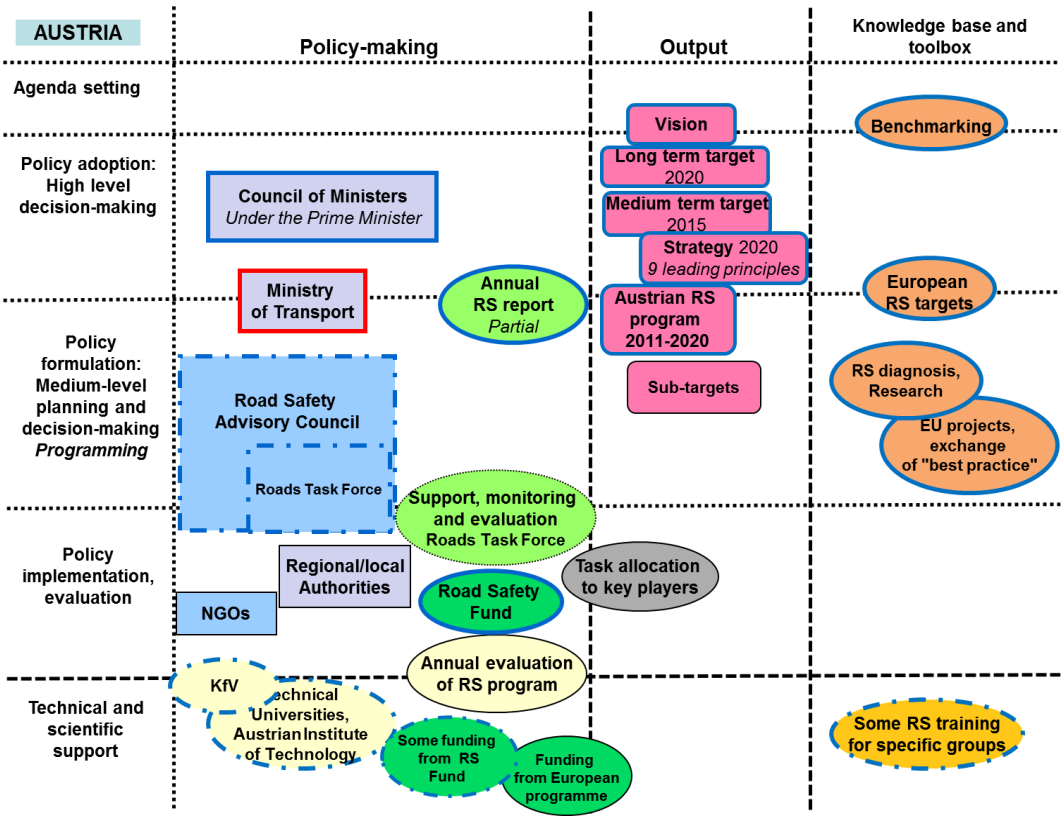


Figure 3.4. Structures, processes and outputs in Austria

3.2.2. Belgium

The body responsible for formulating Road Safety policy in Belgium is the Inter-Ministerial Committee (IMC) for Road Safety. Both national and regional ministers are members of the committee which reports to the Federal Minister for Mobility. Although the members are decision makers, it is up to the responsible ministers to implement decisions in their area and there is no legal impetus for this.

Although there is no officially defined lead agency, the Task Force for Road Safety, which operates under the IMC, coordinates and follows up decisions made by the IMC. However there is no formal reporting procedure.

The Federal Commission for Road Safety is an inter-sectoral institution which was established as a forum for all stakeholders involved in road safety. The Commission includes national and local government representatives and NGOs.

The Belgium Road Safety Institute (IBSR) is a research institute that collects data and conducts research on road safety; research results are then fed into the policy making process. IBSR is represented on the Task Force for Road Safety and its managing director is the chair of the Federal Commission for Road Safety. Thus research and practice are structurally linked.

The road safety programme “Staten Generaal van de Verkeersveiligheid 2011-2020” (general state of road safety) follows the European Commission targets and timescales. It includes both targets and recommendations for action, and monitoring of progress is planned to be performed half way through and at the end of the programme.

There is no specific road safety budget from the federal Treasury. However taxes on vehicle inspections and driving license examinations are used to finance IBSR and fines generated from road safety interventions are passed to the police to be used for further road safety work.

Diagnosis: Belgium	
"Good practice" elements	✓ Inter-Ministerial road safety Committee for inter-sectoral and "vertical" coordination (between ministries and between the national and regional levels) in policy adoption. ✓ "Task Force" under the Inter-Ministerial Committee to follow up decisions and coordinate implementation (however with no real authority). ✓ A formal structure for stakeholder consultation (including local governments and NGOs). ✓ Mostly knowledge-based policy-making, structural links between research (IBSR) and practice, use of benchmarking. ✓ A national Road Safety Observatory. ✓ Availability of a multi-disciplinary research team (at IBSR). ✓ Some sustainable funding for IBSR, based on taxes on vehicle inspection and driver licensing. ✓ A national targeted medium-to-long term road safety programme. ✓ Some monitoring of progress, mostly informal. ✓ Some multi-disciplinary road safety training courses on offer.
Elements needing improvement	✓ The Inter-Ministerial road safety Committee reports to the ministry of Transport (not to the higher government level). ✓ No long term vision. ✓ Sectoral implementation of the road safety programme with no formal monitoring and reporting procedure; the programme is not legally binding for the ministries involved. ✓ No budget estimate for the action programme. ✓ No global road safety budget identifiable, no guarantee of sufficient funding to implement the programme. ✓ Limited funding for research. ✓ No evaluation of safety measures so far (but it is planned). ✓ No training plan for road safety actors.

Table 3.2: Good Practice Diagnosis – Belgium

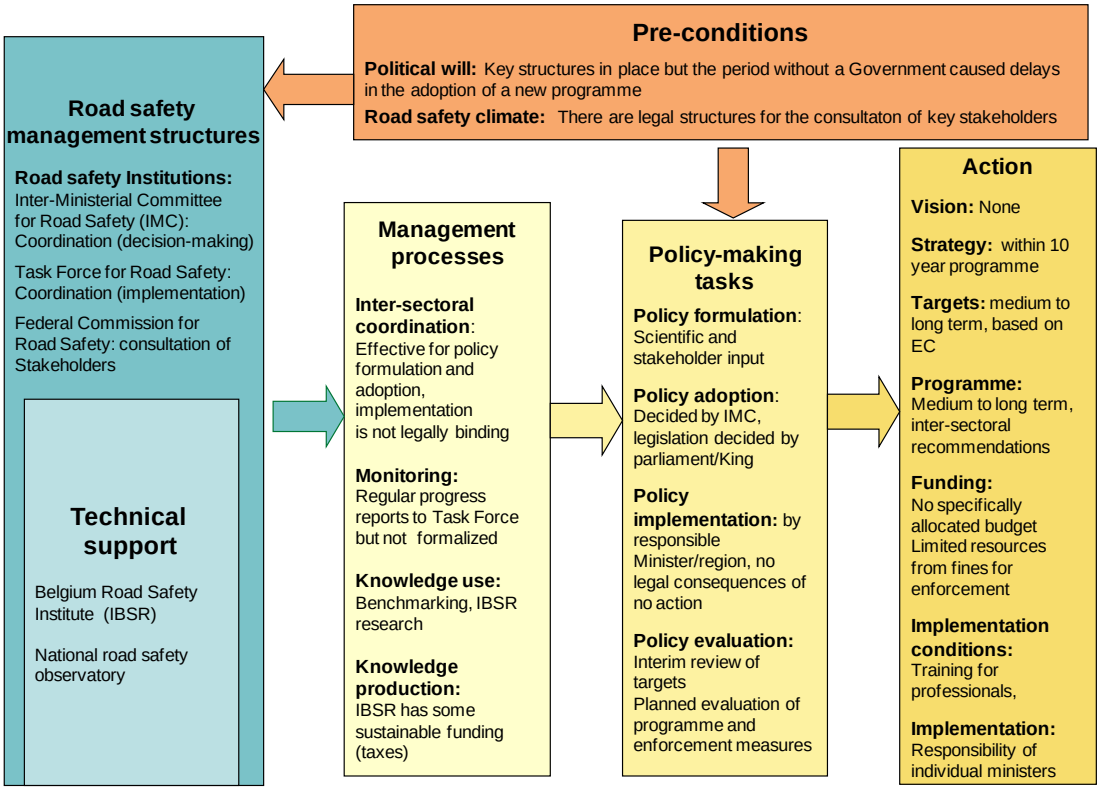


Figure 3.5. Overview of road safety management good practice elements in Belgium

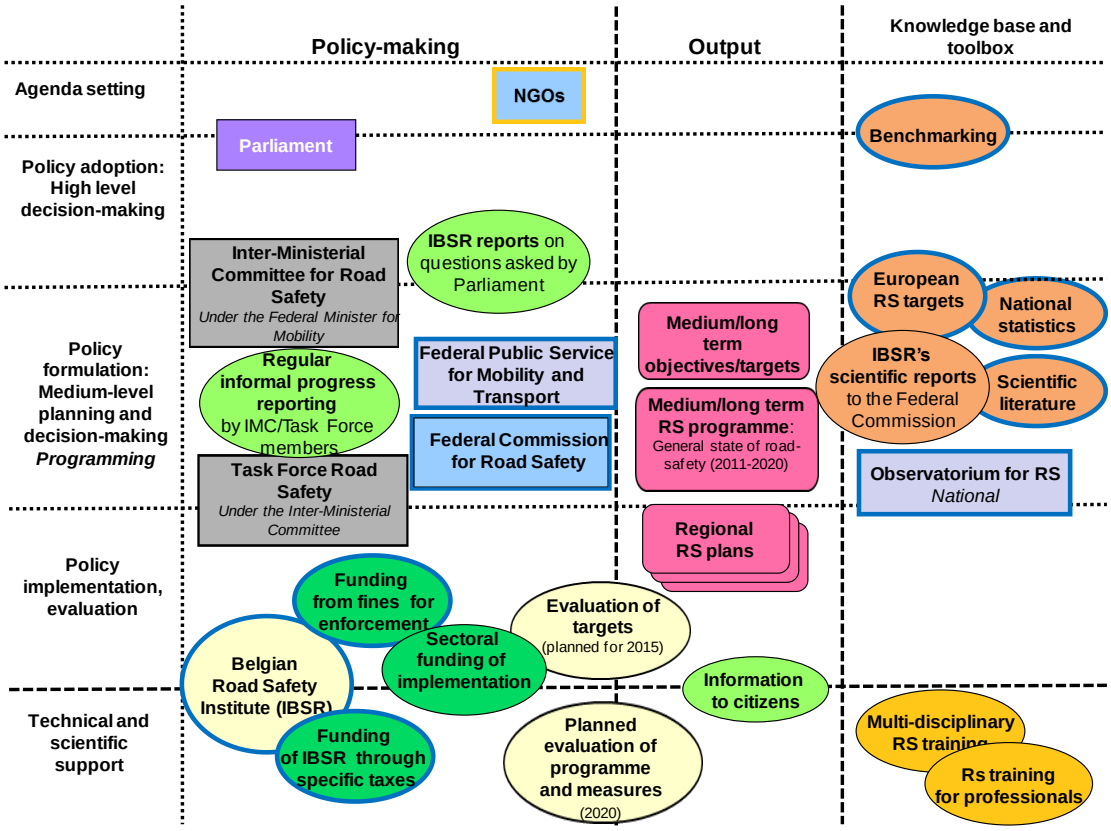


Figure 3.6. Structures, processes and outputs in Belgium

3.2.3. Finland

In Finland, Parliament has played an active role in RS and has been at the origin of the structure of the current RS management system, in particular of the creation of the Traffic Safety Council. Parliament also adopts general policy orientations.

The Finnish road safety management system puts a lot of emphasis on national-regional cooperation. There is both horizontal and vertical coordination for policy formulation through the Traffic Safety Council (TSC), a consultative but powerful structure which has been created by decree under the Ministry of Transport and Communications (MoTC). TSC includes representatives of government ministries, of regional and local authorities and of one NGO (Liikenneturva). It is TSC that prepares the Road Safety Plan. Moreover, broad rounds of consultations of stakeholders take place before major decisions.

MoTC is globally responsible for RS. Within the Ministry, the Finnish Transport Agency is responsible for delivery. Either of these bodies could be considered as Lead Agency; however, the concept does not seem to have much meaning in Finland as RS action is highly decentralized and a national ministry has no jurisdiction over local authorities. Also in MoTC, The Traffic safety Agency works only on vehicle registration and inspection, and driver training and licensing; it has no responsibility over RS policy.

For short term programming and implementation, the Finnish Transport Agency also performs inter-sectoral as well vertical coordination (only to the regional level with the nine Centres for Economic Development). Besides, Liikenneturva, an NGO created by law and funded by the insurance sector and the government budget, deals with RS campaigns and education.

Finland has a vision (Vision Zero), voted by the Parliament as part of the Transport Policy package and adopted by the Council of State (the government in presence of the Head of State), a long-term strategy and a medium-term targeted programme, adopted by the government. The multi-annual programme is implemented in part by regional and local authorities and can be periodically adjusted. The Transport Agency negotiates regional targets in relation to the national one.

Implementation of the programme is divided between the different national and regional partners who have to find the funding for their road safety activities within their own budget. The coordination and consultation processes are obviously working as action gets under way across the board; however, experts agree that funding of road safety measures is insufficient in all areas, given the challenging target and vision.

There is some reporting of road safety activities through the Finnish Transport Agency to MoTC, and global reporting on road safety as one element of Transport policy from the government to Parliament; however, monitoring does not seem to be very efficient so that implementation is not entirely controlled.

Policy is essentially based on knowledge as research results are broadly used, but the relationship between research and practice is not as good as it used to be. Evaluation of the safety measures implemented (both process and product evaluation) is still the general rule and is performed with research institutions and consultants. There are multi-disciplinary research teams (in VTT, some universities), but although funding for research is included in the budget of several RS partners, sustainability has become doubtful.

Universities provide multiple training opportunities (a multi-disciplinary post-graduate RS course, sectoral courses or training sessions for professionals) but there is no overall training plan and this issue is left to the various RS partners.

Diagnosis: Finland	
"Good practice" elements	✓ Determining role of Parliament in stimulating Road Safety management and adopting policy orientations. ✓ Road safety policy is integrated into transport policy. ✓ Emphasis on national/regional cooperation. ✓ A consultative inter-sectoral structure for policy-formulation, including regional/local authorities and one NGO in charge of education and campaigns (Liikenneturva). ✓ Broad consultation of stakeholders before major decisions. ✓ The Finnish Transport Agency performs inter-sectoral coordination as well as "vertical" coordination (between the national and regional levels) for operational road safety activities. ✓ Liikenneturva is individually funded from government budget and the insurance sector. ✓ Mostly knowledge-based policy-making. ✓ A long-term "vision" voted in Parliament. ✓ A long term strategy and a medium term road safety programme adopted by the government. ✓ Evaluation of safety measures is current practice. ✓ Availability of multi-disciplinary research teams. ✓ Large opportunities for multi-disciplinary and disciplinary training from universities.
Elements needing improvement	✓ The main coordinating structure for policy formulation and implementation is only consultative and reports to the Ministry of Transport (not to the higher decision-making level). ✓ Consultation of non-governmental stakeholders does take place but is informal. ✓ No integrated road safety observatory. ✓ No budget estimate for the action programme. ✓ No global road safety budget identifiable, funding for road safety measures is insufficient in all areas. ✓ Some monitoring and reporting to Parliament, but insufficient to ensure control of implementation activities. ✓ The relationship between research and practice is not as good as it used to be. ✓ No coordinated research budget, sustainability of research funding questionable. ✓ No training plan for road safety actors.

Table 3.3: Good Practice Diagnosis – Finland

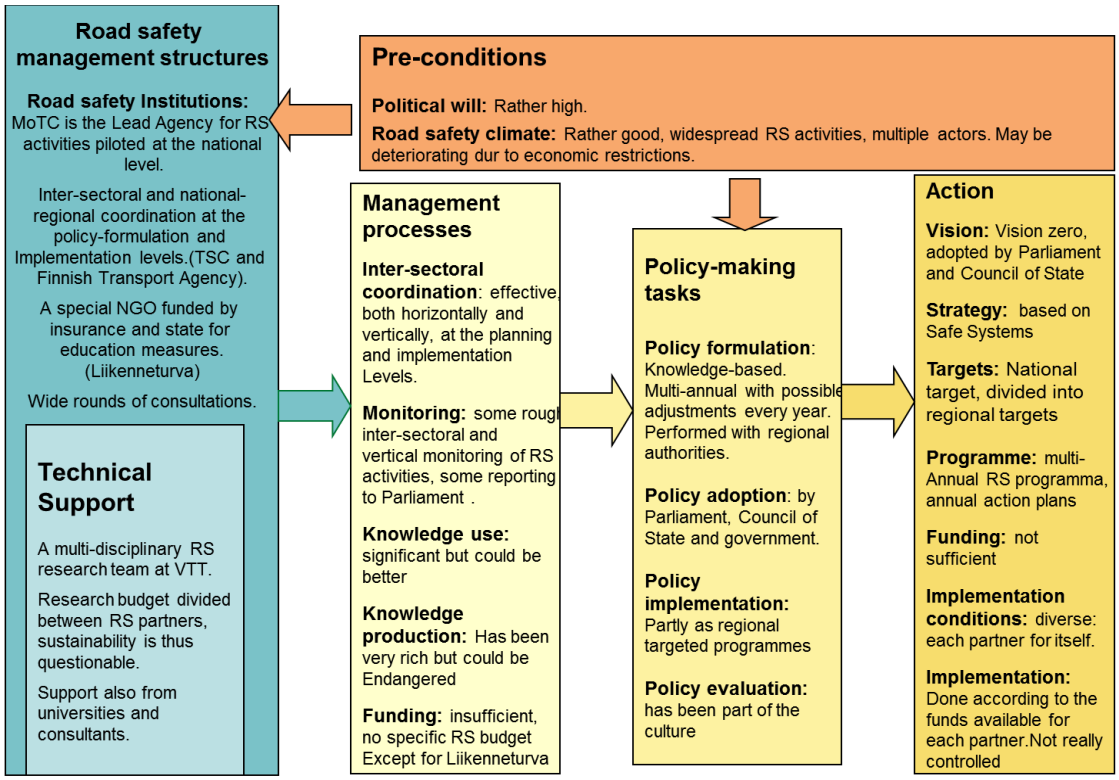


Figure 3.7. Overview of road safety management good practice elements in Finland

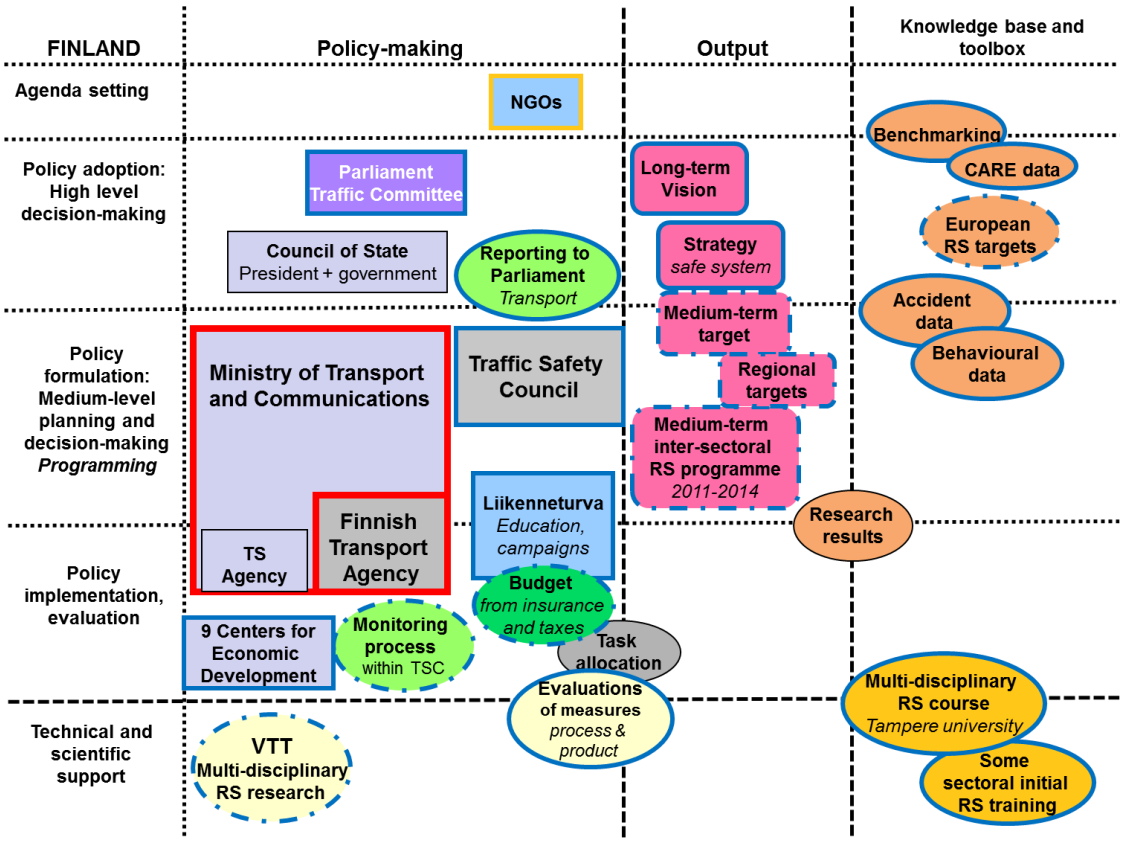


Figure 3.8. Structures, processes and outputs in Finland

3.2.4. France

After a successful period of road safety improvement, largely due to the introduction of automatic speed enforcement, France's road safety management system has recently been changing, and the new government in place since June 2012 has confirmed the Ministry of Interior as the new Lead Agency for road safety. As the previous operational RS coordinating structures were under the Ministry of Transport (Directorate for Road Safety and Traffic, DSCR), it was still unclear how things would get organized at the time the questionnaire survey was carried out. One has to remember that the following description is based on information gathered at the end of 2011.

The Parliament recently took some initiatives to develop RS policy but a new Parliament has just been elected and RS is not one of its current priorities. The Inter-Ministerial RS Committee (CISR, under the Prime Minister), created by decree in 1972, met twice a year to follow up road safety trends and adopt policy orientations. However, CISR has not been fulfilling its meeting schedule for a while, and there may therefore be doubts as to the sustainability of this structure.

The Ministry of Transport used to be the Lead Agency for road safety and, within it, DSCR was both the implementation agency in the transport sector and the inter-sectoral coordinating agency including representatives of other relevant ministries (Justice, Education, Interior, Health, Industry, etc.). With the Ministry of Interior as the Lead Agency, the coordinating role of DSCR at the inter-sectoral level may now be questioned. The Inter-Ministerial RS Observatory, which centralizes accident and behavioural data, and its network of regional observatories, remain sustainable decision-support tools as they are part of the administrative system.

Stakeholders are formally consulted through the National Road Safety Council (CNSR), created by decree in 2001 and whose members include representatives of Parliament, ministries, local authorities, transport related businesses and NGOs. CNSR also has its own Committee of scientific experts for support. However, CNRS was created without an identified budget and with a very imprecise definition of its attributions, so that, although it has worked in the past, its level of sustainability is low. CNSR has thus been dormant for some years and "waiting for re-activation".

No long-term vision for France has been formally adopted. The European ten-year RS target is supposed to serve as a vision but no long-term strategy has been adopted to support it.

Budgetary rules are used in lieu of planning and programming, so that annual RS programmes are designed and the road safety budget is voted as part of the national budget every year. This creates some stability but has also encouraged very short-term decision-making and has been used as a pretext for not designing any medium term action plan. As there is no multi-annual RS programme, RS interventions are adapted to the funds available rather than calibrated to reach the target. Scientific experts underline that available funding is insufficient and government representatives indicate that available manpower has been decreasing and is insufficient in all sectors.

RS policy was originally based on a systems approach, but there are now two separate budgetary lines, one for automatic speed enforcement and another for other safety interventions. This funding procedure, together with the decentralization of a large share of infrastructure safety to county level and moving Lead Agency to the Ministry of Interior (which, by essence, deals with individual or collective human behaviour), actually tip the balance: from a "Safe System". Road safety action is drifting towards putting emphasis on driver behaviour as a key factor and making drivers responsible for road safety performances.

In the present situation, reporting on road safety activities is a purely budgetary exercise. Road safety trends are monitored but there is no systematic effort at evaluation (one exception is the process and product evaluation study which was carried out on automatic speed enforcement at the intiative of the Road Safety Observatory). Fortunately, benchmarking at the European level has provided an incentive to keep up the RS effort.

The links between the national level and the “Département” (county) level used to be a strong point of French RS management. Vertical coordination was performed by DSCR through county-based Prefects and a coordination of all stakeholders at that level ensured that medium-term strategy and annual action plans were agreed upon. However, during the survey, neither the experts nor the policy-makers at the national level seemed to be fully aware of what has become of that system lately.

In spite of the existence of RS Observatories, the base of knowledge used in recent policy-making has been very limited. Links to research are not consistent as, although there are permanent research teams, there is no research programme or steady budgetary line to ensure continuity. Use of the knowledge produced varies according to who heads RS management and the current emphasis on enforcement is not conducive to multi-disciplinary research.

One particularly weak point is the lack of RS training of policy-makers and implementers at all levels. Decision-makers’ are appointed to RS as a step in their civil service career, irrespective of whether they have any knowledge of RS management. The offer of inter-disciplinary training courses is marginal.

It is to be noted that the following diagnosis does not reflect the organization of road safety management that enabled France to reach the European target for 2010.

Diagnosis: France	
"Good practice" elements	✓ High level coordination of road safety policy making through an inter-ministerial road safety committee. ✓ A national inter-ministerial Road Safety Observatory and a network of regional RS observatories. ✓ A national structure for stakeholder consultation (including local authorities, businesses and NGOs) with a committee of experts. ✓ An annual road safety budget voted in Parliament. ✓ Benchmarking is used as an incentive to keep up the road safety effort. ✓ Availability of multi-disciplinary research teams.
Elements needing improvement	✓ The inter-ministerial road safety committee does not follow the meeting schedule. ✓ The ministry of Interior has been appointed as Lead Agency for road safety (focus on driver behaviour rather than on Safe Systems). ✓ The present state of coordination at the planning and implementation levels is uncertain (the transfer of the Road Safety Directorate from the ministry of Transport to the ministry of Interior may have been disruptive). ✓ Uncertain future of "vertical" coordination and reporting (between the national and county levels). ✓ No precise rules and no separate funding for the stakeholder consultation structure. ✓ No long-term vision or strategy. ✓ No medium term targeted road safety programme, interventions are planned year-by-year according to the funds available. ✓ Funding for road safety is found insufficient in most areas and the manpower available has been decreasing. ✓ Reporting to Parliament on road safety activities is only a formal budgetary exercise. ✓ Recent road safety interventions have not been based on knowledge, indicating weak links between decision-making and research. ✓ No current research programme or research budget. ✓ Currently no evaluation of road safety measures. ✓ Lack of RS training of policy-makers and implementers at all levels. ✓ Only a marginal offer of multi-disciplinary training courses.

Table 3.4: Good Practice Diagnosis – France

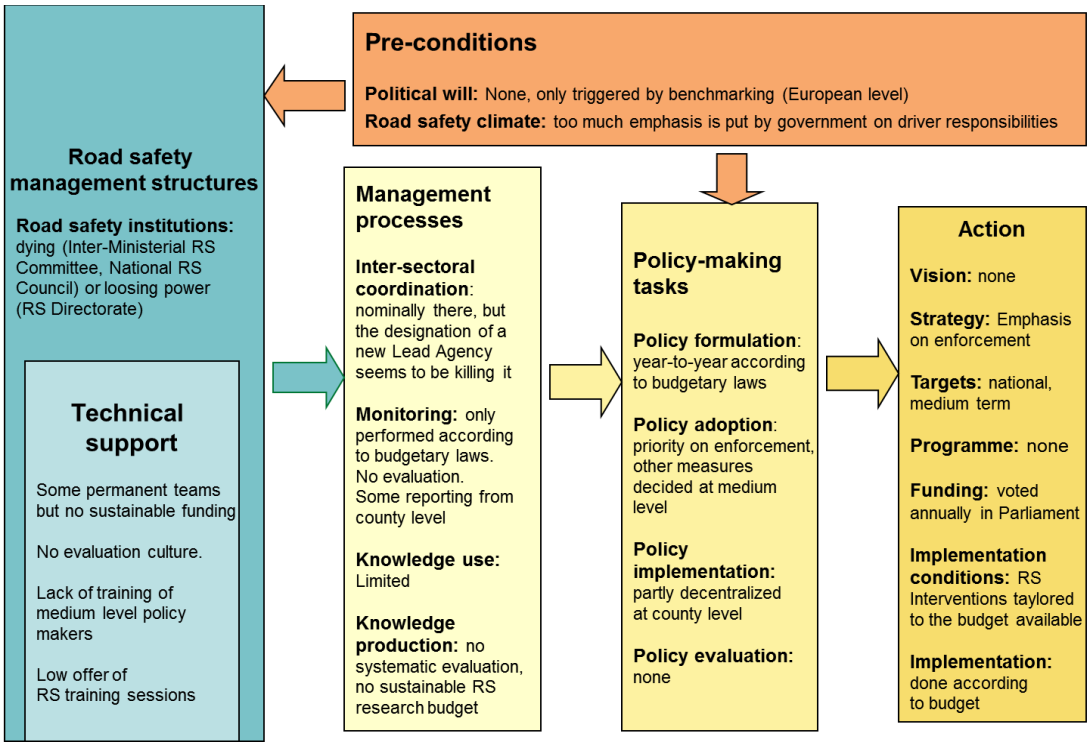


Figure 3.9. Overview of road safety management good practice elements in France

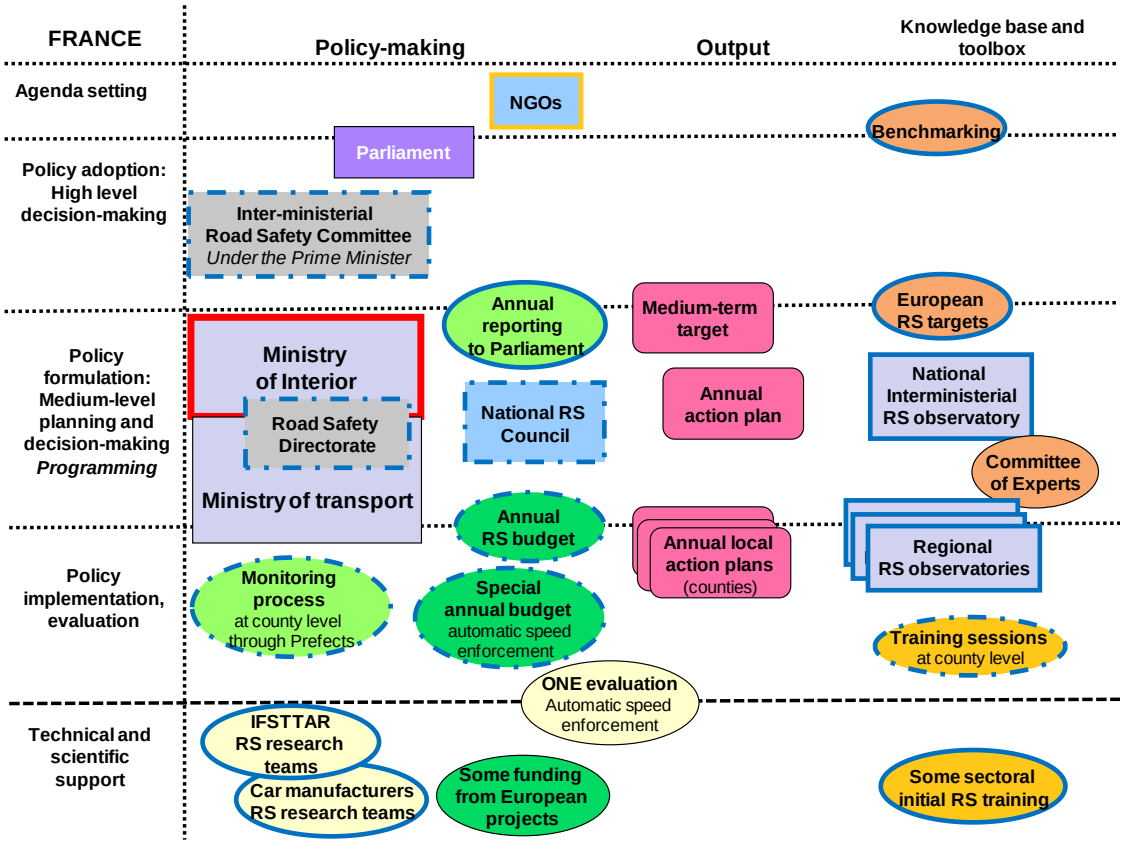


Figure 3.10. Structures, processes and outputs in France

3.2.5. Greece

In Greece, in spite of several Ministries (including Health) advocating the need for RS action and a number of road safety NGOs doing the same, road safety is hardly considered an area of activity of its own. The only management structure ever legally created is the inter-ministerial Road Safety Committee which has no authority over the other sectors' administrations as it has been placed under the Minister of Infrastructure rather than under the authority of the Prime Minister. In reality, the Committee has no decision makingpower and no budget of its own. In spite of its recently created Secretariat, it does not work effectively, as clearly showed by the outputs.

Similarly, there may have been a structure for consultations of stakeholders including NGOs and some experts, but it does not appear to be active.

Although all three administrative levels (national, regional, local) are involved in RS action, and the regional authorities are represented in the inter-ministerial RS Committee, there is no process to integrate national and regional RS activities. There is no reporting from the regional/local levels to the national one.

The main road safety output is a strategic plan, based on a Safe Systems approach and including a vision and targets for 2015 and 2020, which was developed but never formally adopted as a national policy. This demonstrates an obvious gap between policy formulation and policy adoption at a very early level in the decision-making chain. As a consequence, it seems that no RS programme has even been submitted for policy adoption (although a medium-term action programme may have been developed).

Without a road safety programme, it is not surprising that there is no identified road safety budget. However, some RS interventions are implemented from the budget of ministries and some NGOs coordinate their activities with the government's. The monitoring process included in the Strategic plan has not been implemented. It seems that it is not so much adequate manpower but organization which prevents the implementation of some RS measures (except perhaps in Health and Education).

The base of knowledge used in policy formulation is limited, which is to be expected as policy adoption has not taken place. Only police accident data is available on a systematic basis, benchmarking is not really used (except at the research level) and there is no systematic evaluation of the measures implemented.

Although the country has some university-based multi-disciplinary scientific teams available, knowledge production is not in a strong position: research has to rely on funding from European programmes which are, by nature, non-sustainable. In the present situation, there can be no substantial offer of road safety training for professionals.

Diagnosis: Greece	
"Good practice" elements	✓ The ministry of Health as well as some NGOs are strongly advocating for road safety. ✓ An inter-ministerial road safety committee (including regional authorities). ✓ Development of a medium-to-long term Strategical plan based on Safe Systems. ✓ Availability of multi-disciplinary research teams.
Elements needing improvement	✓ Road safety is not a recognized policy area. ✓ The inter-ministerial road safety committee does not have decision power and cannot really perform inter-sectoral coordination (under the ministry of Infrastructures rather than the Prime Minister); it is not currently operational (no budget). ✓ A structure for stakeholder consultation may have existed but is now inactive. ✓ No road safety observatory. ✓ No process to integrate national and regional activities, no reporting from the regional to the national level. ✓ The road safety Strategic Plan has never been formally adopted by the government. ✓ No identifiable budget for road safety. ✓ Limited use of knowledge in policy-making and the design of interventions, no benchmarking. ✓ No evaluation of road safety interventions. ✓ Little national funding for research (European funding keeps the research teams going). ✓ No substantial offer of road safety training. ✓ No training plans for road safety actors.

Table 3.5: Good Practice Diagnosis – Greece

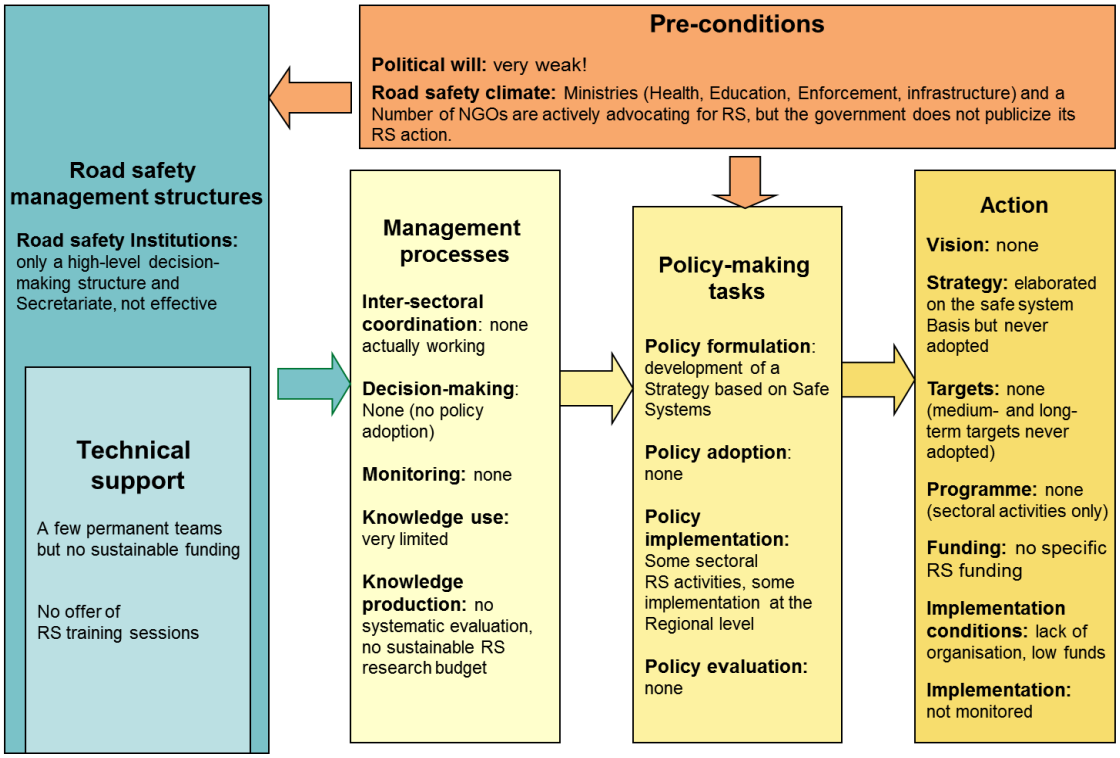


Figure 3.11. Overview of road safety management good practice elements in Greece

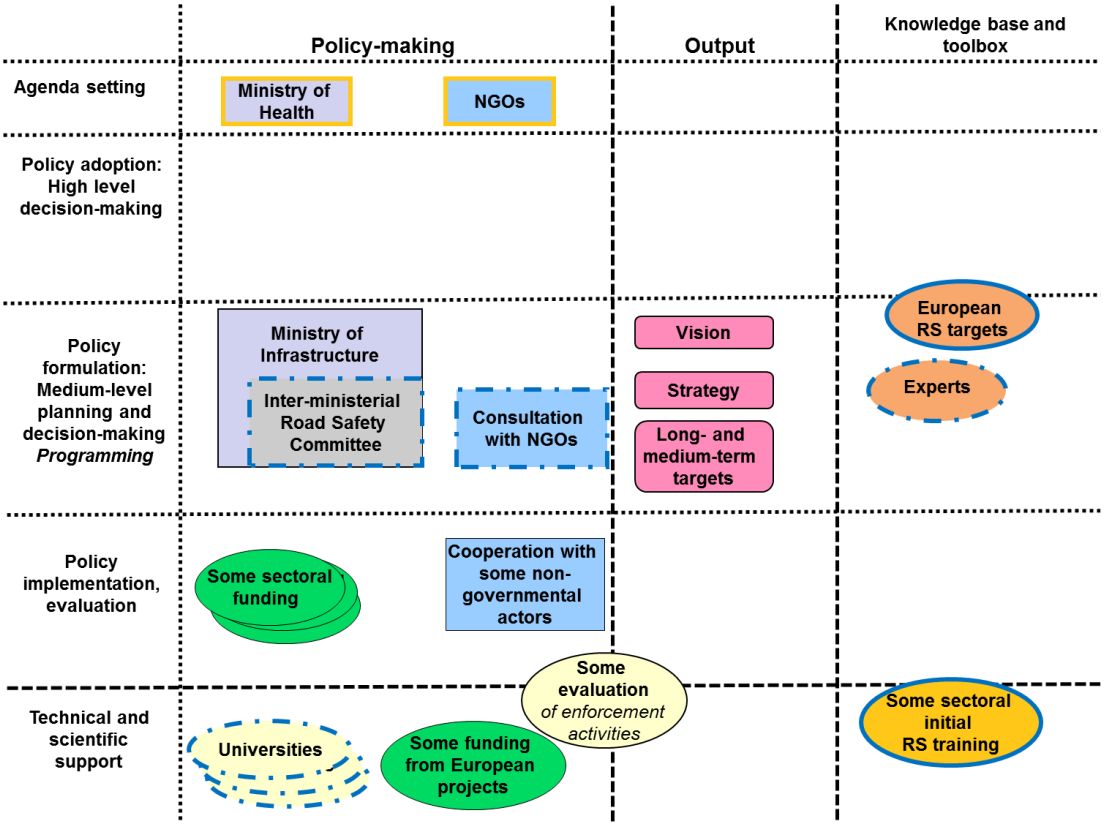


Figure 3.12. Structures, processes and outputs in Greece

3.2.6. Ireland

In Ireland, the government remains the real decision-maker for road safety, although there is an inter-sectoral Cabinet Sub-Committee for Road Safety under the Minister of Transport. The Sub-Committee is not really sustainable as it has not been created legally; however, it does meet regularly and monitors the progress made. Parliament is consulted for high-level decisions (it has approved the national strategy) and oversees road safety activities but does not initiate any action.

At the medium decision-making level, a specialized Road Safety Authority (RSA) has been created legally and is inter-sectoral although it does not involve the infrastructure sector. Infrastructure safety is managed separately by the National Road Authority (except perhaps in the larger urban areas). RSA has been designated as the Lead Agency for road safety, but there is no real inter-sectoral coordination at the implementation level. Task allocation, as planned in the current strategy, is a partial substitute.

Stakeholders' involvement has been minimal: only local authorities are perhaps consulted when fixing the target. Otherwise, the approach is entirely top-down.

The road safety "strategy" adopted in Ireland is in fact both a strategy and a six year programme: it provides orientations and targets, identifies a large number of areas for action and distributes tasks. The strategy is not based on the "safe system" approach and the current targets are not based on the European target (but it seems that the next one will be). Task allocation seems to have been performed in order to dispense with coordination.

There is no specific funding for the current RS strategy, so action is necessarily financed under the current budgets of RSA (Transport), NRA (Infrastructure) and the other road safety sectors to which road safety tasks have been allocated. The RSA has a budget within the ministry of Transport, and an independent board which provides freedom to allocate this budget; moreover, the agency has recently been authorized to seek "self-funding" as a complement. All in all, the assessment of the situation is that more funding (and human resources) should be necessary for enforcement, but the means available are satisfactory in other sectors.

Ireland has a national Road Safety Observatory under RSA. However, the knowledge base seems to have been limited in the production of the current road safety strategy and programme. There is no multi-disciplinary team performing RS research or studies in the country; however, RSA has been sponsoring some disciplinary research at PhD level, and it is expected that research results will be better used in preparing the next strategy. An evaluation process is being set up.

There is no training plan for road safety managers or implementers at the national level and, so far, there this no multi-disciplinary course in road safety available in the country.

One can observe that road safety management is developing in Ireland from the point of view of procedures (not institutions). Comprehensive evaluation of RS action is to be started in 2012, more stock will be taken of the European targets and closer relationships with researchers are being set up to produce the next strategy; finally, the possibility of offering multi-disciplinary RS courses is being considered.

Diagnosis: Ireland	
"Good practice" elements	✓ Parliament has approved the national road safety strategy. ✓ Informal but effective inter-ministerial sub-committee on road safety. ✓ Inter-sectoral coordination at the medium decision-making level through a legally created Road Safety Authority. ✓ The Road Safety Authority has a budget within the ministry of Transport, may spend it independently and may supplement it with funds from private sources. ✓ A national Road Safety Observatory (under the Road Safety Authority). ✓ A strategy and six-year road safety programme. ✓ The Road safety Authority sponsors some disciplinary research at PhD level. ✓ Road safety management procedures are being improved towards increasingly knowledge-based road safety policy.
Elements needing improvement	✓ The Road Safety Agency comes under the ministry of Transport (not the highest decision-making level) which limits its coordinating power (see below). ✓ The road infrastructure sector works independently of all others (through the National Road Authority). ✓ The road safety strategy and programme are not based on Safe Systems. ✓ Task allocation leads to sectoral implementation with no coordination at this level. ✓ Involvement of stakeholders has been minimal. ✓ No budget estimate for the current strategy and programme. ✓ No global road safety budget identifiable (funding seems satisfactory except in the Enforcement sector). ✓ Limited use of knowledge for policy-making. ✓ No evaluation of road safety interventions (but it is being planned). ✓ No multi-disciplinary research team. ✓ No offer of multi-disciplinary training schemes. ✓ No training plan for road safety actors.

Table 3.6: Good Practice Diagnosis – Ireland

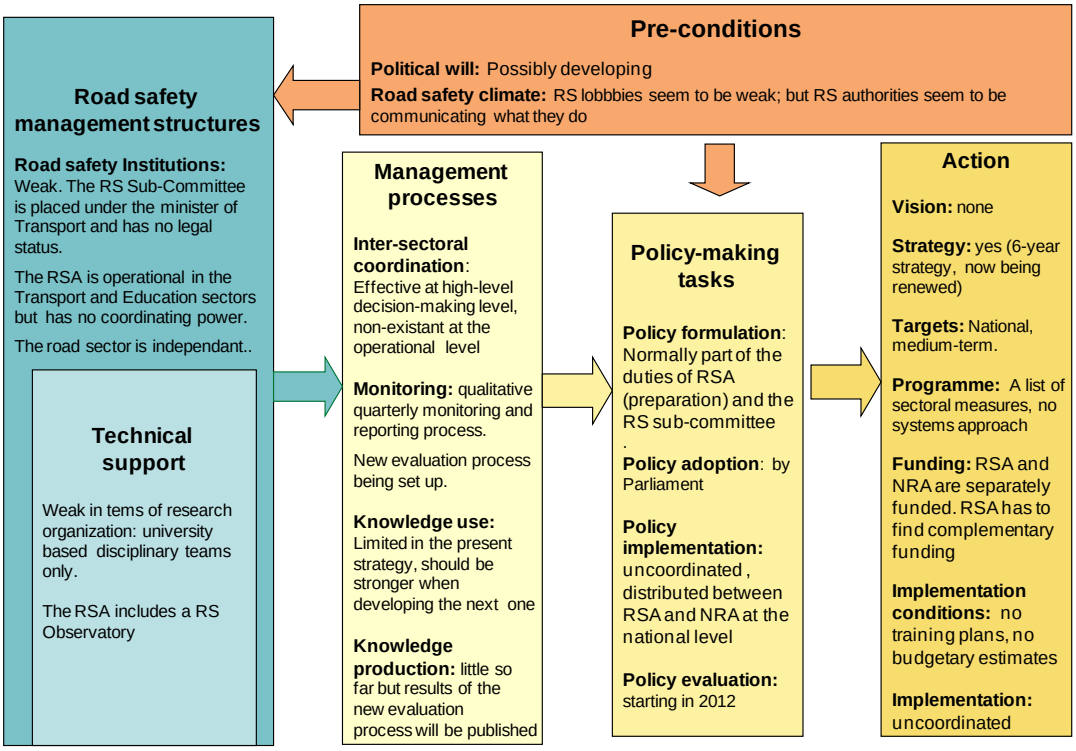


Figure 3.13. Overview of road safety management good practice elements in Ireland

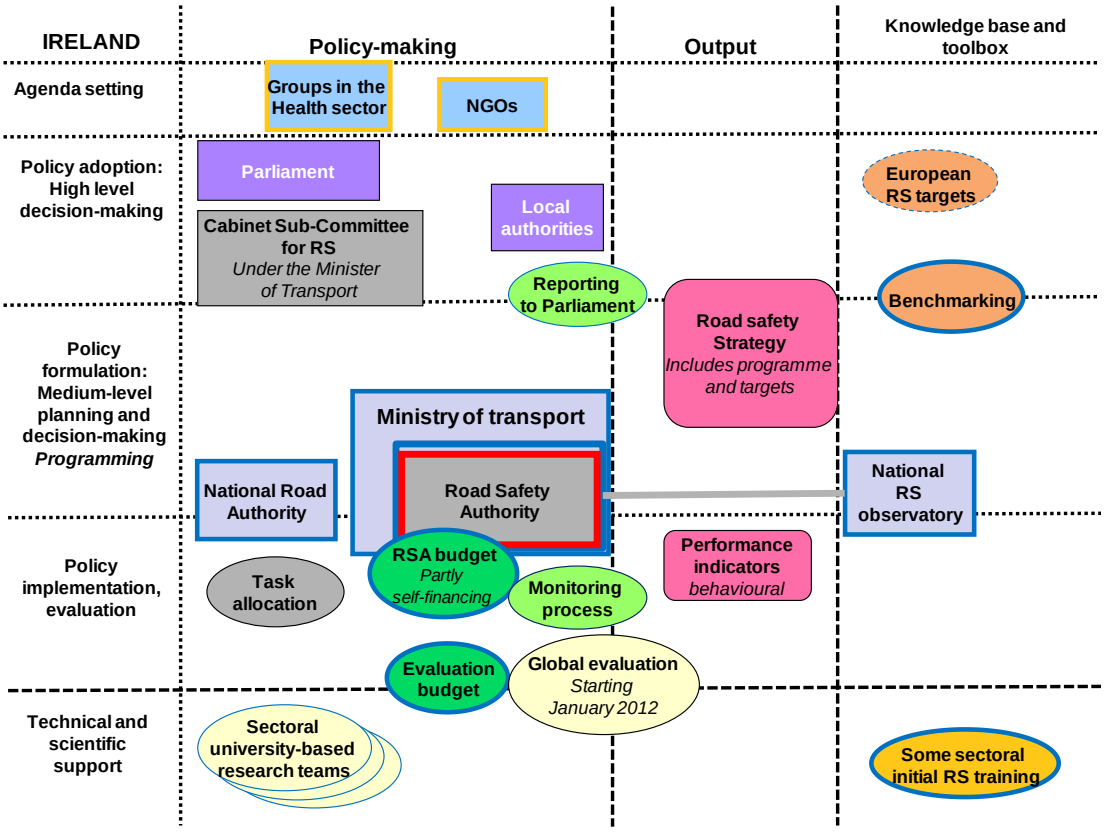


Figure 3.14. Structures, processes and outputs in Ireland

3.2.7. Israel

In Israel, there is a lot of buzz around road safety as NGOs and the media contribute to put it in the forefront. Although all the managing structures for road safety are still under the Ministry of Transport (so not at the highest level), adoption by Parliament and government of the current national RS programme in 2006 indicates growing political will.

The road safety management system has evolved over the last few years as new institutional developments have been triggered by the inter-sectoral RS programme such as the creation of the National Road Safety Agency (NRSA) within the ministry of Transport or the attempts made at securing a legal road safety funding procedure. The next programme, not adopted yet but prepared in 2011, should moreover include performance indicators for monitoring the RS activities.

The fact that the national RS programme was voted in Parliament is not sufficient to make it binding for the government. However, it was also adopted by the Prime Minister and it has triggered action and research as well as capacity building. It is not clear who is responsible for getting the next programme adopted and even less clear how the decision-making process will actually follow. So progress in RS management may not be sustainable at this stage.

NRSA is designated as the Lead Agency for road safety although it is still the Minister of Transport that takes the major decisions. NRSA is in principle empowered to coordinate horizontally the actors involved at the national level, but this does not happen in practice mainly for structural reasons: NRSA is under the Ministry of Transport and therefore ill-equipped to exert any authority over other sectors or check quality of implementation. However, implementation tasks have been divided between sectors and NRSA has established links with Education and Research and discusses with the Infrastructure and Enforcement sectors. NRSA itself is in charge of implementing the measures usually allocated to the Transport sector such as RS campaigns. Furthermore, it has a special organisation for coordination with the local authorities (programming, encouraging initiatives).

The road safety advisory body for the Ministry of Transport (RS Forum) appears to be a remnant from the past RS organization (before creation of the NRSA). However, it seems to have been recently strengthened (more frequent meetings, opening to NGOs). Its role with respects to the NRSA is not precisely defined.

A road safety budget has been estimated for programme implementation, but the amount of funding actually available has been somewhat reduced from the original estimates. Road safety funding is distributed between the actors in charge of implementation (NRSA, the Roads Company, etc.), which is consistent with current separate sectoral implementation of measures. The Ministry of Finances has objected to creating a separate RS budget and funding is insufficient in some sectors. Meanwhile, manpower seems to be insufficient in most sectors.

There is no formal monitoring process of road safety activities. Some monitoring from the national to the local level is performed by NRSA whose part, however, is more one of decision-support (stimulating action, providing guidance and tools for local road safety planning and implementation, training).

Israel has a National RS Observatory which is maintained by NRSA. The Observatory includes the basic road safety data on injury accidents and behaviour and is currently expanding to include data on fines, driver licensing and vehicle registration. Global evaluation of RS performances (trend analysis) is performed by NRSA. Evaluation of road safety interventions is not systematic: some process evaluations of road safety measures have been carried out in the sectors of Infrastructure, enforcement (done by the police),

campaigns as well as some product evaluation of infrastructure measures. Except for the latter, scientific teams were not systematically involved.

Relationships between research and action are loose: although the relevant knowledge produced in the country is well used as a basis for decision-making, researchers are not systematically called upon. NRSA does sponsor some research studies as well as the ministries of Transport and of Education, the National Roads Company, and some local authorities, but there is no steady research budget. The university-based research teams are thus not sustainable, save for a core of professors with tenure. Universities offer some road safety courses, but training is a weak point in the current RS management system, although NRSA may have organized some punctual training sessions.

Diagnosis: Israel	
"Good practice" elements	✓ Growing political will, road safety is a major social issue. ✓ Parliament has adopted the national road safety programme. ✓ The National Road Safety Agency (NRSA) has been created as Lead Agency (under the Ministry of Transport). ✓ NRSA works at the inter-sectoral level on the basis of cooperation (rather than coordination). ✓ NRSA also coordinates and offers technical support for road safety work performed by local authorities. ✓ The national structure for stakeholder consultation has recently been re-activated and opened to NGOs. ✓ A national Road safety Observatory. ✓ A national medium-term targeted and inter-sectoral road safety programme (including institutional building and task allocation). ✓ An estimate of the budget needed for programme implementation has been made. ✓ Global evaluation of the road safety programme. ✓ Some research sponsored by some of the road safety partners.
Elements needing improvement	✓ NRSA as Lead Agency does not have decision-making power (at medium level, decisions are taken by the Minister of Transport). ✓ Inter-sectoral coordination at the implementation level cannot be effective for structural reasons (NRSA is under the ministry of Transport, not at the highest level). ✓ The role of the stakeholder consultation structure in relation to NRSA is undefined. ✓ Failed attempt at securing a legal road safety funding procedure. ✓ The process for presenting and adopting the next national road safety programme is unclear, which questions the sustainability of the current road safety management organization. ✓ No separate road safety budget, insufficient funding in some sectors, insufficient manpower in all sectors. ✓ No formal monitoring of implementation. ✓ No systematic evaluation of road safety measures (although some evaluations have been performed in the Infrastructure and Enforcement sectors). ✓ No steady research budget. ✓ Existing university-based research teams depend too much upon European and other external funding. ✓ No training plan for road safety actors (only some punctual training sessions).

Table 3.7: Good Practice Diagnosis – Israel

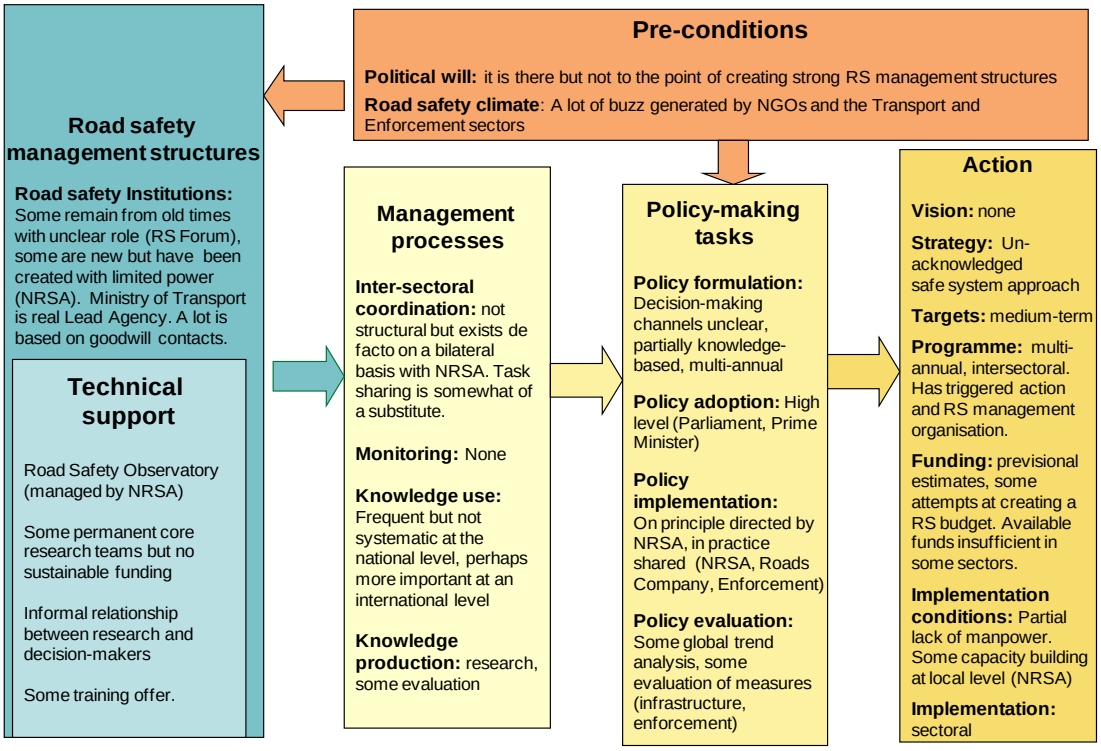


Figure 3.15. Overview of road safety management good practice elements in Israel

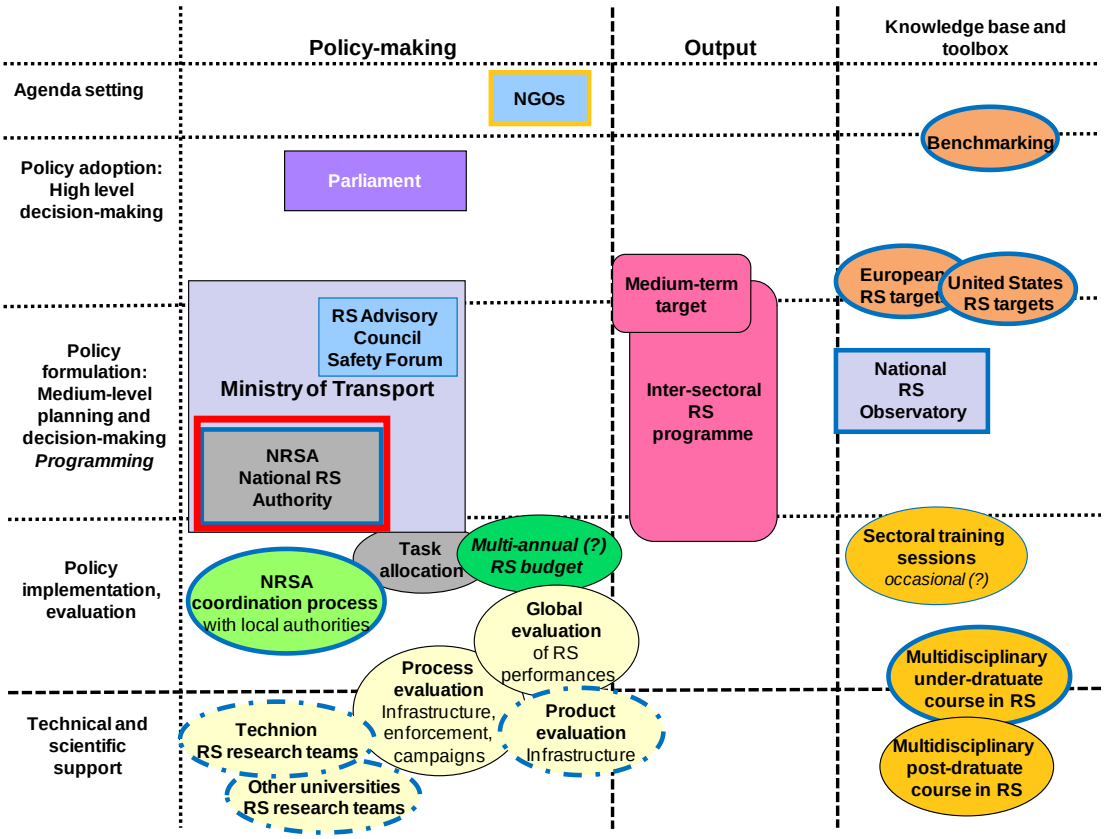


Figure 3.16. Structures, processes and outputs in Israel

3.2.8. Italy

There is no high level inter-sectoral decision-making institution in Italy. Parliament has a relevant role in initiating decisions on road safety orientations or directions and in adopting them.

The Lead Agency for road safety is the Ministry of Transport which, in practice, defines the programme (which needs to be approved by Parliament) and the interventions to be carried out. A technical inter-sectoral institution has been formally created by law to coordinate medium-level decision-making and implementation, but it has never been set up from the operational point of view and so is still missing. Meanwhile, the Ministry of Transport is acting as inter-sectoral coordinator with the other ministries involved in road safety action. Coordination is performed through technical inter-ministerial working groups set up for specific needs (it means that these groups are not permanent and sustainable although the process has been going on for some time).

In order to better define road safety priorities and activities, a National Road Safety Consultation Board has been set up and gathers representatives of a large number of organizations. The current road safety national plan 2001-2010 was thus agreed with a number of non-governmental stakeholders.

In terms of outputs, Italy has no long-term vision but has national medium-term quantitative targets for improving safety performance. The national medium/long term road safety programme and plan (2001-2010) is now under review as a new plan is being prepared (2011-2020). To this purpose, benchmarking with other European countries is now used by the Ministry of Transport.

Regional authorities are involved in implementation and the regional road safety programmes are coordinated with the National Road Safety Plan. The Ministry of Transports, through the Regions, funds interventions and programs at local level that are in line with the national policy.

There are no sustainable funding mechanisms for road safety in Italy. A budget is specifically allocated to road safety activities, interventions and capacity building from the national budget but no funding and no human resources are specifically attributed to supporting the national road safety plan.

Global road safety results are monitored in relation with the national quantitative target. Regions were required to set up a reporting procedure to monitor their road safety interventions and to communicate them to the Ministry of Transport every 4 months, but not all the regions have set up this procedure. As a consequence, a procedure to monitor road safety activities across the country is now under development.

As far as knowledge production and use are concerned, some road safety research has been carried out but research results have not been fully considered for the definition of future policies. CTL, with other partners, is now supporting the Ministry of transport in reviewing the previous road safety plan and defining the new one. Benchmarking between Italy and other European countries on many road safety aspects is included in these activities.

It can be observed that Italy has a very centralized approach to road safety policies and a pragmatic one to inter-sectoral coordination. Knowledge-base policy-making is progressing.

Diagnosis: Italy	
"Good practice" elements	✓ Parliament plays an important part in deciding and adopting policy orientations. ✓ The ministry of Transport has been designated as Lead Agency, responsible for designing the road safety programme and corresponding interventions. ✓ At the medium decision-making level, an inter-sectoral body had been created by law to ensure coordination. ✓ In the absence of real coordination at the planning and implementation levels, the ministry of Transport acts inter-sectorally on the basis of cooperation. ✓ A national structure has been created for stakeholder consultation (including the private sector). ✓ Use of benchmarking at the planning level. ✓ A medium-to-long term multi-sectoral targeted road safety programme. ✓ Regional road safety programmes are coordinated with the National Road Safety Plan and partly funded by the Lead Agency. ✓ Global monitoring of the effects of the road safety programme. ✓ A "vertical" monitoring procedure (from regional to national government) is being formally set up. ✓ Some university-based multi-disciplinary research teams (CTL). ✓ Beginning of a good cooperation between managers and researchers (technical assistance for programme design), knowledge-based policy-making is developing.
Elements needing improvement	✓ The inter-sectoral coordination structure created by law for planning and implementation has not been set up. ✓ The national to regional level relationships are entirely "top-down". ✓ No long term "vision". ✓ The multi-annual programme did not include any budget estimate. ✓ No identifiable road safety budget, no sustainable funding mechanisms for road safety. ✓ Cooperation between managers and researchers has not been good in the past years. ✓ The current (now ending) road safety programme was not based on knowledge. ✓ There is no current training plan for road safety actors at the national or regional level.

Table 3.8: Good Practice Diagnosis – Italy

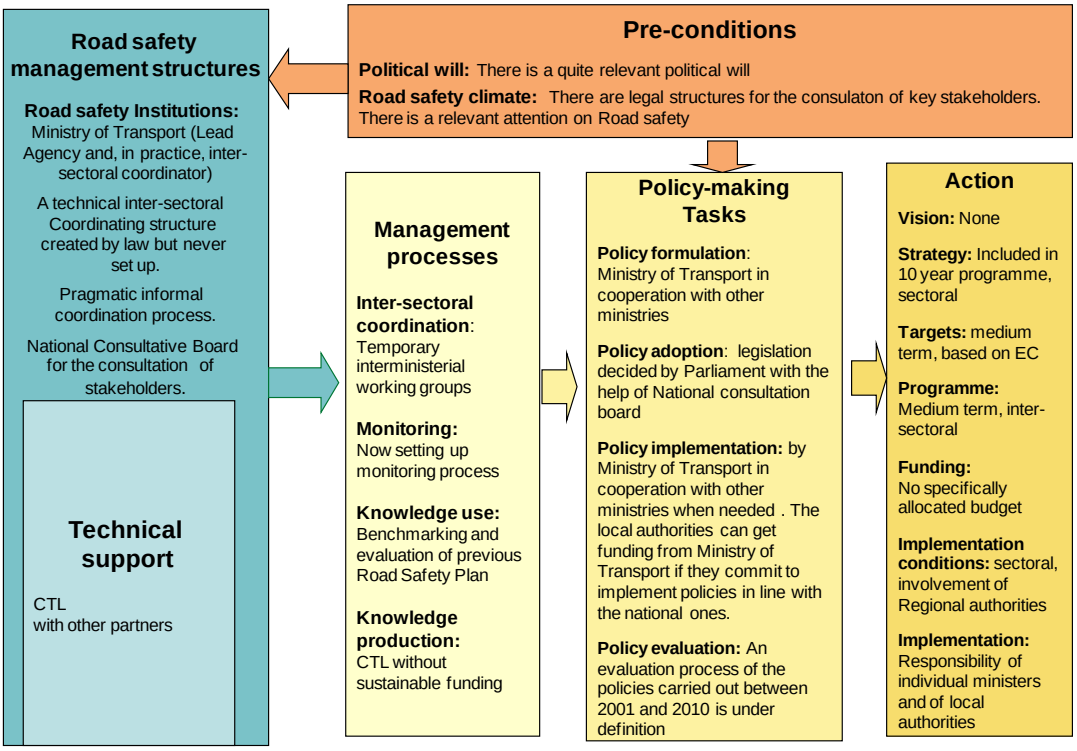


Figure 3.17. Overview of road safety management good practice elements in Italy

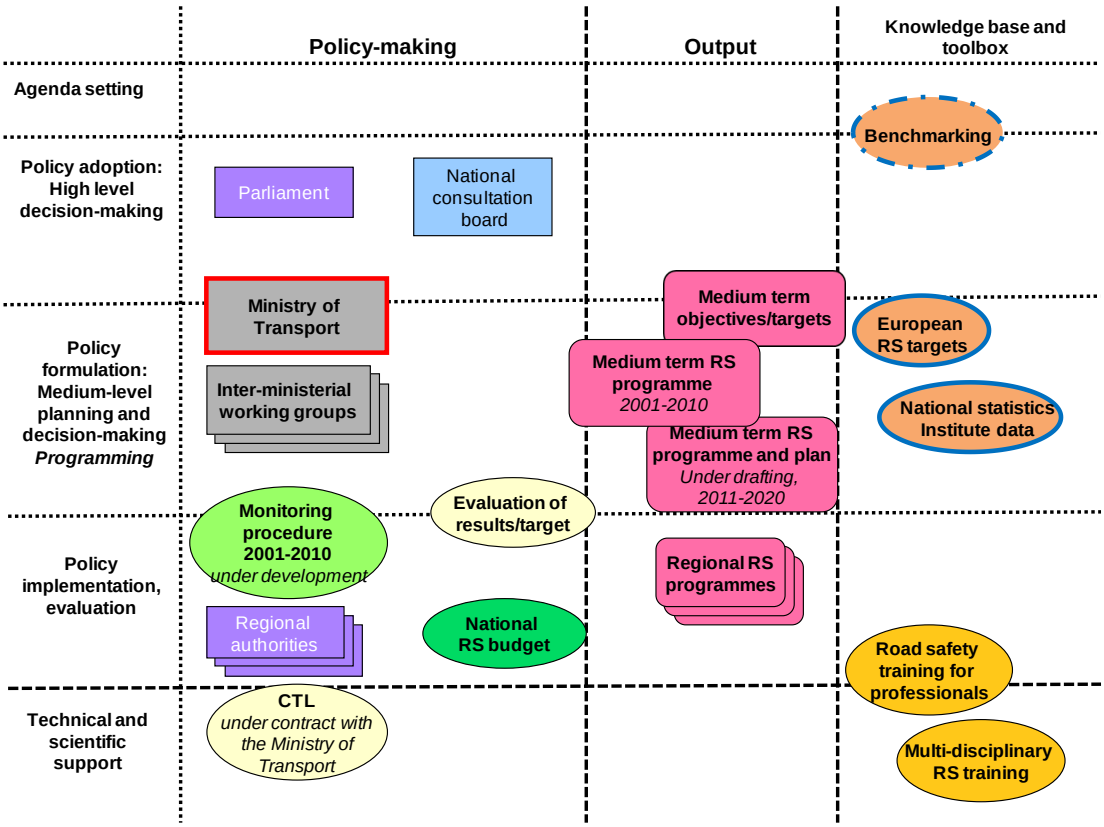


Figure 3.18. Structures, processes and outputs in Italy

3.2.9. Latvia

Latvia has not established a single Lead Agency with responsibility for road safety. Currently, road safety at the national level is globally under the responsibility of the Minister of Transport, but responsibility for the various areas is assigned to different ministries: of Transport (state roads, road audits, road safety devices, vehicle registration, vehicle technical inspection, driver training and testing, information and awareness campaigns); of Interior (road police, traffic offences records, reporting and investigating accidents, coordinating rescue work at accident scenes; of Education and Science (pre-school and school children education); of Health (first aid and medical care for casualties, first aid training). Regional and local authorities are responsible for county and local roads.

The role of Parliament is limited and only involves road traffic-related legislative changes.

The country's policy is defined through its road safety programmes. The first one covered the period 2000-2006 and the second one called the *National Road Traffic Safety Improvement Programme* is for the years 2007-2013. Both programmes were built around the "3 Es" concept (Engineering, Education and Enforcement). The target of National Road Traffic Safety Improvement Programme for the years 2007–2013 was to reduce the number of deaths by 70%. At present work is under way on a new road safety programme for the years 2014-2020 whose target will be consistent with the declared European target (to reduce the number of deaths in road accidents until 2020 by half in comparison with 2010).

At the medium decision-making level, the role of a national coordinating body is taken up by the National Road Safety Council, created in 1996. The Council includes representatives from different ministries and other interested organisations (research institutions, NGOs) and acts as an advisory body on national road safety policy and the coordination of road safety activities. The Minister of Transport is the Chairman of the National Road Safety Council, and the Road Traffic Safety Directorate (state-owned company) acts as its Secretariat. The Road Safety Council does not have a fixed schedule of meetings but usually meets twice a year.

The Road Traffic Safety Council serves as a platform for the exchange of opinions. There is no other formal stakeholder consultation process in Latvia.

The National Road Traffic Safety Improvement Programme sets out measures for implementation and the timelines, the implementing body, costs and sources of money. The programme is mainly run by government bodies.

The National Road Safety Improvement Programme for 2007-2011 included an estimate of the annual budget necessary to implement the measures planned. The only stable source of funding is provided by insurance companies (under the Motor Third Party Liability Insurance Act). Funding is allocated and controlled by the Road Safety Council. Other funds are contributed by the State Budget (the budgets of the relevant ministries), EU, local authorities, private companies which take part in the financing of campaigns and the Road Traffic Safety Directorate (financing TV shows and some public awareness campaigns). The amounts are defined on an annual basis and are generally not up to the original estimates.

Latvia does not have any organisation to coordinate the work of national, regional and local road safety bodies. Regional authorities are not consulted on new road safety programmes or assigned responsibility for a specific task in the national programme. The only exception is the municipality of the capital city of Riga. Some targets from the traffic safety improvement programme of Riga, which is distributed under the form of a "white book" to the stakeholders, are mentioned in the national traffic safety program.

At the local level, only some municipalities have adopted specific road traffic safety programmes. Most of road safety implementation work is run centrally with very little input from the regional and local level (most of it is education). This is because of the lack of competent staff and organisations, lack of funding and absence of support from the central

level (there is no system of training for decision-makers at different levels or those responsible for prevention).

A road safety observatory does not exist as a separate organization in Latvia. However the Road Traffic Safety Directorate covers some of the functions expected of a road safety observatory. The data collected covers accidents, fatalities, injuries, behavioural indicators, exposure, violations and fines, driver licensing and vehicle registration.

Since 2008 programme implementation has been monitored annually. Each year the responsible ministries and local governments prepare a programme progress report and submit it to the Road Safety Council. The evaluation looks at the current state of road safety, delivery of allocated implementation tasks, and global effectiveness of programme implementation using cost benefit analyses. It also assesses progress in the EU context. The report is prepared by a consultant, Road Traffic Research, Ltd, in cooperation with Riga Technical University and sent to all members of the Road Safety Council and other organisations interested. The results are also presented at conferences and radio and TV shows.

In Latvia, road safety research is conducted by only a few technical institutions and universities (Riga Technical University, private consultants such as “Road Traffic Research Ltd” and “Inzenierbuve Ltd”) and is not multi-disciplinary, although in recent years researchers from the Faculty of Psychology of Latvian University have become involved in road user psychology. The shortage of research is supplemented through an active exchange of experience with Baltic Sea countries and European Union member states. The research results have had some influence on the planning and implementation process in the country. For example, experts participated in the preparation of the last road safety programme.

It is to be noted that the rate of improvement of road traffic safety in Latvia during 2001-2010 was one of the best in the European Union (reduction in fatalities by 61%) although the road traffic safety indicators are still among the worst for the member states. Uncertainty of funding is the basic weakness and it is not quite clear how the road safety funding procedures should be handled and controlled. In order to maintain a high rate of progress, strengthening of the organisational framework and road safety management procedures is also needed, including more emphasis on staff training.

Diagnosis: Latvia	
"Good practice" elements	✓ A formal institution for stakeholder consultation, the National Road Safety Council (which includes NGOs and research institutions), has been created at the planning and implementation levels. ✓ The National Road Safety Council also acts as a coordinating body at the operational level. ✓ The Road Traffic Safety Directorate (Ministry of Transport) covers some of the functions expected of a road safety observatory ✓ Successive medium-term targeted inter-sectoral programmes, including task allocation to key actors (government bodies) ✓ The road safety programme for the capital city, Riga, is coordinated with the national road safety programme ✓ The annual budget necessary for implementation as well as the detailed costs of road safety measures are estimated in the programme. ✓ A stable source of funding is money contributed by insurance companies (under the Motor Third Party Liability Insurance Act). ✓ Funding available for road safety is allocated by the National Road Safety Council. ✓ Annual monitoring of road safety implementation activities, reporting to the National Road Safety Council, presentation to the citizens. ✓ Some cost-benefit evaluations. ✓ Effective cooperation of managers and university-based scientists, the road safety policy is knowledge-driven. ✓ Use of benchmarking and international experience (Baltic countries, Europe). ✓ Some disciplinary research in road safety (engineers, human sciences).
Elements needing improvement	✓ No centralized responsibility for road safety (instead a distributed responsibility between the ministries involved). ✓ No steady road safety budget from the government, annual funding only, funding is usually inferior to the estimates. ✓ No clear idea of how to remedy the current weakness of road safety funding procedures. ✓ No coordination between the national and the regional/local levels, except for the city of Riga. ✓ No multi-disciplinary research teams available. ✓ No training plan for road safety actors, not enough emphasis on road safety training.

Table 3.9: Good Practice Diagnosis – Latvia

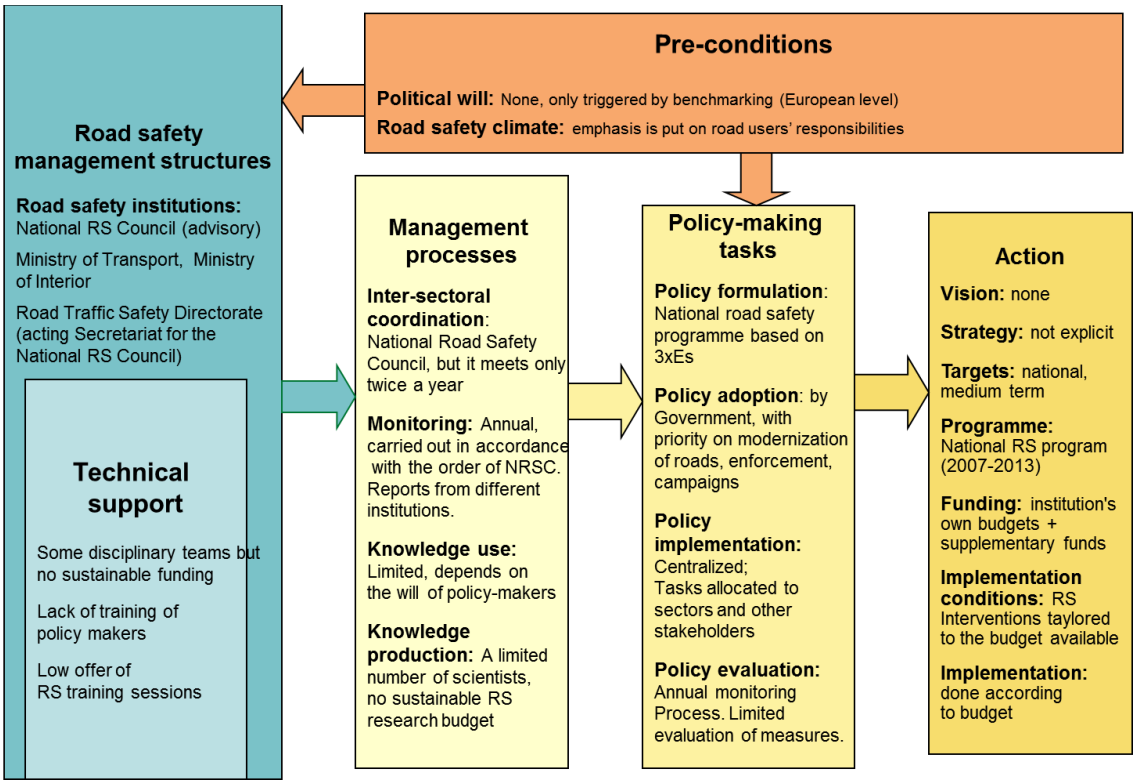


Figure 3.19. Overview of road safety management good practice elements in Latvia

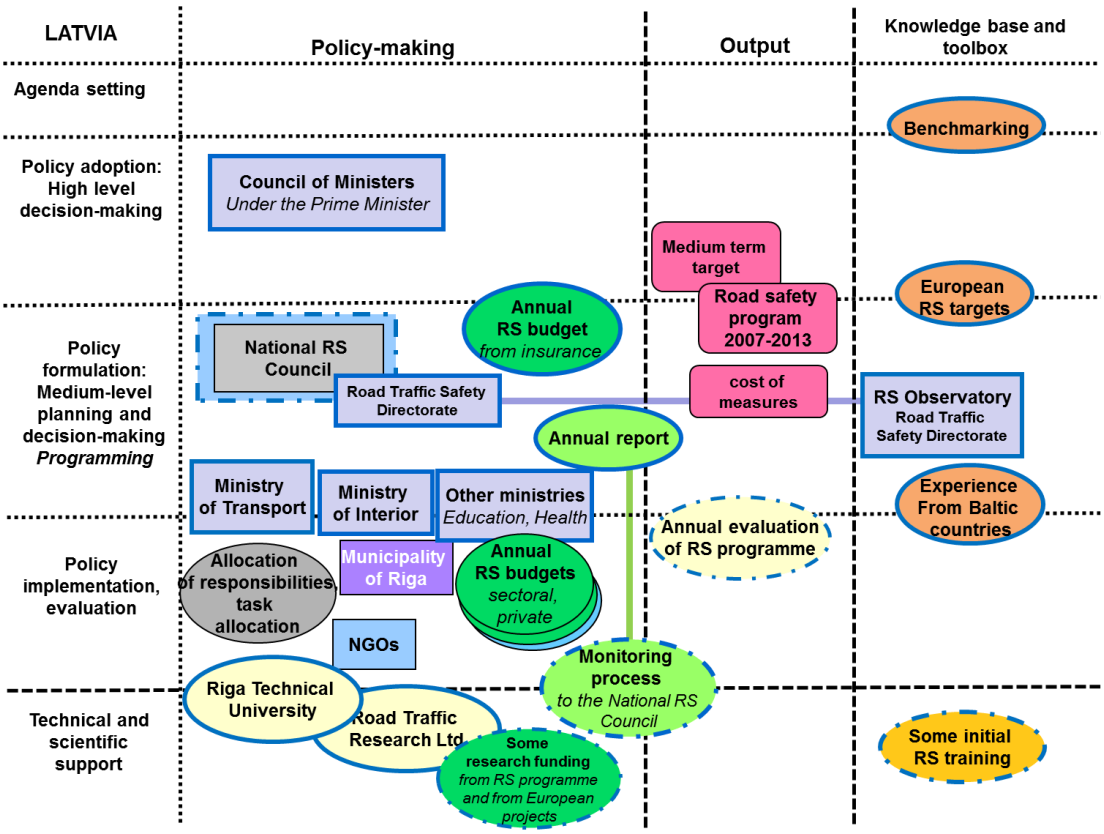


Figure 3.20. Structures, processes and outputs in Latvia

3.2.10. The Netherlands

In the Netherlands, road safety activities are highly decentralized at the regional and local levels and are integrated into wider-ranging mobility activities. Although the ministry of Infrastructures and the Environment is designated as the Lead agency for RS at the national level, regional and local authorities play an important role in decision-making as well as in implementation. This is illustrated by the country's road safety management system in which the only formally established coordinating body, BKO, serves to consult and negotiate with the regional and local authorities. Although BKO is only a consultative structure, it does influence decisions. In particular, it enabled regional and local authorities to participate in the design of the national Strategic RS Plan. BKO has a working structure in which boards prepare the ground for decision-making (for example, proposing adequate regional targets). Other stakeholders are also frequently consulted although no formal consultation structure involving the private sector has been established.

Although there is no formalized structure for horizontal inter-sectoral coordination at the national level, some coordination takes place on a bi-lateral basis between ministries (mainly between the ministries in charge of infrastructures and of enforcement), at all policy levels from decision-making to implementation

The long-term vision and the 12-year RS strategy are themselves integrated into mobility policies. Parliament discusses the policy orientations presented by the government after having been prepared by the ministry of Infrastructures and the Environment, and monitors the delivery process within the wider scope of mobility; in some of the issues debated, Parliament may overrule the government. Operational plans are very short-term (2 years), which allows for flexibility by giving frequent opportunities to revise the long and short term targets (making them more ambitious), strengthen action or review the planning and funding instruments. Evaluation of safety measures is part of the culture and research teams are active on this.

Sources of funding for RS activities are found at several levels: the national government where part of the budget of the ministry of I&E is allocated to road safety (research, evaluation, some action), the BDU which finances mobility activities undertaken by regional/local authorities, the budget of local authorities themselves, and the private sector as some NGOs are active in funding and participate in the implementation of specific safety measures. Due to the current economic conditions, the share of RS funding coming from the national budget has been reduced, so some types of interventions implemented at the national level, such as RS campaigns, have decreased accordingly. Research may also suffer from a reduced budget.

There is no real monitoring of RS activities at the regional/local levels, except within the broader-scoped National Mobility Monitor presented to the Parliament. The negotiating process between the national and the regional/local activities seems sufficient to ensure active implementation although there are some variations between regions.

Interaction between research and practice has been good at least at the national level and a strong link to training has been established: universities and research institutes provide sectoral RS courses addressing the road safety professionals who are new-comers in the field as well as a multi-disciplinary RS course at master level. There is no actual training plan at the ministry level and, as road safety professionals are disseminated over the country, it is difficult to assess how much use is made of the available training opportunities. Due to involvement of local authorities in the policy-making process, the road safety culture may be widespread.

Diagnosis: The Netherlands	
"Good practice" elements	✓ Road safety policy is integrated into wider-ranging mobility policy. ✓ A large-spread road safety culture related to a large number of field actors across the country. ✓ Parliament discusses policy orientations and monitors the delivery process. ✓ The ministry of Infrastructures and the Environment is designated as the Lead agency for RS at the national level. ✓ Regional and local authorities play an important role in decision-making as well as in implementation. ✓ A formally established coordinating body, BKO, serves to consult and negotiate with the regional and local authorities. ✓ BKO also has a working structure in which boards prepare the ground for decision-making. ✓ Frequent informal consultation of a wide range of stakeholders (including the private sector). ✓ In the absence of formal inter-sectoral coordination, bilateral cooperation between ministries operates at all levels (from decision-making to implementation). ✓ A long term "vision" for road safety and a twelve-year strategy are included in mobility policy. ✓ Successive two-year programmes are planned and implemented, which provides some flexibility to strengthen interventions and review funding procedures. ✓ Multiple sources of funding, including regional and local authorities and NGOs. ✓ Some global monitoring of road safety activities at the regional/local levels, reporting to Parliament. ✓ Evaluation of safety measures is part of the culture and involves research teams. ✓ Good interaction between managers and researchers at the national level. ✓ Multiple training opportunities offered by universities, including a multi-disciplinary course in road safety.
Elements needing improvement	✓ No formal structure for horizontal inter-sectoral coordination at the national level. ✓ No formal procedure for stakeholder consultation. ✓ No steady budget for road safety and a current decrease in government funding. ✓ No detailed monitoring of regional/local road safety activities, so some Regions are not as active as others. ✓ No steady government budget for research, currently reduction of road safety research funding. ✓ Insufficient links between researchers and regional/local road safety managers. ✓ No training plan for road safety actors in spite of the training opportunities on offer.

Table 3.10: Good Practice Diagnosis – Netherlands

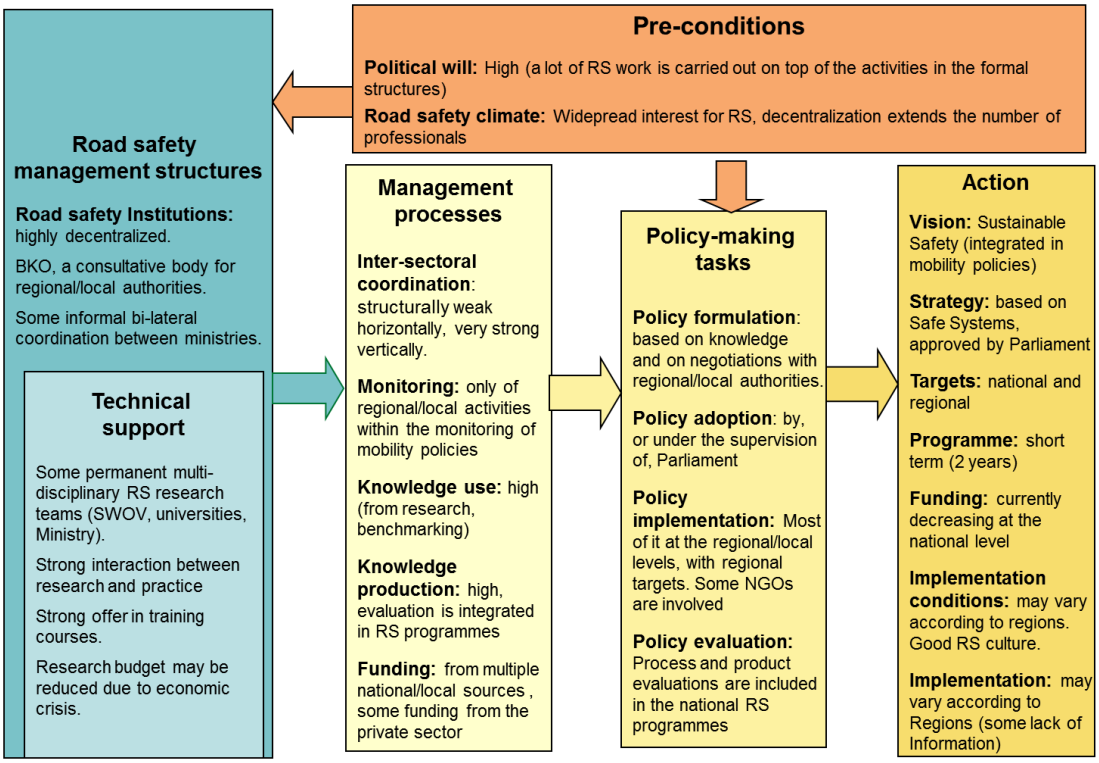


Figure 3.21. Overview of road safety management good practice elements in the Netherlands

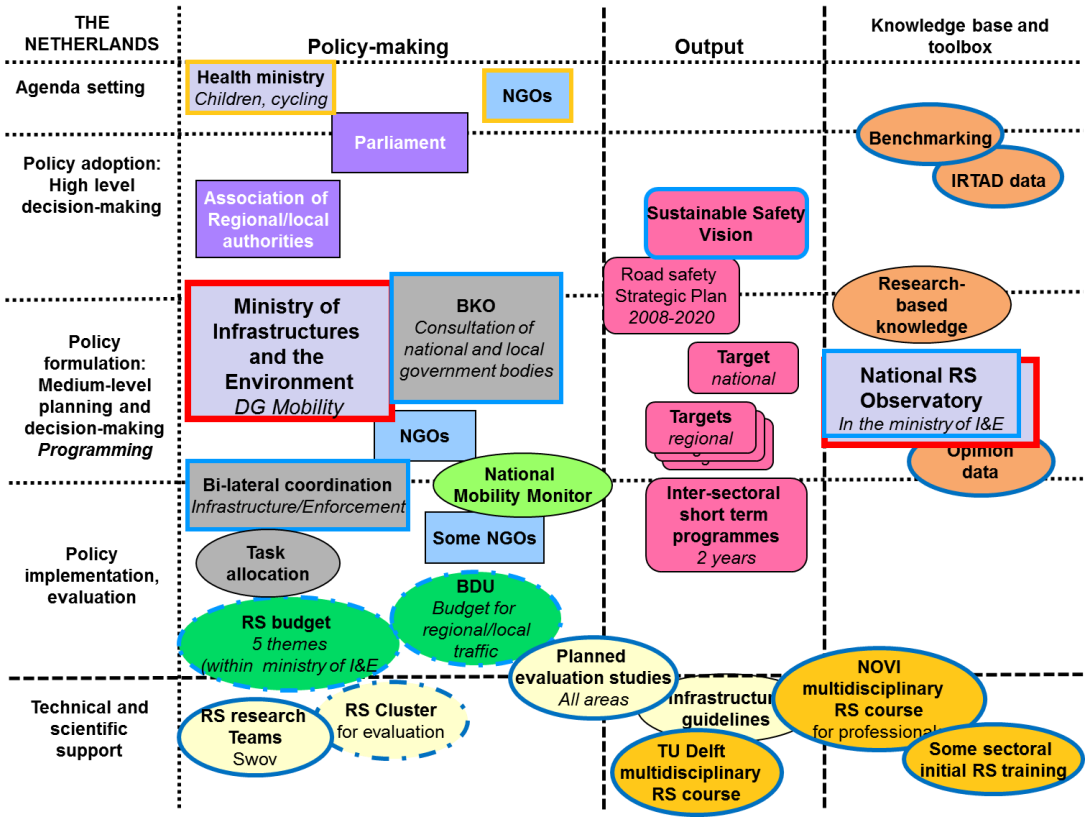


Figure 3.22. Structures, processes and outputs in the Netherlands

3.2.11. Poland

The National Road safety Council (NRSC), the inter-sectoral road safety management structure legally set up in Poland, is an addition to the government and administrative structure of the country (its introduction did not involve any major reorganization or changes in the decision-making patterns). The National Road Safety Council has been created as a consultative agency reporting to the government: it does not take any decisions and is not strategically placed to coordinate action at the national inter-sectoral level. Council members are delegated by their respective administrations for unspecified periods of time. The Council meets at least once or twice a year and is responsible for policy-formulation. Its Secretariat works in between meetings: it monitors road safety activities and may implement some measures of its own with various partners (local authorities, NGOs).

NRSC plays a major part in the consultation of stakeholders, especially regional road safety authorities. However, in Poland, public consultation in the area of road safety is hardly ever applied. There is a list of RS stakeholders but how it was established is not clear. Bodies and organisations which are not part of central government implement their own policies in areas where there are gaps in public policy.

NRSC does not have its own budget but is allocated some funds by the Ministry of Infrastructure for current operations, some limited research and implementation of campaigns; these funds are insufficient so that the Council has to rely on private sponsorship for most of its interventions (communication, training of local stakeholders, etc.)

The development of the current national road safety programme (Gambit 2005-2013) was based on research and European experience and performed by a university-based scientific team. The programme includes a vision (under the form of a long-term target), a medium term target and a medium term intersectoral action plan. It was adopted by the government, which makes it official national policy. Parliament has decision-power on any legal changes involved in the programme, but groups of parliament representatives may also take the initiative of introducing new road safety legislation.

The vision adopted with Gambit has not triggered any action or research so far. No budget has been allocated to the implementation of the medium term action plan and tasks have not been systematically allocated to potential actors, so implementation has not been complete and has not covered all sectors. The most active ministries are Infrastructure and Interior (enforcement) and measures are funded from their current budget. External funding from European or World Bank projects or from bi-lateral cooperations have also been used for some interventions.

The absence of any budgetary plans as well as of any formal process of inter-sectoral coordination at the operational level indicates an obvious gap between policy adoption and policy implementation.

The National RS Council monitors road safety activities at the regional level through the Regional RS Councils (which are quite independent) and reports annually to the Prime Minister who presents the report to Parliament. The reporting process is not based on systematic evaluation although some elements of evaluation are performed in the infrastructure and enforcement sectors. Although the reporting process has not (yet) triggered specific action, the interest for road safety in Parliament has been rising and some MPs have provided active support.

The toolbox available for RS planning is still limited to police accident data and to some limited ad'hoc surveys on behavioural factors (none have been conducted since 2005). The need for establishing a Road Safety Observatory, for example at the Motor Transport Institute in Warsaw, has been expressed.

Only limited evaluation of interventions has been performed in the two most active sectors (Infrastructures and Enforcement). The evaluations studies were carried out by the agencies in charge of the interventions themselves and the results are not published and have not been widely disseminated.

A few research teams based in three universities and the Motor Transport Institute can provide scientific support, but there is no sustainable funding for research which thus can be performed only on a project basis. Survival of the multi-disciplinary road safety research teams thus relies mostly on European funding. Preparation of the next medium-term national road safety programme, which just started under the leadership of the National Road Safety Council as our investigation was being carried out (spring 2012), has not triggered any research project and it is unclear how much knowledge-based it will be.

There is a general need for multi-disciplinary road safety training of policy-makers and implementers. However, the current offer of training remains limited: the Motor Transport Institute provides road safety training sessions for regional personnel and some universities run post-graduate courses for engineers and auditors. There is currently no multidisciplinary road safety course.

Poland is evidently in a transition period at the end of a first medium term programme and there is no sign of any political will to improve or consolidate the road safety management structure in order to facilitate knowledge-based policy formulation and ensure adequate implementation on a system basis. Whether the gap observed between policy formulation and policy adoption will be reduced in the new cycle of policy-making now starting remains to be seen.

Diagnosis: Poland	
"Good practice" elements	✓ Lobbying for safety from scientific experts and some NGOs ✓ Involvement of Parliament in road safety issues ✓ An inter-sectoral National Road Safety Committee ✓ A Secretariat for the Committee to lead policy formulation and monitor road safety activities ✓ Some consultation of regional/local stakeholders performed through the National Road Safety Council ✓ A long term vision (long-term target) ✓ A medium-term target ✓ A knowledge-based medium-term inter-sectoral road safety programme ("Gambit") ✓ Use of all possible frunding sources to implement the programme (sectoral, regional and local budgets, EU and World Bank programmes, bi-lateral cooperation). ✓ An annual monitoring and reporting process of road safety activities through the National Road Safety Council, to inform the government and Parliament. ✓ Some evaluation performed in the Infrastructure and Enforcement sectors. ✓ Some road safety training sessions for professionals at the regional level.
Elements needing improvement	✓ The National Road Safety Committee is only an advisory body, ill-placed in the decision-making chain to coordinate policy implementation. ✓ No formal inter-sectoral and "vertical" (between the national and regional levels) coordination at the operational level. ✓ No established list of road safety stakeholders in the private sector and no formal consultation process. ✓ The long term vision has not triggered any research or action. ✓ No global budget allocation to the implementation of the Gambit programme and no coordination of available funds so that only part of it has been implemented. ✓ The monitoring process focusses on what has been done by the national and regional road safety actors rather than on results and has not triggered and response so far. ✓ Evaluations have been carried out by the agencies in charge of interventions with little involvement of scientific teams ✓ No national Road Safety Observatory (but the need for it has been recognized) ✓ No systematic collection of behavioural data. ✓ The next national road safety programme which is being prepared may not be as knowledge-based as the current one. ✓ No research plan at the national level. ✓ Available multi-disciplinary research teams have heavily relied upon European projects and may not be sustainable ✓ No multi-disciplinary road safety course available.

Table 3.11: Good Practice Diagnosis – Poland

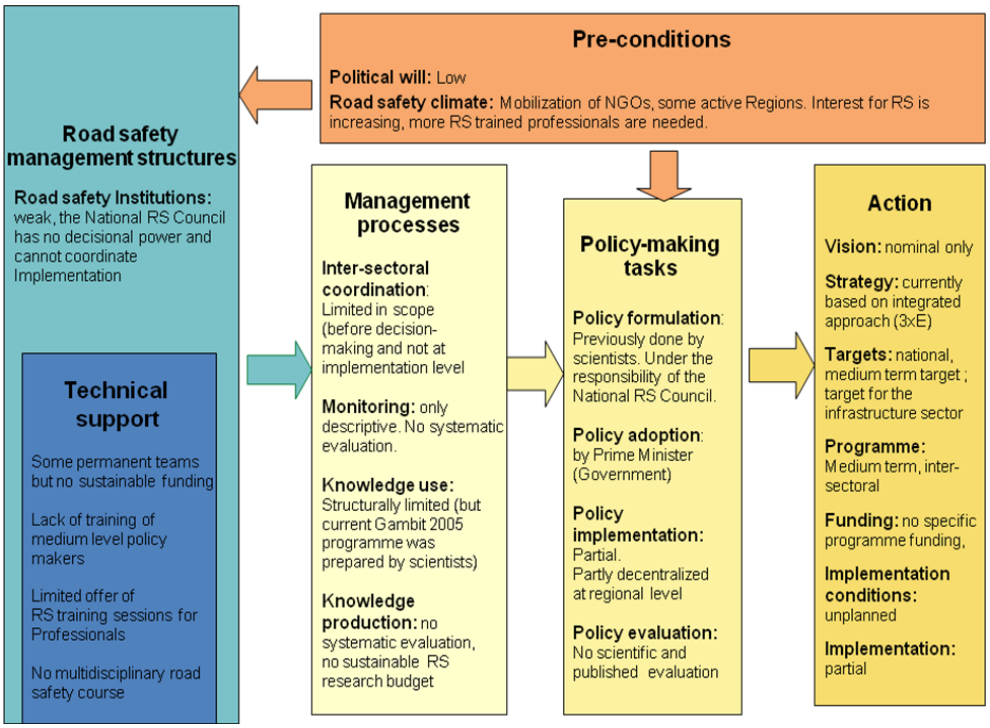


Figure 3.23. Overview of road safety management good practice elements in Poland

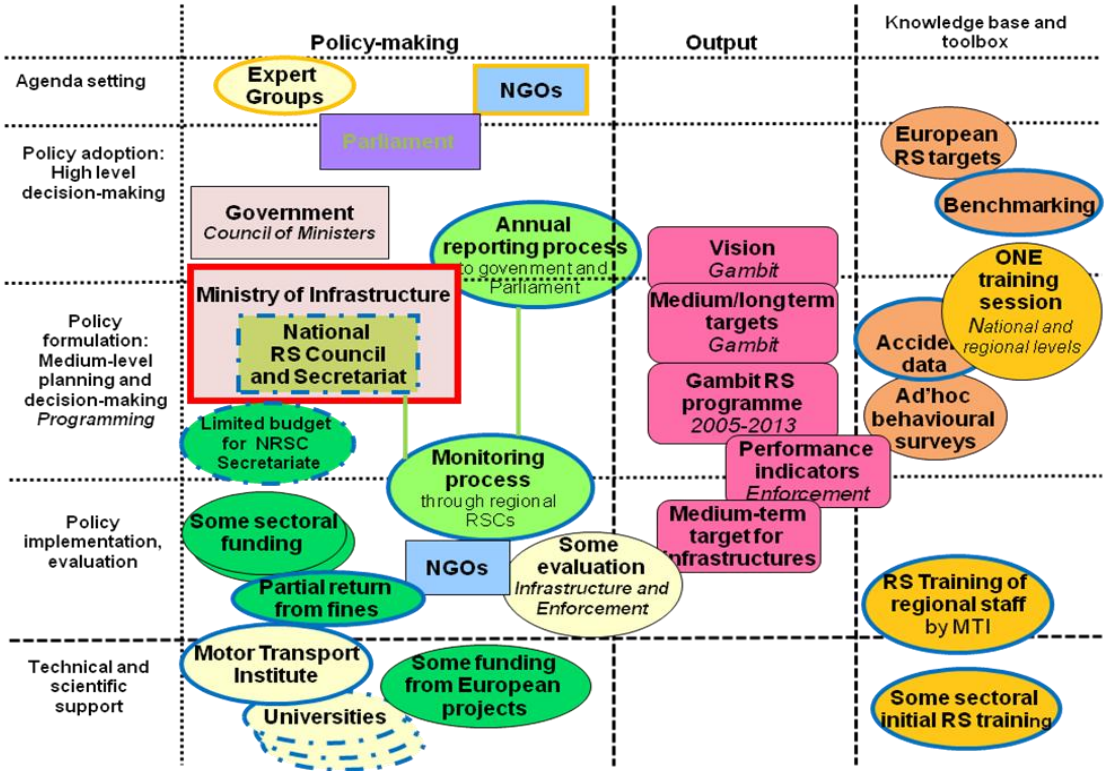


Figure 3.24. Structures, processes and outputs in Poland

3.2.12. Spain

In Spain, Parliament has a specific Commission for Road Safety to adopt policy orientations and road safety programmes. Political will has increased in the recent years, which has led to an increasing number of road safety interventions.

The General Directorate of Transport (under the Ministry of Interior) is considered the Lead Agency for road safety, although it has not formally be designated as such. In the Ministry of Interior, there is also a Public Prosecutor in charge of Road Safety whose role in the management system is not clearly defined (at least according to our investigation) but includes some coordination of road safety activities.

DGT coordinates the key sectors at the national level (Interior, Infrastructures and Health) and also performs “vertical” coordination with regional/local authorities over the country, except in Cataluña and the Basque Countries, autonomous regions where Servei Català de Trànsit and the Basque Interior department play this part.

DGT is responsible for the development of the national road safety programme and organizes the consultation of stakeholders which is performed mostly through the National Confederation of Municipalities and Provinces.

DGT runs a national Road Safety Observatory in which accident and related data from the Police, the Health sector and the demerit point system are gathered. Such data is used for policy formulation as well as benchmarking with European countries.

In terms of policy, Spain has adopted medium term quantitative targets (related to the European target) and a multi-annual inter-sectoral programme. However, implementation of the programme is sectoral and partly decentralized and it does not seem that coordination and monitoring of progress have been strongly organized. Some evaluation of interventions is performed.

The links between road safety managers and researchers for policy formulation seem to be weak as the available scientific teams are scattered through universities and the private sector (automobile associations, insurance companies, and consultants). In such conditions, knowledge accumulation and storage is obviously not easy. However, some opportunities of multi-disciplinary and professional road safety training are offered.

Diagnosis: Spain	
"Good practice" elements	✓ Political will ✓ A specific Road Safety Commission in Parliament for high-level decision-making. ✓ A Lead Agency (under the Ministry of Interior) ✓ A formal procedure to consult regional and local authorities through an existing permanent structure. ✓ A national Road Safety Observatory. ✓ A targeted inter-sectoral multi-annual programme. ✓ Some evaluation of road safety interventions.
Elements needing improvement	✓ The Lead Agency and principal coordinator is under the Ministry of Interior (rather than at a higher level) and therefore not well situated for inter-sectoral coordination. ✓ Unclear specifications of the role of the Public Prosecutor for road safety with respect to road safety management. ✓ Stakeholder consultation does not seem to include relevant NGOs or businesses. ✓ The national Road Safety Observatory does not seem to have the complete set of data usually used for policy formulation and evaluation (apparently no systematic collection of behavioural data). ✓ No long-term "vision". ✓ No identified budget for road safety. ✓ No effective monitoring of implementation. ✓ No strong multi-disciplinary research team, some scattered research only. ✓ No training plan for road safety actors.

Table 3.12: Good Practice Diagnosis – Spain

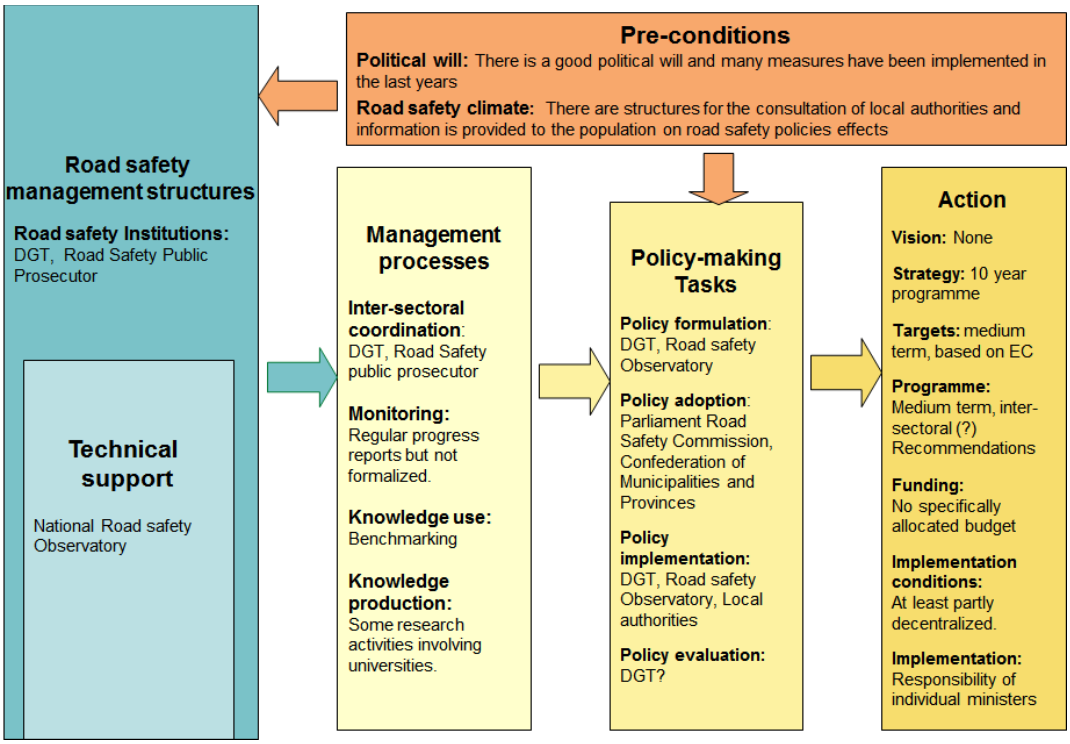


Figure 3.25. Overview of road safety management good practice elements in Spain

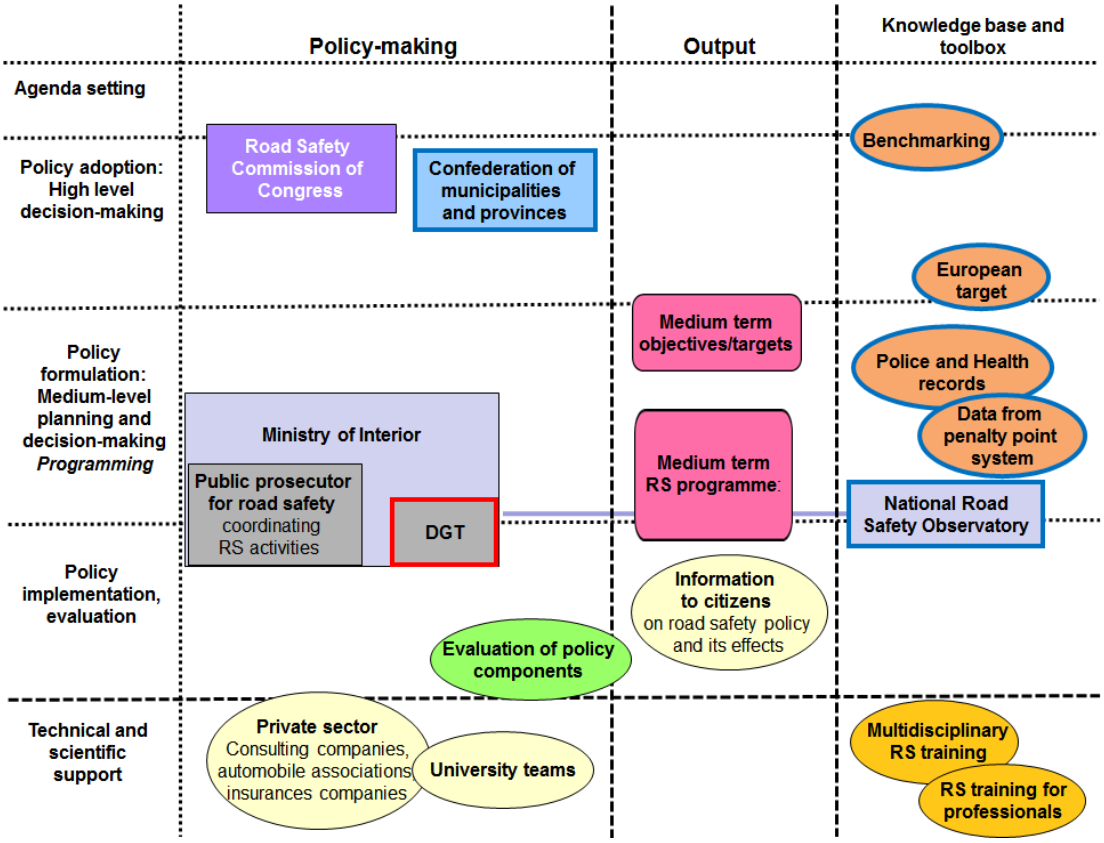


Figure 3.26. Structures, processes and outputs in Spain

3.2.13. Switzerland

In Switzerland, which is a federal country, the main road safety responsibilities lie with ASTRA (the Swiss Federal Roads Office), an executive agency under the Swiss Ministry of Transport. The 26 cantons have regional responsibility, and they put different weight on different road safety issues. There is only limited vertical coordination with the federal level. There is some horizontal coordination between Cantons (regions). However, coordination is limited due to language barriers. The major stakeholders are consulted through the Swiss Road Safety Council, which includes representatives of the federal and regional governments as well as of NGOs.

A road safety programme (Via Secura) was developed but has not yet been adopted by the parliamentary chamber representing the Cantons. At the time of data collection, it was expected to be adopted in 2012. The long-term policy of Vision Zero was taken out of the Road Safety Programme (high level decision). The programme is only targeted in vague terms ("a significant reduction of the numbers of accidents and fatalities").

The cost of the Road Safety Programme has been estimated but no preliminary cost-benefit analysis has been carried out. There is no specific road safety budget allocated from the Treasury but there is a formal funding structure which requires part of the road insurance tax to be allocated to the Swiss Council for Accident Prevention (BfU) and the Road Safety Fund. The workers compensation insurance also provides some resources.

Some evaluations of the programme are planned. Some training needs have been identified for programme implementation; however, no budget has yet been allocated to ensure the training plan is applied.

BfU provides scientific support to ASTRA both in terms of research and expertise. There is no official national road safety observatory; however BfU collates road safety data and knowledge in a similar way.

It can be observed that the federal government takes care of not imposing too precise directions to the regional governments which are, in effect, in charge of most safety interventions: the long-term vision has been dropped and a precise quantitative target avoided. In order to fully assess road safety management in Switzerland, the next step would be to investigate at least a sample of the Cantons using the same approach as at national level.

Diagnosis: Switzerland	
"Good practice" elements	✓ The Parliament representing the Cantons (regions) is the high level institution that adopts the federal road safety policy. ✓ A Lead Agency for road safety ✓ A formal structure for stakeholder consultation. ✓ The cost of the proposed federal road safety programme has been estimated. ✓ Some formal sustainable funding procedures for research, technical support and road safety campaigns and training (from car and workers' insurance). ✓ A sustainable road safety research structure serving as technical support for decision. ✓ A federal road safety programme (probably) based on knowledge. ✓ Identification of training needs. ✓ A sustainable multi-disciplinary road safety institution performing research and providing advice and technical support.
Elements needing improvement	✓ The Lead Agency is under the Ministry of Transport (not at the highest level) and is not particularly dedicated to road safety. ✓ No formal inter-sectoral and vertical coordination, so no clear picture of what road safety action is like across the country. ✓ The only horizontal coordination is between Cantons and is informal and limited. ✓ No incentives from the federal level to ensure regions are active in road safety management. ✓ No long-term "vision". ✓ No real quantitative target for the proposed federal road safety programme. ✓ No identifiable federal road safety budget so far. ✓ No budget allocated to training of road safety professionals (yet).

Table 3.13: Good Practice Diagnosis – Switzerland

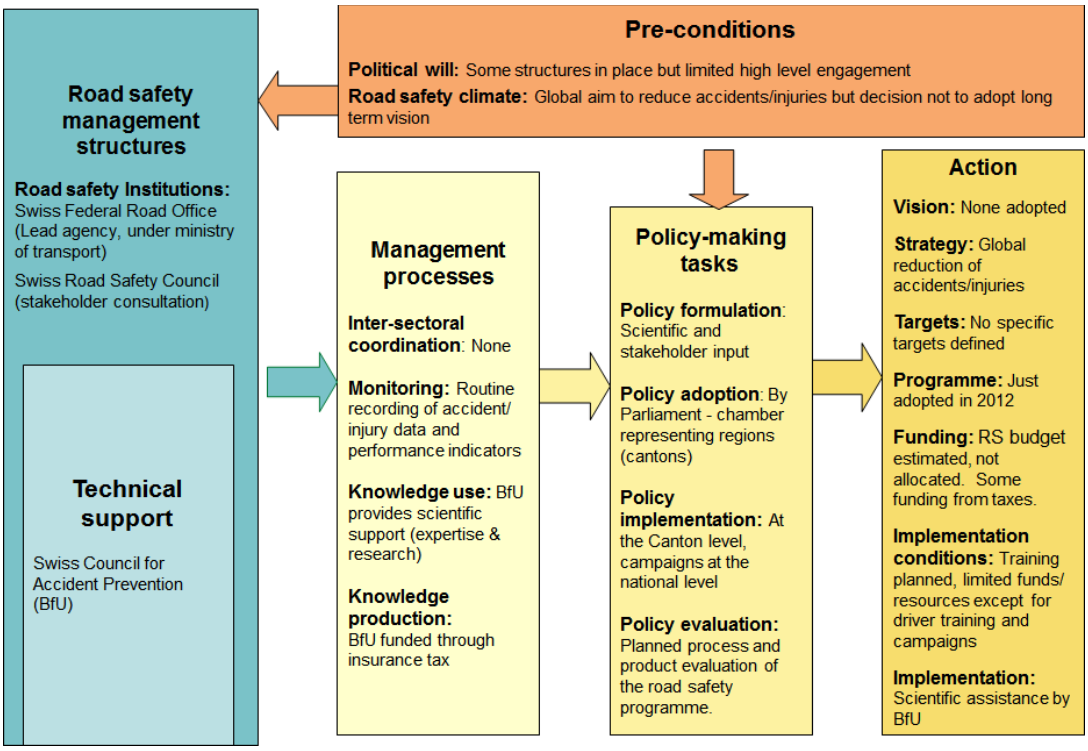


Figure 3.27. Overview of road safety management good practice elements in Switzerland

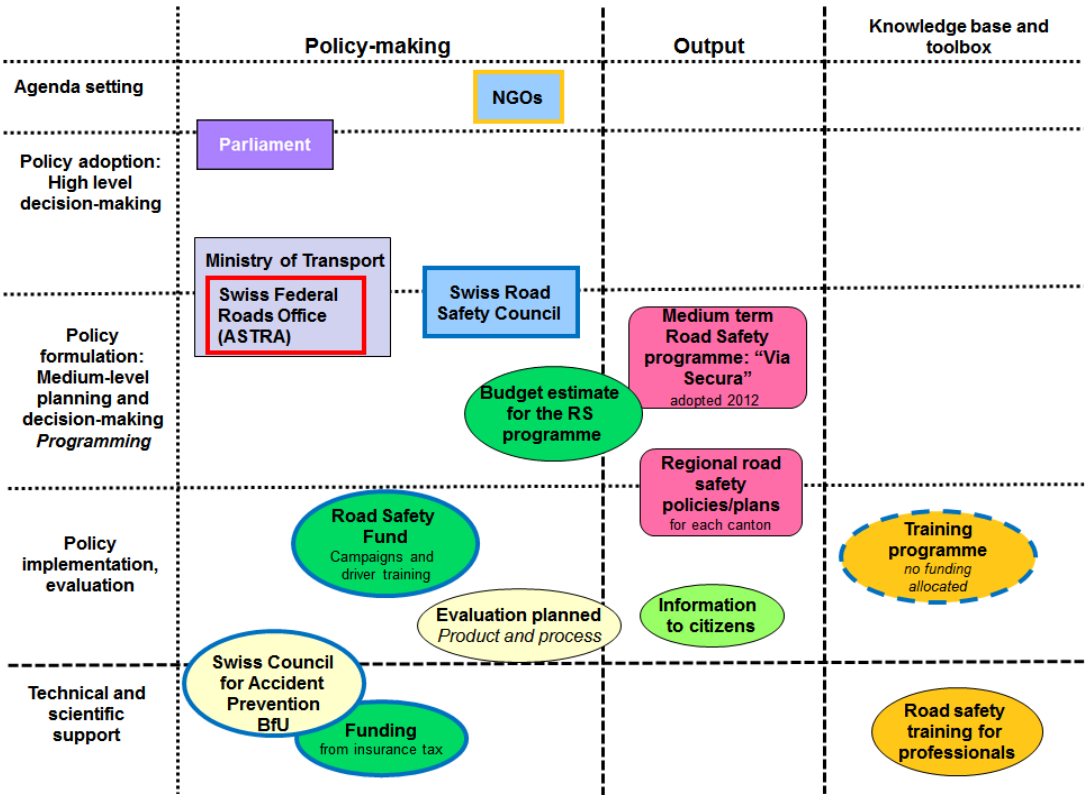


Figure 3.28. Structures, processes and outputs in Switzerland

3.2.14. United Kingdom

The British road safety management system is in full mutation. Government has withdrawn from whatever can be left to non-national government stakeholders: implementation is left to the initiative of regional authorities which link the national Lead Agency (the Ministry of Transport, DfT) to local stakeholders, while most training is left to non-governmental bodies such as IRSO, the Institute of Road Safety Officers) and universities. The national RS strategy and programme, based on a "safe systems" approach, are basically a framework for regional and local authorities to define their own work programmes; even regions tend to give the upper hand to local authorities. Local programmes are expected to respond to local RS problems at the same time as contributing to the national goals set in the strategy. Some RS data collection has also been re-allocated to local authorities without ensuring that the task is actually performed.

In such a situation, it is unclear what DfT really does, once the strategy and programme have been approved at high level: although DfT has been designated as Lead Agency, it has no real power to coordinate sectors at the national level and only has some liaison teams with the sectors of Enforcement, Justice and Health. Whatever coordination there is takes place mostly between national and sub-regional levels, on the initiative of regional or local authorities, and horizontally at the regional level, on the basis of partnerships. None of this is structurally sustainable, although the long experience of UK in road safety action probably helps to keep the issue on the agenda. There has even been some lobbying to move road safety leadership to the ministry of Health, as the Health sector is becoming more and more involved in promoting road safety.

It is equally unclear how much the non-governmental stakeholders have been consulted for the preparation of the national road safety strategy and programme. There may have been such consultation but it has in any case remained informal.

Only a very sketchy long term vision has been adopted (remain the best in RS and continue progressing!) and it is not compelling for the government. The road safety programme itself has not been targeted.

Road safety funding seems to have been planned and accordingly made available for implementation and research in the past, but to have been cut down in relation to the current economic crisis. Moreover, the product of fines is no longer formally allocated to RS activities. As a result, *the funds as well as the human resources currently available for interventions are described by one expert as insufficient in all sectors "in the current financial climate*". Thus, road safety has become an adjustment variable, which is inconsistent with the high level government decision to implement the adopted programme.

Although the national RS programme has been approved at high level (at least by the Prime Minister), it seems that the former monitoring process of RS activities has now disappeared, and only monitoring of the global effects of road safety action is still being carried out on the basis of performance indicators. Evaluation is no longer in the picture except in the enforcement sector.

There is a long established system of knowledge production and dissemination in the country, through universities and, to some extent, by professional organizations such as IRSO. However, there is now only a small budget available for RS research at the national level, so the previous level of road safety research in the UK cannot be sustained. Moreover, the links between researchers and decision-makers have become loose, so that it is to be feared that the existing multi-disciplinary research teams will soon cease to be "sustainable".

The potential for training current and future RS actors is provided by universities and some professional organizations, but how much use is made of that potential to train staff is unclear in the absence of any training plan at DfT level.

It is to be noted that, in the following diagnosis, items of “Elements needing improvement” are mostly related to a downward trend in road safety management and so assessed in comparison with what used to be in the country. The present diagnosis thus does not reflect the long-term efforts made by the UK to reach its current performance level in road safety.

Diagnosis: United Kingdom	
"Good practice" elements	✓ The ministry of Health is getting more and more involved in promoting road safety action. ✓ A national Lead Agency, the ministry of Transport (DfT). ✓ In the absence of formal coordination at the planning level, some inter-sectoral work is performed on the basis of cooperation (via "liaison teams" and partenrships) between DfT and some other ministries. ✓ Regional authorities serve as a link between DfT and the local stakeholders. ✓ Some "vertical" coordination is performed on the initiative of some regional authorities. ✓ A national strategy and road safety programme, based on "Safe Systems" and approved at high level (Prime Minister). ✓ Monitoring of the global effects of road safety action on the basis of performance indicators. ✓ Some long-established multi-disciplinary research teams. ✓ A potential for training current and future road safety actors is provided by universities and some professional organizations.
Elements needing improvement	✓ Low political will, road safety is no longer a priority issue at the national level (rather an "adjustment variable" for government spending). ✓ No sustainable road safety management system at the national level. ✓ DfT, as Lead Agency, has no real power to coordinate sectors at the national level. ✓ No formal consultation of stakeholders at the planning and decision-making level. ✓ Some components of road safety data collection have been re-allocated to local authorities without ensuring that the task is actually performed. ✓ Only a very sketchy long term vision has been adopted and it is not compelling for the government. ✓ The strategy and programme are essentially a framework for regional and local authorities to define their own work programmes. ✓ The road safety programme is not targeted. ✓ The present role of DfT in programme implementation is unclear. ✓ Road safety funding is no longer planned as it used to be and seems to have been cut down in relation to the current economic crisis. ✓ The product of fines, which used to provide some steady funding, is no longer formally allocated to RS activities. ✓ The funds as well as the human resources currently available for interventions are found insufficient in all sectors. ✓ There is no longer any full-size monitoring process of road safety activities. ✓ Evaluation of road safety measures is no longer performed (except in the Enforcement sector). ✓ The links between researchers and decision-makers have become loose. ✓ Only a small budget is now available for RS research at the national level, so the previous level of knowledge production in the UK cannot be sustained. ✓ No training plan for road safety actors at the national level.

Table 3.14: Good Practice Diagnosis – United Kingdom

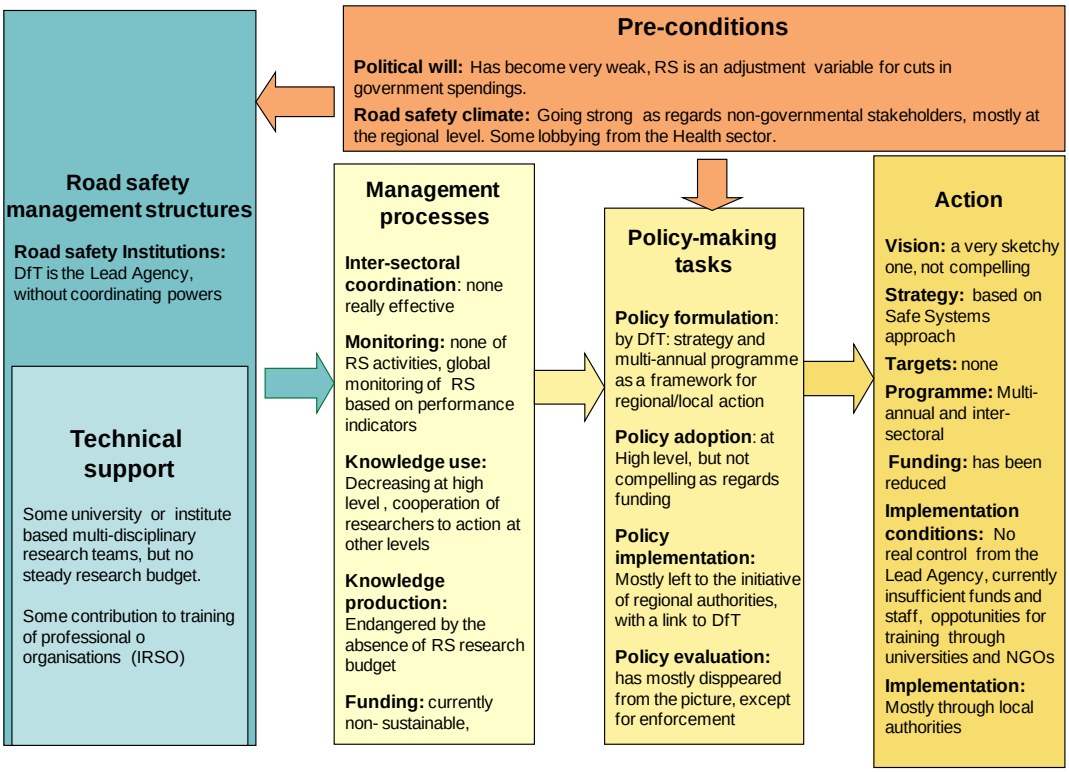


Figure 3.29. Overview of road safety management good practice elements in the United Kingdom

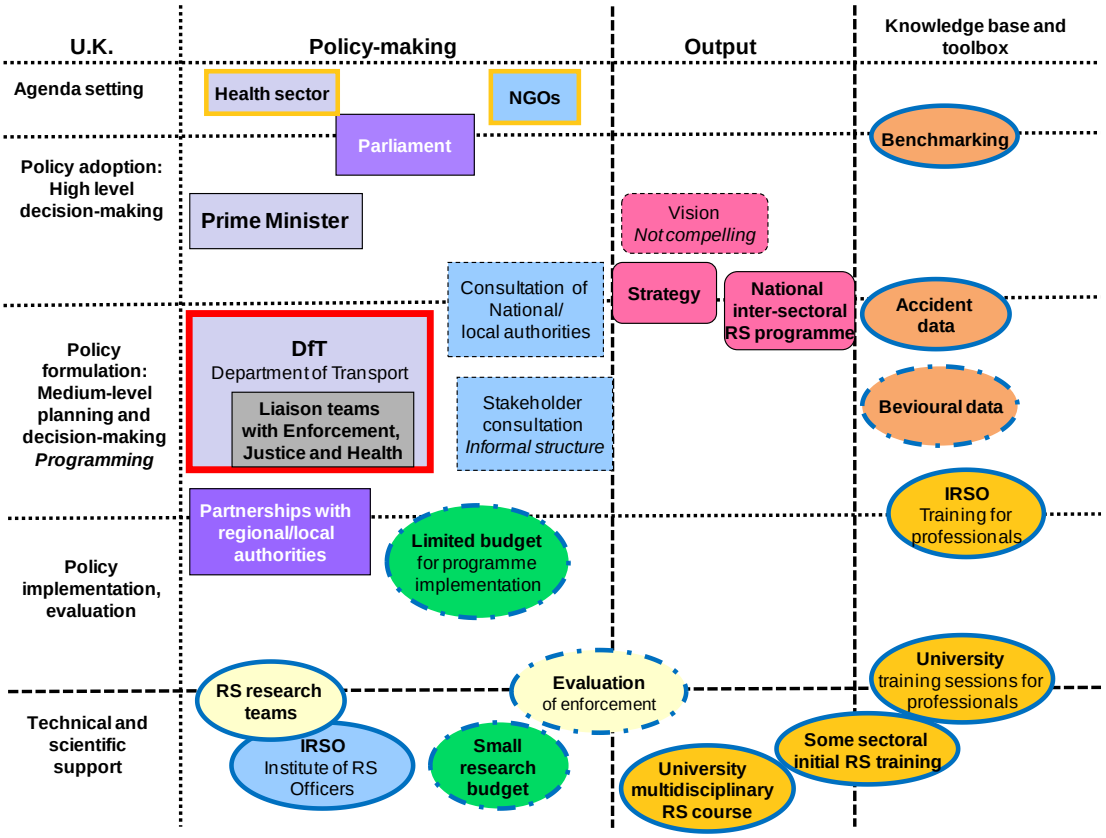


Figure 3.30. Structures, processes and outputs in the United Kingdom

3.3. Observations from country profiles

The countries cited in the paragraphs below are only examples; the whole list of countries concerned by each observation couldn't be inserted for readability reasons.

3.3.1. Decentralization

European countries' administrations are not decentralized to the same extent and this reflects on road safety activities and organization. In all countries, municipalities are responsible for the safety of their citizens, at least on their own road network. Infrastructure safety is usually distributed between road authorities from the national to the local level although the proportion of national roads in the network varies from country to country. Regional or intermediate authorities may have a part to play by establishing regional RS plans. The "top-down" approach, in which the national government takes the lead in developing and implementing national road safety policies, may or may not be more important than the "bottom-up" approach, in which regional/authorities take most initiatives for road safety improvement (initiative to Regions is actually the rule in federal countries such as Switzerland). The formal or informal relationships between the national and the regional/local levels also differ according to countries.

At one end of the range, regional authorities and the national administration cooperate on a legal basis to define a target, prepare a national RS programme, and allocate targets for regional programmes which constitute the bulk of implemented interventions (Finland, the Netherlands). At the other end, road safety policy is decided at the national level and regional/local authorities are, either required to fit into it or at least contribute to its objectives (France, Israel, Italy), or left to their own devices (Greece). In the latter case, not much is known at the national level of what goes on in road safety at the regional/local one.

Some of the European road safety management systems may be changing due to the economic crisis which forces governments to reduce expenses, and as a side-effect of the progress made over the last ten years in road safety (as the European target has been reached in most countries). Some countries such as the UK are now partly withdrawing from RS policy and leaving the initiative to regional/local authorities, however without setting up any consultation/negotiation system. In other countries, it is hoped that reduction of the national funding for road safety can be compensated by more regional/local funding and even by more private funding from transport-related businesses and NGOs (the Netherlands). Decentralization of this kind indicates weakened political will at the national level while "balanced" decentralization like in the Netherlands is conducive to larger involvement of the citizens across the country, therefore to a better road safety climate.

Following DaCoTA, road safety management at the regional level (or state level in federal countries) should be investigated, along the same lines as in this survey of national RS management systems. Needs for data and decision-support tools of regional and local actors need also to be given more attention in the future.

3.3.2. The limits of the Lead Agency

The concept of Lead Agency, put forward as a "good practice" item in literature, does not seem to have much meaning in European countries. The structure designated as responsible for road safety at the national level is usually the Ministry in charge of Transport or Infrastructures (or both), more rarely the Ministry of Interior (France, since 2011, Spain) although national road safety programmes usually need to be adopted at least by governments, sometimes by Parliaments, in order to be implemented. For operational planning and implementation, a number of countries have established an agency or a coordinating structure under the lead ministry (Belgium, Ireland, Israel); in this case, it

becomes unclear if the Lead agency is the ministry or this inter-sectoral structure which is in charge of most of the work producing the desired outputs (road safety interventions, road safety improvement).

Having one ministry as Lead Agency may be a deterrent for other ministries (Health for instance) or other potential actors that would otherwise take more initiatives in road safety: thus a Lead Agency has to be efficient in harnessing all potential forces to road safety work to qualify as an element of “good practice”. In countries where decentralization is taken seriously and a fair amount of road safety activities are carried out at the regional/local level, the concept of leading from the national level even becomes unacceptable.

3.3.3. Inter-sectoral and vertical coordination

The existence of an inter-sectoral coordinating structure at the higher decision-making level does not seem to be a determining criterion of “good practice”. When it exists (France, Belgium), it is at best a sub-group of the council of ministers (government), at worst a reunion of ministers or high level officials under the Ministry of Transport (most often the Lead Agency). In the latter case, the decisions taken still have to be approved at a higher level (government, Prime Minister or Parliament). If the inter-sectoral structure is a sub-group of government, it has to be effectively working: if it happens not to meet according to schedule, the government tends not to get involved in road safety matters.

On the contrary, an inter-sectoral coordinating structure at the planning and implementation level or, at least at the operational level (putting into practice the policy adopted at the higher level) seems to be boosting road safety activities (Israel, France until recently).

When such a medium level technical coordinating structure has not been created, some inter-sectoral coordination often still takes place on an informal or bilateral basis or through a structure meant for the consultation of stakeholders. This is not systematic and definitely not sustainable as partnerships or working groups formed for the purpose are highly dependent on the competences and goodwill of the persons involved.

3.3.4. Stakeholders’ involvement

Most countries have introduced the consultation of stakeholders in road safety policy, either before taking major decisions or at the planning level. Stakeholders usually include representatives of regional authorities and of NGOs (associations, professional organizations), more rarely of businesses related to transport or infrastructures. In some countries, the consultation may be informal but nevertheless systematic at the decision-making level; however, the existence of a formal consultation structure is a plus as it induces continuity of stakeholders’ involvement during the policy making cycle (from policy making and adoption to implementation) as well as monitoring procedures of road safety activities.

The degree of involvement of stakeholders varies according to countries: in some, part of the stakeholders, for instance the regional authorities, are really considered as part of the decision-makers while in others, the role of stakeholders is purely advisory. In both cases, stakeholders may participate in implementation either through funding or through direct cooperation with national or regional governments.

Stakeholders’ involvement generates a large number of road safety actors in a country, which contributes to developing a road safety culture. However, we have no indication as to the level of road safety knowledge and competences displayed by the different groups of stakeholders (regional/local authorities, NGOs).

3.3.5. Programming road safety activities

National inter-sectoral programmes based on the “Safe Systems” approach or, at least, on the “Engineering, Education and Enforcement” model are the general rule in the countries investigated although there are still countries that have not adopted any multi-annual programme (France, Greece). Most programmes are meant to meet a quantitative target although some are not (Switzerland). The quasi-generalization of multi-annual inter-sectoral programming has been greatly encouraged by the projects and recommendations of the European Commission and the benchmarking activities at the European level (sometimes with added references from other OECD countries).

Modalities for preparing a multi-annual programme vary from country to country. Designing the programme is normally commissioned by the Lead Agency or the multi-sectoral road safety coordinating body, and may be performed by the road safety actors themselves (with or without technical and scientific support) or by university-based teams and/or consultants.

There is sometimes a long time gap between programme design (policy formulation) and programme adoption at high level, which indicates that the road safety management system is not fully integrated, and missing links prevent the policy making cycle to run smoothly (Greece, Poland). In some countries with no long-term “vision”, once a multi-annual programme is nearing its end, it is not even clear who should take the initiative of starting a new one and how.

In most of the countries investigated, it can be observed that policy formulation is, or has been at some stage, based on knowledge (research results, international comparisons and experience). However, knowledge-based planning is not always sustained over several consecutive road safety programmes. This is highly dependent upon the level of cooperation between managers and scientists which may vary with successive teams of managers. How to promote continuity of such cooperation is an item of “good practice” that still has to be designed.

Once a multi-sectoral programme has been adopted, task allocation to key actors ensures that all programme components will be taken charge of, and inter-sectoral links should be active at the implementation level to ensure the full benefits of inter-sectoral approaches (complementarity of measures, balance between safe mobility environments and safe behaviour, etc.). A few countries follow this pattern. However, for a number of multi-sectoral programmes, task allocation consists in re-distributing implementation between sectors, thus avoiding the issue of inter-sectoral coordination at the operational level. This solution is easier as it fits the usual hierarchical government organization, but it reduces the impact of programming on a “Safe Systems” basis.

3.3.6. Availability of knowledge

Useful knowledge for policy formulation and implementation is available at the European level, in particular through ERSO, and at the national level through research in most of the countries investigated. Exchanges of experience are also organized in European sub-regions (the Baltic one, for example). However, even in some of the countries where policies are highly knowledge-based, it does not seem that full advantage is taken for policy formulation from what is available internationally or nationally. However, international knowledge plays an important part in getting road safety on the agenda, and also in formulating policy in countries where road safety research has not long been developed (Latvia).

3.3.7. Funding, budgeting

Few countries produce an estimate of the cost of the RS programme that is being pushed for adoption. In the few instances when a provisional budget has indeed been estimated, the

amount of funding made available for road safety interventions is usually lower (Israel, Latvia). In most countries, implementation of road safety interventions is neatly divided between sectors and partners at the regional/local level or from the private sector, so the annual budgets of all partners contribute. Thus, there is no centralized decision-making where funding is concerned and no way to ensure that measures planned in a programme are going to be equally implemented in all sectors.

Funding is usually annual, at least from the part allocated from the national and local authorities budgets, while programming is usually multi-annual (except in France, Greece): this inconsistency indicates that the building of road-safety management systems is still unfinished. Funding seems to be chronically insufficient at least in most sectors of RS activities. However, some experts mentioned that more could be done with from the money and the human resources available if only the organization was better! Attempts at evolving a dedicated RS funding system often fail against the opposition of ministries of Finances (Israel), but some RS Funds have been established (Austria, Switzerland) and the way they work is worth monitoring.

Overall, there is room for improvement in the road safety funding systems in Europe, in order to increase both its level and its returns.

3.3.8. Implementation conditions

“Good practice” would demand that a national road safety programme which has been adopted at high level (by government of Parliament) should be fully implemented. However, this is not the case in most of the countries investigated. Lack of reflection on a suitable funding procedure, the resulting uncoordinated funding process and chronically insufficient funding (see observation above) are only part of the problem. The rigidity of the administrative structure which has been largely overcome in decision-making and policy-formulation seems much more daunting at the operational level. Only a few countries have developed an effective coordination structure or procedure to implement their multi-sectoral programme (Finland, Israel, the Netherlands) and in a number of countries, implementation is still distributed between government sectors without any further control to ensure consistency of interventions with the original programme (Belgium, Italy, Spain, Poland, etc.).

Task allocation to implement a multi-sectoral programme is “good practice” when it ensures that all items of the programme have found an “owner” and will thus be taken up. However, task allocation is still often used to avoid the issue of coordination at the operational level and of allocating a global budget for programme implementation; this usually results in some sectors being more keen or efficient than others in performing the road safety interventions attributed to them, which is in total contradiction with the systems approach usually adopted in programme design.

3.3.9. Evaluation

There is a great contrast between European countries on this issue: in some countries, evaluation of safety measures is part of the culture and planned with the multi-annual programme or at least with the measures to implement, with funding often ready in advance, while in others, evaluation is so rare as to be non-existent (France). Even where evaluation is consistently performed, it is usually limited to infrastructure and enforcement measures.

As to the global effects of a national RS programme, it is more often monitoring which is performed (checking the progress of the road safety situation towards the target) rather than actual evaluation (checking that a decrease of the number of road traffic casualties has actually been obtained through the set of measures and interventions implemented). Monitoring at least serves to alert the policy-makers when the current action programme is

not implemented fast enough or is not sufficient to reach the goals and therefore must be adapted. Evaluation provides a more accurate assessment of the success of the current RS policy, but this is obviously not often found necessary by decision-makers.

3.3.10. Monitoring, implementation and reporting

Some countries have developed an exhaustive monitoring system of road safety activities at the national and, if applicable, at the regional level (Latvia, Poland). This is neither a means of coordinating implementation activities nor an evaluation process but it is an element of "good practice" as it obviously stimulates the various road safety actors, provides an overview of what has been going on in the country and enables the government or lead agency or road safety coordinating structure to inform the citizens on the road safety action undertaken.

In road safety policies based on Safe Systems, providing information on what is done by the government and its various partners shows that half of the contract is fulfilled and the road users are therefore expected to play their own part (adopting a safe behaviour).

3.3.11. Knowledge production

Most countries in our sample have one or several multi-disciplinary teams to perform road safety research. In most cases however, there is no steady national research budget available, which means that a number of teams have survived thanks to European research programmes but their sustainability is now in question. University teams are usually centred on a few professors with tenure who remain available (Greece, Poland), but other researchers may have to move to other subjects, which will also hinder knowledge accumulation, storing and dissemination.

The situation is a little more stable in countries with a long culture of systematic evaluation of road safety interventions, but is overall threatened by the current economic crisis.

3.3.12. Capacity building, training

Capacity building to ensure "good practice" in road safety policy formulation and implementation is still a generally neglected issue. Road safety training plans for the personnel at medium decision-making level or in charge of implementation very seldom exist and even if they do, they are not financed. Lack of professionalism of road safety actors and the need for state-of-the-art training has been mentioned in several countries. In federal or highly decentralized European countries, a large part of the road safety actors and stakeholders are at the regional and local levels where the needs for training and decision-support are even more acute.

Capacity building is an on-going process as there is usually a fast turnover in administrative and local authority personnel. Some sustainable offer of training courses or sessions is therefore necessary at country level and can only be provided by the scientific and technical teams with a long experience in road safety research and development (which most countries still currently have). At the moment, this offer of training is still sketchy in most countries. Only a few European universities or research institutes run a regular multi-disciplinary road safety course, mostly at the post-graduate level. Of course, the lack of demand from the road safety management system is a deterrent for scientific institutions to invest in such courses which are out of the usual disciplinary channels and somewhat estranged to usual academic studies.

3.3.13. Benchmarking, using European decision-support tools

Benchmarking is practiced by most European countries in our sample and seems to be a powerful tool to keep road safety on the political agenda. European targets have also been used so far by most countries, either as a reference or to define a national quantitative target, but the most successful countries, like the Netherlands, are going to be less ambitious for the current decade as, the lower the fatality figures are, the more difficult it will be to obtain substantial improvements. Overall, exchanges at the European level have proved very useful to keep road safety going.

3.3.14. Are road safety policies victims of economic crisis?

There are signs that road safety funding is going down in a number of countries, a fact that country experts attribute to the current economic crisis. Road safety thus appears as an “adjustment variable” which can be compressed when savings are wanted at the State level. This may indeed be linked to the conjuncture but may be just as well a consequence of ten years of successful efforts which have reduced the priority of the road safety problem. This illustrates the need for a longer term Vision: most countries in our sample have one, but under a weak form, which means not really compelling for the government.

3.4. Country Comparisons

In this section, country comparisons are carried out for several key road safety management components. The DaCoTA questionnaire responses were used, together with the DaCoTA/ETSC-PIN data as well as additional data sources, so that 30 European countries are included in this analysis.

3.4.1. Introduction

With road safety management knowledge and definitions in early stages of development, comparing road safety management systems across Europe is quite a challenge. This is not helped by the lack of commonly accepted tools and system quality assessment procedures or the fact that the data for analysis are not available from specific sources or not available at all.

The point of reference for describing the systems used in Europe was a management model developed in the course of DaCota's WP1 and its Deliverable 1.2: Muhlrad, N. et al. (2011): *Road safety management investigation model and questionnaire.* The term "Investigation model*"* means that the proposed approach is not final and will continue to be updated and upgraded. As defined in this report, a **road safety management system** is *a complex institutional structure involving cooperating and interacting bodies which supports the tasks and processes necessary to the prevention and reduction of road traffic injuries*. (Muhlrad, N. et al.; 2011, pg. 22). The system works well to the extent that the institutional and organisational arrangements are adequate, that responsibilities are allocated along with sufficient resources and that knowledge transfers between different positions and between generations are effective. Improvements of road safety management systems are designed to ensure that the measures will be effective and developed according to the best of professional standards and that institutional, human resource, technical and financial measures required for the implementation will be used efficiently. Finally, the report stresses that the effectiveness of a system depends not only on its design but also on the environment in which it operates. While this chapter makes a brief mention of elements such as countries' political organization, economic and social situation, political will and road safety culture in the broad sense, they are definitely deserving of an in-depth analysis. The definition of the road safety management system proposed by the "Policy" Work Package of the DaCoTa project is obviously not the only one. The International Standard ISO 39001:2012 published in October 2012 covers *Road traffic safety (RTS) management systems — Requirements with guidance for use*. Its definition of management system is as follows:

"Management system: set of interrelated or interacting elements of an **organization** (*person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives*) to establish **policies** (*intentions and direction of an organization as formally expressed by its* ***top management***[2]) and **objectives** (*result to be achieved*), and **processes** (*set of interrelated or interacting activities which transforms inputs into outputs*) to achieve those objectives."

While this chapter does not negate the approach proposed by ISO 39001, the model developed within the DaCoTa project was chosen because of the flexibility it offers for describing a variety of transitional or less advanced RS management systems across Europe.

[2] Top management - person or group of people who directs and controls an **organization** at the highest level (ISO 39001:2012).

Following this RS management model, the content of the current country comparisons will be presented in five parts:

1. Institutional organization, coordination and stakeholders' involvement
2. Policy formulation and adoption
3. Policy implementation and funding
4. Monitoring and evaluation
5. Scientific support and information, capacity building

If we take account of the SUNFlower's hierarchical definition of the road safety system (Figure 3.31), the development of a road safety target should take place at the first three layers of the pyramid (see: Wegman et al., 2008, 2010 for a complete description of the model).

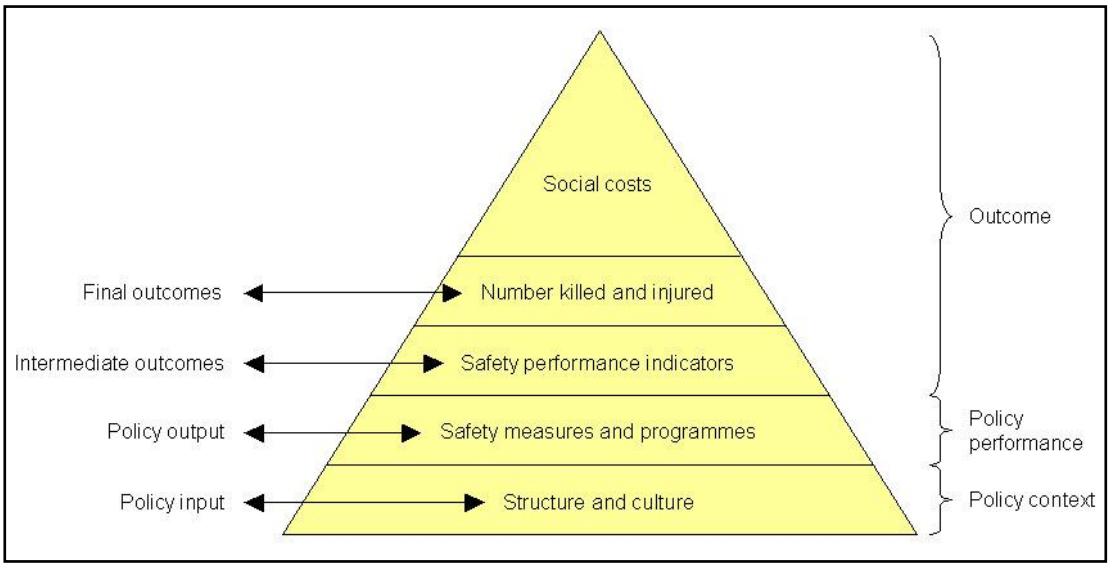


Figure 3.31: A target hierarchy for road safety (Koornstra et al., 2002; LTSA, 2000: after: Wegman F. et al. 2008)

The problems involved in "Institutional organization, coordination and stakeholders' involvement" and "Scientific support and information, capacity building" should be analysed at the lowest level of "Structure and culture". As a consequence, we need to understand the differences between the countries from the point of view of their organisation (e.g. decentralisation), their history and cultural background and public attitudes towards risk and safety and how the relevant road safety bodies are organised, their tasks, the availability of information, staff, funding and the attitudes displayed by those running road safety policies regarding risk and safety and the programme. "Policy formulation and adoption" and "Policy implementation and funding" should be analysed at the level of "Safety measures and programmes" while "Monitoring and evaluation" should be considered at the level of "Safety performance indicators". In the latter case the emphasis should be on the evaluation of the effectiveness and the efficiency of the measures in the programme. There is a lot to suggest that in the future an additional set of performance indicators will have to be incorporated to address quality assessment of the road safety management system.

The purpose of "Country comparison" is to understand how the different countries in Europe handle their road safety management systems and whether the model developed under DaCoTA can serve as a useful tool for comparing different national solutions. This

comparison is based on the research on road safety policy-making and management processes in Europe conducted within the "Policy" Work Package of DaCoTA, i.e.:

- The study of the different aspects of actual road safety policy-making and management processes for 14 countries that are presented in the previous section[3],
- A first consultation of a panel of experts on the needs for data and technical tools in road safety policy-making, (Muhlrad, N. et al.; 2011),
- The on-line consultation of a wider array of RS stakeholders about their needs in terms of scientific support (Machata et al., 2011).

The comparison also draws on data collected by the European Transport Safety Council under the PIN project (Jost G. et al.:2012)[4]. This allowed an additional set of 16 countries to be included in the analysis. Where possible, these data were verified using other sources (e.g. the World Bank (Bliss T. and Breen J.;2009*),* OECD (ITF 2011, 2012), WHO (2004, 2009), reports from different EU programmes (WP3 results under DaCoTA (so- called Master Table of the DaCoTA project - part on "Road Safety Management"; SUNflower (Wegman F. et al. 2008, 2010), SUPREME, 2007). Information was also sourced from national road safety programmes, websites of road safety bodies and finally from direct consultations with those involved in accident prevention.

Despite all these efforts to gather the necessary information, and the cross-checks with other sources, the conclusions presented in the remainder of this section should be considered with some caution. Indeed, it has not always been possible to collect all of the necessary materials and expert opinions frequently appear to be incomplete or inconsistent. Another major hurdle was the language barrier (a lot of important policy-making and management processes data are published in national languages only).

3.4.2. Institutional organization, coordination and stakeholders' involvement

In everyday language "institution" and "organisation" are treated interchangeably, frequently leading to misunderstandings and errors. The most frequently cited definition is provided by North (1993: after Lobo C. 2008). According to this author institutions can be considered to be the "rules of the game" and organizations to be "the players". *Institutions exhibit both a formal nature (constitutions, rules, regulations, laws, rights, etc.) and an informal nature (sanctions, customs, mores, traditions, etc.). Organizations, on the other hand, refer to a group or association, formal or informal, in which there are defined and accepted roles, positions and responsibilities structured in some relationship to each other in order to achieve a specific objective(s)*. According to these definitions, institutions set the context and framework within which organizations operate. The programme SUPREME (2007) aimed to define the idea of "institutional organization" in the area of road safety. According to the authors of the SUPREME report (2007, p. 7) "*institutional organisation of road safety refers to the general organisational framework, visions, targets, and strategies, provision and*

[3] The study was conducted in 2012 involving decision-makers and experts from 14 countries (Austria, Belgium, Finland, France, Greece, Ireland, Israel, Italy, Latvia, the Netherlands, Poland, Spain, Switzerland, United Kingdom).

[4] PIN questionnaires were completed by experts from 30 countries (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom, Israel, Norway, Switzerland); no response was received from Bulgaria. The questionnaire was based on the DaCoTA questionnaire.

allocation of financial resources, and tools and strategies for the selection and implementation of measures. Activities in this area are for the most part integrated in the political and administrative systems of the countries and establish a basis for the implementation of safety measures on all fields of road safety". Because many of the elements of the definition will be discussed further in the chapter, in this section the focus will be limited to the most important organisations involved in developing and delivering a country's preventive policy and on defining the relations between them.

Road safety typically is a government's responsibility, because it aims to protect the lives and health of its citizens. Governments undertake to do this by establishing an appropriate set of organisations and launching specific programmes. Table 3.15 lists policy-making "actors" and management processes in particular European countries and shows that, overall, the organisation of road safety management is quite similar in these countries. While responsibilities for road safety are spread over different levels of the government, there is usually one minister responsible for the country's road safety. In most cases it is the road transport and occasionally the interior minister (in particular for road police). The day-to-day work of the minister is usually supported by a department within the ministry, a government agency specifically set up for that purpose (e.g. Road Safety Authority in Ireland, Traffic Safety Agency in Slovenia or Swedish Transport Administration), or a body responsible for the country's national roads and additionally for road safety (e.g. Estonian Road Administration or Swiss Federal Roads Office). Government agencies that have recently been established to link all functions in one place and control the management and funding of road safety constitute an area of particular interest. The Irish Road Safety Authority is a good example. Established in 2006, the RSA is now the only government agency with responsibility for road safety in Ireland. It focuses on a few main areas: driver testing and training, vehicle standards and certain enforcement functions, road safety promotion, driver education and road safety research. The RSA receives funding from two sources. It is funded by the Department of Transport but has its own income as well. The RSA generates income from Driving Test Fees, the National Car Test Levy, Digital Tacho-Graph receipts and other amounts that arise through the Authority's campaigns and programmes (Road Safety Authority; 2012).

	Parliament	**Responsible minister**	**Main organisations**	
Austria		Austrian Federal Ministry of Transport, Innovation and Technology BMVIT. (Technology and road safety department)	The Austrian Road Safety Advisory Council (Roads Task Force) (2006)	
Belgium	Prominent role in initiating decision-making on road safety orientations or directions, involved in adopting road safety orientations or directions	Federal Minister for Mobility	The Inter-Ministerial Committee for Road Safety (Task Force Road Safety) (2002)	The Federal Commission on Road Safety
Bulgaria		Ministry of Transport, Information Technology and Communications	State-Public Consultative Commission on the Problems of Road Safety	National Road Safety Commission (NRSC)
Cyprus		Minister of Communications and Works. (Road Safety Unit)	The Cyprus Road Safety Council	
Czech Rep.		The Ministry of Transport (MoT) (Road Safety Department (BESIP))	The Czech Governmental Council for Road Safety (2004)	
Denmark		Ministry of Justice and Ministry of Transport	The Danish Road Safety Commission - The Danish Road Safety	Danish Road Safety and Transport Agency

			Council (Rådet for Sikker Trafik) (1935)	
Estonia		Ministry of Economic Affairs and Communications	The Road Safety Committee of the Government of the Republic of Estonia	Estonian Road Administration (ERA)
Finland	The Parliament Traffic Committee discusses all issues that concern traffic safety. It hears experts and can suggest changes to a proposed new law.	Ministry of Transport and Communications	Consultative Committee on Road Safety (1973) Central Organisation for Finnish traffic safety (Liikenneturva)	Finnish Transport Agency (2010) Traffic Safety Agency
France	Parliament may introduce amendments to Traffic laws. More recently, a Parliamentary mission has been appointed to review and propose changes in RS management institutions and policies.	Minister of Interior and Minister of Transports (Road Safety Directorate)	The Inter-ministerial Committee for Road Safety (CISR) (*Under the Prime Minister*).	National Road Safety Council (2000)
Germany		Federal Ministry for Transport, Building and Housing (BMVBW)	German Road Safety Council (DVR) (1969)	
Greece	There is a Road Safety Committee (not represented) in the Inter-ministerial committee which makes proposals for programmes and measures.	Ministry of Infrastructure, Transport and Networks	Inter-ministerial Committee on Road Safety (ICRF) (*Under the Minister of Infrastructure*)	National Road Safety Council
Hungary		Ministry of National Development and the Ministry of Interior (BM)	Interministerial Committee on Road Safety (early 1990's)	
Ireland		Minister of Transport, Tourism and Sport	Cabinet Subcommittee for Road Safety (The High Level Group on Road Safety) *(Under the Minister of Transport)*	The Road Safety Authority (RSA) (2006) Medical Bureau of Road Safety (MBRS).
Italy	YES	Ministry of Infrastructure and Transport (Directorate for Road Safety which is part of the Department of Inland Transport)	Road Safety Advisory Board (Consulta Nazionale per la Sicurezza Stradale).	General Directorate for Road Safety
Latvia		Minister of Transport (and Minister of Interior)	National Road Safety Council (1996)	Road Traffic Safety Directorate (CSDD) (1991)
Lithuania		Ministry of Transport and Communications	Traffic Safety Commission	Traffic Safety Department within Min. of Transport
Luxemburg		Ministry of Transport	Commission de Circulation de l'Etat",	
Malta		Ministry for Infrastructure, Transport and Communication		Malta Transport Authority (MTA) (2010)
Netherlands	The involvement of Parliament mainly concerns specific measures, but the Mobility Policy Document (Nota Mobiliteit) and the Strategic Plan Road Safety also have to be approved by Parliament.	Ministry for Infrastructure and the Environment. (Directorate-General for Mobility and Transport)	Association of Regional Water Authorities (BKO - Bestuurlijk Koepel Overleg')	Regional Road Traffic Safety Authorities (ROV's) of provinces and city regions
Poland	During the recent term of office Parliament discussed road safety more often than before. The Parliamentary Road Safety Group was set up. Parliament hosts more discussions and	Ministry of Transport and Communications (Secretariat of National Road Safety Council)	National Road Safety Council (1993)	

	conferences than before which does a lot for the meetings' importance.			
Portugal		Ministry of Internal Affairs.	National Council for Road Safety	Road Safety National Authority (ANSR - Autoridade Nacional de Segurança Rodoviária)
Romania		Ministry of Transport	Inter-ministerial Council for Road Safety (Consiliul Interministerial de Siguranta Rutiera (CISR) (1995)	Romanian Transport Authority (ARR)
Slovakia		Ministry of Transport, Construction and Regional Development (Department for Road Safety)	Council of the Government of the Slovak Republic for Road Safety (CGSRRS) (2004; in 2011 canceled)	
Slovenia		Ministry Of Infrastructure and Spatial Planning	Inter-ministerial Working Group on Road Traffic Safety	Slovenian Traffic Safety Agency. (and Inter-departmental working group on the National Safety Program) (2010)
Spain		Ministry of Interior (The General Directorate of Traffic (DGT Dirección General the Tráfico))	Inter-Ministerial Commission for Road Safety (1997)	The Superior Council for Traffic and Road Safety
Sweden		Ministry of Industry, Employment and Communication (MIEC)		Swedish Transport Administration (2010)
United Kingdom	YES	Ministry of Transport	Road Safety Advisory Panel (2000)	The Parliamentary Advisory Council for Transport Safety (PACTS)
Israel	Two parliamentary bodies: the Economics Committee and Road Safety lobby promote road safety (RS) initiatives on a permanent basis. However, those initiatives are typically subject-specific and do not concern RS orientations.	Ministry of Transport	Road Safety Advisory Council for the Minister of Transport (2005)	National Road Safety Authority (NRSA)
Norway		Ministry of Transport and Communications	Norwegian Council for Road Safety (Trygg Trafikk (1956)	Public Roads Administration
Switzerland	Not by definition, but in practice. There are circa 40 initiatives/letters of enquiry/motions at parliamentary level in the area of road safety	Federal Department of the Environment, Transport, Energy and Communications (DETEC)	Swiss Transport Safety Council (VSR) (1952) Swiss Council for Accident Prevention (bfu) (1938)	ASTRA (FEDRO = Federal Roads Office)

Table 3.15: The main organisations involved in road safety policy-making and management process in particular European countries.

If so initiated by the government or minister responsible for road safety, the majority of European countries appoint additional bodies to support the national authorities. They usually take the form of:

- **inter-ministerial committee for road safety** - an institutional structure composed of representatives of several ministries and representatives of government organisations designed to take common decisions and/or coordinate action. Inter-ministerial committees were appointed in Belgium (the Inter-Ministerial Committee for Road

Safety), France (Inter-ministerial Committee for Road Safety (CISR)), Greece (Inter-Ministry Committee on Road Safety), Ireland (Cabinet Subcommittee for Road Safety) and Poland (National Road Safety Council[5]). These bodies are frequently established under specific laws and their decisions are to be implemented by the different ministers involved,

- **road safety council** - an institutional structure composed of representatives of government, a central governmental agency but also representatives of regional authorities, NGOs and all organizations interested in road safety. This is the model used in Austria (Advisory Road Safety Council), Germany (German Road Safety Council), Finland (Consultative Committee on Road Safety), Israel (Advisory Council for the Minister of Transport) and Latvia (Road Safety Council). The large majority of the bodies provide advice and consultation and are considered a convenient channel of communications with road safety stakeholders other than government bodies. Road safety councils are also used for developing draft national road safety programmes.

Clearly, the most advanced of these organisations is the German Road Safety Council. Established in 1996, the DVR is composed of more than 200 members, such as the Federal Ministry of Transport and the transport-related Ministries of the Federal States, the Statutory Accident Insurance Institutions, the German Road Safety Volunteer Organisation (Deutsche Verkehrswacht), automobile clubs, vehicle manufacturers, the insurance sector, passenger transport operators, employers' associations, trade unions, churches and even international organisations. One of DVR's pivotal tasks is that of bundling the efforts of all parties involved in road safety in order to achieve joint and efficient action (co-ordinating function)**.** The income budget of the organisation comes from different sources. It receives a financial contribution from the Federal Government, the German Statutory Accident Insurance (DGUV), membership fees, other financial contributions and extraordinary contributions from other DVR members and other donors. Membership fees and other financial contributions received from its members are dedicated to financing the organisation's assignments[6].

The relations between the organisations described above are not always clear. In the case of government agencies, the reporting line is dictated by the way the country is organised. In the case of inter-ministerial committee for road safety and road safety councils the arrangements differ from country to country. If the interministerial committee is chaired by the prime minister (e.g. in France), the structure becomes a convenient platform for coordinating the work at the governmental level. If it is the transport minister, this becomes more of a cooperation platform. It is not entirely clear what the relations between inter-ministerial committees and road safety councils are. Sometimes the councils provide an expert pool for inter-ministerial committees, but in most cases they provide the results of their work directly to the minister responsible for road safety.

Finally, the role of Parliaments in delivering national preventive policies deserves a few words of explanation. Because of its position in the state, the Parliament analyses proposals and takes decisions to adopt or reject road safety regulation bills. In most cases, the revised regulations are prepared by the country's government, but in some cases Parliament members take their own legislative initiatives (Belgium, Finland, Greece, Poland or Switzerland). The data collected during DaCoTA surveys show that initiatives undertaken by members of Parliament do not always take into account expert proposals, although it is often difficult to obtain a full picture of how these processes take place due to data

[5] Despite the name, Poland's National Road Safety Council brings together representatives of different ministries and central government bodies (e.g. police or national roads directorate). While other organisations are also invited, their representatives cannot take decisions.

[6] http://www.dvr.de/dvr/aufbau/kurzdarstellung_20.htm

incompleteness. Finally, in several countries (e.g. in Belgium, Finland, France, Spain or the Netherlands), Parliament controls expenditure and in some countries also checks the progress in reducing road risks (e.g. Poland [7]) . Generally, however, there is a lot to suggest that Parliament's capacity for supporting prevention policy in not sufficiently used.

Organisations are set up, among other things, to make a better use of available resources. This objective can be achieved if it is supported by adequate coordination procedures. There are different levels of coordination[8] but for the purpose of describing Europe's road safety management systems it was agreed that coordination is a deliberate activity designed to harmonise, integrate and synchronise the efforts of many people and organisations to ensure that everyone works to achieve the same goals. Starting from this general definition co-ordination may be further subdivided into different categories, for example on the basis of scope or coverage (internal vs. external) or on the basis of flow (vertical vs. horizontal). Coordination is one of seven institutional management functions (OECD; 2008; p. 97, Bliss & Breen, 2009, ERSO; 2009). It should be noted, however, that coordination is sometimes viewed not as a separate function of management, but as the key to the success of management.

The DaCoTA report (Muhlrad et al., 2011) states that inter-sectoral coordination is required in policy-making at least at three levels where different sets of actors may be involved: policy formulation, policy adaptation, and policy implementation, but coordination can also serve as a useful management tool at the other levels of the policy-making process.

Data collected during DaCoTA show that any discussion on coordination first requires the clarification of two concepts: cooperation and lead agency. So far it was agreed that *cooperation* refers to the collective and voluntary efforts of people (organisation) who associate to achieve specified objectives. *Coordination* is much more formal and requires more than the stakeholders' willingness to cooperate. It involves a deliberate and conscious effort to bring together the activities of various individuals in order to provide unity of action. It requires concurrence of purpose, harmony of effort and concerted action[9]. In the future when indicators to measure the state of the road safety management system are firmly set, the question should be whether cooperation should be treated as the weakest form of coordination (cooperation being usually treated as the basis of coordination) or as a separate management instrument.

It may be equally difficult to define the term "lead agency". In general, this would be a government agency mandated and funded by the government which takes responsibility within Government for the development of the national road safety strategy and its results. It serves as the central point for programme development at the local, regional, or state level, defines the agenda, ensures continuity among the agencies, and is responsible for implementing decisions, has a dominant role in most of the institutional management functions for road safety. Its leadership role is accepted and fully supported by the rest of the government (to ensure the development of appropriate capacity and funding), regional and local authorities, NGOs and key stakeholders. The agency might undertake much of the work itself or else it might delegate aspects of the work to other organizations, including provincial and local authorities, research institutes or professional associations.

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[7] Once a year the government reports to Parliament on road safety developments.

[8] As an example ISO 39001:2012 defines coordination as orchestration and alignment of interventions, both (internally) within the organization and horizontally across related organizations with a role or interest in RTS.

[9] http://www.preservearticles.com/201106168013/what-is-the-difference-between-coordination-and-cooperation.html

Data collected during DaCoTA suggest that in many European countries it is not easy to identify the "lead agency". Table 3.16 shows a list of different organisations which the ETSC (Jost G. et al., 2012) and DaCoTA (WP1 and WP3) identified as "lead agency". The list shows that so far the majority of European countries have not succeeded in establishing a single "lead agency" and the term is used less formally where agencies take a lead role on specific operational matters.

Country	"Lead agency"	Country	"Lead agency"	Country	"Lead agency"
Austria	1. Austrian Federal Ministry of Transport, Innovation and Technology BMVIT. 2. Austrian Road Safety Advisory Council	**Greece**	1. Inter-ministerial Committee on Road Safety (ICRF)	**Portugal**	1. Ministry of Internal Affairs 2. National Council for Road Safety 3. Road Safety National Authority (ANSR))
Belgium		**Hungary**	1. Ministry of National Development and the Ministry of Interior (BM) 2. Interministerial Committee on Road Safety	**Romania**	1. Inter-ministerial Council for Road Safety
Bulgaria	1. Ministry of Transport, Information Technology and Communications 2. State-Public Consultative Commission on the Problems of Road Safety 3. National Road Safety Commission (NRSC)	**Ireland**	1. Minister of Transport, Tourism and Sport 2. Cabinet Subcommittee for Road Safety 3. Road Safety Authority (RSA)	**Slovakia**	1. Council of the Government of the Slovak Republic for Road Safety (CGSRRS) (in 2011 canceled)
Cyprus	1. Minister of Communications and Works. 2. (Road Safety Unit) 3. Cyprus Road Safety Council	**Italy**	1. Ministry of Infrastructure and Transport (Directorate for Road Safety which is part of the Department of Inland Transport)	**Slovenia**	1. Ministry Of Infrastructure and Spatial Planning 2. Slovenian Traffic Safety Agency.
Czech Rep.	1. Ministry of Transport (MoT) 2. Road Safety Department (BESIP)) 3. Czech Governmental Council for Road Safety	**Latvia**	1. Minister of Transport (and Minister of Interior) 2. National Road Safety Council.	**Spain**	1. General Directorate of Traffic (DGT)
Denmark	1. Ministry of Justice and Ministry of Transport 2. Danish Road Safety Commission	**Lithuania**	1. Ministry of Transport and Communications 2. Traffic Safety Commission	**Sweden**	1. Ministry of Industry, Employment and Communication (MIEC) 2. Swedish Transport Administration.
Estonia	1. Ministry of Economic Affairs and Communications 2. Estonian Road Administration (ERA)	**Luxemburg**		**United Kingdom**	1. Ministry of Transport 2. Road Safety Advisory Panel
Finland	1. Ministry of Transport and Communications 2. Traffic Safety Agency	**Malta**	1. Ministry for Infrastructure, Transport and Communication 2. Malta Transport Authority (MTA	**Israel**	1. Ministry of Transport 2. National Road Safety Authority (NRSA)
France	1. Minister of Interior and Minister of Transports (Road Safety Directorate) 2. Inter-ministerial Committee for Road Safety (CISR)	**Netherlands**	1. Ministry for Infrastructure and the Environment.(Directorate-General for Mobility and Transport)	**Norway**	2. Ministry of Transport and Communications 3. Norwegian Council for Road Safety 4. Public Roads Administration
Germany	1. Federal Ministry for Transport, Building and Housing (BMVBW) 2. German Road Safety	**Poland**	1. Ministry of Transport and Communications 2. National Road Safety Council	**Switzerland**	1. Swiss Council for Accident Prevention (bfu 2. ASTRA (FEDRO = Federal Roads Office)

	Council (DVR)				

Table 3.16: "Lead agency" in selected European countries (Source: Jost G. Et al 2012, DaCoTA)

As we can see from the World Bank reports (Bliss & Breen, 2009) "*case studies showed that effective management can be achieved with varied lead agency structural and procedural forms and, thus, no preferred model can be identified".* An analysis of how road safety management systems have been evolving seems to show that the future management system should be based on strong departments of ministries (just as is the case in Spain, the Netherlands or United Kingdom) or use government agencies specifically established for this purpose with clear responsibility for the government's road safety policy. The information collected during DaCoTA shows that when road safety is managed by inter-ministerial committees or road safety councils, the effectiveness may suffer. There is particular concern regarding the poor effectiveness of coordination (vertical and horizontal; this is more of a cooperation rather than coordination) and very little is said about how a policy should be implemented. There is a lot to suggest that in many countries setting up a "lead agency" and providing it with the necessary funding and power could solve at least some of the problems.

The data presented so far relate mainly to the governmental level. It is clear however that an effective road safety management system cannot do without regional authorities, NGOs, stakeholders or the public at large. The only involvement of these groups is via consultation but DaCoTA data show that even consultation is limited. Regional authorities are consulted primarily if they are members of existing organisations (e.g. road safety councils) or if the consultation takes place as part of new programme development. Stakeholder consultation was identified as acknowledged by respondents from Austria, Belgium (Federal Commission for Road Safety), Finland (Traffic Safety Council), France CNSR (National Road Safety Council), Israel (an informal co-operation between NRSA and NGOs), Latvia (National Traffic Safety Council), Netherlands (BKO) and Switzerland (Swiss Road Safety Council). While local authorities are also encouraged to include the targets and priorities of the national road safety programme in their local programmes, there are no mechanisms to ensure that this actually is the case. The situation improves when consulting a lower level of government is a natural consequence of how the state is organised (e.g. through the decentralisation of the government's activities with respect to RS management). The data collected indicate that road safety can be improved, if more actors taking an active part in developing and implementing road safety policies are involved, if key stakeholders are identified[10] and assigned the appropriate place for them within the system. The main motives to involve stakeholders in policy making is to diminish the veto power of various societal actors, improve the quality of decision making by using the information and solutions they have to offer, and bridge the perceived growing gap between citizens and elected politicians.

This part "Institutional organization, coordination and stakeholders' involvement" provided basic information about the organisational basics of road safety management systems across Europe. Several problems were identified which will require a more in-depth analysis and some recommendations in the near future. The data in the tables show that Europe's road safety management system has changed over the last decade. New agencies are established and previous activities of existing institutions have been modified. Because the problems of road safety management are poorly researched, it will be difficult to evaluate the changes and establish if they have helped improving the efficiency of the efforts made and of the use of the available resources.

[10] A stakeholder is anybody who can affect or is affected by an organisation, strategy or project. Some definitions suggest that stakeholders are those who have the power to impact an organisation or project in some way (For example: People or small groups with the power to respond to, negotiate with, and change the strategic future of the organization). http://www.stakeholdermap.com/stakeholder-identification.html

3.4.3. Policy formulation and adoption

A main objective of the "Policy Work Package" of DaCoTA was to understand how different European countries formulate their prevention policies. As defined in Muhlrad et al. (2011) policy formulation is a thought process of formulating objectives and selecting – among the available options - a logical solution to reach these objectives. On the formal side, a country's policy is translated into road safety programmes which usually include some or all of the following components:

- a long term vision (a qualitative goal or quantitative target to be reached in the distant future);
- a strategy (the long term inter-sectoral targets, political choices and orientations which are meant to govern the design of medium-term road safety programmes and other planned road safety activities),
- a short-to-medium term goal (defined by a quantitative target),
- a short-to-medium term inter-sectoral (or "integrated") action programme,
- priority sectoral interventions,
- and provisions for implementation (operational implementation processes, fund allocation, actors involved, capacity building).

Table 3.17 presents the most important information about road safety programmes currently running in Europe. As we can see from the table only two countries Luxemburg and Malta do not have separate road safety programmes. The other countries have their own road safety programmes although not all of them have been updated. Because the majority of the programmes refer to the EU's 4th Road Safety Action Programme (EC; 2010) and the United Nations' Decade of Action for Road Safety, it is quite likely that these documents have played an important role in motivating the governments of these European countries to start work on new road safety policies. The information collected suggests that there is no single procedure for drafting a road safety programme. In some cases the work on a programme is coordinated by inter-ministerial committees (e.g. in France), or more frequently by road safety councils (e.g. in Austria, Czech Republic, Finland or Spain). The involvement of the scientific communities varies[11].

	The last programme	Vision in programme	Road safety approach	Targets for deaths	Targets for Serious injuries
Austria	Austrian Road Safety Programme 2011-2020	Become one of the five safest countries in the EU	Safe System Approach	- 50% (based on the average for the years 2008-10). Interim target : -25% by 2015	'-40% serious injuries by 2020, based on the average for the years 2008-10. Interim target : -20% by 2015;
Belgium	Recommendation of 20 priority measures to be adopted within the 2011 – 2015 period	.	Comprehensive (Integrated) approach (3XE)	- 50% in the number of road fatalities by 2020 compared to 2010.	
Bulgaria	Road Safety Plan 2011-2020	Safety is a shared responsibility		-50% of fatalities (base: 2010)	-20% of serious injuries (base: 2010)

[11] E.g. in Austria, Estonia or Greece the first version of the programme was developed by research centres (KfV, Tallinn University, National Technical University of Athens, respectively).

Cyprus	Road Safety Plan for 2012-2020	No		- 50 % less fatalities	-50% less serious injuries
Czech Republic	National Road Safety Strategy 2011-2020	Safety on roads – right and responsibility of each and every one of us. Vision Zero	Safe System Approach ?	Decrease the mortality rate (deaths/100 000 population) to the EU-27 average (i.e. by about 60%)	Decrease by 40% the number of persons seriously injured in comparison to the 2010 level
Denmark	Danish Governmental Action Plan on road safety "Every accident is one too many" (2000-2012)	'Every accident is one too many " (setting a course for a future traffic system without any road accidents whatsoever)	Vision Zero	40% reduction of fatalities n 2012 compared to 2005 (not exceed 300)	40% reduction of injuries in 2012 compared to 2005 (not exceed 2443)
Estonia	Estonian National Traffic Safety Programme for 2003-2015	Vision 100	Vision Zero (partly)	less than 100 fatalities by 2015 (as in the national road safety programme), and revised proposal (as in the draft of road safety action plan 2012-2015- less than 70 (average of 2013-2015)	
Finland	Road Safety Programme 2011-2014	The transport system must be designed in such a way that nobody should die or be seriously injured in traffic.	Vision Zero	by 2020, the number of traffic fatalities will have been halved as compared to the 2010 numbers (272 persons).	by 2020, the number of injuries in road traffic will have been reduced by one quarter as compared to the 2010 numbers (7,673 injured)
France	Annual road safety plan	No		The national target set in 2007 was: a 35% reduction in fatalities by 2012 (reference year: 2007).	
Germany	Road Safety Programme 2011 (2011-2020)	Facilitate safe and secure mobility for all its citizens, while at the same time making this mobility environmentally friendly and reducing its climate change impact		-40% for fatalities by the year 2020	
Greece	National Strategic Plan 2011-2020	Developing Road Safety Culture.	Sustainable Road Safety System	Reducing the number of road fatalities **by 50% by 2020** compared to 2010. 650 lives to be saved annually (from 1.300 fatalities in 2010 to 650 fatalities in 2020).	
Hungary	Hungarian Road Safety Action Plan 2011-2013	No	Comprehensive (integrated) approach	by 2020, the number of accident fatalities of the year 2010 shall be reduced by 50%	by 2010, the number of accidents with personal injuries in 2001 shall be reduced by 30%
Ireland	Road Safety Strategy 2007-2012	No	Comprehensive (Integrated) approach (4XE)	no greater than 60 fatalities per million by the end of 2012 (252 deaths per year) and 50 or fewer in the following years (210 deaths per year)	To reduce injuries by 25%.

Italy	Road Safety National Plan for the period 2001-2010	Road safety is a shared responsibility	Safe System Approach	to reduce the number of fatalities by 50% compared to 2001;	to reduce the number of injuries by 20% compared to 2001
Latvia	Road Safety Plan for years 2007–2013	No		reduce number of deaths by 70% from 558 (2001) to 160 (2013)	
Lithuania	The Road Safety Strategy 2011-2017		Vision Zero	Not more than 200 road deaths in 2017. Not more than 60 deaths per million inhabitants	
Luxemburg	There is no formal National Road Safety Action Plan. Some RS solutions are included in Transport Governmental Implementation Plan			NO	NO
Malta	no national road safety plan for Malta	Safe travel for all users (In: White Paper setting objectives for land transport policy)			
Netherlands	The Strategic Road Safety Plan 2008-2020 "From, for and by everyone"	From, for and by everyone (Road safety is everyone's responsibility, benefits everyone and depends on everyone)	Sustainable Road Safety System	maximum of 500 fatalities in 2020 (In 2007 there were 791 fatalities).	a maximum of 10 600 serious road injuries (MAIS2+).
Poland	Road Safety Programme GAMBIT 2005 (2003-2013)	Vision zero	Comprehensive (Integrated) approach	-50% the number of fatalities in comparison to 2003, (i.e. not more than 2800 fatalities in 2013).	
Portugal	Estratégia Nacional de Segurança Rodoviária 2008-2015	To place Portugal among the 10 EU countries with a low number of road fatalities measured in deaths to 30 days per million inhabitants		78 deaths per million inhabitants by 2011, 62 deaths per million inhabitants by 2015	
Romania	National Strategy for Road Safety 2011-2020			Improve legislation on road infrastructure safety and gradual reduction in the number of traffic accident victims	
Slovakia	National Road Safety Plan of Slovak Republic 2011-2020	The whole road transport system has to be designed with regard to human health	Comprehensive (Integrated) approach	Halving road fatalities (fatalities within 30 days from accident) by the year 2020 compared to the reference year 2010.	
Slovenia	National Road Safety Programme 2012-2021	No fatalities and seriously injured people due to traffic accidents in Slovenia (Vision Zero)	Comprehensive (Integrated) approach	50% reduction of fatalities by 2020. Max. 35/1 m inhabitants (2021)	50% reducing seriously injured by 2020. Max. 210/1 m inhabitants (2021)
Spain	Spanish Road Safety Strategy 2011-2020	Citizens have the right to a Safe Mobility System in which everyone, citizens and agents involved, has a	Sustainable and safe mobility	achieve a rate of 37 deaths per million inhabitants in 2020 (59 deaths per million population in 2009)	Reduce the number of serious injuries by 35% (The number of serious injuries was 13,923 in 2009)

		responsibility.			
Sweden	Management by objectives for road safety work. Stakeholder collaboration towards new interim targets 2020	Vision zero	Safe System Approach (Management by objectives" - no common strategy at measurement level but at management level)	50% reduction between 2007 (the average for 2006-2008 is used as the base figure) and 2020 (220 deaths in traffic by 2020).	a 25% reduction target for severely injured persons, as defined by functional capacity after the injury, rather than police reports
United Kingdom	Strategic Framework for Road Safety	Remain a world leader in road safety	Combination of Safe System Approach and Public Health Approach (with most focus upon the public health approach)	No post-2010 target has been adopted Great Britain has left the idea of targets, and uses forecasted scenarios.	
Israel	Towards Safer Roads. National Road Safety Plan 2020[12]	Reach a level of road safety on par with the leading road safety countries, within ten years.		less than 300 fatalities in 2015, less than 270 fatalities in 2020, or 17% and further 10% reduction, respectively (compared to 2009-2010 average)	
Norway	National Transport Plan (NTP) 2010-2019, National Plan of Action for Road Traffic Safety 2010-2013	Vision Zero	Vision Zero	number of fatalities should be reduced by 33 % from an expected level of 1150 in 2010 to a maximum of 775 in 2020.	33 % reduction by 2020 (2206-2208 basis)
Switzerland	Via siura. Federal Action Programme for Greater Road Safety		The new federal road safety policy was developed using the methodological principles of strategic management. First, the system of objectives was defined in the light of the Federal Council instructions and the Vision Zero philosophy	reduce the annual number of traffic fatalities to less than 300 by 2010. The number of deaths is to be reduced by at least 30% in every subsequent ten-year period.	reduce the annual number of seriously injured to less than 3,000 by 2010. The number of serious injuries is to be reduced by at least 30% in every subsequent ten-year period.

Table 3.17: Basic information about road safety programmes in European countries.

Proposals coming from local authorities are hardly ever incorporated into national road safety programmes. Urban programmes are the exception (e.g. programmes for capital cities). Local authorities, however, are encouraged in various ways to develop their local programmes modelling them on national programmes. For example the Road Safety Authority in Ireland has been asked to prepare a template from which each Local Authority could draft and implement its own road safety plan. In the Austrian and British safety programmes national authorities made a commitment to ensure that local authorities have better access to information about road traffic risk, risk assessment methods and to catalogues of recommended safety measures. The most advanced solutions can be found in the Netherlands with €80 million from the Transport Ministry's budget allocated each year for local and regional road safety projects. In general, however, despite the importance openly attached to the involvement of regional and local authorities in national road safety

[12] National Road Safety Authority's proposal

programmes, there is actually very little practical support in the programmes for this involvement.

Based on the information available and on the opinions of experts and decision-makers, it is difficult to recreate the process of programme development. It is consequently not quite clear why a country adopted a specific main goal or how it selected the measures, built the schedule and appointed bodies responsible for the implementation. Despite that, there are a few problems worth discussing.

The majority of countries adopt a similar main target in their programmes, namely to halve road deaths in the next decade. This suggests a strong influence of European Union proposals. The design of the programmes and then selection of priorities also refers to the EU's 3rd and 4th programme. Having a uniform policy for selecting goals and priorities is definitely helpful with benchmarking, but also suggestive of the influence of political rather than of technical arguments.

With the European Union serving as a model (EC; 2011. *By 2050, move close to zero fatalities in road transport*), the road safety programmes of many countries include long-term objectives (visions). As defined by Muhlrad et al. (2011) a road safety vision is *a qualitative goal or quantitative target to be reached in the distant future. Such a vision is acknowledged and accepted by a country's society and independent of the political changes which may occur over time.* Not all of the visions, however, meet these criteria. If it is to be implemented, a vision needs a long-term concept of how the road transport system should be built and modified. This has probably led some countries to declare that their road safety programmes is based on Vision Zero, Sustainable Road Safety System or the Safe System Approach. Interestingly, the majority of countries lack consistency between how the programmes are designed, how the priorities and delivery dates have been selected and the actual conception of the way the measures proposed should be implemented. What is missing is monitoring for example, which allows keeping track of the quality of the work of road transport systems designers or of the improvement of the road safety management system. One may consequently wonder whether the references to some general ideas regarding the road transport system used to describe the programmes do not result mostly from a marketing strategy. This nevertheless remains an area that should be strongly supported in the future.

It is difficult to assess the quality of the programmes. The idea so far has been that countries with road safety programmes containing numerical targets are more likely to accomplish them. The data collected in the interviews reveal that almost all European countries have road safety programmes today, with the majority boasting ambitious targets. Yet it is quite unlikely that they will all perform to the same high levels. As a result, it seems that in the future road safety programme assessments and selection of the best measures will have to relate to criteria other than the formal ones. Such proposals were first formulated in the SUNFlower programme (*the political support of policy documents, the active support of stakeholders, the precision of the definitions of goals/objectives/targets, the use of valid causal theories on the relations between problems and solutions. (*Wegman and in.; 2010*),* but this work needs to be continued.

To finish, a few words about the procedure for approving a road safety programme. The conception of road safety management developed in this Work Package conceives the official programme approval as an important factor, one that helps with the implementation. It is assumed that the procedure takes the form of multi-sectoral consultations and may be the result of the country's regulations. Finally, we agree that "*the final shape and content of the components adopted may vary from what had originally been formulated due to possible trades-off during consultation of the stakeholders*" (Muhlrad, N. et al.: 2011). As we know from the research, road safety programmes are usually drafted by multi-disciplinary teams and involve consulting other bodies. This can effectively limit the possibility that anyone will object to the programme once it is formally adopted. It is not quite clear, however, how the

final versions are finalised in ministries and in governments, which proposals have been changed or struck off the programme, and for what reasons. It is also not very clear who in a given country takes the decision to formally adopt a road safety programme for implementation. Table 3.18 gives the information which the WP1 team has managed to collect. Similarly to other lists, the data should be treated with a lot of caution.

	AT	BE	BG	CZ	ES	FI	FR	EL	IE	IS	IT	LV	NL	PL	PT	CH	UK
Parliament									X				?				X
Government	X		X	X		X			X	X		X		X	X		X
Ministry	X		X	X	X	X			X	X		X		X	X		X
NO/Unknown		X					X	X			X					X	

- Finland: *Parliament decides on the budget and therefore on the implementation of the plan; on annual basis the plan is adopted at the Minister level*
- Netherlands: *The Action program is drawn up by the Ministry, Association of provinces, Association of Municipalities, regions, and Association of Regional Water Authorities. The Action program is discussed in a committee of the Parliament*
- Spain: *programme made by the DGT (Ministry of Interior) as a governmental task*

Table 3.18: The institutions adopting road safety programmes in selected countries in Europe.

As we can see, the formal adoption of a road safety programme usually takes place at the governmental level, although it is not quite clear if this makes the programme a government programme. Ireland and the United Kingdom are the only countries to involve all major centres of power when the final version of the programme is adopted, in the Netherlands the programme is discussed in the Parliament, but we do not know if Parliament adopts it as well. What is clearly interesting is that in several countries even road safety experts were unable to make it absolutely clear how such programmes are adopted.

3.4.4. Policy implementation and funding

To state that a road safety programme that is formally adopted is a road safety programme that should be implemented would be a truism. Yet problems start early on when trying to establish the person(s) responsible for this implementation. There may be a variety of answers. Some programmes simply leave it out but many quote the entire nation (government administration, regional, local authorities, stakeholders, NGOs, and ordinary road users) as the responsible party for attaining the goals. In countries with a clearly designated “lead agency”, this agency takes over the majority of programme management duties (e.g. the RSA in Ireland). Finally, some of the recent programmes include propositions to establish additional institutions to support programme implementation. A good example of such practice can be found in Spain’s and Portugal’s new road safety programmes.

Another serious hurdle faced during programme implementation is the number of road safety measures included in the programme (sometimes as many as several dozens of new proposals) along with vague implementation procedures. One example is the proposal to “improve the effectiveness of road police” without explaining what this really entails. Part of the solution could be the inclusion in the main programme of 1-2 year Action Plans focussing on the practical aspects of implementing the recommended measures.

Implementation problems usually go hand in hand with funding problems. Over the last decade there have been a number of proposals on how to finance road safety measures (e.g. general tax revenues, specific taxes (usually traffic fines), road safety levies on

insurance premiums, road funds which are usually based on fuel levies, sponsorship by private businesses) stressing the need for transparent funding procedures. But the problem is that none of these proposals has been implemented in Europe. The interviews conducted addressed the way funding is provided for road safety in each country (Table 3.19).

	Estimated cost of last RS programme		Budget for road safety programme		Road Safety Fund
Austria	NO		NO		the Austrian Road Safety Fund
Belgium	NO		NO	Budget at local level	the Belgian Road Safety Fund
Cyprus	b.d		NO	There is no dedicated budget, but funds are included in budget bills directly or indirectly related to road safety.	
Czech Rep.	NO		NO	NO national budget. All stakeholders (Police, Road Authorities, Regions, Cities) are asked to finance road safety from their own budgets	
Denmark	YES	918 DKK million/per year (278 – local authority, 302 – counties, 226 – state, 112 – private)	NO	NO specific national budget, but different authorities and organisations have budgets to spend on road safety measures according to the national strategy	
Estonia	YES	Total: 958,2 m Euro (Phase I -212,9 m Euro, Phase II – 279 m Euro Phase III - 466 m Euro)		Each measure in the application plan has its expected cost, but those implementing the measures should apply for financing from the state budget every year.	
Finland	NO		NO	All operators should take the traffic safety plan into account in their own budgets	
France	YES		**YES**	**T**wo separate lines of RS funding are voted annually by the Parliament, one for Automatic Speed Enforcement and the other for all other RS activities piloted from the National level. The process of budget allocation is currently sustainable, but not the amount of funding provided (no long-term planning). The National RS Observatory and the National RS Council are funded from the RS budget through the RS Directorate (no autonomy). Funding is structurally sufficient as the annual action plan is tailored to the budget available	
Germany	NO		YES		
Greece	NO				
Hungary			NO		
Ireland	NO	Dedicated funding is available for the work of the RSA, NRA and the Garda Traffic Corps.	NO		
Italy	YES		PARTLY	There is a quantification of the resources needed, but not yet an allocation of available resources.	
Latvia	YES	Each year[13] every Ministry dealing with road traffic safety problems receives funding from the state	YES	Traffic safety measures budget are around 15 million euros per year. From them approximately 3 million euros from third party liability insurance. The financial	

[13] Lama Aldis, Smirnovs Juris, Naudzuns Juris (2009)

		consolidated budget to ensure the principles that guarantee road traffic safety. However, it is insufficient to achieve the set goal – to halve the number of killed. Therefore additional financing of 19.7 million Lats (in 2006 prices) was allocated for the implementation of different tasks set in Road Traffic Safety Programme. Additional financing for road traffic safety improvements was achieved from the state and municipal resources, international funds, as well as, other sources of financing. In 2007 different sources of financing provided ~16.8 million Lats, i.e. ~85% of the planned additional funding.		costs are paid from the State Budget, private companies which take part in financing of campaigns.	
Luxemburg			NO		
Netherlands	NO ?				
Poland	NO		NO		
Portugal	Partly	Only in case of some of proposals	NO		
Romania			NO	Each authority with responsibilities in road safety has to plan its own budget dedicated to the implementation of the Plan	
Slovakia			NO	Activities are financed from budget lines of relevant institutions responsible for their implementation	
Slovenia			YES		
Spain	NO		NO	NO global budget. Each of the government agency involved contributes their specific funds from their own budget for the implementation of road safety measures set in the strategy.	
Sweden	NO		NO	No specific budget dedicated to implementation of a national safety programme. Measures are financed. The idea with management by objectives relies on the fact that all relevant parties make commitments (and make measures) and set their own goals.	
United Kingdom			NO		
Israel			PARTLY	An estimate was made requiring 550 million NIS annually (about 100 million Euro) for the programmes' implementation; in practice it was reduced to 300-400 million NIS per year. However, there are RS-dedicated budgets of the National Road Safety Authority, Ministry of Transport, National Roads Company, Ministry of Education, local authorities	
Norway	NO		NO	There is no specific budget reserved for road safety	
Switzerland	YES	Over the next 15 years, the implementation of Via sicura will cost an average of CHF 670 million per year. Around two thirds of the costs will be borne by the public purse (Confederation, cantons, communes and Road Safety Fund) and one third by private individuals.	NO		Fonds de sécurité routière

Table 3.19: Estimated costs of implementing road safety programmes and the funds available for prevention policy in selected countries in Europe

It is quite astonishing that the majority of programmes currently running do not provide any information about the costs of implementation with the exception of three countries: Denmark, Estonia and Switzerland. It is difficult to say why this important piece of information is left out of national policy documents. It may be that such estimations are included in other government papers. But this may suggest that those developing the programmes simply do not know how to calculate the costs. Without this information it is impossible to apply for funding from the state budget. As a result, the programme has to be funded by the bodies responsible for the proposed measures. As this model of funding safety measures is becoming predominant in Europe, there are some consequences to be considered. First, the majority of the budgets of the relevant institutions are agreed annually making it difficult to know in advance how much money will be available in a given year. Moreover the availability of the funds and the amount they represent is determined by the entity in charge of the budget which means that what matters is their approach to road safety. Second, with safety measures funded from a number of different sources, it is difficult to follow a strict implementation schedule and to monitor the measures and the transparency of the allocations. Nor is it possible to examine the effectiveness and efficiency of the programmes. This situation will not be improved by the proposal to use the so called road safety funds[14], a solution offered by some of the programmes. The money offered by these funds is insufficient to cover the costs of the entire road safety programme. As a result, some funds provide resources to selected measures. It is not very likely that this will change anytime soon.

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. The success of the Road Safety Fund supporting the UN's Decade of Action for Road Safety shows that more effective solutions are possible in this area as well.

3.4.5. Monitoring and evaluation

The DaCoTA programme defined **monitoring** as a systematic and purposeful recording and analysis of information on how programme progresses. It enables you to determine whether the resources you have available are sufficient and are being well used, whether the capacity you have is sufficient and appropriate, whether implementation is proceeding according to

[14] Some of the best known funds include those established in Switzerland (*Swiss Fonds de sécurité routière*), Austria and Belgium. And so e.g. **the Austrian Road Safety Fund (VSF)** was set up in 1989 within the bmvit with the goal of boosting road safety in Austria (bmvit; 2011). The funds available for this are drawn from the road safety contribution paid when reserving a personalised number plate (in 2010 EUR 200 for 15 years). Of this, 60% is channelled back into the Road Safety Fund of the relevant federal state and 40% of the road safety contribution remains with the Austrian Road Safety Fund. These finances are used by the VSF to fund projects to improve road safety. Since 2010 the VSF has issued invitations to tender twice each year. The bmvit specifies the topics in coordination with the targets of the RSP and the current trends in accident statistics. The **Belgium Road Safety Fund** – was established in 2004. Funds can be used by the federal police (usually 5% of the amount available to the Fund) and by 195 local police forces. The average income of the fund represents an average of 4% of the budget of the police zones. The fund has lead to improved and increased enforcement activities for types of traffic behaviour that are known to contribute to many severe accidents. The distribution of money available depends on several criteria, including the size of the police zones (54%), the extent of roads (9%) and the decrease in the number of fatalities and serious injuries in each area (37%). Activities are based on action plans, and the quality and effectiveness of these plans must be evaluated. There are incentives for effective enforcement measures because unjustified money can be called back.

plan and potential undesirable side-effects are kept under control. It helps to keep the work on track, and can let management know when things are going wrong. Monitoring is a continuing, or at least periodical task, with formalised rules, if needed. The results are used to revise the action programme or conditions of implementation before implementation is completed.

Evaluation on the other hand, compares actual programme impacts against the agreed quantitative targets in terms of crash and injury reduction. For those activities whose safety outputs (effects on accidents, fatalities, injuries) cannot be directly measured, surrogate indicators can be developed to measure the scope, quality and success of the activity (OECD, 2002). It looks at what you set out to do, at what you have accomplished, and how you have accomplished it. It can happen during the life of a programme with the intention of improving the strategy or functioning of the programme or after the programme ends.

The most important use of monitoring and evaluation should be for the organisation or the programme itself to see how it is doing against objectives, whether it is having an impact, whether it is working efficiently, and to learn how to improve the efficiency and effectiveness of a programme, its organisation or various specific interventions. In practical terms monitoring and evaluation require reliable data, qualified and independent scientific and technical staff and fixed procedures for the collection and communication of results. Table 3.20 gives information about monitoring and evaluation procedures in individual countries.

As you can see, many countries already have monitoring procedures in place for their safety measures. Monitoring, however, is not conducted according to a single commonly accepted principle. In the majority of cases it involves collecting information when a scheme ends; only two countries (Belgium and Finland) monitor schemes while they are still in progress. Most of the countries collect the data annually (e.g. Cyprus, Estonia, Finland, France, Poland, Portugal, Sweden, Israel), but there are some who do it more often e.g. every month (Belgium, Finland and probably Portugal), every quarter (Finland, Ireland), but it can also be every two years (Germany). In the Netherlands post-scheme information is collected only when necessary and possible, but there are strict deadlines for conducting programme reviews. The Action Plan is updated every two years, and the strategic plan – every 4 years. In all countries those responsible for the tasks are the main sources of information. It is not quite clear whether monitoring covers all of a country's schemes or just the ones included in road safety programmes. It is not certain what the scope of data is and how the results of monitoring are used to e.g. modify road safety programmes, improve the work of the implementing bodies or the control of implementation.

The situation is different in the case of evaluation procedures. As we can see in Table 3.20 only some of the countries study the efficiency of the road safety measures implemented. In most cases the evaluation is based on accident data and the results of research on specific road traffic behaviours and public opinion surveys. Estonia, Finland, Spain and Sweden carry out evaluations quite regularly, in the other countries the frequency depends on the particular scheme and funding available. Evaluation is usually conducted by bodies which are independent of programme bodies and tend to look at specific solutions. As we know from the data collected, Spain was the only country to evaluate its entire programme (the previous strategy was evaluated in 2009, the current one will be evaluated in 2015). Just as with monitoring, there is a lack of clarity about the relation between evaluation procedures and on-going programmes and whether the subject and scope of evaluation are coordinated or just the result of a tradition and available funds. No data could be collected about the effects of evaluation on the current safety policy. All of these problems need further discussions in Europe. It seems that in the years to come a certain canon of analyses should be established regarding monitoring and evaluation. This is the only way to ensure reasonable country comparisons and a possibility to choose the best solutions.

	Monitoring of country's road safety performance		Evaluation of the efficiency of the road safety measures or interventions	
Austria	YES	Comparisons of Austrian police reported data and indicators with those from IRTAD, CARE or EC. The BMVIT issues an annual report which concentrates on campaigns at national and regional level, brochures and other materials, road safety related legislation, and accident statistics. The results are also published in KFV annual statistics	PARTLY	Research institutes such as the KFV (on a contract basis) depending on the issue: simple before and after studies (accidents, speeds, seatbelt wearing), process evaluations (campaigns), …
Belgium	PARTLY	Monthly. All participants of the interministerial committee have to report regularly in the Task Force RS about the progress. However, this is not a formalized reporting procedure and depends on the frequency of Task Force RS meetings. The reports cover enforcement (Police and Ministry of Justice). Road safety campaigns (IBSR), driver training (Ministry of Transport), vehicle related measures (Ministry of Transport). The reports primarily cover the work of ministries and government agencies). Sometimes the results lead to changes in the programme but they are quite limited. The results are published in quick indicators only.	NO	
Bulgaria				
Cyprus	YES	On a daily basis for fatalities and on a monthly basis for injuries. The results are published annually, in the statistical Report for Transport and on the police website. Information about road safety measures and interventions implemented in the country is provided to the Road Safety Unit and the Road Safety Council.	NO	
Czech Rep.	YES	Every year the Police publishes an annual summary of road safety statistics (information about accidents). There is a programme of measuring the indirect road safety performance indicators too.	NO	
Denmark	YES	Data are published every month by the Danish Road Directorate. Road Safety Commission, not regularly but on an ad hoc basis also receives data on accidents and survey data, such as seat belt use, speed monitoring and much more	PARTLY	Danish Transport Research Institute (Number of accidents, qualitative and quantitative studies).
Estonia	YES	Annually + according to the stages of the national road safety programme (3rd period: 2012-2015). The information is published on the website Road administration+ Police + other authorities collect data on road safety measures and interventions implemented in their own field of actions.	Partly	There is special project going on (road user behaviour monitoring LiMo- where a number of behavioural aspects have been monitored regularly. These are: seat belt and children restraint usage, red light violations (both drivers and pedestrians), drink driving etc.
Finland	YES	There is an annual, quarterly and monthly reporting for the national safety plan, which includes an assessment of the progress and evaluation of problems. Each responsible organisation reports their own measures, the Ministry of Transport and Communications collects the information. It is performed "horizontally" at the national level (The Transport Agency requests reports from the "surrounding" Ministries), and "vertically" (partly; the responsibility ends at the level of Centres for Economic Development, Transport and Environment; it goes down to the level of municipalities). The report is sent to the government (through the Ministry of Transport and Communications) and Parliament (with the Transport Policy report). The results are published in statistical reports, press releases, seminar presentations. The Transport Agency reports to the Ministry on the implementation of laws and the support it gives to the Centres for Economic Development, Transport and the Environment	YES	The evaluation is conducted by the Ministry of Transport and Communications and Liikenneturva based on traffic behaviour data, surveys (questionnaires) etc.

France	YES	Only at the national level, according to the Budgetary Law. Annual: an aggregated document is produced. Based on performance indicators. This covers the part of national policies performed by departments (under Prefects). It is performed "horizontally" at the national level, but not "vertically" (Action on local initiatives is not reported although CERTU and SETRA monitor some of it). The National Observatory for Road Safety publishes yearly a road safety report (all the results, all the actions and all the measures taken during the year). The report is considered by the Parliament before voting on the annual budget. At least, it shows that the funds available have been effectively used (this is needed to avoid any reductions in funding the following year).	PARTLY	National Observatory for Road Safety (number of deaths and traffic).
Germany	YES	Every 2 years. It is a report going to the Deutsche Bundestag. The Minister of Transport and DVR collect data on road safety measures and interventions implemented in the country.	PARTLY	Mainly BAST and other research institutes
Greece	NO	A procedure is foreseen in the national Strategic Plan, but not yet implemented	NO	
Hungary	YES	Annual. The results are sent to the ministries responsible and published in research reports, papers, technical and scientific journals and websites for the public on all relevant issues	YES	KTI, the national research institute (road safety performance indicators, number of people killed and injured)
Ireland	YES	Actions in the Road Safety Strategy 2007-2012 are reviewed quarterly by the Government Sub committee chaired by Minister of Transport. It is performed "horizontally" at the national level, but not "vertically".	NO	
Italy	YES	In the 2001-2010 National Road Safety Plan included a procedure to monitor the interventions carried out in the country. The procedure is now under definition. Periodical reports cover tasks already completed. It is performed "horizontally" at the national level, and "vertically" (regions should monitor the situation and provide the data to Ministry of Infrastructure and Transport every 4 months but not all the regions follow this procedure).	YES	The evaluation is carried out by the Ministry of Infrastructure and Transport – Road Safety General Directorate (Safety Performance Indicator, Time series analysis, Before/After Methodology)
Latvia	YES	Annual. The report is sent to all members of the Road Safety Council and other organisations which are interested in this report.	YES	Company Road Traffic Research, Ltd in cooperation with Riga Technical University (Statistical methods, CBA etc.)
Lithuania				
Luxemburg				
Malta				
Netherlands	YES	In general, interventions are monitored when necessary and possible. This covers all areas. The publication 'Key figures of road safety' contains monitoring information (mainly (intermediate) performance indicators). The report goes to Parliament and the results are available online. The Action Plan Road Safety contains deadlines for implementation. The Action Plan is updated every two years. The strategic plan is updated every 4 years. There are no set rules for data collection regarding actions implemented at the governmental level but in the BKO a broad horizontal coordination takes place. There are regular meetings of national government with regional and local governments. This is not 'vertical' because of decentralization. In general, there is little information about the implementation of measures, but it depends on the type of measures. For example, there is some information about enforcement and vehicle safety	YES	CB and Risk/rates

		devices, but there is little information about implementation. The knowledge about road safety and implementation of measures is for example reported, together with other mobility issues, in the National Mobility Monitor. The Minister of Transport sends the National Mobility Monitor to Parliament.		
Poland	PARTLY	Progress in road risk reduction is evaluated on the basis of police road accident reports. Once a year the Polish National Police publish a report on previous year's accidents and their consequences. Accident data are published in the National Council's reports, in the reports of research institutes and the mass media. Once a year the National Council collects reports about completed road safety interventions on the basis of information provided by the members of NRSC, but the evaluation lacks consistency. National Council reports are presented by the Prime Minister to Parliament. The Ministry of Infrastructure has also procedures for reporting on measures funded from foreign funds.	PARTLY	This is usually done by the agency implementing a specific measure. It is hardly ever done by an independent organisation. There are public opinion surveys in the case of major public campaigns.
Portugal	YES	Monthly and annual Reports published by the Road Safety Observatory of ANSR. Every year the relevant institutions provide data on measures completed but there are no aggregate reports for interventions from all institutions.	NO	
Romania	YES	Traffic police (accidents and their consequences) on quarterly basis. The results are published in the press and on websites. Data on implemented measures are sent to the Inter-ministerial Council for Road Safety (CIRS) by institutions responsible for implementing them.	YES	Traffic Police
Slovakia				
Slovenia	YES	Interdepartamental working group for road safety. The results are not published.	PARTLY	
Spain	YES	Every 24 hours DGT monitors traffic accidents involving fatalities. Every day the DGT publishes the number of fatal accidents and deaths and every year the DGT develops a Road Safety Yearbook that contains the main figures of the road safety situation in Spain for that year. The report is sent to the main bodies of the road safety policy: the High Council for Road Safety and the Steering Committee of the Strategy, and it is available for the general public through the DGT web.	YES	The previous strategy plan was evaluated on 2009 by the Spanish Evaluation Agency. An intermediate evaluation of the current strategy is planned in 2015. Moreover, every year there is an evaluation of the special measures established for that year. The evaluation is performed by the Spanish Evaluation Agency, DGT and other Research Bodies. The evaluation looks at the variations in the number of accidents and number of people killed or seriously injured using evaluation models like DRAG or ARIMA.
Sweden	YES	This is done by annual result conferences where the development of the targets for fatalities and serious injuries is monitored as well as the development of the 13 Performance Indicators. Reports are published annually by the Swedish Transport Administration (measures on the state authority roads for example: number of new safety cameras, roads with median barriers, new roads etc.) These reports have been produced by an analysis group consisting of analysts from the Swedish Transport Agency, Transport Analysis, VTI ect. and sent to Government.	PARTLY	In the yearly result reports, the development against the targets are evaluated, but not the efficiency of the different measures. Traffic safety measures are evaluated regularly in Sweden, but not necessary within the programme "Management by objectives". Depending on the measure, in general it is researchers (from institutes or universities) or the organisation responsible for the measure. Efficiency is often measured by the numbers of saved lives and serious injuries and the related values (monetary valuation).
United Kingdom	YES	Department for Transport publication	No	Not at present
Israel	YES	On annual basis by NRSA, but only selected measures which are funded by the NRSA (RS campaigns, traffic education) . In addition, there are various summary leaflets on specific issues, distributed through internet, papers, professional forums, etc. Information about road safety measures and interventions implemented in the country is collected by the Ministry of Transport and NRSA. In general: no systematic reporting exists.	YES	Mostly, research bodies commissioned by the NRSA, National Roads Company, etc. (changes in accidents/injuries and/or behaviour changes).

Norway	YES	Annual updates (report on safety performance indicators)	YES	Public Roads Administration and TOI (Effect on casualties and benefit-cost ratio)
Switzerland	YES	Annually. Published by bfu in Annual SINUS-report .	Partly	The evaluation Is conducted by different organisations, i.e. bfu, universities, engineering offices. The evaluation draws on data on fatalities and injured/ behaviour, attitudes, knowledge of road users

Table 3.20: Procedures for monitoring the progress of road safety programmes and their effectiveness evaluation implemented in different countries of Europe.

3.4.6. Scientific support and information, capacity building

The final part of the chapter provides information about scientific support for national safety policies. The emphasis will be on identifying research institutions studying this area and the influence they have on the country's policy. Another objective is to identify so called road safety observatories which are selected to act as a convenient channel in the future for transferring knowledge to the wider public. The data in the section (Table 3.21) come from questionnaire responses collected during DaCoTA and by the ETSC (Jost G. et al.; 2012), as a consequence, the data may be incomplete. Despite that, the information can still be used as a point of departure to a discussion about the position and future of road safety research in Europe.

Before the information is presented, first a reminder of the definition of "capacity building" proposed by the DaCoTA team in its report on the methodology applied in the project. Capacity building (Muhlrad, N. and in.; 2011) means developing institutional structures and the competences within them to enable a country or a local authority to perform the tasks it is responsible for. This capacity building includes developing a management system (institutions and processes) and providing the participants in the system with adequate knowledge (through training and technical assistance) and the needed data and technical tools [15]. Because some of the issues in the definition have been highlighted previously in the chapter, this section will only focus on the available forms of training of road safety staff.

As we can see, Romania is the only country which has not identified a research body involved in road safety research. In some countries research is taken up by a number of different institutes and universities, but in general the scientific potential is there and may support a safety policy in the future. What is clearly a problem is coordination between research and on-going road safety programmes and a better use of the scientific capacity for interpreting the results of monitoring and evaluation and proposing corrective measures where errors are found. There are a number of issues in need of more analysis in the near future (e.g. funding research, research coordination in Europe and in the countries or the independence of research from political and economic influences). But the potential is definitely there. Contrary to expectations, the influence of the scientific community on national safety policies is reasonable. The majority of the respondents think that at least in

[15] This is the right point to introduce another definition included in a paper by the British Department for International Development (DFID). It says that: *Capacity is the ability of people, institutions and societies to perform functions, solve problems, and set and achieve objectives. Capacity building is the process whereby individuals, groups, and organisations enhance their abilities to mobilize and use resources in order to achieve their objectives on a sustainable basis. Efforts to strengthen abilities of individuals, groups, and organisations can comprise a combination of (and) human skills development; (ii) changes in organisations and networks; and (iii) changes in governance/institutional context* (DIFD; 2008)

some cases specialist recommendations are taken account of. This area too needs improvement.

Because access to road safety information and the results of research were covered in other reports by the DaCoTA team (Muhlrad, N, Dupont, E (Eds.) (2010*),* Machata, K, Barnes, J, Jahi, H (Eds.) (2011)), it might be worthwhile to discuss the problem of building national road safety observatories. The data show that this is a slow process. In three cases only (France, Portugal and Spain) road safety observatories are part of lead agencies, in the other cases this role is taken over by research centres, statistical offices occasionally or the police. Clearly, lack of observatories impedes the transfer of knowledge across the European Union (language barrier), the development of harmonised procedures for data collection and use of data to feed into new or revised safety policies. This constitutes one more problem in need of a deeper analysis.

Training for road safety professionals in Europe comes as another warning signal. Only a few countries provide regular training and little is known about the content of the courses or how the graduates are then used for practical or scientific work to improve road safety. An integrated training system for road safety professionals is the most important challenge in the years to come due to its significance for a continued progress in reducing road risks.

	Multidisciplinary team	**Research influence on politics**	**Road Safety Observatory**	**RS Training**
Austria	KFV, Technical Universities, AIT (Austrian Institute of Technology)	You will find both kinds of policies: science based and politically driven	NO	YES
Belgium	IBSR -- However; what Belgium is missing is an independent institute that can make recommendations free of political constraints.	YES	YES	YES
Cyprus	Partly. Specific research projects are assigned to various universities.	YES		
Czech Republic	YES , CDV	Partly, but probably not		
Germany	YES	YES		
Denmark	Danish Transport Research Institute and the Danish Accident Investigation Board	Partly		
Estonia	Tallinn University of Technology and other universities	Partly		
Finland	VTT	At least they are available and have been in the hands of the decision-makers. Research results are collected when preparing national road safety plans.	Statistics Finland (has the accident data, but not necessarily the other data)	YES. All at Tampere University
France	IFSTTAR at least. The existence of IFSTTAR as a support to CISR and DISC is a strong point, although the extent of the use of research varies according to the personalities in charge of national policies (as Inter-ministerial Delegate). LAB (Peugeot-Renault)	Partly. Research results are produced, but they are used in practice only when it suits the decision-makers	The National Inter-ministerial Road Safety Observatory (ONISR)	NO

Greece	Few research organisations (including NTUA, AUTH) perform multi-disciplinary road safety research and/or studies	Sometimes	NO. Data exist in different sources. Research Organisations (like NTUA) make some efforts	NO, Technical Universities offer road safety courses, with some multi-disciplinarity.
Hungary	KTI Institute for Transport Sciences Non-profit Ltd.	Partly		
Ireland	The Road Safety Agency works with a range of departments at different Universities e.g. Psychology, Engineering. It sponsors a number of PhDs.	YES, for the next RS strategy		NO. Trying to establish this
Italy	The Centre for Research on Transport and Logistic of Sapienza	Partly	NO	
Latvia	Faculty of Civil Engineering and Faculty of Transport and Mechanical Engineering from Riga Technical University, the company "Road Traffic Research", Ltd.	Partly	YES	
Netherlands	SWOV, TNO	Questions from the parliament sometimes trigger research, the results of which are used in policy making. There are many examples of studies that are used in policy making, recently for example a study into the effects of raising the minimum age from 70 to 75 for the medical examination for driving licences		NOVI Traffic Academy (University of applied sciences) offers a multi-disciplinary course on road safety. DTV Consultants offers road courses. Both are aimed at professionals who are not much involved (yet) in road safety. Delft University of Technology offers a multi-disciplinary Post Graduate course on road safety, focussing on implementation of the Sustainable Safety vision. In addition, there are various universities of applied sciences that offer courses in which road safety is incorporated.
Poland	The Motor Transport Institute, some universities (Gdansk, Cracow and Warsaw Universities of Technology,)	Partly, but not so big	NO	NO
Portugal	LNEC has been called to help with this issue by some Institutions, such as ANSR, InIR Estradas de Portugal and some concessionaires. It is, however, not a regular procedure, and evaluation of effects is seldom promoted by Portuguese road administrations.	Partly	Road Safety Observatory of ANSR	
Romania	NO	NO		
Slovenia	Partly. Faculty of Engineering, Faculty of Arts	YES		
Spain	There are different multi-disciplinary institutes. But there is not any centre that covers all the disciplines.	Yes, they are taken into consideration for the development of Road Safety Strategy and the Annual Plan of Road Safety Measures.	The Spanish Road Safety Observatory (a body of the DGT)	
Sweden	VTI is involved in the monitoring and evaluation by taking part in the work by a group of analysts producing	YES		

	annual follow-up reports			
United Kingdom	YES	Partly. In the past yes		YES
Israel	Technion, Ben-Gurion University, Bar-Ilan University	Yes, In some cases. Examples: infrastructure improvements for pedestrian safety in urban areas; GDL	YES, Since 2008, maintained by the NRSA	YES. Bar-Ilan university for under-graduate students; Technion - for post-graduate students. Training courses on RS-related issues are organized by the Ministry of Transport, but not regularly
Norway	Mostly the Institute of Transport Economics (TOI)	YES. TOI is asked to estimate effects of measures; this serves as part of the input to the National Transport Plan		
Switzerland	bfu	YES	The Swiss Council for Accident Prevention (bfu) on their own behalf	NO

Table 3.21: Selected elements of scientific support and information and capacity building in European countries.

3.4.7. Conclusions

The chapter looked at some elements of the road safety management system and how different countries across Europe have implemented the systems. Because the available data is limited, all conclusions in the chapter should be treated as a stimulus for further discussions rather than a final diagnosis. The management system was described in reference to the so called “investigation model” and the definitions developed under the DaCoTA project. This has helped with arranging the information transparently, identifying a number of problems and proposing new areas of research. By confronting the model with reality, problems which previously have not been defined properly could now be identified. The results of the analyses will be included in the final report of the working group dealing with road safety management.

The results so far cannot be used for reliable evaluations of how the different countries run their road safety management systems or to make any country comparisons. As a result, the majority of the conclusions were qualitative. However, the information can serve as a point of reference when the first version of RSM performance indicators is built and help DaCoTA programme readers understand the aspects they should have in mind during discussions on the problems of road safety management.

In terms of the technical content, the information suggests that from the moment a road safety programme is formally adopted, there is a gradual loss of control over the policy-making process. This can be explained in a number of ways and some have been highlighted here (dispersed funding for safety measures, lack of coordination, insufficient procedures for monitoring procedures and evaluation leading to a lack of reaction when irregularities are found). All this makes the programmes less effective with money and resources used inefficiently. Different countries address the problem in different ways but none can claim excellence in this field. There is some reason to believe, however, that some solutions already applied in some European countries, if analysed and described more thoroughly, could offer a valuable suggestion for other countries working on their management systems.

4. QUANTITATIVE ANALYSIS

4.1. Clustering countries

4.1.1. Introduction

This analysis aims at contributing to the investigation of the road safety management (RSM) systems in European countries, based on the RSM DaCoTA questionnaire responses, by identifying groups of countries sharing similar RSM components. Differing from those presented in the first part of this report, this analysis is quantitative. Statistical techniques were applied to the answers provided to the RSM questionnaire in order to recognize country groups for which similar answers were provided concerning the availability of certain RSM components. We believe that the identification of similar RSM components for country groups, can assist the understanding of typical RSM structures available in Europe and, moreover, allow the exploration of the relationships between the RSM structures and components and the countries' safety performance.

As mentioned in the previous chapters, a total of 25 RSM questionnaires were collected, including 11 responses filled in by governmental representatives, 11 - by independent experts and 3 by both. For some countries, both governmental and expert opinions were available, for others only one of them; for Poland, two governmental responses were provided. A general assumption of the study was that governmental and expert visions of the RSM situation in the country would not necessarily be identical (that is why both sides were asked to fill in the questionnaire). For countries for which both types of representatives answered the questionnaire, the responses supplied actually supported this assumption. Therefore, as the analysis should be based on the original answers provided it was reasonable to carry out two separate analyses of governmental versus expert responses. For each analysis, we aspired to consider as large a set of responses as possible; thus, we added "both" responses to the sets of expert and governmental responses. However, to avoid unnecessary uncertainties, such "both" responses were considered for additional countries only, i.e. for those not presented in the original set.

Based on the above considerations, **two analyses** were undertaken, using:

(1) Independent expert responses: in total 14, including 11 expert responses plus 3 "both expert and governmental" responses for additional countries (Finland, Ireland and the Netherlands), providing a dataset that characterized 14 different countries.

(2) Governmental responses: in total 12, including 11 governmental responses (with two for PL) plus one "both" response for an additional country (Ireland), providing a dataset that characterized 11 different countries.

The RSM questionnaire was structured in 5 parts, and contained a total of 50 questions. It is thus a rather complex questionnaire. In total, each response included about 330 lines of values, some of which were conditional on the response provided to the initial question, i.e. covered additional details provided that "yes" was stated for a previous question. The small sample size available for the analyses (14 and 11 countries for the independent expert responses and the governmental responses respectively) certainly does not allow for using such a large amount of information for the analyses. Therefore, we decided to proceed to the grouping of countries:

(a) focusing on the main questions only - 50 questions, for which the answers are supposed to be provided in each response;

(b) carrying out the analysis separately for each part of the RSM questionnaire, in order to improve the number of observations (responses) to number of variables (questions) ratio.

The five parts of the RSM questionnaire for which the analyses were separately conducted are:

1 - Institutional organisation, coordination and stakeholders' involvement (9 questions);
2 - Policy formulation and adoption (11 questions);
3 - Policy implementation and funding (13 questions);
4 - Monitoring and evaluation (9 questions);
5 - Scientific support and information, capacity building (8 questions).

For each part of the questionnaire, the analyses were conducted on the experts' answers and on the governmental responses separately. In both cases, 3 steps were followed

1) First, data preparations were carried out, including coding the response values, data imputations and preliminary data analysis to exclude "consensus variables", i.e., variables (answers) for which identical responses have been provided in the whole sample, and which were therefore of little use for grouping countries on the basis of similarities/dissimilarities.

2) Second, a number of clustering methods were applied to organize the observed responses for the various countries into meaningful groups, aiming to maximize the within-group similarity of cases while maximizing the between-group dissimilarity. The clustering techniques applied were: Ward clustering, k-means and PAM (Partitioning Around Medoids) with a Silhouette plot. Such a clustering was carried out for each of the five parts of the RSM questionnaire.

3) The country groups identified for each part of the RSM questionnaire were considered aiming to provide interpretations of similar RSM components identified for the country groups and, possibly, for understanding typical RSM structures and components available in the European countries.

The chapter is structured as follows. Section 4.1.2 describes the analysis of the independent expert responses' dataset, including data preparations, selecting the analysis methods and their results, and interpretations of the country groups identified in this analysis. Section 4.1.3 briefly describes the findings of a similar analysis carried out on the governmental responses' dataset. Section 4.1.4 discusses the findings, providing a summary of the results of the quantitative analyses performed.

4.1.2. Grouping countries based on the analysis of expert responses

4.1.2.1. Data preparation

As mentioned above, the analysis (country grouping) was carried out separately for each one of the five parts of the RSM questionnaire. Thus, the original 50 main questions were renamed to define the five parts as shown in Table 4.1. For the sake of briefness, all the questions will be referred to on the basis of these new labels when providing the analysis results. For their interpretation, however, full questions labels will be applied.

The data preparations' step included: coding the response values, data imputations and preliminary data analysis to exclude the variables with a low potential for contribution to the analysis.

New name#	Original main question
V1_1	1. Has a high level inter-sectoral decision-making institution been established to prepare policy orientations or directions for RS?
V1_2	2. Does Parliament have a prominent role in initiating decision-making on road safety orientations or directions?
V1_3	3. Is Parliament involved in adopting road safety orientations or directions?
V1_4	4. Has a Lead Agency been formally appointed to take responsibility for road safety (direct the national road safety effort)?
V1_5	5. Has a technical inter-sectoral road safety institution been established to coordinate?
V1_6*	6. Coordination horizontally (6a-b, 6c-d)
V1_7	7. Coordination vertically (7a, 7b)
V1_8	8. Has an institutional structure for the consultation of stakeholders been formally established (by law or decree)?
V1_9*	9. Are the legislative instruments defining inter-sectoral road safety management functions periodically reviewed and reformed
V2_1*	10. Are some government agencies actively advocating the need for taking road safety action:
V2_2	11. Are there NGOs actively promoting road safety?
V2_3*	12. Are regional authorities consulted as to the part they called to play in national road safety policy, before
V2_4	13. Are regional road safety programmes or policy components integrated into the national road safety policy?
V2_5*	14. Are local authorities (municipalities, counties) consulted as to the part they are called to play in national road safety policy before
V2_6	15. Are local road safety programmes or policy components integrated into the national road safety policy?
V2_7	16. Has a national "vision" for improved RS performance in the long term officially been set?
V2_8	17. Have national medium-term (four to ten years) quantitative targets been set for improved safety performance?
V2_9	18. Has a national RS Strategy (or national Policy directives) been produced based on a Safe System approach (as opposed to primarily improving behaviour)?
V2_10	19. Has a national medium term road safety programme been elaborated?
V2_11	20. Has a national medium term road safety programme been adopted at high level?
V3_1*	21. Have partnerships or agreements been established at the national level with the private sector for a contribution in terms of
V3_2	22. If a national road safety programme has been elaborated and adopted, has the budget needed for programme implementation been estimated?
V3_3	23. If a long term vision has been adopted, has a budget been estimated to move towards this vision (distinct from the road safety budgets allocated to medium-term inter-sectoral programmes)?
V3_4*	24. Has a high level engagement (decision) been taken to ensure availability of a budget for road safety
V3_5	25. Does the government allocate the product of fines (or any funds collected from RS measures) to road safety interventions or related activities?
V3_6	26. Is there a budget specifically allocated to road safety activities, interventions and capacity building from the national budget (Treasury)?
V3_7	27. Is there a sustainable funding structure for road safety, independent from the Treasury (RS Fund, RS Foundation)?
V3_8	28. Are there formal resource allocation procedures to support road safety management tasks and interventions?
V3_9	29. Is funding allocated to evaluation?
V3_10*	30. Are the funds allocated sufficient to implement the programme or policy components adopted in each area:
V3_11*	31. Are the human resources needed to implement the programme or policy components adopted sufficient in each area:
V3_12*	32. Are the legislative instruments and procedures regularly reviewed and improved as regards:
V3_13	33. Have training plans been designed to support implementation of the national road safety programme or policy components?
V4_1	34. Are sustainable systems (durable, funded, maintained) in place to collect and manage data on road

New name#	Original main question
	accidents, fatalities and injuries?
V4_2	35. Are sustainable in-depth accident investigations for road safety purpose in place?
V4_3*	36. Are sustainable system in place to collect and manage data on behavioural indicators:
V4_4	37. Is there a national Observatory centralizing the data systems for road safety?
V4_5	38. Has a reporting procedure been set up to monitor the road safety interventions carried out in the country?
V4_6	39. Has a procedure been set up to evaluate safety performances of the global programme or policy?
V4_7	40. Is "benchmarking" used to monitor progress in the road safety situation relatively to other (European) countries?
V4_8	41. Does some "process evaluation" of safety interventions take place during the implementation period of the programme? (checking that measures work as expected and do 2t generate undesired side-effect)
V4_9	42. Has an evaluation process been planned to assess the effects on accidents and injuries of some policy components ("product" evaluation)?
V5_1	43. Is there at least one institute or university department performing multi-disciplinary road safety research and/or studies?
V5_2*	44. Using research results for formulating road safety policy
V5_3	45. Are the government or road safety institutions providing factual and valid information on road accidents, injuries and risk to the citizens?
V5_4	46. Are the government or road safety institutions systematically (or periodically) informing the citizens of the national road safety policy and interventions and their effects?
V5_5	47. Are there articles or programmes in the media on road accidents and/or on road safety activities which review, criticize or challenge current policies?
V5_6	48. Is there at least one university (or other superior education structure) providing a multi-disciplinary course on road traffic safety for students?
V5_7*	49. Do universities or other educational institutions offer specialized courses addressing future professionals who may be involved in road safety:
V5_8*	50. Do universities, research or other educational institutions offer further-training sessions addressing key professionals currently involved in road safety:

Table 4.1: Renaming the variables (questions) in accordance with the five parts of the RSM questionnaire

The new name is composed of the number of the questionnaire's part and the number of question in the part
* A composite question for which a score was estimated

All responses were coded using the following scale:

1 for "yes", 2 for "no", 1.5 for "unknown" (in the latter case, it was assumed that lack of information not necessarily indicates the absence of a certain RSM component).

In addition, some questions were subdivided into several sub-questions in the original questionnaire, where the final answer on such a question should account for all the sub-answers. As Table 4.1 indicates, 14 of the 50 questions were such “composite questions”. In all cases, the answers and sub-answers completed each other in relation to the availability of certain RSM components. For such composite questions a single score was thus estimated, which corresponds to the mean value of answers provided for all the sub-questions.

As a result, for each response, a list of 50 coded values corresponding to the 50 main questions of the RSM questionnaire was produced. The dataset containing the 14 responses (countries) based on the 50 coded values subdivided in five groups was used for the analysis, in accordance with the questionnaire's parts. For some variables, namely V1_7, V2_3, V2_4, answers were missing. These have been imputed using the MI procedure of SAS 9.2.

Further examination of the dataset revealed that the answers to some questions hardly varied between the countries. (12 to 14 identical answers for the 14 countries). Given the high consensus among the countries concerning the availability of the RSM components addressed by these variables, they were termed "consensus

variables". Given that they would not really contribute to the countries' grouping, they were excluded from the clustering analysis. One more question (V2_1) was not used in the analysis due to low variability of its values compared to other questions.

The RSM characteristics which, according to the expert responses, were common for the majority of countries ("consensus variables") are summarized in Table 4.2.

Variable name	Question on the RSM component	Common value
V2_2	11. Are there NGOs actively promoting road safety?	**Yes**, for all countries
V2_8	17. Have national medium-term (four to ten years) quantitative targets been set for improved safety performance?	**Yes**, for most countries
V3_3	23. If a long term vision has been adopted, has a budget been estimated to move towards this vision (distinct from the road safety budgets allocated to medium-term inter-sectoral programmes)?	**No**, for most countries
V4_1	34. Are sustainable systems (durable, funded, maintained) in place to collect and manage data on road accidents, fatalities and injuries?	**Yes**, for most countries
V5_1	43. Is there at least one institute or universally department performing multi-disciplinary road safety research and/or studies?	**Yes**, for most countries
V5_3	45. Are the government or road safety institutions providing factual and valid information on road accidents, injuries and risk to the citizens?	**Yes**, for most countries
V2_1 (a score)	10. Are some government agencies actively advocating the need for taking road safety action?	Mostly, **yes** (most values lie between 1.0-1.5)

Table 4.2: The RSM characteristics common for the majority of countries ("consensus variables"), based on expert responses

4.1.2.2. Analysis methods

4.1.2.2.1. Preliminary considerations

The general purpose of our analysis is to recognize country groups with similar values of the RSM characteristics considered. The first step of such an analysis usually includes a reduction of the dimensions examined, i.e. checking the correlation structure of the data in order to identify a certain number of latent factors, smaller than the number of original variables, representing the data. Such a process actually fits the common factor analysis (e.g. Nardo et al, 2005). Once such common factors are found, they are used as a basis for grouping the countries.

As a first step of the current study we tried to conduct a common factor analysis, in order to describe variability among the variables observed in terms of a potentially lower number of unobserved variables called "factors". A major problem encountered in this case for performing the factor analysis was the small sample size (N=14), limited the number of variables that could be examined.

A literature examination was undertaken in order to clarify "what is the minimum sample size, i.e., the minimum number of cases for performing factor analysis". It was learned that there are two categories of general recommendations in terms of minimum sample size in factor analysis. One category says that the absolute number of cases is important, while another says that the subject-to-variable ratio is important. The rule of absolute minimum number of cases says that it should lie between 100 and 500, whereas the rule of subject-to-variable ratio states that it should vary between 20:1 (20 observations per variable) to 2:1.

Research has demonstrated that the general rules of thumb of the minimum sample size are not valid or useful (e.g. MacCallum et al, 1999; Preacher & MacCallum, 2002), whereas the minimum level of sample size was dependent on other aspects of study design, such as:

- Communality of the variables, e.g. research suggested that such communalities should all be greater than 0.6;
- The number of factors related to the number of variables, e.g. a minimum of 3 variables per factor is required;
- Size of loading, e.g. the performance of factor analysis is good for the high (0.80) loading condition, moderate for the middle (0.60) loading condition, and very poor for the low (0.40) loading condition.

For example, Preacher & MacCallum (2002) conducted a Monte-Carlo simulation study and concluded that the number of cases "had by far the largest effect on factor recovery, which exhibited a sharp drop-off below 20" (p.157). However, they also concluded that: "As long as communalities are high, the number of expected factors is relatively small, and model error is low (a condition which often goes hand-in-hand with high communalities), researchers and reviewers should not be overly concerned about small sample sizes" (p.160).

In our case, as we decided to analyze each one of the five parts of the questionnaire separately and excluded the consensus variables, we had 8-12 variables per part, which produced a ratio of 1.16-1.75 observations to variables, where in total we had less than 20 observations. Hence, applying a common factor analysis we would limit the examination to several factors analyzed per part, representing the most correlated variables. This would enable us to somewhat reduce the dimension of the problem. However, we would not be able to combine many of the variables. Thus, we decided to apply a factor analysis for a preliminary data examination, in order to recognize the correlated variables, where both the factor scores (combined variables) and non-combined variables will be used to calculate the distances among the observations, in order to produce their clustering.

Cluster analysis is an exploratory data analysis tool for organizing observed items (e.g. countries) into meaningful groups, or clusters, based on combinations of independent variables, which maximizes the similarity of cases within each cluster while maximizing the dissimilarity between the groups. The groups are initially unknown, and cluster analysis creates new groupings without any preconceived notion of what clusters may arise. Each cluster thus describes, in terms of the data collected, the group to which its members belong. Items in each cluster are similar in some ways to each other and dissimilar to those in other clusters. However, cluster analysis provides no explanation as to the reasons for the grouping received or any interpretation made.

A huge number of clustering algorithms exist in the literature. One should be aware that different clustering algorithms may give us different results on the same data. Moreover, the same clustering algorithm may give us different results on the same data, when it involves some arbitrary initial condition. Hence, in the current study we decided to use several approaches, in order to get an impression about the stability of our solution, over the methods applied.

A known problem in clustering analysis is how to find the right number of clusters. There is currently little theory about this problem. It is not even completely clear what "the right number of clusters" means. As a result, no "best" solutions for the problem of determining the number of clusters to extract can be suggested. In most cases, we seek a clustering that is somehow "natural" to the data. Unless there is some sort of prior knowledge, the best approach is to select the number of clusters that gives the most natural partition according to some distance measure, or visual plot. Hence, in the current study, several criteria and methods for selecting the clusters' number will be tried to demonstrate the solution. If the results of several trials are consistent, this will strengthen our belief in the validity of the obtained country groups.

4.1.2.2.2. Clustering methods applied in the study

To cluster the countries into similar groups we applied two commonly used cluster analysis techniques which are: (1) the Ward method and (2) the k-means. To apply the methods, we used both the cluster library of R (see Maechler et al, 2005), and CLUSTER procedure of SAS 9.2.

The first method (The Ward method) applied in the current analysis was a hierarchical cluster analysis using the Ward method, with a squared Euclidean Distance as the distance measure. Applying this method, the decision upon the optimum number of clusters is generally subjective, but looking at a dendrogram (a tree diagram created by the method) helps us to determine the range of the number of clusters we should work with. The clustering height appeared on the dendrogram is the value of the criterion associated with the clustering method (the Ward error sum of squares) for the particular classification.

Using the Ward method, for selecting the number of clusters required, two values were used: (a) the pseudo-*F* statistic, and (b) the pseudo *T*-squared statistic (both values are plotted against the number of clusters by the CLUSTER procedure of SAS).

The pseudo-*F* statistic is intended to capture the 'tightness" of clusters, where it is estimated as a ratio of the mean sum of squares between groups to the mean sum of squares within group. Larger numbers of the pseudo-*F* usually indicate a better clustering solution.

Using the pseudo *T*-squared statistic, one should look at the plot from right to left until finding the value markedly larger than the previous value, and then move to the right in the plot by one step in the cluster history.

We used the k-means function of R. This function clusters the data by the *k*-means method, which aims to subdivide the items into *k* groups so that the sum of squares of distances from the items to the assigned cluster centers is minimized.

A plot of the within-groups sum of squares by the number of clusters extracted can help to determine the appropriate number of clusters. Using the plot, the analyst should look for a kink in the sum-of-squares curve to locate the optimal number of clusters, similar to a scree-test in the factor analysis.

A more robust version of the k-means is called PAM (Partitioning Around Medoids), where clustering of the data into *k* clusters “around medoids” is done. A Silhouette plot of the items classified is produced, providing a succinct graphical representation of how well each item lies within its cluster. The Silhouette method was introduced by Rousseeuw (1987), and it is considered as a method of interpretation and validation of clusters of data.

Looking at the Silhouette plot of items (countries) the following clues can be applied: a Silhouette close to one means that the datum is appropriately clustered; a Silhouette close to negative means that it would be more appropriate to cluster the item in its neighboring cluster; a Silhouette near zero means that the datum is on the border of two natural clusters. The average of Silhouettes of a cluster is a measure of how tightly all the data in the cluster are grouped. Hence, the average Silhouette of the entire dataset is a measure of how appropriately the items have been clustered.

To summarise, considering each part of the RSM questionnaire for the countries' clustering, two methods were applied: the Ward and the k-means. To determine the number of clusters required we considered: (a) the pseudo F- and the pseudo T-squared statistics of the Ward's method, and (b) the plot of the k-means.

To examine the composition of the clusters extracted we compared: (a) the classification tree (dendrogram) produced by the Ward method, (b) the groups created by the k-means, and (c) the clusters' Silhouette produced by the PAM-method. If the composition of the clusters created by different methods is close, one can state that a stable countries' classification into homogeneous groups has been received.

4.1.2.3. Institutional organization

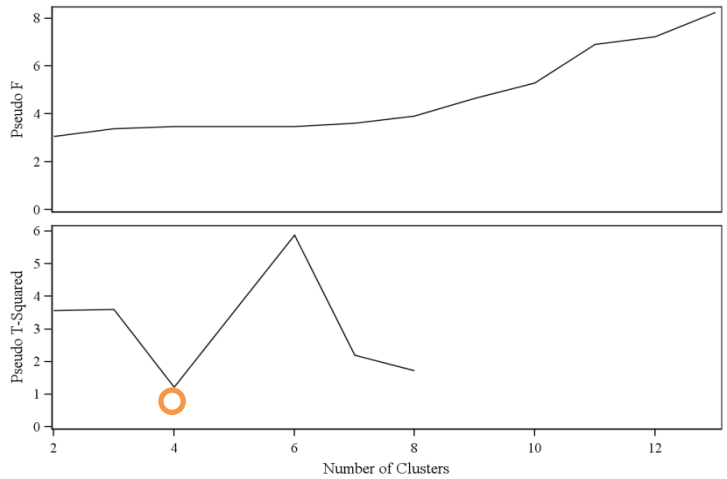
Part 1 of the RSM questionnaire "Institutional organisation, coordination and stakeholders' involvement" included 9 variables.

An initial analysis revealed that the level of data communalities was low and unacceptable for applying a factor analysis. For example, the values of Kaiser's Measure of Sampling Adequacy were far below 0.5 both overall and for variables estimated separately, where a common factor analysis solution would enable less than three variables to be loaded by each factor.

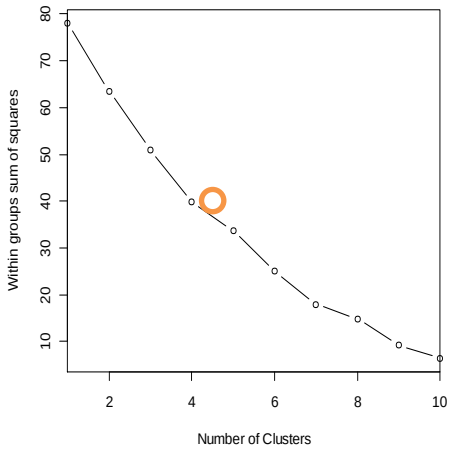
At the same time, a high correlation[16] was observed between the pairs of variables such as: V1_7 and V1_9; V1_2 and V1_6; V1_1 and V1_5. As all the variables in the pairs had the same range of values (1-2), their values could be meaningfully averaged. The averaging was useful to reduce the dimensionality of the analysis.

We defined the new variables as a mean value for each pair, such as: V1_79 as a mean of V1_7 and V1_9; V1_26 as a mean of V1_2 and V1_6; V1_15 as a mean of V1_1, V1_5. Hence, for the countries' clustering 6 variables were left. The variable values were standardized before clustering, by subtracting the mean of each variable and dividing by its standard deviation.

To select the number of clusters required, the plots of the pseudo *F*- and the pseudo *T*-squared statistics of the Ward method were considered as well as the plot of the k-means' within groups sum of squares (Figure 4.1). According to both methods, 4 clusters seemed to be an appropriate choice for the data considered (other selections are also possible).



The Ward output for criteria for the number of clusters

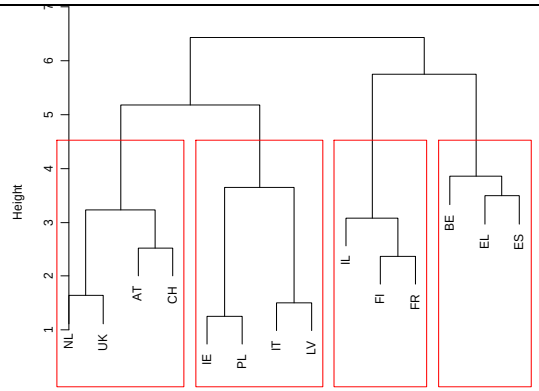


The k-means output for criterion for the number of clusters

[16] According to Pearson correlation coefficients, a significant positive correlation at the 0.05 level

Figure 4.1: The Ward and the k-means output plots of criteria for selecting the appropriate number of clusters, for the Part 1 analysis.

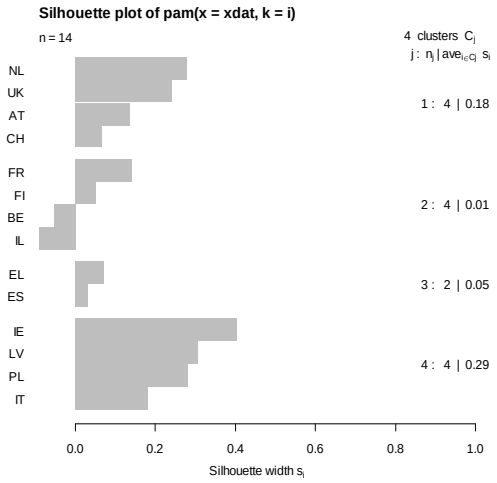
The classification results received by different methods, for the 4-clusters' solution, are presented on Figure 4.2: (a) a cluster dendrogram produced by the Ward method, (b) groups created by the k-means, and (c) clusters' Silhouette produced by the PAM-method.



A cluster dendrogram produced by the Ward method

Groups created by the k-means*:

1 IL IE PL
2 BE FI FR
3 IT LV CH NL UK
4 AT EL ES



Clusters' Silhouette produced by the PAM-method

* Consistently stable subgroups of countries are indicated by colour

Figure 4.2: Countries' clusters received by different methods using the Part 1 characteristics, for the 4-clusters' solution.

Considering the classification results on Fig.4.2, the following observations can be made:

- Both the Ward and the Silhouette methods identified two homogeneous groups of countries such as: NL, UK, AT, CH and IE, PL, IT, LV[17].

- Additional stable country groups are FI, FR and EL, ES, which were recognized by all the methods.

- In contrast, IL and BE seem to be different from other countries where they changed the group depending on the method of clustering. However, according to the Ward, IL was found to be similar to the FI, FR subgroup, where according to the *k-means* BE was attached to that subgroup. Thus, the four clusters' composition based on the Silhouette method, where IL and BE were attached to the FI, FR country subgroup seemed to provide a reasonable summary of the results produced by different methods.

The countries' groups recognized using the "Institutional organization" components of the RSM questionnaire were as follows:

Cluster1: FI, FR, IL, BE

Cluster2: NL, UK, AT, CH

[17] The country abbreviations used are presented in Appendix V

Cluster3: IE, LV, PL, IT

Cluster4: EL, ES,

where the clusters are numbers in the ascending order of average of variable means, i.e. going from more "yes" to more "no" answers as to the availability of the "Institutional organization" RSM components in countries belonging to each cluster.

Figure 4.3 characterizes the clusters identified by means of the mean values of original variables (the RSM components' availability) by cluster[18]. It can be seen that:

Cluster1 (FI, FR, IL, BE) - includes countries definitely having *a high level inter-sectoral decision-making institution* to prepare policy orientations and *a technical inter-sectoral road safety institution* to coordinate policy formulation and implementation. In addition, most of other "Institutional organization" RSM components tend to be available in these countries.

Cluster2 (NL, UK, AT, CH) – includes countries definitely having *a Lead Agency* formally appointed to take responsibility for road safety and in which *an institutional structure for the consultation of stakeholders* was formally established. Also, in these countries, the Parliament is usually involved in adopting road safety orientations. At the same time, a high level inter-sectoral decision-making institution to prepare policy orientations and a technical inter-sectoral road safety institution to coordinate policy formulation and implementation were not established in these countries.

Cluster3 (IE, LV, PL, IT) - includes countries definitely having *a Lead Agency* formally appointed to take responsibility for road safety, where *the Parliament* is typically *involved* in adopting road safety orientations. At the same time, the countries do not have the institutional structure for the consultation of stakeholders, where the vertical coordination tends to be absent and the legislative instruments defining inter-sectoral road safety management functions are not periodically reviewed.

Cluster4 (EL, ES) - includes countries for which the majority of the "Institutional organization" RSM components tend to be lacking. In particular, the countries do not have a Lead Agency appointed to take responsibility for road safety, where the Parliament is not involved in adopting road safety orientations.

[18] The mean values of the RSM components' availability, by clusters of countries, received in the analysis of each part of the questionnaire are given in Appendix 2.

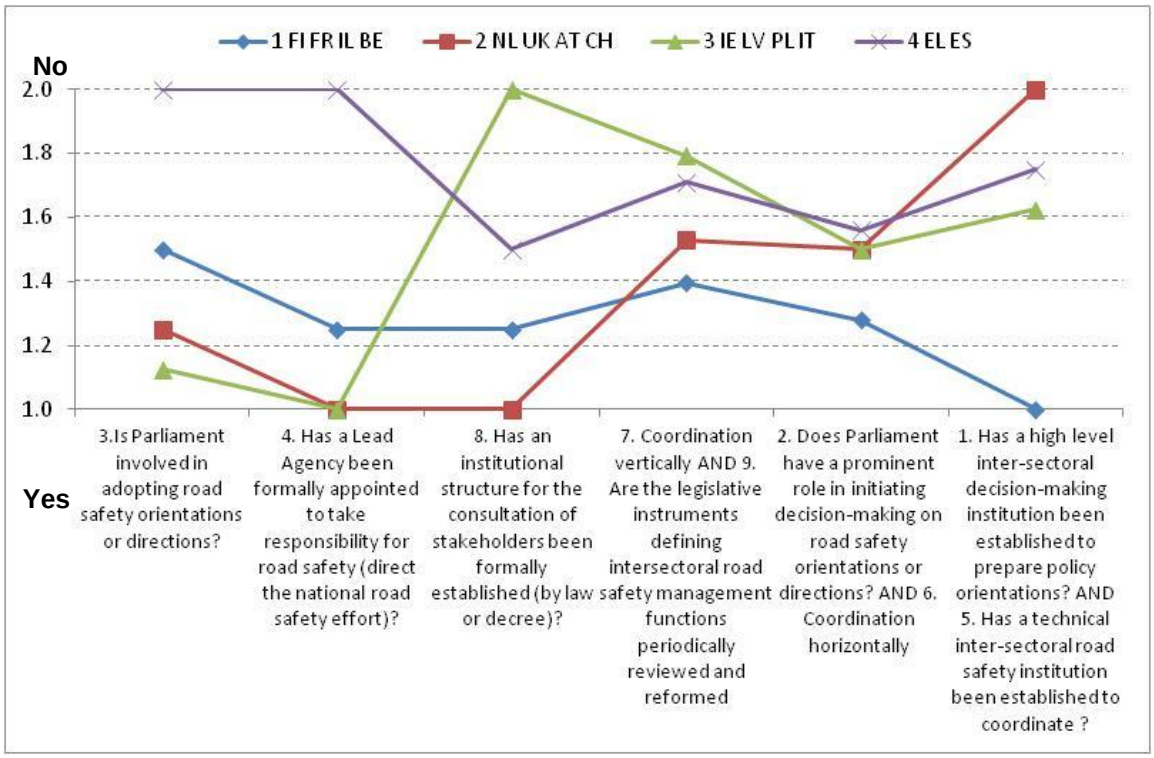


Figure 4.3: Part 1 ("Institutional organization") analysis results: mean values of availability of the RSM components, by clusters of countries.

4.1.2.4. Policy formulation and adoption

Part 2 of the RSM questionnaire "Policy formulation and adoption" originally included 11 variables but was reduced to 8 where the "consensus" variables were excluded.

An initial analysis revealed that the level of data communalities was low and unacceptable for applying a factor analysis[19]. At the same time, certain correlations were observed between the pairs of variables such as: V2_10 and V2_11; V2_3 and V2_4[20]; as well as V2_7 and V2_9[21]. To reduce the dimensionality of the analysis, the values of these pairs were averaged and new variables were introduced, respectively. Hence, for the countries' clustering 5 variables were left, the values of which were standardized before the clustering.

To select the number of clusters required, the plots of the pseudo *F*- and the pseudo *T*-squared statistics of the Ward method were considered as well as the plot of the k-means' within groups sum of squares (Figure 4.4). According to both methods, 4 clusters seemed to be an appropriate choice for the data considered (alternatively, a 3-clusters' solution was examined as possible but found less consistent compared to the 4-clusters' solution).

The classification results received by different methods (the Ward, the k-means and the PAM), for the 4-clusters' solution, are presented on Figure 4.5.

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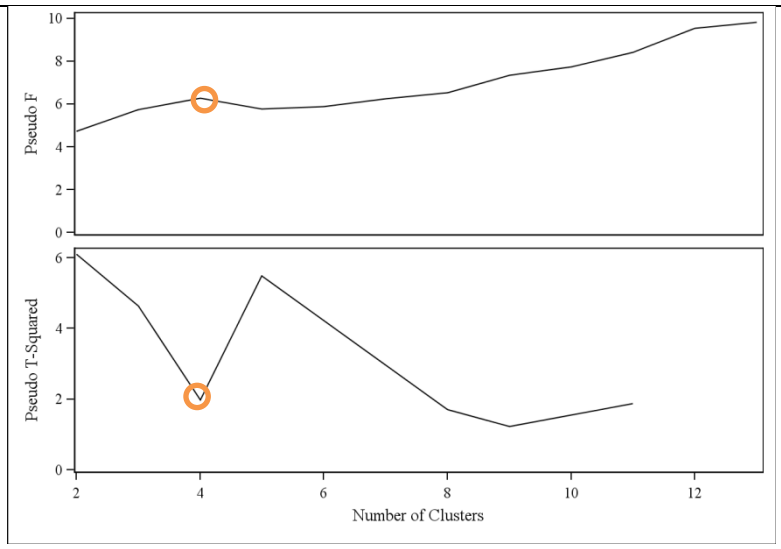
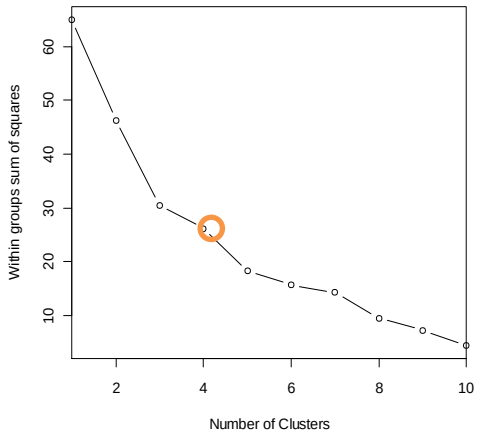
[19] The values of Kaiser's Measure of Sampling Adequacy were far below 0.5 both overall and for variables estimated in separate.

[20] According to Pearson correlation coefficients, a positive correlation at the 0.05 level

[21] Similarly, a positive correlation at the 0.11 level

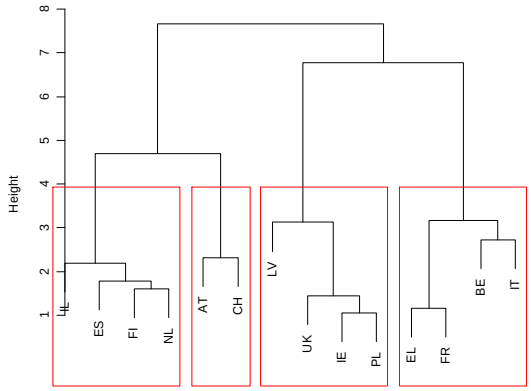


The Ward output for criteria for the number of clusters



The k-means output for criterion for the number of clusters

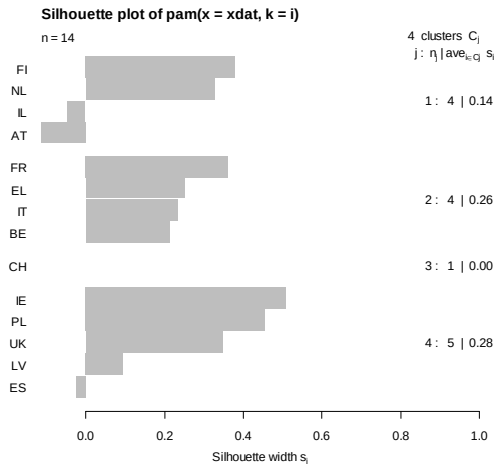
Figure 4.4: The Ward and the k-means output plots of criteria for selecting the appropriate number of clusters, for the Part 2 analysis.



A cluster dendrogram produced by the Ward method

Groups created by the k-means:

1 AT CH
2 BE EL FR IT
3 ES FI IL NL
4 IE LV PL UK



Clusters' Silhouette produced by the PAM-method

Figure 4.5: Countries' clusters received by different methods using the Part 2 characteristics, for the 4-clusters' solution.

Considering the classification results on Fig.4.5, the following observations are evident:

- The Ward and the k-means methods produced identical results as to the composition of the four country groups.

- The Silhouette method also identified two homogeneous groups of countries, which are similar to the results of the two other methods. These groups are: FR, EL, IT, BE

and IE, PL, UK, LV. However, the two other groups of countries recognized by other methods were not fully supported by this method, especially concerning the position of AT, CH, ES.

Accounting for the identical results produced by two methods (out of three examined), the countries' groups recognized using the "Policy formulation and adoption" components of the RSM questionnaire were as follows[22]:

Cluster1: AT, CH

Cluster2: ES, FI, IL, NL

Cluster3: IE, LV, PL, UK

Cluster4: BE, EL, FR, IT.

Figure 4.6 characterizes the clusters identified in terms of the mean values of original variables – the availability of the RSM components. One can note that:

Cluster1 (AT, CH) – includes the countries in which both *local and regional authorities* are consulted as to the part they are called to play in the national road safety policy where their local/regional programmes are integrated into the national road safety policy.

Cluster2 (ES, FI, IL, NL) – includes the countries in which *a national medium-term road safety programme* was elaborated and adopted at a high level, and *a national "vision"* for improved road safety performance in the long-term was set, mostly based on a Safe-System approach. In addition, in these countries *local authorities* are usually consulted as to the part they are called to play in national road safety policy but their local programmes are not integrated into the national road safety policy.

Cluster3 (IE, LV, PL, UK) - includes the countries in which *a national medium-term road safety programme* was elaborated and adopted at a high level, but a national "vision" for improved RS performance was not set. Also, in these countries, local and regional authorities are usually not involved in the road safety policy formulation and adoption.

Cluster4 (BE, EL, FR, IT) – includes the countries not having a national medium-term road safety programme, where they all have *a national long-term "vision"* for improved road safety performance. Local authorities are usually not involved in the preparation of the national road safety policy. Similarly, regional authorities are usually not involved in the preparation of the national road safety policy, except for one country - BE.

[22] Similarly to the results of Part 1, the clusters were numbers in the ascending order of average of the variable means, i.e. going from more "yes" to more "no" answers as to the availability of the "Policy formulation and adoption" components in the countries' RSM.

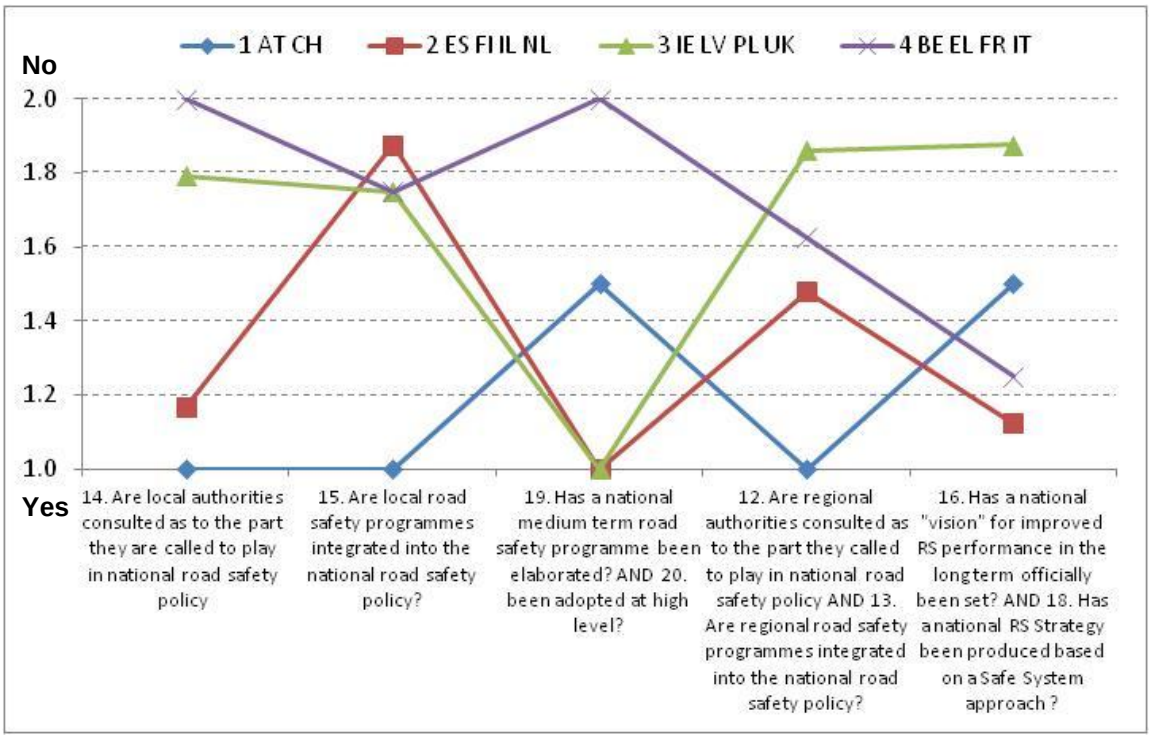


Figure 4.6: Part 2 ("Policy formulation and adoption") analysis results: the mean values of availability of the RSM components, by clusters of countries.

4.1.2.5. Policy implementation and funding

Part 3 of the RSM questionnaire "Policy implementation and funding" originally included 13 variables but, excluding a consensus variable, was reduced to 12.

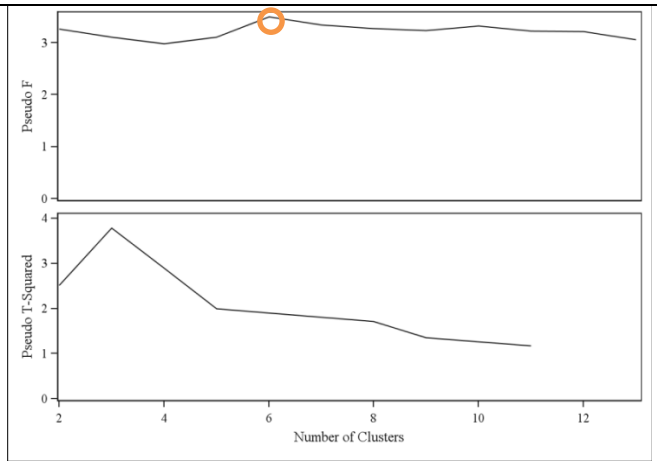
Similarly to the previous parts of the questionnaire, an initial analysis revealed that the level of data communalities in Part 3 was low and unacceptable for applying a factor analysis. However, certain correlations[23] were observed between groups of variables such as: V3_9, V3_10, V3_11 and V3_4, V3_6, V3_12. Both groups were averaged, respectively. Hence, for the countries' clustering 8 variables remained, the values of which were standardized before the clustering.

Considering the plots of the Ward method and the k-means' method for criteria of the number of clusters required (Figure 4.7), 2, 3 or 6 clusters can be chosen as an appropriate solution. A further analysis demonstrated higher consistency in the classification results received by different methods for the 6-cluster solution. Thus, these results were selected for a further consideration. The classification results received by different methods (the Ward, the k-means and the PAM), for the 6-cluster solution, are presented on Figure 4.8.

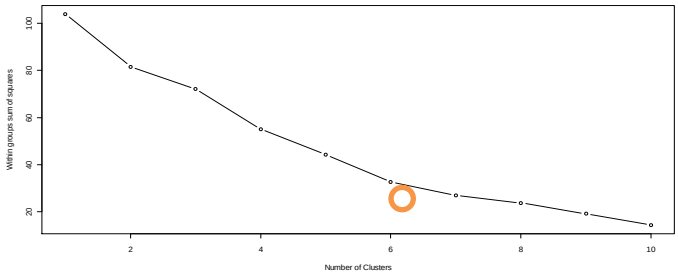
Considering the classification results on Fig.4.8, one can observe that:

- The Ward and the k-means methods produced identical results as to the composition of the six country groups.

[23] According to Pearson correlation coefficients, a positive correlation at the 0.05 level

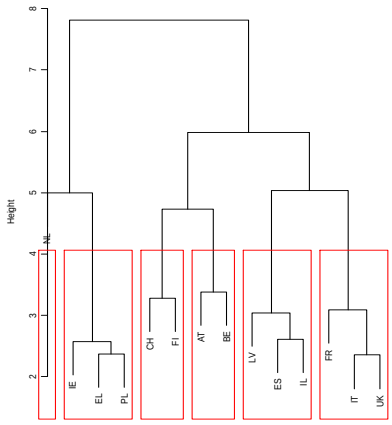


The Ward output for criteria for the number of clusters



The k-means output for criterion for the number of clusters

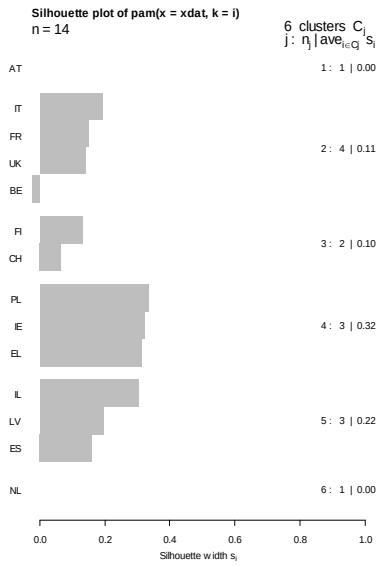
Figure 4.7: The Ward and the k-means output plots of criteria for selecting the appropriate number of clusters, for the Part 3 analysis.



A cluster dendrogram produced by the Ward method

Groups created by the k-means:

1 CH FI
2 EL IE PL
3 ES IL LV
4 NL
5 FR IT UK
6 AT BE



Clusters' Silhouette produced by the PAM-method

Figure 4.8: Countries' clusters received by different methods using the Part 3 characteristics, for the 6-clusters' solution.

- The Silhouette method also identified four homogeneous groups of countries, which are identical to the results of the two other methods. In addition, countries FR, IT, UK were also recognized by this method as a homogeneous subgroup, yet, inside a larger group of countries. The main difference in the results of this method concerns the position of two countries: AT and BE (which by other methods were seen as a common group).

Summing up the classification results and accounting for the country groups identically recognized by two methods, the countries' groups identified using the "Policy implementation and funding" components of the RSM questionnaire were defined as follows:

Cluster1: CH, FI

Cluster2: NL

Cluster3: ES, IL, LV

Cluster4: AT, BE

Cluster5: FR, IT, UK

Cluster6: EL, IE, PL

(As previously, the clusters are numbered in ascending order of average of the variable means, i.e. going from more "yes" to more "no" answers on the availability of the "Policy implementation and funding" RSM components in the country groups).

Figure 4.9 compares the clusters in terms of mean values of the original variables (answers) considered. It can be seen that:

Cluster1 (CH, FI) – includes countries in which *the budget* needed for programme implementation *was estimated*; there is *a sustainable funding structure* for road safety, independent from the Treasury; and *training plans* were designed to support implementation of the national road safety programme. However, the funds allocated on implementation of the programme and the human resources needed for it are considered, in these countries, as insufficient. Similarly, a high level decision to ensure availability of a budget for road safety was not taken and there is no budget specifically allocated to road safety from the Treasury.

Cluster 2 (NL) – includes a country in which there is *a sustainable funding structure* for road safety, independent from the Treasury; *training plans* were designed to support implementation of the national road safety programme; the funds allocated on implementation of the programme and the human resources needed for it are considered as *sufficient*; there is *a budget* specifically allocated to road safety *from the Treasury* and related legislative instruments and procedures *are regularly reviewed*. On the other hand, it was stated that the budget needed for programme implementation was not estimated, the government does not allocate the product of fines to road safety activities and there are no formal resource allocation procedures to support road safety management tasks and interventions. (An interesting point here is that in spite of lack of preliminary estimates and formal budget allocation procedures, sufficient budget is available for road safety activities.)

Cluster 3 (ES, IL, LV) - includes countries in which *the budget* needed for programme implementation *was estimated* and *formal resource allocation procedures* to support road safety management tasks and interventions are mostly available. In addition, for these countries, *a budget* specifically allocated to road safety *from the Treasury* tends to be available and relevant legislative instruments and procedures tend to be regularly reviewed. On the other hand, training plans were not designed to support implementation of the national road safety programme where the government does not allocate the product of fines to road safety activities.

Cluster 4 (AT, BE) – includes countries in which the government does allocate *the product of fines* to road safety activities and there is *a sustainable funding structure* for road safety, independent from the Treasury. However, the budget needed for programme implementation was not estimated, training plans supporting the programme were not designed, there is no budget specifically allocated to road safety from the Treasury, and the legislative instruments and procedures are not regularly reviewed.

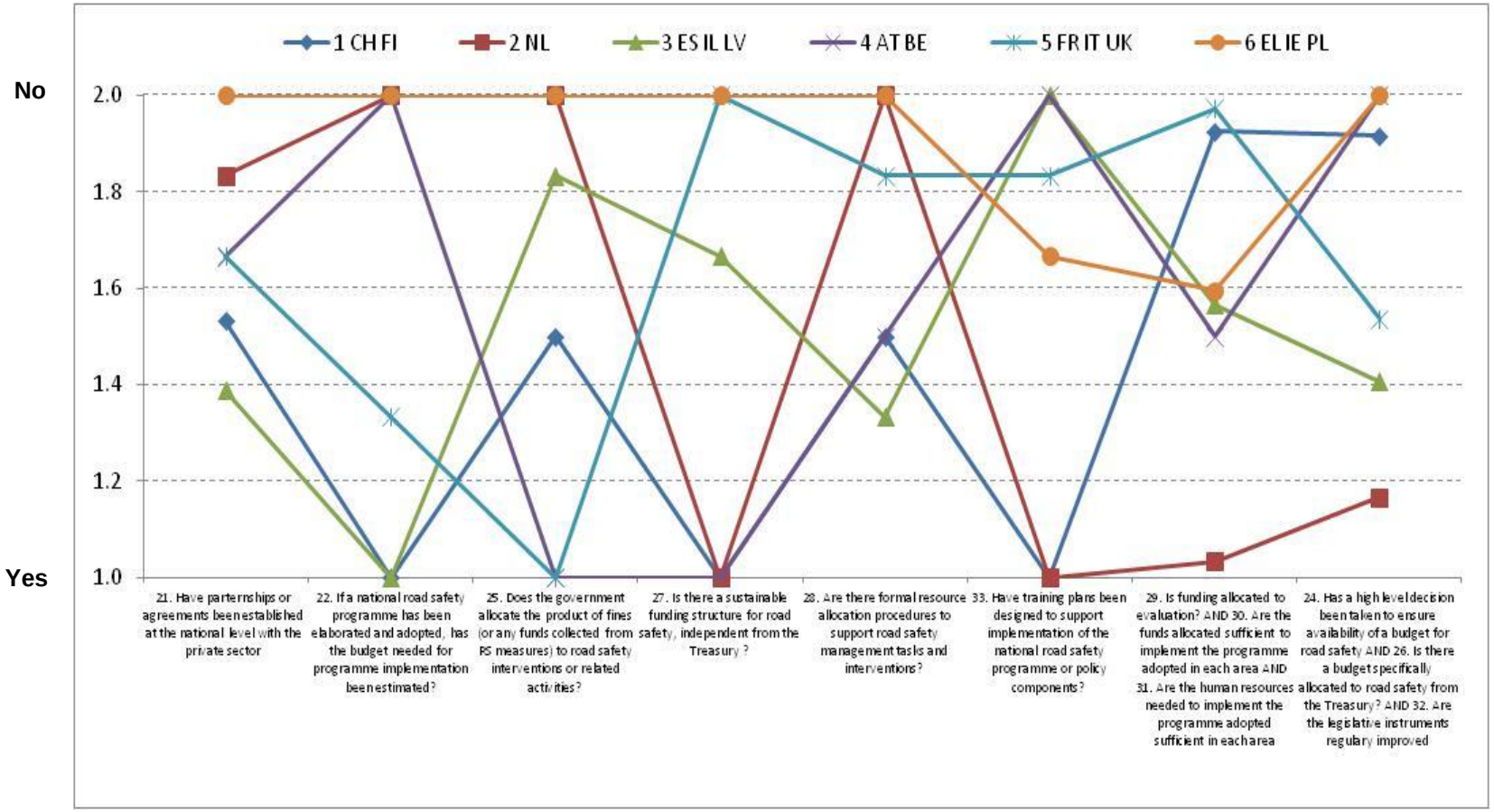


Figure 4.9: Part 3 ("Policy implementation and funding") analysis results: the mean values of availability of the RSM components, by clusters of countries.

Cluster 5 (FR, IT, UK) - includes countries in which the government allocates *the product of fines* to road safety activities and *the budget* needed for the programme implementation was mostly *estimated*. However, as stated by experts, these countries do not have a sustainable funding structure for road safety, independent from the Treasury; the funds allocated on implementation of the programme and the human resources needed for it are considered as insufficient, where concerning the availability of other components of the "Policy implementation and funding" the answers tend to be negative.

Cluster 6 (EL, IE, PL) - includes countries in which experts reported on unavailability of the majority of "Policy implementation and funding" RSM components.

4.1.2.6. Monitoring and Evaluation

Part 4 of the RSM questionnaire "Monitoring and Evaluation" originally included 9 variables but was reduced to 8, where a consensus variable was excluded.

An initial analysis revealed that the level of data communalities was marginal. Certain correlations were observed between the pairs of variables such as: V4_3 and V4_4; V4_8 and V4_9[24]. The values of these pairs were averaged and, consequently, for the countries' clustering 6 variables remained. Similarly to the previous cases, the variable values were standardized before clustering.

The plots of criteria for selecting the number of clusters did not indicate a consistent choice in this case. Based on the "bends" of the k-means plot, we decided to examine 2-4 cluster solutions. A further analysis demonstrated higher consistency in the classification results received by different methods for the 2-clusters' solution[25]. Thus, the 2-clusters' solution was selected for application.

The classification results received by different methods (the Ward, the k-means and the PAM), for the 2-clusters' solution, are presented on Figure 4.10.

Considering Fig.4.10, one can observe that:

- The Ward and the k-means methods produced identical results as to the composition of the two country groups.

- Similarly to other methods, the Silhouette method recognized a homogeneous group of three countries (EL, IT, AT), where PL was classified in another group (yet, the Silhouette plot on Fig.4.10 indicates that PL differs from other countries in the second group).

Summarising the classification results, the countries' groups recognized using the "Monitoring and Evaluation" components of the RSM questionnaire were:

Cluster1: BE, CH, ES, FI, FR, IE, IL, LV, NL, UK

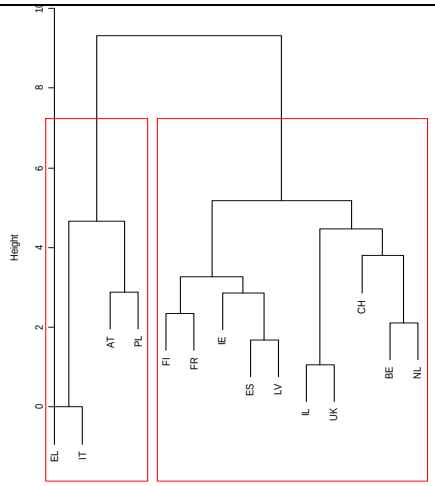
Cluster2: AT, EL, IT, PL,

where the countries in Cluster1 are characterized by more "yes" answers as to availability of the "Monitoring and Evaluation" RSM components when compared to the second group.

---

[24] According to Pearson correlation coefficients, a positive correlation at the 0.05 level

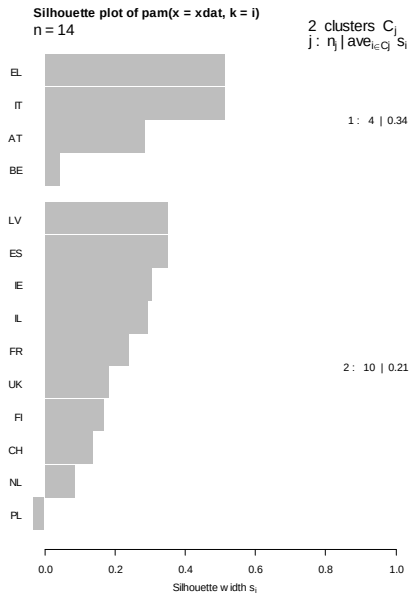
[25] In addition, for the 2-clusters' solution, the Ward dendrogram demonstrated highest distance between the clusters, where the Silhouette plots were associated with a better value of the inside-the-groups' consistency.



A cluster dendrogram produced by the Ward method

Groups created by the k-means:

1 AT EL IT PL
2 BE CH ES FI FR IE IL LV NL UK



Clusters' Silhouette produced by the PAM-method

Figure 4.10: Countries' clusters received by different methods using Part 4 characteristics, for the 2-clusters' solution.

Figure 4.11 provides more details on the availability of the RSM components in the two clusters defined, using the mean values of original variables. One can note that:

Cluster1 (BE, CH, ES, FI, FR, IE, IL, LV, NL, UK) – includes countries in which, mostly, *"benchmarking*" relatively to other (European) countries is used to monitor progress in the road safety situation; a sustainable system to collect and manage data *on behavioural indicators* is in place, where both some *"process evaluation"* of safety interventions during the implementation period of the programme takes place and *an evaluation of the effects on accidents* and injuries of some policy components was planned. Other RSM components also tend to be available in these countries, where, however, in-depth accident investigations and a reporting procedure to monitor the road safety interventions carried out in the country are available in half of countries only.

Cluster2 (AT, EL, IT, PL) – includes countries in which, in particular, in-depth accident investigations do not take place; the "process evaluation" of safety interventions during the implementation period of the programme is not common; the evaluation of effects on accidents and injuries of policy components was not planned; and a sustainable system to collect and manage data on behavioural indicators is not in place (with a partial exception for AT). Also, other RSM components tend to be unavailable in these countries, except for the "benchmarking" relatively to other (European) countries which is applied in some of them (PL, AT).

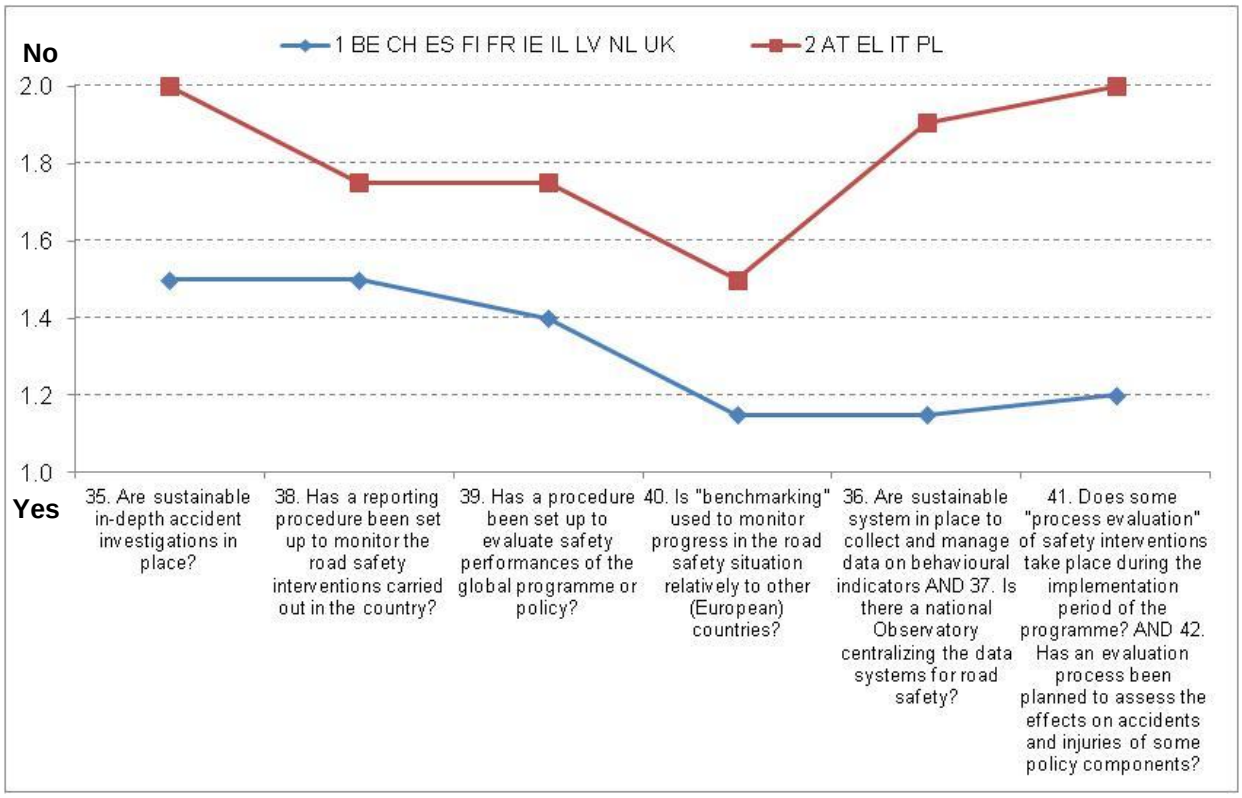


Figure 4.11: Part 4 ("Monitoring and Evaluation") analysis results: the mean values of availability of the RSM components, by clusters of countries.

4.1.2.7. Scientific support and information, capacity building

Part 5 of the RSM questionnaire "Scientific support and information, capacity building" originally included 8 variables but was reduced to 6, where consensus variables were excluded.

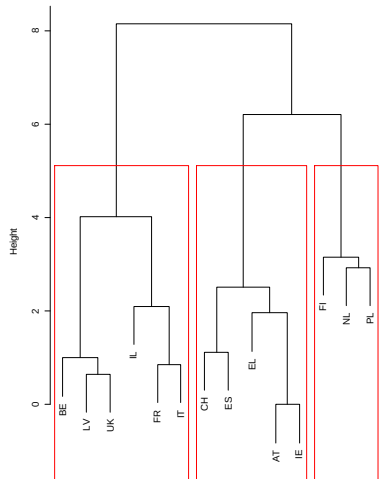
An initial analysis revealed that the level of data communalities was low but certain correlations were observed between the pairs of variables such as: V5_7 and V5_8; V5_2 and V5_4[26]. The values of these pairs were averaged and, hence, for the countries' clustering 4 variables remained. The variable values were standardized before the clustering.

The plots of criteria for selecting the number of clusters did not indicate a consistent choice. Accounting for the "bends" in the k-means plot, low points in the pseudo T-squared plot and bigger between-group-distances on the Ward dendrogram we decided to examine 2-4 cluster solutions. A further analysis demonstrated higher consistency in the classification results received by different methods for the 3-clusters' solution[27], which, consequently, was selected for application.

The classification results received by different methods (the Ward, the k-means and the PAM), for the 3-clusters' solution, are presented on Figure 4.12.

[26] According to Pearson correlation coefficients, a positive correlation at the 0.05 level

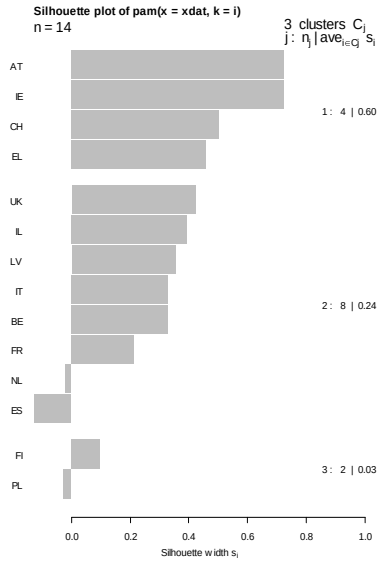
[27] In addition, a 2-clusters' solution was similarly consistent between the methods but less preferable due to weaker differences between the country groups received.



A cluster dendrogram produced by the Ward method

Groups created by the k-means:

1 AT CH EL ES IE
2 BE FR IL IT LV UK
3 FI NL PL



Clusters' Silhouette produced by the PAM-method

Figure 4.12: Countries' clusters received by different methods using the Part 5 characteristics, for the 3-clusters' solution.

Considering Fig.4.12, one can observe that:

- The Ward and the k-means methods produced identical results as to the composition of the three country groups.

- The Silhouette method recognized three homogeneous groups of countries which are generally similar to the results of other methods, except for the position of two countries: NL, ES. However, according to the Silhouette plot on Fig.4.12, these two countries actually differ from other countries in their group and then, could belong to other groups.

Summing up the classification results, the countries' groups recognized using the "Scientific support and information, capacity building" components of the RSM questionnaire were:

Cluster1: BE, FR, IL, IT, LV, UK

Cluster2: AT, CH, EL, ES, IE

Cluster3: FI, NL, PL

where the clusters are numbers in the ascending order of average of the variable means, i.e. going from more "yes" to more "no" answers as to the availability of the "Scientific support and information, capacity building" RSM components in the countries' groups.

Figure 4.13 provides more details on the availability of the RSM components in the three clusters defined, using the mean values of original variables. One can note that:

Cluster1 (BE, FR, IL, IT, LV, UK) – includes countries in which there are articles or programmes *in the media* on road accidents and/or on road safety activities which

review, criticize or challenge current policies, and where there is at least one university providing a *multi-disciplinary course* on road traffic safety for students. Other components of the RSM are also present, to some extent.

Cluster2 (AT, CH, EL, ES, IE) – includes countries in which, similar to Cluster1, there are articles or programmes *in the media* on road accidents and/or on road safety activities which *review, criticize or challenge current policies*. In addition, in these countries a stronger *use of the road safety research results* was reported, where the government or road safety institutions more *systematically inform* the citizens on the national road safety policy, interventions and their effects. On the other hand, in these countries no university provides a multi-disciplinary course on road traffic safety for students.

Cluster3 (FI, NL, PL) - includes countries which, similar to Cluster2, tend *to use the road safety research results*, where the government or road safety institutions typically *inform the citizens* on the national road safety policy, interventions and their effects (especially true for NL). However, for these countries the experts reported on the absence of articles or programmes in the media which would review, criticize or challenge current road safety policies.

It should be mentioned here that, on average, the level of availability of "Scientific support and information, capacity building" RSM components is close among the clusters, meaning that it is not obvious which cluster is clearly better in these terms.

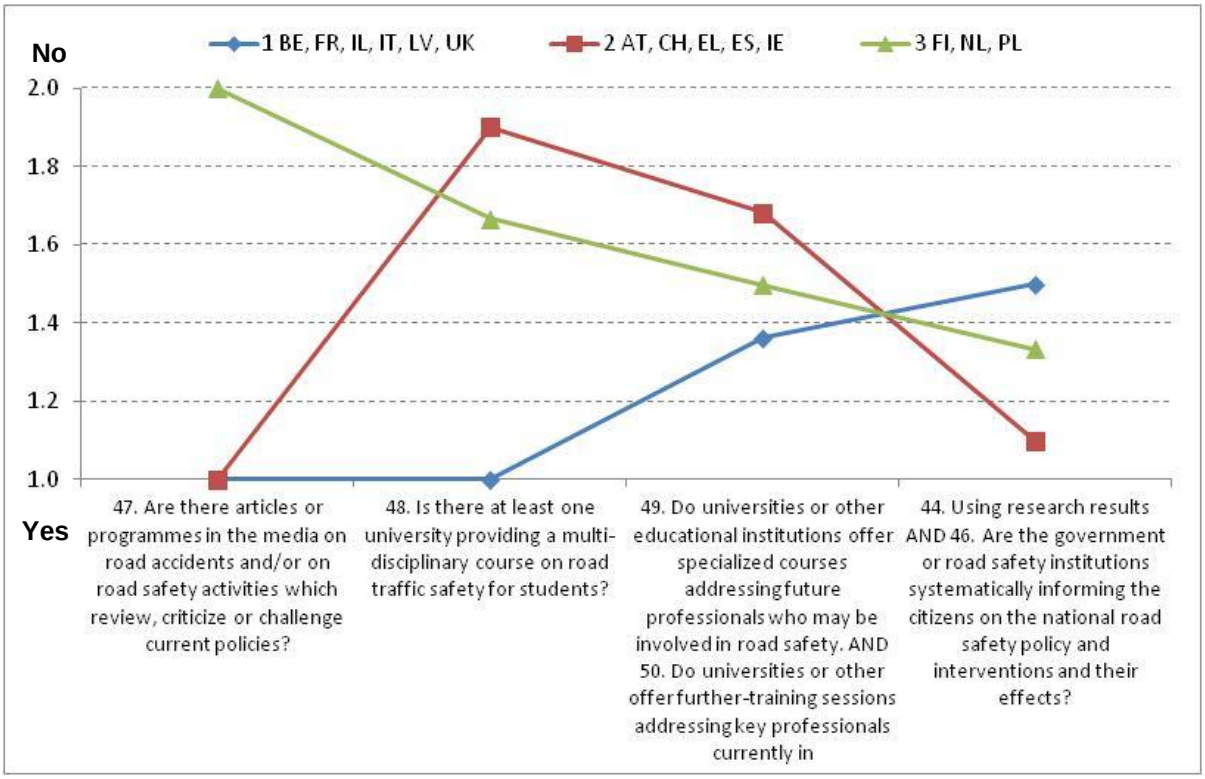


Figure 4.13: Part 5 ("Scientific support and information, capacity building") analysis results: mean values of availability of the RSM components, by clusters of countries.

4.1.3. Grouping countries based on the analysis of governmental responses

4.1.3.1. Data and method

The second set of responses on the RSM questionnaire included those supplied by governmental representatives of the countries. This set included 12 responses in total, with two for PL, thus, covering 11 different countries.

A general expectation was that governmental and expert visions of the RSM systems of the countries might be different to some extent. Thus, grouping countries based on the governmental responses different results are possible compared to those based on expert responses. The purpose of this second analysis was to produce possible results stemming from the governmental responses and to examine possible reasons for their differences compared to the countries' grouping based on expert responses.

Similarly to the previous case, the current analysis (country grouping) was carried out separately for each one of the five parts of the RSM questionnaire, where it was based on the original 50 main questions as presented in Table 4.1. The data preparation step included, again: coding the response values, data imputations and preliminary data analysis to exclude the variables with a low potential of contribution to the analysis. The coding rules applied were identical to the previous case, i.e. 1 for "yes", 2 for "no", 1.5 for "unknown" in order to create values fitting an ordinary scale. In addition, out of 50 questions, 14 were composite, where for such question a score equal to a mean value across all the sub-answers, was estimated (see questions indicated in Table 4.1).

As a result, a dataset of 12 responses with 50 coded values was created and brought to the analysis, where the values were subdivided into five groups, in accordance with the questionnaire's parts. There were missing values for such variables as V1_7, V2_3, V2_4, V3_3, which were imputed using the MI procedure of SAS 9.2.

Further consideration of the dataset revealed that there were variables (questions) with low variance in answers between the countries, mostly stemming from identical answers given for the majority of countries (10-12 out of 12). Such variables could not contribute to the countries' grouping. Hence, they were excluded from the analysis and termed as "consensus variables". The RSM characteristics which, according to the governmental responses, were common for the majority of countries ("consensus variables") are summarized in Table 4.3.

Considering Table 4.3, one can note that this list includes all the "consensus variables" identified in the expert responses (see Table 4.2) and four variables added, providing, in total, 11 RSM characteristics. This means that according to the official vision, the RSM systems in various countries are similar in over a fifth of the RSM components. Moreover, compared to the expert vision, the official one is more optimistic as it reports on the availability of more RSM components in the countries examined.

Based on the "consensus variables" found, the common features of the RSM systems in the European countries are as follows:

- Typically, a high level inter-sectoral decision-making institution is established in the country to prepare policy orientations for road safety;

- In most countries, there are some government agencies actively advocating the need for taking road safety action, and there are NGOs actively promoting road safety;

- Typically, a national medium-term road safety programme is elaborated in the country, and national medium-term quantitative targets are set;

- At the same time, a budget needed to move towards long-term road safety vision is typically not estimated;

- Concerning monitoring and evaluation, in all the countries, a sustainable system to collect and manage data on road accidents, fatalities and injuries is in place. In addition, it was stated for most countries that a reporting procedure was set up to monitor the road safety interventions carried out in the country and that "benchmarking" is commonly used to monitor progress in the road safety situation relatively to other (European) countries.

- In all the countries, the government or road safety institutions provide factual information on road accidents, injuries and risk to the citizens, and there is at least one institute or university department performing multi-disciplinary road safety research.

Variable name	Question on the RSM component	Common value
V1_1*	1. Has a high level inter-sectoral decision-making institution been established to prepare policy orientations or directions for RS?	**Yes**, for most countries
V2_2	11. Are there NGOs actively promoting road safety?	**Yes**, for all countries
V2_8	17. Have national medium-term (four to ten years) quantitative targets been set for improved safety performance?	**Yes**, for most countries
V2_10*	19. Has a national medium term road safety programme been elaborated?	**Yes**, for most countries
V3_3	23. If a long term vision has been adopted, has a budget been estimated to move towards this vision (distinct from the road safety budgets allocated to medium-term inter-sectoral programmes)?	**No**, for most countries
V4_1	34. Are sustainable systems (durable, funded, maintained) in place to collect and manage data on road accidents, fatalities and injuries?	**Yes**, for all countries
V4_5*	38. Has a reporting procedure been set up to monitor the road safety interventions carried out in the country?	**Yes**, for most countries
V4_7*	40. Is "benchmarking" used to monitor progress in the road safety situation relatively to other (European) countries?	**Yes**, for most countries
V5_1	43. Is there at least one institute or university department performing multi-disciplinary road safety research and/or studies?	**Yes**, for most countries
V5_3	45. Are the government or road safety institutions providing factual and valid information on road accidents, injuries and risk to the citizens?	**Yes**, for all countries
V2_1 (a score)	10. Are some government agencies actively advocating the need for taking road safety action?	Mostly, **yes** (values lie between 1.0-1.5)

* An additional "consensus" variable compared to expert responses

Table 4.3: The RSM characteristics common for the majority of countries ("consensus variables"), based on governmental responses

The statistical analysis of the responses was aimed at recognizing country groups with similar values of the RSM characteristics. To cluster the countries into similar groups, based on the governmental responses, we applied the same methods as in the analysis of expert responses, i.e. (a) the Ward method, (b) the k-means, and (c) the PAM-method. To select a preferable number of country groups (clusters) we checked for similarities in the composition of clusters created by different methods. Once a cluster composition of at least two methods was identical (or very close), we believed that a stable countries' classification into homogeneous groups was achieved and, hence, could be applied for further consideration.

4.1.3.2. Institutional organization

Considering the governmental responses, Part 1 of the RSM questionnaire originally included 9 variables, but by excluding a consensus variable, was reduced to 8. In the initial analysis, certain correlations were observed between the pairs of variables such as: V1_5 and V1_9; V1_4 and V1_6[28], which were averaged, respectively, leaving 6 variables for the countries' clustering.

Two- and three-cluster solutions were examined. We preferred a 3-clusters' solution as in this case the Ward and the PAM methods produced identical results. The countries' groups recognized using the "Institutional organization" components were as follows:

Cluster1: BE, FI, IT, UK

Cluster2: FR, IL, LV

Cluster3: EL, IE, NL, PL1, PL2

where the clusters are numbers in the ascending order of average of variable means, i.e. going from more "yes" to more "no" answers as to the availability of the "Institutional organization" RSM components in the countries belonging to each cluster.

Comparing the clusters received now with those recognized based on expert responses (see Sec.4.1.2.3) it was clear that the results are **different**: only 3 countries kept a similar position in both classifications, which are BE, FI consistently belonging to the first cluster and EL belonging to the last. All other countries moved to other clusters, i.e. improved or worsened their positions compared to the "expert" classification.

It should be mentioned here that such differences in the results of both analyses are possible *in principle*, as we tried to classify items (countries) using various numbers of observations (14 versus 12), with sometimes different values given to the same characteristics considered. As the classification results depend on data behaviour, both grouping the variables during data preparation (e.g. averaging of correlated pairs of variables to reduce dimensionality) and final grouping of observations may be different in each case.

To attain a deeper insight into the results' meaning, we prepared a detailed comparison of the 11 country characteristics obtained by both analyses (Table 4), where, for each variable, the mean value per cluster the country assigned to, is given. In Table 4 we indicated in green color the countries belonging to the first (best) group of countries and in red color those belonging to the last (worst) group, according to both classifications. Also, concerning the average values of characteristics among the countries, we indicated those falling outside the "medium level of availability across the countries" (range of 1.4-1.6), where the values of "higher than medium availability" (below 1.4) are indicated "in green" and the values of "lower then medium availability" (over 1.6) are indicated "in red".

From Table 4.4 it can be learned that:

- Only three countries (BE, EL, FI) were classified similarly in both analyses.

- A most drastic change concerned the position of IT which, according to the governmental responses, moved from the third to the best cluster.

[28] According to Pearson correlation coefficients, a positive correlation at the 0.08 level

- Other countries, based on the governmental responses, moved to a neighbor cluster, where, for example, FR, IL, NL worsened their positions and LV, UK improved them.

- In general, governmental responses state a higher availability of the RSM "Institutional organization" components in their countries compared to expert estimates.

- In particular, compared to experts, the governmental representatives believe more that the Parliament plays a prominent role in initiating decision-making on road safety orientations and that there is a technical inter-sectoral body empowered to carry out a vertical coordination between other bodies involved.

- On the other hand, the governmental representatives were less confident, compared to experts, that an institutional structure for stakeholder consultations was formally established in the country.

Country	Results of analysis of governmental responses (G)							Results of analysis of expert responses (E)						
	V1_2	V1_3	V1_8	V1_7	V1_59	V1_46			V1_3	V1_4	V1_8	V1_79	V1_26	V1_15
	2. Does Parliament have a prominent role in initiating decision-making on road safety orientations or directions?	3. Is Parliament involved in adopting road safety orientations or directions?	8. Has an institutional structure for the consultation of stakeholders been formally established ?	7. Coordination vertically	5. Has a technical inter-sectoral road safety institution been established to coordinate? AND 9. Are the legislative instruments defining inter-sectoral road safety management functions periodically reviewed	4. Has a Lead Agency been formally appointed to take responsibility for road safety? AND 6. Coordination horizontally	Country group G	Country group E	3.Is Parliament involved in adopting road safety orientations or directions?	4. Has a Lead Agency been formally appointed to take responsibility for road safety (direct the national road safety effort)?	8. Has an institutional structure for the consultation of stakeholders been formally established (by law or decree)?	7. Coordination vertically AND 9. Are the legislative instruments defining intersectoral road safety management functions periodically reviewed and reformed	2. Does Parliament have a prominent role in initiating decision-making on road safety orientations or directions? AND 6. Coordination horizontally	1. Has a high level inter-sectoral decision-making institution been established to prepare policy orientations? AND 5. Has a technical inter-sectoral road safety institution been established to coordinate ?
BE	1.0	1.0	1.3	1.0	1.3	1.2	1	1	1.5	1.3	1.3	1.4	1.3	1.0
EL	1.5	1.1	2.0	1.7	2.0	1.6	3	4	2.0	2.0	1.5	1.7	1.6	1.8
FI	1.0	1.0	1.3	1.0	1.3	1.2	1	1	1.5	1.3	1.3	1.4	1.3	1.0
FR	1.3	2.0	1.7	1.0	1.6	1.0	2	1	1.5	1.3	1.3	1.4	1.3	1.0
IE	1.5	1.1	2.0	1.7	2.0	1.6	3	3	1.1	1.0	2.0	1.8	1.5	1.6
IL	1.3	2.0	1.7	1.0	1.6	1.0	2	1	1.5	1.3	1.3	1.4	1.3	1.0
IT	1.0	1.0	1.3	1.0	1.3	1.2	1	3	1.1	1.0	2.0	1.8	1.5	1.6
LV	1.3	2.0	1.7	1.0	1.6	1.0	2	3	1.1	1.0	2.0	1.8	1.5	1.6
NL	1.5	1.1	2.0	1.7	2.0	1.6	3	2	1.3	1.0	1.0	1.5	1.5	2.0
PL	1.5	1.1	2.0	1.7	2.0	1.6	3	3	1.1	1.0	2.0	1.8	1.5	1.6
UK	1.0	1.0	1.3	1.0	1.3	1.2	1	2	1.3	1.0	1.0	1.5	1.5	2.0
Average btw the countries	1.27	1.31	1.64	1.27	1.60	1.27	--	--	1.36	1.18	1.50	1.59	1.43	1.48

[#] See text for explanation on colors indicated in the table

Table 4.4: Comparison of country clusters' characteristics recognized based on governmental versus expert responses, using Part 1 of the RSM questionnaire[#]

4.1.3.3. Policy formulation and adoption

Considering the governmental responses, Part 2 of the RSM questionnaire "Policy formulation and adoption" originally included 11 variables but was reduced to 7 when the "consensus" variables were excluded. In the initial analysis, certain correlations were observed between the three of variables such as: V2_3, V2_4 and V2_5[29], which were averaged, respectively, leaving 5 variables for the countries' clustering.

A 3-clusters' solution was fitted to the data where the Ward and the PAM methods produced very close results (only 1 country was classified differently by the two methods). The countries' groups recognized using the "Policy formulation and adoption" components were as follows:

Cluster1: BE, EL, FR

Cluster2: FI, NL, UK

Cluster3: IE, IL, IT, LV, PL1, PL2

where the clusters are numbered in the ascending order of average of variable means, i.e. going from more "yes" to more "no" answers as to the availability of the "Policy formulation and adoption" RSM components in the countries belonging to each cluster.

Comparing the clusters here with those recognized based on expert responses (see Sec.4.1.2.4) one can notice that the results are **different**: only 3 countries kept a similar position in both classifications (FI, NL belonging to the first cluster and IT belonging to the last). All other countries moved to another cluster, i.e. improved or worsened their positions compared to the "expert" classification. As we mentioned in Sec.4.1.3.2, such differences in the results of both analyses are expected due to various data analyzed.

A detailed comparison of the 11 country characteristics obtained by both analyses is presented in Table 4.5, where, for each variable, the mean value per cluster, the country assigned to, is given. In addition, in Table 5, the countries belonging to the first (best) group of countries, according to each classification, are indicated in green and those belonging to the last (worst) group - in red. Also, concerning the average values of characteristics among the countries, the values of "higher than medium availability" (below 1.4) are indicated in green and those of "lower then medium availability" (over 1.6) are indicated in red.

It can be seen that:

- Only three countries (FI, NL, IT) were classified similarly by both analyses.

- Most countries, based on the governmental responses, moved to a neighbor cluster, where, for example, UK, BE, EL, FR improved their positions while IL, LV, PL worsened them.

[29] According to Pearson correlation coefficients, a positive correlation at the 0.002 level

Country	Results of analysis of governmental responses (G)						Results of analysis of expert responses (E)					
	V2_6	V2_7	V2_9	V2_11	V2_345			V2_5	V2_6	V2_1011	V2_34	V2_79
	15. Are local road safety programmes integrated into the national road safety policy?	16. Has a national "vision" for improved RS performance in the long term officially been set?	18. Has a national RS Strategy been produced based on a Safe System approach?	20. Has a national medium term road safety programme been adopted at high level?	12. Are regional authorities consulted as to the part they called to play in national road safety policy AND 13. Are regional road safety programmes integrated into the national road safety policy? AND 4. Are local authorities consulted as to the part they are called to play in national road safety policy	Country group G	Country group E	14. Are local authorities consulted as to the part they are called to play in national road safety policy	15. Are local road safety programmes integrated into the national road safety policy?	19. Has a national medium term road safety programme been elaborated? AND 20. been adopted at high level?	12. Are regional authorities consulted as to the part they called to play in national road safety policy AND 13. Are regional road safety programmes integrated into the national road safety policy?	16. Has a national "vision" for improved RS performance in the long term officially been set? AND 18. Has a national RS Strategy been produced based on a Safe System approach ?
BE	2.0	1.0	1.0	2.0	1.7	2	4	2.0	1.8	2.0	1.6	1.3
EL	2.0	1.0	1.0	2.0	1.7	2	4	2.0	1.8	2.0	1.6	1.3
FI	1.0	1.0	1.0	1.0	1.0	1	2	1.2	1.9	1.0	1.5	1.1
FR	2.0	1.0	1.0	2.0	1.7	2	4	2.0	1.8	2.0	1.6	1.3
IE	1.8	1.9	1.5	1.1	1.7	3	3	1.8	1.8	1.0	1.9	1.9
IL	1.8	1.9	1.5	1.1	1.7	3	2	1.2	1.9	1.0	1.5	1.1
IT	1.8	1.9	1.5	1.1	1.7	3	4	2.0	1.8	2.0	1.6	1.3
LV	1.8	1.9	1.5	1.1	1.7	3	3	1.8	1.8	1.0	1.9	1.9
NL	1.0	1.0	1.0	1.0	1.0	1	2	1.2	1.9	1.0	1.5	1.1
PL	1.8	1.9	1.5	1.1	1.7	3	3	1.8	1.8	1.0	1.9	1.9
UK	1.0	1.0	1.0	1.0	1.0	1	3	1.8	1.8	1.0	1.9	1.9
Average btw the countries	1.61	1.42	1.23	1.31	1.49	--	--	1.70	1.78	1.36	1.67	1.44

[#] See text for explanation on colors indicated in the table

Table 4.5: Comparison of country clusters' characteristics recognized based on governmental versus expert responses, using Part 2 of the RSM questionnaire[#]

- In general, governmental responses state a higher availability of the RSM "Policy formulation and adoption" components in their countries compared to expert estimates.

- In particular, compared to experts, the governmental representatives believe more that regional and local authorities were consulted as to the part they played in national road safety policy and that regional and local road safety programmes were integrated into the national road safety policy.

4.1.3.4. Comments on the results of governmental responses' analysis

Similarly to the results of analyses of Part 1 and Part 2, substantial differences were observed in the country groupings received for other parts of the RSM questionnaire based on the governmental responses, compared to the results of the analysis of expert responses. As we mentioned previously, technically, such discrepancies were expected and for practical reasons the detailed results for Parts 3, 4 and 5 are not presented here.

In principle, both analyses produce different results, providing possibilities for different country groupings and their interpretations. As expert responses covered a higher number of countries and also assuming that expert opinions reflect an independent and objective view of the RSM system in the country, it seems reasonable to apply the country groups identified based on expert responses. At the same time, the common tendencies recognized in the governmental responses compared to expert ones, can be useful for interpretation of the official vision of the RSM systems in the countries considered.

As we demonstrated above for the first two parts of the questionnaire, the governmental representatives tend to be more optimistic concerning the availability of certain RSM components in their country. To create a more general vision of the issue, we carried out a detailed comparison between the (50) answers provided by the experts versus the officials for each one of the (11) countries. The comparison was quantitative, i.e. based on the codes prepared for the current analyses, where, for each variable, the official value was subtracted from the expert value and, then, a sum of such differences was received for each country. The findings demonstrated that:

- In 8 cases (out 12) the values of experts were higher, implying that the *governmental representatives systematically reported on a higher availability of the RSM components compared to the experts*. Remarkably high differences in answers, with a summary score of differences in the range of 12-14, were found for such countries as IT, PL[30], UK, indicating that for these countries *in many cases* the official opinion was in favour of availability of certain RSM features, whereas experts doubted that. Other countries with more optimistic picture of availability of the RSM components according to governmental versus expert opinions were: BE, EL, FI, FR, LV.

- In two countries (IE, IL) the total score of differences was close to zero, indicating a general similarity in the RSM system view, by both sides.

- In one country (NL) the total score of differences was below zero, indicating that some expert estimates were more optimistic than that of the official.

[30] According to one governmental representative, where according to another (as we had two governmental responses from PL) the total score of differences was close to zero, i.e. overall, the expert and the governmental view of the RSM components' availability was close.

A similar quantitative comparison enabled us to recognize those variables (questions) which are associated with higher discrepancies in the governmental versus expert answers, across the countries considered. Among the RSM components with stronger differences[31] between both opinions, where the official responses systematically stated for the availability of a feature and the expert not, were:

- A prominent role of the Parliament in initiating decision-making on road safety orientations;

- Carrying out consultations with local authorities (municipalities, counties) on the part they are called to play in national road safety policy;

- The application of a Safe System approach while a national road safety Strategy was produced;

- The availability of a national medium-term road safety programme;

- The availability of formal resource allocation procedures to support road safety management tasks and interventions;

- Fund allocation to evaluation of road safety interventions;

- Setting a reporting procedure to monitor the road safety interventions carried out in the country;

- Setting a procedure to evaluate safety performances of the global programme;

- Regular informing the citizens, by the government or road safety institutions, on the national road safety policy and interventions and their effects.

4.1.4. Discussion and conclusions

In this chapter, the road safety management systems of the European countries were explored by means of quantitative statistical techniques aiming to recognize country groups with similar RSM components. Two analyses were carried out: using expert responses and using governmental responses on the RSM questionnaire, with 14 and 11 countries examined, respectively.

Based on expert responses, the 14 countries were subdivided into homogeneous groups in accordance with five parts of the RSM questionnaire. The numbers of country groups (clusters) identified considering each part of the questionnaire were as follows:

for part 1 "Institutional organisation, coordination and stakeholders' involvement" – 4 clusters;
for part 2 "Policy formulation and adoption" – 4 clusters;
for part 3 "Policy implementation and funding" – 6 clusters;
for part 4 "Monitoring and evaluation" – 2 clusters;
for part 5 "Scientific support and information, capacity building" – 3 clusters.

Considering the availability of the RSM components – through the mean values of variables attributed to each country group (see Appendix II), some conclusions concerning the general availability of the RSM components can be drawn. One can note that for a substantial share of the RSM components, the expert answers lay between "yes" and "no" so that, on average, the level of availability of a certain

[31] A summary score of differences across the countries was 3 or more

component across the countries examined was medium, within a score of 1.4-1.6. On the other hand, we can distinguish such RSM components which, on the sample of the countries considered, are associated with higher or lower than medium value of score indicating a different level of availability. In addition, we should account for the meaning of "consensus" variables identified at the beginning of analysis. Applying such considerations to each part of the RSM questionnaire the following observations can be made:

(1) In part 1 "Institutional organisation, coordination and stakeholders' involvement", most RSM components had a medium level of availability across the 14 countries considered, where for the component of "Lead Agency formally appointed to take responsibility for road safety" a ***higher*** availability level was observed among the countries.

(2) In part 2 "Policy formulation and adoption", most RSM components had a medium level of availability across the countries, except for

- a national medium-term road safety programme (elaborated and adopted) that is associated with a ***higher*** level of availability, and

- local road safety programmes' integration into the national road safety policy, which is associated with a ***lower*** level of availability among the countries.

Besides, in most countries, there are national medium-term quantitative targets set for improved safety performance, NGOs actively promoting road safety and some government agencies actively advocating the need for taking road safety action.

(3) In part 3 "Policy implementation and funding", for a substantial share of the RSM components a ***lower*** than medium level of availability was observed among the countries. Such components concern:

- establishing partnerships at the national level with the private sector;

- availability of formal resource allocation procedures to support road safety management tasks and interventions;

- designing training plans to support the implementation of the national road safety programme or its components;

- funding allocated to evaluation;

- the sufficiency of funds allocated for the programme's implementation;

- the sufficiency of human resources needed to implement the programme;

- a decision taken to ensure the availability of a budget for road safety;

- a budget specifically allocated to road safety activities coming from the national budget;

- the legislative instruments and procedures regularly reviewed.

In addition, in most countries, a budget needed to move towards a long-term vision was not estimated.

(4) As to part 4 "Monitoring and evaluation", about half of components had a medium level of availability across the countries, where a ***lower*** level of availability was indicated for "sustainable in-depth accident investigations". On the other hand, a ***higher*** than medium level of availability was associated with such components as:

- using "benchmarking" to monitor progress in the road safety situation relatively to other countries;

- a sustainable system in place to collect and manage data on behavioural indicators, which frequently belongs to a national Observatory centralizing the data systems for road safety.

In addition, for most countries, sustainable systems to collect and manage data on road accidents, fatalities and injuries are in place.

(5) Finally, for part 5 "Scientific support and information, capacity building", a number of components were associated with a ***higher*** than medium level of availability among the countries, such as:

- using research results for formulating road safety policy;

- systematically informing the citizens on the national road safety policy and interventions and their effects;

- availability of articles or programmes in the media which review, criticize or challenge current road safety policies.

In addition, in most countries, there is an institute or a university department performing multi-disciplinary road safety research, and the government or road safety institutions provide factual information on road accidents, injuries and risk to the citizens.

One can conclude that according to the expert responses, among the countries considered, the most problematic section of the RSM is "Policy implementation and funding", where a higher level of unavailability was stated for a significant number of components.

As demonstrated in Sec. 4.1.2.3-4.1.2.7, for the various aspects of RSM analysed (institutional organisation, policy formulation, policy implementation, monitoring and evaluation, and scientific support), country groups with similar components were identified. The next step should be in summarizing the results into a whole picture, in order to examine whether similarities can be seen among the countries, when the whole RSM structure is concerned.

Table 4.6 provides a summary of the groups each country belonged to, for the various aspects of RSM analysed. In each analysis, the group (cluster) numbering was given in such a way that first cluster had the highest level of availability of the RSM components and the last – the lowest one. Hence, one can expect, for example, that the countries with a good RSM level will be systematically found in the first group of countries identified on the basis of each (classification) analysis. Similarly, one might assume that the countries with a low RSM level will be consistently found in the last group defined by each analysis. To support the examination, in Table 6, the countries of the first group found by each analysis are coloured in green, and the countries of the last group – in red.

In addition, to summarize the results across the five analyses, a final position (group) was estimated for each country, by means of rescaling and averaging the values. The countries were finally ranked in accordance with their final (estimated) values of group (see Table 4.6), with possible alternatives of 3, 4 or 5 final country groups. To strengthen the view, the countries belonging to the first final group are colored in green, to the second one – in blue, to the last group – in red.

Looking at Table 4.6, the following observations can be made:

- All the countries are ***different*** when ***the whole RSM systems*** are considered as no two countries belonged to the same group according to the results of various RSM parts' analyses.

- Across all the analyses, a number of countries with a ***consistently higher level*** of the RSM component availability and with a ***consistently lower level*** of the same features can be recognized. Those are, for example, the groups of CH, IL, FI and PL, EL, respectively. However, one should admit that for the first countries' group with seemingly higher level of availability of the RSM components compared to others, the availability level was not the best across all the analyses. As a result, where a final subdivision into 4-5 groups is considered, none of the countries belongs to the first group.

	Country clusters identified following the RSM components' analysis of					A final country group where the number of groups requested is		
Country	Part1	Part2	Part3	Part4	Part5	**3**	**4**	**5**
CH	2	1	1	1	2	1	2	2
IL	1	2	3	1	1	1	2	2
FI	1	2	1	1	3	1	2	2
BE	1	4	4	1	1	2	2	3
LV	3	3	3	1	1	2	2	3
NL	2	2	2	1	3	2	2	3
FR	1	4	5	1	1	2	2	3
UK	2	3	5	1	1	2	2	3
AT	2	1	4	2	2	2	2	3
ES	4	2	3	1	2	2	3	3
IE	3	3	6	1	2	2	3	4
IT	3	4	5	2	1	2	3	4
PL	3	3	6	2	3	3	4	5
EL	4	4	6	2	2	3	4	5

Table 4.6: A summary of each country group following the five analyses and a final group estimated for each country

Due to the diversity of existing forms of road safety management in the countries examined, the task of identifying the typical RSM structures available in the European countries seems to be ***unrealizable*** when the RSM system is considered as a whole. However, it is ***possible*** to compare the countries when parts of the RSM system are considered separately as was demonstrated in this chapter. The clusters of countries recognized by the analyses of each part of the RSM questionnaire actually present the forms of RSM systems common for the European countries.

An additional analysis demonstrated that country groupings received based on the governmental representatives' responses was different compared to that based on expert responses. Such a difference was expected given the various numbers of observations (countries) considered in both analyses, with sometimes different values assigned to the same characteristics. As expert responses covered a higher number of countries and, also, assuming that expert opinions reflect an independent and more objective view of the RSM system in the country, we suggest to apply further the country groups identified ***based on expert responses***.

However, the tendencies recognized in the governmental responses compared to expert ones, can be useful for understanding the official vision of the RSM systems in the European countries. It was found that, in general, the governmental representatives tend to be ***more positive*** concerning the availability of the RSM components in their country.

Among the RSM components associated with stronger differences between the governmental and expert opinions, i.e. where the governmental responses systematically stated the availability of a feature and the expert not, can be mentioned:

a prominent role of Parliament in initiating decision-making on road safety orientations; carrying out consultations with local authorities (municipalities, counties) on the part they are called to play in national road safety policy; application of a Safe System approach while a national road safety Strategy is produced; availability of a national medium-term road safety programme; availability of formal resource allocation procedures to support road safety management tasks and interventions; fund allocation to evaluation of road safety interventions; setting a reporting procedure to monitor the road safety interventions carried out in the country; setting a procedure to evaluate safety performances of the global programme; and regularly informing the citizens, by the government or road safety institutions, on the national road safety policy and interventions and their effects.

4.2. Exploring a statistical link between RSM clusters and fatality rates

4.2.1. Introduction

This section explores whether a statistical link can be established between the countries ranking in terms of road safety management and their respective ranking in terms of fatality rates.

The analysis is based on the cluster analysis and the country rankings in terms of road safety management aspects presented in chapter 4.1. It is reminded that these results are on the road safety management (RSM) DaCoTA questionnaire responses, explored by means of quantitative statistical techniques aiming to recognize country groups with similar RSM components. Using expert responses, 14 countries were subdivided into homogeneous groups for five aspects of RSM investigated in the different parts of the RSM questionnaire, where the numbers of country groups (clusters) identified for each part of the questionnaire were as follows:

for part 1 "Institutional organisation, coordination and stakeholders' involvement" – 4 clusters;
for part 2 "Policy formulation and adoption" – 4 clusters;
for part 3 "Policy implementation and funding" – 6 clusters;
for part 4 "Monitoring and evaluation" – 2 clusters;
for part 5 "Scientific support and information, capacity building" – 3 clusters.

Table 1 provides a summary of the groups each country was assigned to for each of the 5 RSM aspects investigated. In each case, the group (cluster) numbering was given in such a way that first cluster had the highest level of availability of the RSM components and the last – the lowest one. It is assumed that higher availability of the RSM components is associated with better RSM level. Thus, countries with a good RSM level belong to the first groups received by the classification analyses, whereas the countries with a low RSM level will be found in the last groups.

Furthermore, to summarize the results across the five analyses, a final group was estimated for each country. The countries were ranked in accordance with their final (estimated) values of group, with possible alternatives of 3, 4 or 5 final country groups (see Table 4.7).

A question was raised whether a statistical link can be established between the RSM clusters of countries and fatality rates in these countries. It was assumed that finding such a link would indicate a relation between the level of RSM system and safety performance of the country.

For this purpose, the fatality rates of countries, in terms of fatality numbers per million population, were collected for 2010 (see Table 4.7).

4.2.2. Method

The comparison between RSM rankings and fatality rates was made by means of estimating Spearman's rank correlation coefficient, which is a non-parametric measure of the strength of association between two ranked variables. The sign of the Spearman correlation indicates the direction of association between *X* (the

independent variable) and *Y* (the dependent variable). If *Y* tends to increase when *X* increases, the Spearman correlation coefficient is positive; if *Y* tends to decrease when *X* increases, the Spearman correlation coefficient is negative. A Spearman correlation of zero indicates that there is no tendency for *Y* to either increase or decrease when *X* increases. The Spearman correlation increases in magnitude as *X* and *Y* become closer to being perfect monotone functions of each other.

	Country clusters identified following the RSM questionnaire components' analysis of					A final RSM country group, where the number of groups requested is			Fatality rate per million inhabitants, 2010
Country	Part1	Part2	Part3	Part4	Part5	**3**	**4**	**5**	
AT	2	1	4	2	2	2	2	3	65.9
BE	1	4	4	1	1	2	2	3	77.5
CH	2	1	1	1	2	1	2	2	42.0
EL	4	4	6	2	2	3	4	5	113.3
ES	4	2	3	1	2	2	3	3	53.9
FI	1	2	1	1	3	1	2	2	50.8
FR	1	4	5	1	1	2	2	3	61.7
IE	3	3	6	1	2	2	3	4	47.5
IL	1	2	3	1	1	1	2	2	45.7
IT	3	4	5	2	1	2	3	4	65.2
LV	3	3	3	1	1	2	2	3	97.0
NL	2	2	2	1	3	2	2	3	38.6
PL	3	3	6	2	3	3	4	5	102.4
UK	2	3	5	1	1	2	2	3	30.7

Table 4.7. Country groups recognized in the analyses of five parts of the RSM questionnaire, final RSM groups estimated for each country and country fatality rates

In our case, we considered the fatality rate as a dependent variable, where country clusters served as an independent one. Eight estimations were carried out in total, i.e. for each part of the RSM questionnaire and the three final RSM classifications. The CORR procedure of SAS was applied.

4.2.3. Results

Results of the estimations are given in Table 4.8. It can be seen that:

- For most parts of the RSM questionnaire, except for part 5 "Scientific support and information, capacity building", a positive correlation was observed with the fatality rates of the countries.

- The strongest association with the fatality rates was found for part 4 "Monitoring and evaluation": a correlation coefficient of 0.63 (significant, at the 0.05 level).

- For part 2 "Policy formulation and adoption" and part 3 "Policy implementation and funding" the association was noticeable as well: correlation coefficients of 0.45-0.48 (close to significant).

- For part 1 "Institutional organisation, coordination and stakeholders' involvement" the association was weaker (a coefficient of 0.37, not significant).

- For part 5 "Scientific support and information, capacity building" actually no relation was observed (a coefficient close to zero).

- In addition, a significant positive correlation was found between the fatality rates and final RSM country classifications: the correlation coefficients derived for country classifications into 3 or 5 groups were of 0.57-0.63 (significant, at the 0.05 level).

Issue of comparison: country clusters according to	Spearman correlation coefficient (p-value)
Part1 of the RSM questionnaire	0.37 (p=0.19)
Part2 of the RSM questionnaire	0.48 (p=0.08)
Part3 of the RSM questionnaire	0.45 (p=0.11)
Part4 of the RSM questionnaire	0.63 (p=0.016)
Part5 of the RSM questionnaire	-0.028 (p=0.92)
Final RSM classification with three country groups	0.63 (p=0.015)
Final RSM classification with four country groups	0.48 (p=0.08)
Final RSM classification with five country groups	0.57 (p=0.03)

Table 4.8. Spearman correlation coefficients for a relation between country fatality rate and the RSM clusters

4.2.4. Conclusions

The results of estimation of statistical correlations between the RSM clusters of countries and their fatality rates indicate that a positive correlation exists between the level of the RSM system in the country and its safety performance.

The countries with higher availability of the RSM components, in general, are characterized by lower fatality rates.

In particular, lower fatality rates are stronger associated with higher availability of the "Monitoring and evaluation" RSM components. In addition, lower fatality rates are associated with higher availability of the "Policy formulation and adoption" and "Policy implementation and funding" components.

4.3. Linking road safety management and road safety performance

In this section, the relationship between road safety management and road safety performance is further explored by more detailed statistical analysis and for a larger set of European countries. The DaCoTA/ETSC-PIN questionnaire data are used for that purpose (30 countries). Furthermore, a theoretical framework is used, namely the SUNflower methodology, in order to test specific hypotheses on the relationship between road safety management and road safety performance.

4.3.1. Objectives

The road safety management 'footprint' of a country at a specific point in time can be described on the basis of the SUNflower pyramid (Koornstra et al., 2002; Wegman et al. 2005), which includes a target hierarchy of five levels of road safety components, starting from the bottom, as follows (see Figure 4.14):

- The road safety performance of a country is related to structural and cultural characteristics (i.e. policy input) at the bottom level.
- It is consequently related to common practice (i.e. safety measures and programs - policy output), resulting from the structural and cultural characteristics, at level 2.
- To link these first two layers to the actual road accident outcomes an intermediate layer specifies the operational level of road safety in the country, containing road safety performance indicators (RSPI) on issues like speeding, drinking and driving, as well as a concise depiction of the road network and the main features of the vehicle fleet.
- Final outcomes expressed in terms of road casualties are then necessary to understand the scale of the problem. This type of information is found at level 4, and consists of different types of road risk indicators.
- The top of the pyramid includes a sound estimate of the total social costs of road crashes.

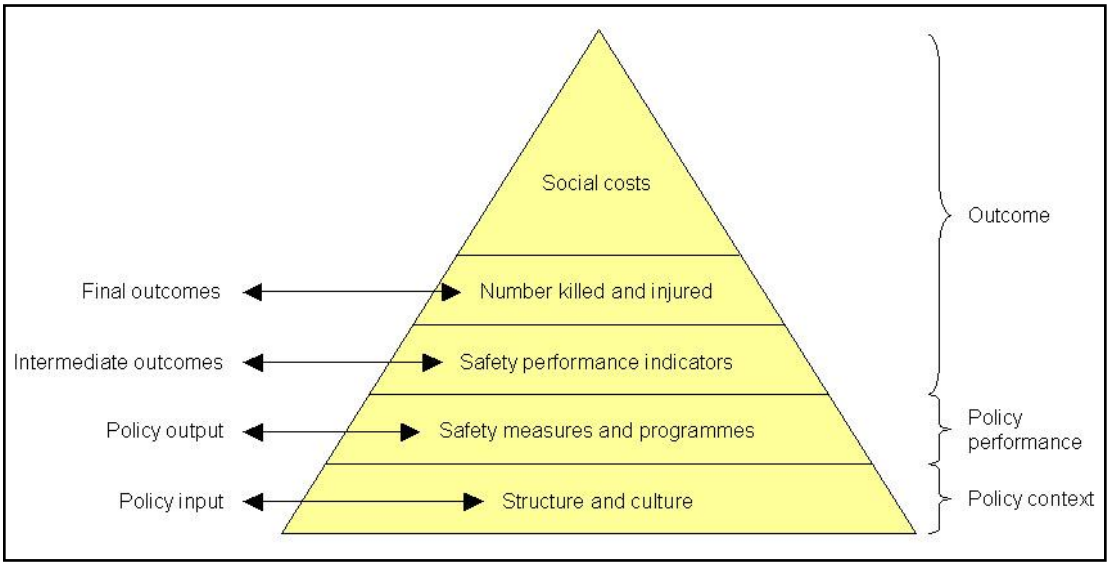


Figure 4.14: A target hierarchy for road safety (Koornstra et al., 2002; LTSA, 2000)

This pyramid implies an indirect impact of road safety policies, and specific programmes and measures on road safety performance, either in terms of 'intermediate' outcomes (SPIs) or final outcomes (fatalities and injuries). There are numerous studies that examine the effect of specific policies and measures to specific outcomes, for instance, alcohol-related measures (e.g. enforcement) to the share of drink-driving, and to alcohol-related accidents. However, this relationship has not been examined as a whole in the international literature, in terms of the relationship of the road safety management level with the overall road safety performance.

A related analysis is under way within DaCoTA Task 4.3 'Composite Index', where as a first step, composite indicators are estimated for each level of the pyramid, so that their relationships can be statistically analysed (Bax et al., 2012). Moreover, in a recent research (Elvik, 2012), a statistical model was built linking road safety performance with road safety management and a couple of other possible confounding factors, but no relationship was identified, and this was attributed partly to the small sample size (17 countries) and the way road safety management was 'measured' (i.e. as the number of road safety management tools implemented in each country).

Within this context, the objective of this analysis is to identify road safety management components and to link those with road safety performance in the European countries, on the basis of the DaCoTA/ETSC-PIN data, within the framework of the SUNflower pyramid. The dependent variable in the analysis is the road safety outcomes (i.e. fatality risk, fatality reduction etc.) and the explanatory variables include road safety management (RSM) indicators, other background indicators (e.g. socioeconomic), and safety performance indicators.

4.3.2. Data sources

4.3.2.1. Background data: structure and culture

Road safety management features are likely to interact with other background indicators, reflecting the overall road safety structure and culture in a country. Within the first stages of this analysis, it was attempted to use a geographical grouping of countries in order to reflect the common socioeconomic, transport and road safety backgrounds between countries, i.e. northern / western, central / eastern and southern. However, given that such a classification was not very informative, it was later decided to exploit the work of DaCoTA WP4 Task 4.3 on the "Composite Index (CI)", whose objective was the grouping of EU countries on the basis of structural and cultural data.

The description of the extensive research carried out within the CI group, testing several different indicators and several clustering techniques is beyond the scope of this report (Bax et al. 2012). Nevertheless, it is worth mentioning that, despite the fact that slightly different results were obtained when testing different methods and data, it was concluded that:

- The basic background indicators among the numerous data examined were GDP per capita and the level of motorization, which were proved to reflect all other background information.

- In the different clusterings attempted, two relatively stable “groups” of countries were identified, on the basis of GDP per capita and level of motorization.

More specifically, the two groups were stable across various classification methods, where the country grouping is based on the four main country characteristics: GDP per capita, motorization level, population density and the percentage of population living in urban areas:

- The first group includes 10 countries: RO, BG, HU, SK, LV, PL, EE, PT, CZ, LT, and, on average, is characterized by lower values of the background country characteristics.
- The second group includes the remaining 20 countries.

The key characteristics subdividing the countries into two groups were the indicators of motorization level and GDP per capita which are commonly known as characteristics of the level of a country's economic development.

4.3.2.2. Road Safety management data

The common DaCoTA/ETSC-PIN questionnaire was selected for this analysis. This questionnaire includes a limited number of questions, but for a higher number of countries, compared to the DaCoTA extensive RSM questionnaire. The following common DaCoTA/ETSC-PIN questions are used (Table 4.9).

	PIN / Dacota question	Coding for RSM3
1.	Has a national road safety vision been set in your country?	1_Vision
2.	Has a national long-term road safety strategy been set in your country?	2_Strategy
3a.	Has a national quantitative road safety target been set in your country for reducing the number of deaths?	3a_Target_fatalities
3b.	Has a national quantitative road safety target been set in your country for reducing the number of people seriously injured?	3b_Target_seriousinj
3c.	Have any other quantitative road safety targets been set in your country?	3c_Target_other
4.	Has a national road safety programme or plan been formulated and adopted in your country?	4_Programme_plan
5a.	Is there a budget dedicated to the implementation of your national road safety programme or plan?	5a_Budget
5b.	Is the budget seen as being adequate to make your country's targets achievable?	5b_Budget_adequate
5c.	Have there been any changes since 2009 to the budget allocated to roads policing in your country?	5c_Budget_changes
6a.	Is there a lead agency or structure bearing responsibility for road safety policy-making in your country?	6a_LeadAgency_PolicyMaking
6b.	Is there a lead agency that is empowered to co-ordinate the road safety activities of the main actors involved in advancing road safety in your country?	6b_LeadAgency_Coordination
7a.	Does regular quantitative monitoring of your country's road safety performance take place?	7a_Monitoring
7b.	Are the results of this monitoring published periodically?	7b_Monitoring_published
8.	Does a regular evaluation of the efficiency of the road safety measures or interventions implemented in your country take place?	8_Evaluation
9.	Is there regular reporting on the road safety measures and interventions implemented in your country?	9_Reporting
10a.	Are the attitudes of people towards road safety measures being measured nationally?	10a_Attitudes_measures
10b.	Are the attitudes of people towards behaviour of road users being measured nationally?	10b_Attitudes_behaviour
10c.	Are behaviours of road users being measured nationally?	10c_Behaviours

Table 4.9: DaCoTA/ETSC-PIN common questions on road safety management

Responses are available from 30 countries, however the usable responses come from 29 countries (BG did not return any response).

4.3.2.3. Safety Performance Indicator (SPI) data

A composite SPI index developed within DaCoTA Task 4.3 was used. This indicator was based upon a weighted score of 8 normalised SPIs concerning road user behaviour and vehicles in each country namely (Bax et al., 2012):

- Roadside police alcohol tests per 1,000 population, 2008
- Percentage of drivers above legal alcohol limit in roadside checks, 2008
- Daytime seat belt wearing rates on front seats aggregated of cars, 2009
- Daytime wearing rates of seat belts on rear seats of cars, 2009
- Average percentage occupant protection score for new cars sold in 2008
- Average percentage score of pedestrian protection for new cars sold in 2008
- Renewal rate of passenger cars in 2007
- Median age of passenger cars, 2008

It is noted that all the indicators were expressed in the same direction with respect to their expected road safety impact, i.e., a higher SPI value should correspond to a

better operational level of road safety and a lower crash/injury risk. The composite SPI data are presented in Appendix III.

4.3.2.4. Road safety outcomes data

A country's road safety performance can be measured in a number of ways, i.e. mortality or fatality rates at a given year (road safety outcomes per million inhabitants or per million vehicle-kilometres of travel), development over time (e.g. percentage decrease over a decade, or average annual change over a decade), etc.

In this research, it was decided to test both the road safety level and the road safety development of each country. Fatality data for years 2000-2010 are obtained from the CARE database, whereas population and passenger-kilometres[32] data for year 2010 are obtained from the Eurostat database (see Appendix III).

Again, within DaCoTA Task 4.3, a composite index concerning road safety outcomes was created, on the basis of a weighted score of seven normalised outcomes indicators, namely (Bax et al. 2012):

- Fatalities per million inhabitants, 2008
- Fatalities per million vehicle fleet, 2008
- Fatalities per 10 billion person km, 2008
- Annual average percentage reduction in fatalities, 2001-2008
- Pedestrian as a % of total fatalities, 2008
- % of pedal cycle fatalities of the total, 2008
- % of motorcycle and moped fatalities of the total, 2008

It is therefore noticed that the composite index includes both fatality risk rates and development indicators, together with indicators concerning particular – vulnerable – road user groups. In this case as well, as in the composite SPI, the scale differences of the various indicators were eliminated by means of normalization, and care was taken that they were expressed in the same direction with respect to road safety performance, i.e. higher scores correspond to better road safety performance and lower risk.

The road safety outcomes data used in the present research, including the composite index, are presented in Appendix III.

4.3.3. RSM data coding and handling

A datafile was created on the basis of the DaCoTA/ETSC-PIN data, with the following variable coding:

1: yes
0.5: partially
0: No
99999: Unknown

In the original datafile, responses indicated as "no reply from panelist" were coded as "unknown". In some cases, there was a response with the indication "no comment

[32] Passenger-kilometres data concern passenger cars only; however, passenger car traffic is considered to be quite representative of national traffic.

from panelist" (i.e. the related section for comments or explanations was blank), these responses were accepted in the new datafile.

Moreover, the data coding in the original datafile was not consistent in all the questions. In some questions (Q3a,b,c, Q6b, Q7b, Q10a,b,c), the proposed 0 / 0.5 / 1 scale was used. In other questions however (e.g. Q1, Q2, Q4, Q5, Q8, Q9), a four-level scale was used, namely 0, 1, 2, 3, in which values 1 and 2 both correspond to "partially", depending on whether the comments / explanations of the expert suggested a "no, but.." or "yes, but…" situation. These were converted to the proposed scale by introducing a single value for "partially". A couple of questions (Q6a, Q7a) used the proposed scale with values 0 / 1 / 2 instead of 0 / 0.5 / 1; these were easily converted.

A preliminary thorough consistency check of the data was carried out with the original PIN questionnaires.

Then, data handling was carried out with two objectives:
- identify questions with little usability due to many missing / unknown values or other (theoretical) reasons
- identify "consensus" questions that would not add variability in the analysis and would thus be not meaningful to examine.

As shown in Table 4.10, for two questions, namely 5c and 5c (see Table 4.9), concerning the adequacy and the changes in the budget dedicated to road safety, there are more than 10 unknown values (obviously related to the fact that, if the response to question 5a was "no", then these questions were not relevant). These are excluded from the analysis. Only in questions 10a and 10b, concerning the measurement of attitudes towards road user behaviour and related measures, there are a couple of unknown values, which can be handled in the statistical analysis (e.g. replaced by the mean of the known responses).

Concerning the selection of "consensus" questions, there seems to be no straightforward solution and several steps were taken to make an initial decision. First, the sum of all known responses was calculated, in order to give a first indication of consensus in the responses (i.e. a high sum of responses might imply a large number of "yes" responses). Questions 3a, 4, 6a, 6b, 7a and 7b had a sum of known responses higher that 23.

Then, the counts of "yes", "partially" and "no" responses were examined for these questions. The criteria for considering a question to be a consensus were a combination of many "yes" values, few "partially" values and very few "no" values

Question 7a (monitoring) was easily characterized as a consensus question, given that 27 countries replied "yes" and another 2 replied "partially". The same was the case for question 4 (national programme / plan), with 21 countries replying "yes" and 6 countries replying "partially"). Only 3 countries reported no official target for the reduction of fatalities (Q3a) and thus this question was also considered a consensus question.

Questions 6a and 6b (on lead agencies) and 7b (monitoring results published) were also eventually included in the consensus questions, given that there are 3-4 "no" values and 2-4 "partially" values in each case, so there appears to be little detectable variability between countries.

Question	count of "yes"	count of "partially"	count of "no"	count of "unknown"	sum of responses (excl. "unknown")
1_Vision	13	7	9	0	16,5
2_Strategy	20	4	5	0	22
3a_Target_fatalities	**26**	**0**	3	0	**26**
3b_Target_seriousinj	11	0	18	**0**	11
3c_Target_other	13	2	14	**0**	14
4_Programme_plan	**21**	**6**	2	0	**24**
5a_Budget	5	8	14	2	9
5b_Budget_adequate	5	7	4	**13**	8,5
5c_Budget_changes	6	1	11	**11**	6,5
6a_LeadAgency_PolicyMaking	**23**	**2**	4	0	**24**
6b_LeadAgency_Coordination	**21**	**4**	4	0	**23**
7a_Monitoring	**27**	**2**	0	0	**28**
7b_Monitoring_published	**23**	**3**	3	0	**24,5**
8_Evaluation	10	11	8	0	15,5
9_Reporting	15	8	6	0	19
10a_Attitudes_measures	10	12	5	2	16
10b_Attitudes_behaviour	11	10	6	2	16
10c_Behaviours	17	8	4	0	21
unusable questions					
consesnus questions					

Table 4.10: Identification of 'consensus' and unusable questions in the PIN data

Two other questions were considered unusable, namely questions 3b and 3c concerning the targets about serious injuries or other specific road user groups; such targets have only been very recently adopted by some countries, and therefore their existence is not expected to correspond to the current level of efficiency or maturity of the road safety management system, nor to contribute to the relationship between the existing model of road safety management and road safety performance.

The remaining 8 questions can be considered usable and useful for the identification of RSM indicators.

4.3.4. Estimation of RSM indicators

A distinct part of the analysis is devoted to the estimation of road safety management indicators, given that for all the other levels (layers) of the pyramid, appropriate composite indicators have been estimated within DaCoTA Task 4.3 (Bax, 2012). In order to estimate RSM indicators, an appropriate data dimension reduction technique should be used.

However, the available DaCoTA/ETSC-PIN dataset on road safety management is a relatively small one, as it concerns only 29 countries. Moreover, the 8 variables that have been selected are categorical ones, taking discrete ordered values. Both these aspects make the use of dimension reduction techniques less straightforward. In order to address these particular properties of the dataset, three alternative methods of data dimension reduction were tested:

1. Calculation of average values of correlated variables
2. Principal Component Analysis
3. Categorical Principal Component Analysis

Each method presents different properties, advantages and limitations; therefore, the application and testing of all three methods may allow for cross-checking the

commonalities between variables and selecting an appropriate reduced set of variables.

4.3.4.1. Calculation on the basis of variables correlations

As a first step, the correlations between the 8 variables were calculated, on the basis of the Pearson coefficient. These are presented in Table 4.11.

Statistically significant correlations include:

- Road Safety "Vision" and "Strategy"
- "Budget" and "Reporting"
- "Evaluation" and "Reporting"
- The three variables concerning the existence of systematic surveys for "Attitudes towards measures", "Attitudes towards behaviours" and "Behaviours".

From these results, three groups of variables can be broadly distinguished:

- Group 1: includes 2 variables concerning road safety "vision and strategy"
- Group 2: includes 3 variables concerning "dedicated budget for road safety, systematic evaluation and reporting"
- Group 3: includes 3 variables concerning "systematic surveys for measuring road user attitudes and behaviours".

For these three groups of variables, the average value of the responses in each question was calculated.

Correlations		1_Vision	2_Strategy	5a_Budget	8_Evaluation	9_Reporting	10a_Attitudes_ measures	10b_Attitudes_ behaviour	10c_Behaviours
1_Vision	Pearson Corr.	1							
	p-value								
2_Strategy	Pearson Corr.	,412*	1						
	p-value	,026							
5a_Budget	Pearson Corr.	-,038	,119	1					
	p-value	,851	,555						
8_Evaluation	Pearson Corr.	,241	,112	,250	1				
	p-value	,207	,563	,209					
9_Reporting	Pearson Corr.	-,063	,019	,382*	,576**	1			
	p-value	,746	,920	,049	,001				
10a_Attitudes_measures	Pearson Corr.	,379	,155	-,031	,333	,238	1		
	p-value	,051	,441	,880	,089	,232			
10b_Attitudes_behaviour	Pearson Corr.	,298	,210	-,077	,249	,223	,869**	1	
	p-value	,131	,293	,710	,210	,264	,000		
10c_Behaviours	Pearson Corr.	,067	,141	,044	,249	,299	,627**	,456*	1
	p-value	,730	,467	,828	,192	,115	,000	,017	
*correlation is significant at 95%									
**correlation is significant at 99%									

Table 4.11. Correlations among the RSM variables

4.3.4.2. Estimation on the basis of Principal Component Analysis

A Principal Component Analysis was carried out on the 8 selected variables, in order to identify groups of variables ("components"). This technique has two main objectives: the first is to understand the structure of a (usually large) set of variables and the second is to reduce the dataset to a more manageable size and at the same time retain as much of the original information as possible.

In order to perform principal component analysis, it is crucial that the size of the sample is adequate. The general rule is that at least 10-15 participants (e.g. respondents) per variable should be available – which is clearly not the case in the present analysis. Another alternative is to use the Kaiser-Meyer-Olkin measure of sampling adequacy, in which values above 0.7 are considered to be very satisfactory. In the present analysis the value of the KMO measure was 0,55 and this shows that the sample size is not sufficient.

In addition, the communalities were calculated. Communalities show how much of each variable's variance is common between variables. Variables with low values of communality can be eliminated from the analysis, as they do not share important variance with other variables. The results shown in Table 4.12 suggest that all the communalities were above 0.5 and therefore no variables were eliminated.

Communalities	Initial	Extraction
1_Vision	1,000	,733
2_Strategy	1,000	,676
5a_Budget	1,000	,589
8_Evaluation	1,000	,624
9_Reporting	1,000	,774
10a_Attitudes_measures	1,000	,909
10b_Attitudes_behaviour	1,000	,803
10c_Behaviours	1,000	,589

Table 4.12. Communalities of variables used in the PCA

The next step is to determine the optimal number of components, and to estimate and save the component scores. The components that were retained were those that had an Eigenvalue above 1, indicating a large proportion of variance explained. As a result, 3 components were extracted which explain 71% of the variance (see Table 4.13).

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,870	35,871	35,871	2,870	35,871	35,871	2,420	30,244	30,244
2	1,586	19,821	55,692	1,586	19,821	55,692	1,788	22,347	52,591
3	1,242	15,525	71,217	1,242	15,525	71,217	1,490	18,626	71,217
4	,780	9,745	80,962						
5	,620	7,746	88,708						
6	,490	6,119	94,827						
7	,327	4,084	98,911						
8	,087	1,089	100,000						

Table 4.13. Eigenvalues and % of total variance explained for the estimated components - PCA

The interpretability of the 3 components was improved through rotation. Orthogonal rotation (Varimax) was selected in order to be sure that the estimated components are unrelated. It was decided to suppress all component loadings less than 0.5 to make the interpretation substantially easier (see Table 4.14).

	Component		
Variable	1	2	3
1_Vision			,830
2_Strategy			,815
5a_Budget		,738	
8_Evaluation		,713	
9_Reporting		,825	
10a_Attitudes_measures	,932		
10b_Attitudes_behaviour	,874		
10c_Behaviours	,740		

Table 4.14. Rotated component matrix - PCA

Finally, the (standardized) component scores were calculated according to the Anderson-Rubin method to ensure that component scores are uncorrelated - this is particularly important given that the final goal is to use these components in regression analysis. The component loadings suggest that variables' sign and magnitude within each component are similar, which means that all variables have the same kind of "effect" within each component (i.e. common high or low scores within each component).

The components can be summarized as follows:
Component 1: This component shows the presence of a national vision and strategy as regards road safety.
Component 2: This component includes the existence of dedicated budget for road safety management, the regular evaluation of programmes and measures and the reporting of the evaluation results.
Component 3: This component concerns the measurement of road user attitudes and behaviour.

It is noted that the three estimated 'components' are identical to the three 'groups' of variables identified in the previous section (4.1) on the basis of the correlation coefficients.

4.3.4.3. Estimation on the basis of Categorical Principal Component Analysis

Standard principal components analysis assumes linear relationships between numeric variables. However, in the present analysis, variables are discrete ordinal (i.e. the responses are coded as "yes, partially, no"). Moreover, there are reasons to assume nonlinear relationships between variables; it is likely that the "distance" between "yes" and "partially" is very different from the "distance" between "partially" and "no", as assumed by the coding of the responses (i.e. 0, 0.5, 1). Another limitation of standard PCA for the present analysis is the adequate sample size requirement, which is obviously not met here.

For these reasons, another approach was tested, namely Categorical Principal Component Analysis (CATPCA), which fall within the broad family of optimal scaling techniques. With these techniques, discrete (nominal and ordinal) variables can be converted to "interval" variables, i.e. variables which are continuous within a given

interval. The optimal-scaling approach allows variables to be scaled at different levels, and categorical variables are optimally quantified in a specified dimensionality. As a result, nonlinear relationships between variables can be modelled (Muelman et al. 2004).

The first step of optimal scaling is the selection of the scaling and weighting level for the transformation of discrete variables into interval ones[33]. In the present analysis, ordinal weights were applied, in accordance to the nature of the examined variables, in order to preserve the order of the categories in the optimally scaled variable. Moreover, a 'ranking' method was applied for recoding the variables, which is the standard procedure for ordinal data (Linting et al., 2007). Within this process, missing values were imputed on the basis of the variable mode. The process results in the creation of new, transformed variables, which maintain the properties of the initial variables but are interval-continuous ones. The optimally scaled variables in this analysis are presented in Appendix IV.

Then, the CATPCA is applied on the transformed (optimally scaled) variables, in order to reduce the dimensionality of the dataset to a predefined number of dimensions. An object-principal normalization was applied for estimating the dimensions, which maximises the distance between the 'objects' / dimensions identified.

Taking into account the pearson correlations between variables (4.11), as well as the results of the standard PCA (4.2), a solution of 3 dimensions was sought. The results, presented in Table 4.15, confirm that a 3 dimension solution is the optimal one, given that 3 'dimensions' have Eigenvalues higher than 1, explaining in total 77% of the variance – a share that is higher compared to the standard PCA's.

Dimension	Eigenvalues		
	Total	% of Variance	Cumulative %
1	2,804	35,051	35,871
2	1,806	22,581	57,632
3	1,563	19,535	77,167
4	,638		
5	,555		
6	,292		
7	,197		
8	,144		

Table 4.15. Eigenvalues and % of total variance explained for the estimated dimensions – CATPCA

The dimensions' strongest loadings are presented in Table 4.16.

[33] the optimal quantification for each scaled variable is obtained through an iterative method called "alternating least squares" in which, after the initial quantifications are used to find a solution, the quantifications are updated using that solution. The updated quantifications are then used to find a new solution, which is used to update the quantifications, and so on until some convergence criterion is reached.

	Dimension		
Variable	1	2	3
1_Vision			1,873
2_Strategy			1,779
5a_Budget		1,272	
8_Evaluation		1,807	
9_Reporting		1,760	
10a_Attitudes_measures	1,491		
10b_Attitudes_behaviour	1,486		
10c_Behaviours	1,392		

Table 4.16. Dimensions matrix -CATPCA

The dimensions can be summarized as follows:
Dimension 1: This dimension corresponds to the systematic measurement of road user attitudes and behaviour.
Dimension 2: This dimension corresponds to a dedicated budget for road safety, the regular evaluation and reporting on programmes and measures.
Dimension 3: This dimension corresponds to a national vision and strategy of road safety.

The three dimensions identified in the CATPCA are identical to the three components estimated in the standard PCA.

4.3.4.4. Selection of indicators

The estimation of RSM indicators on the basis of the DaCoTA/ETSC-PIN questionnaire yielded quite encouraging results. All three estimation methods tested provided a single identical solution. The main differences between the three methods lie (a) on the assumptions concerning the data properties, and (b) on the country scores of the indicators, both in terms of scale and values.

The first method, based on the average values of correlated variables, is not strongly affected by the sample size and the variable properties. However, the calculation of average values for correlated variables again provides a rough estimate of a country score, since the final values are by default the average of some combination of 0, 0.5 and 1. In this way, although the average values lie in theory on a continuous scale, in practice specific values are obtained in most cases. It is thus expected to be difficult to identify true or more subtle differences in RSM scores.

The second method, the standard PCA, is clearly compromised by the small sample size and the requirement for continuous variables. On the other hand, the resulting component scores are in more appropriate format.

The third method, the CATPCA, is more successful in meeting the theoretical requirements for the estimation of RSM indicators on the basis of a small sample with ordinal data. The optimal scaling of the eight initial variables allow for these requirements to be met, however the researcher has far less control over the calculation of the transformed variables. Nevertheless, the initial data properties have been taken into account in the final RSM indicators scores, which can be eventually considered as an advantage.

On the basis of the above, the CATPCA results are considered to be more reliable for the estimation of RSM indicators, and only these will be used in the statistical analysis that is presented in the following sections.

4.3.5. Linking RSM with road safety performance

As mentioned in the introduction, apart from the final outcomes (e.g. fatality rates, fatality reductions etc.), another 'intermediate' layer may be considered between RSM and road safety performance, namely the 'operational level of road safety' expressed by road safety performance indicators.

In the present analysis, three hypotheses will be tested:

- RSM indicators are associated with a county's road safety level as reflected in its fatality risk rates.
- RSM indicators are associated with a country's road safety development as reflected in the percentage reduction in fatalities over the last decade.
- RSM indicators are associated with a country's operational level of road safety as reflected in its road safety performance indicators.

In each case, appropriate statistical models are tested, taking into account the characteristics of the data and attempting to control for as many confounding factors as possible, while at the same time keeping the models parsimonious – the latter being particularly important, given the risk of model over-fitting when the sample size is notably small.

More specifically, apart from the RSM indicators, which are the main explanatory variables of interest in the present analysis, some or all of the following additional variables will be considered, as appropriate:

- Background information: apart from RSM, other structural and cultural indicators are considered, namely the background country grouping on the basis of socioeconomic indicators developed within DaCoTA Task 4.3 (see section 4.4.2.1)
- Exposure: the amount of travel in each country is one of the main determinants of road fatality risk. However, traffic measurements are not systematically carried out in all countries. On the other hand, Eurostat data, based on national data or 'estimates' were recently published for all European countries (European Commission, 2012). Despite the uncertainty about the sources and estimation methods for these figures, it was decided to use them in the analysis – their lack from the models might be more compromising for the results compared to these uncertainties.
- Safety Performance Indicators: when not used as a dependent variable, the composite SPI developed within DaCoTA Task 4.3 (see section 4.4.2.3) will be tested as an additional explanatory variable, as it has been found to directly affect the road safety outcomes (Bax et al. 2012).

The modelling techniques applied fall within the broad family of Generalised Linear Models (GLM). These models are linear regression models, in which the –quite restrictive- Gauss-Markov assumptions of classical linear regression models are relaxed. Therefore, these models allow for a large set of distributional assumptions to be considered (mainly normal / Gaussian and exponential, but also others). They are also more efficient with small samples.

4.3.5.1. Linking fatality rates with RSM

Two types of risk rates are examined in terms of their association with RSM indicators and other variables: the mortality rate (fatalities per million inhabitants) and the fatality risk rate (fatalities per million vehicle-kilometres of travel).

A Poisson GLM is considered, in which the dependent variable is the logarithm of the count of fatalities, and the explanatory variables include an 'offset' term, namely the logarithm of the exposure, so that rates are modelled instead of counts:

$$\text{Log}(F_i) = \log(E_i) + \beta_0 + \beta_1 x_i + \ldots + e_i$$

Where F_i are the actual fatality counts of country (i), E_i represents the expected number of fatalities (offset term) i.e. the amount of exposure, β_0 is the constant term, β_k are parameter estimates of the explanatory variables x_i and e_i is the observation variance (error term).

The Poisson model assumes equal sample means and variance. However, in the present case there are theoretical reasons to assume that extra-Poisson variation may be present in the data, i.e. that the variance is greater than the mean, since the counts examined come from significantly heterogeneous populations, and thus the expected values may vary significantly more than the mean of the distribution would allow (Dean, 1992; Hauer, 1986). In order to handle this 'overdispersion', an additional scale parameter α is estimated, resulting in what is known as an extra-Poisson or quasi-Poisson distribution[34].

The explanatory variables considered in the Poisson models are the background indicator (country group), the composite SPI and the three RSM dimensions scores for each country. The results of the best fitting models for the mortality rate (fatalities per million inhabitants are presented in Table 4.17.

Parameter Estimates					
	B	Std. Error	Wald	p-value	
Constant	4,650	,3110	223,622	,000	*
[Background indicator=1]	,407	,1481	7,536	,006	*
[Background indicator=2]	0	.	.	.	
Composite SPI score	-,937	,4025	5,426	,020	*
RSM Dimension 1 score	-,003	,0953	,001	,975	
RSM Dimension 2 score	,175	,1184	2,180	,140	
RSM Dimension 3 score	-,142	,1400	1,027	,311	
Scale	81,030				
Model's fit					
Likelihood Ratio Chi-Square	34,690				
degrees of freedom	5				
p-value	,000				

** indicates a significant effect at 95% confidence level*

[34] The Negative Binomial model would have been another alternative, however it is known to be inappropriate for implementation with small samples.

Table 4.17. Quasi-Poisson model for mortality rates (fatalities per million inhabitants) in the European countries – 2010

The results suggest no statistically significant association of mortality rates with any of the RSM indicators. On the other hand, the background indicator and the composite SPI are strongly associated with mortality rates. More specifically, countries belonging to background group 1 (i.e. lower economic and motorization level) have higher mortality rates than countries belonging to background group 2 (i.e. stronger economic and motorization level). Moreover, increased composite SPI scores are related to lower mortality rates, which is also intuitive, as increased SPI scores suggest a better operational level of road safety.

A similar picture is obtained when modeling the fatality rates, i.e. the number of fatalities per billion passenger-kilometres of travel (see Table 4.18). In this case, only the background variable is statistically significant, as the statistical significance of the SPI score fell beyond 90%.

Parameter Estimates					
	B	Std. Error	Wald	p-value	
Constant	2,233	0,454	24,179	0,000	*
[Background indicator=1]	0,948	0,211	20,150	0,000	*
[Background indicator=2]	0,000	.	.	.	
Composite SPI score	-0,828	0,594	1,942	0,163	
RSM Dimension 1 score	0,056	0,144	0,154	0,695	
RSM Dimension 2 score	0,136	0,172	0,629	0,428	
RSM Dimension 3 score	-0,139	0,206	0,455	0,500	
Scale	176,066				
Model's fit					
Likelihood Ratio Chi-Square	40,973				
degrees of freedom	5				
p-value	,000				

** indicates a significant effect at 95% confidence level*

Table 4.18. Quasi-Poisson model for fatality rates (fatalities per billion passenger-kilometres) in the European countries – 2010

In both models, a Likelihood Ratio Test is statistically significant, leading to accept the model as significantly improved over the null ('empty' / constant only) model. Moreover, in both models, a high scale parameter was estimated, confirming the assumption of overdispersed fatality counts in the European countries.

RSM indicators were not found to be significant predictors of the mortality and fatality rates in the European countries on year 2010. As a next step, it is investigated whether the evolution in fatalities over the last decade is affected by the RSM indicators.

4.3.5.2. Linking the decrease in fatalities with RSM

The reduction in fatalities between 2001-2010[35] is a continuous variable and could be modelled as such by a GLM assuming a normal, lognormal or other distribution. However, it should be taken into account that the values are proportions, i.e. real numbers lying within the unit (0,1) interval, and therefore there is a natural 'floor' and 'ceiling' in the values of this variable.

Such dependent variables do not fall within the GLM family, not only because they do not come from the exponential family, but also due to a number of other properties (Ferrari & Cribari-Neto, 2004). Moreover, regressions involving data from the unit interval such as rates and proportions are typically heteroscedastic: they display more variation around the mean and less variation as we approach the lower and upper limits of the standard unit interval. Finally, the distributions of rates and proportions are typically asymmetric, and thus Gaussian-based approximations for interval estimation and hypothesis testing can be quite inaccurate, especially in small samples (Cribari-Neto & Zeileis, 2010).

Typically, a suitable candidate for modelling unit interval data (e.g. rates and proportions) is the beta distribution. The models recently proposed in the literature for such dependent variables are known as Beta regression models. These model both the location (mean) and the dispersion (variance)[36] of the dependent variable, with their own distinct sets of predictors (continuous and/or categorical), thereby explicitly modeling heteroscedasticity. The location sub-model link function is the logit – allowing for the predicted values to be 'squeezed' into the unit interval , whereas the dispersion sub-model is log-linear – in order to obtain only positive values for the variance (Smithson & Verkuilen, 2006).

The beta regression model can be written as follows. For a Beta distributed dependent variable, with mean μ and dispersion φ:

$$\text{Log}\,[\mu_i\,(1-\mu_i)] = \beta_0 + \beta_1\,x_i + \ldots$$
$$\text{Log}\,(\varphi_i) = \gamma_0 + \gamma_1\,x_i + \ldots$$

The Beta regression model requires a particular estimation technique, based on nonlinear models estimation, whose description is beyond the scope of this report. For detail the reader is referred to Smithson & Verkuilen (2005), as only the main steps of the model development are presented here, as follows:

- The equations for modelling the mean and the dispersion of the dependent variable are provided, together with the Likelihood Function to be Maximised – these were taken from Smithson & Verkuilen (2005).
- As all nonlinear model estimations, good starting values are essential; the starting values of the constant terms β_0 and γ_0 can be directly estimated from the data (i.e. sample mean and variance). These are used to estimate the 'null' model.
- Once the null model has been estimated, the parameters for that model are used as starting-values for a model that includes one β_j or γ_j. The starting-values for the additional β_j or γ_j can be set to arbitrary values near 0. Likewise, when the new

[35] The reduction in fatalities was calculated as the absolute value of the rate [(fatalities 2010)-(fatalities 2001)] / fatalities 2001.

[36] In contrast, the GLM models only allow for the estimation of a fixed dispersion (scale) parameter. The case of a Beta regression model with fixed dispersion can be considered 'analogous' to a quasi-Binomial GLM (Cribari-Neto & Zeileis, 2010).

model has been estimated, its coefficients become the starting-values for the next one, and so on, until all explanatory variables of interest have been tested.

- For each new model, i.e. each new variable tested, a Likelihood Ratio Test is used for assessing the contribution of the new variable to the model. Bootstrap estimates of the standard errors (and the corresponding confidence intervals of the estimates) are finally provided.

One of the main questions in a Beta regression analysis is whether the dispersion should be considered fixed (i.e. modelled by means of a constant term only) or variable (i.e. modelled by means of some or all the variables used to model the mean). Although there might be reasons to opt for exhaustiveness – ignoring the natural heteroscedasticity in the data has known impact on the standard errors of the parameter estimates - , difficulties in the estimation may occur when the number of variables in the dispersion equation increases.

In the present analysis, Beta regression was opted for, for two reasons: first, for theoretical reasons, given the nature of the dependent variable; and second, in order to deal with the small sample size by means of explicitly modelling the variance and applying improved estimation methods compared to those of the GLM. Nevertheless, it was also decided to keep the number of variables in the dispersion equation to a minimum, in order to avoid estimation problems or over-fitting the model.

More specifically, fixed dispersion models are initially estimated i.e. assuming the dispersion in the reduction of fatalities between 2001-2010 is fixed. If the mean (location) model yields statistically significant parameters, it is further tested whether there are variables affecting the dispersion model.

The results of the fixed dispersion model concerning the reduction in fatalities in the European countries in the period 2001-2010 are presented in Table 4.19.

	Estimate	Std. Error	95% Confidence Interval		
Location sub-model			Lower Bound	Upper Bound	
Constant	-1,359	1,069	-3,455	,737	
Background indicator	,001	,406	-,796	,798	
Composite SPI score	1,514	1,586	-1,597	4,625	
RSM Dimension 1 score	-,075	,265	-,594	,444	
RSM Dimension 2 score	,276	,336	-,383	,934	
RSM Dimension 3 score	-,259	,312	-,871	,353	
Dispersion parameter	-2,354	,498	-3,330	-1,378	*
Models fit					
Null Log-likelihood	-11,254				
Final Log-likelihood	-14,960				

*Note: *indicates a significant effect at 95%. Parameters are bootstrap estimates based on 2000 samples*

Table 4.19. Beta regression model (fixed dispersion) for 2001-2010 reduction in fatalities in the European countries

The results suggest that the model is of very poor fit. Moreover, none of the variables examined in the location sub-model (apart from the marginally significant constant) is statistically significant. The fixed dispersion parameter, however, is highly significant.

It is noted that the same model was also fitted as a simple linear GLM, and the results were strongly consistent with those of the beta regression, i.e. no significant parameter and significant dispersion / scale parameter, with a very similar Likelihood Ratio test.

For completeness, it was attempted to include explanatory variables in the dispersion sub-model of the beta regression, and no improvement in fit or in parameter estimates was observed, while convergence problems were encountered once the variables in the dispersion sub-model became several.

These results suggest no relationship between RSM and the 2001-2010 fatalities reduction.

4.3.5.3. Linking the composite outcomes index with RSM

The composite road safety outcomes index was tested next, in terms of its association with RSM features. In this case as well, the composite index was estimated in such a way that its values fall within the unit interval [0,1]; therefore, a beta regression model was fitted to the data, with a similar process as the one described in 5.1. The results of the fixed dispersion model are presented in Table 4.20.

	Estimate	Std. Error	95% Confidence Interval		
Location sub-model			Lower Bound	Upper Bound	
Constant	-2,507	1,239	-4,937	-,077	
Background indicator	1,103	,676	-,223	2,429	*
Composite SPI score	2,930	2,790	-2,541	8,401	
RSM Dimension 1 score	-,183	,382	-,933	,567	
RSM Dimension 2 score	-,269	,395	-1,044	,506	
RSM Dimension 3 score	-,508	,526	-1,540	,523	
Dispersion parameter	-2,374	,335	-3,032	-1,716	*
Models fit					
Null Log-likelihood	-15,258				
Final Log-likelihood	-27,867				

*Note: *indicates a significant effect at 95%. Parameters are bootstrap estimates based on 2000 samples*

Table 4.20. Beta regression model (fixed dispersion) for the composite road safety outcomes index in the European countries

The results show that, apart from the constant term, the background indicator is significant, and the SPI composite index is also marginally significant (i.e. a higher SPI index lead to a higher outcomes index). On the other hand, none of the RSM indicators appears to have an effect on the road safety outcomes composite index. Moreover, the fixed dispersion parameter is highly significant. The model is improved over the 'null' model. Similar results are also obtained by a GLM approach (assuming a normal distribution for the road safety outcomes index).

Adding explanatory variables to the dispersion equation, starting from the statistically significant parameters of the location equation, did not lead to any improvement,

whereas convergence problems were encountered when other variables (RSM indicators) were added.

These results suggest that the road safety outcomes indicator is strongly affected by background country characteristics, and also by SPIs. The latter is not surprising, as SPIs and road safety outcomes are “neighbour” layers of the pyramid reflecting the road safety management and operation system. It is reminded that similar results were obtained from the Poisson models linking mortality and fatality rates with the variables examined.

4.3.5.4. Linking the composite SPI index with RSM

The results in the previous sections indicate a lack of a direct relationship between road safety management and road safety performance. However, they do reveal a relationship between the operational level of road safety (SPIs) and road safety performance (outcomes). As a last step of the analysis, it will be tested in this section whether road safety management is related to the operational level of road safety (SPIs).

Again, the composite SPI score for each country was estimated in such a way that the scores lie within the unit interval [0,1], therefore a beta regression approach is opted for. In this case, explanatory variables include RSM indicators and background indicators. The results of a fixed dispersion beta regression model are presented in Table 4.21.

	Estimate	Std. Error	95% Confidence Interval		
Location sub-model			Lower Bound	Upper Bound	
Constant	-,400	,491	-1,363	,563	
Background indicator	,901	,295	,322	1,480	*
RSM Dimension 1 score	,699	,329	,054	1,345	*
RSM Dimension 2 score	,402	,274	-,136	,940	
RSM Dimension 3 score	-,333	,223	-,771	,105	
Dispersion parameter	-2,062	,402	-2,849	-1,274	*
Models fit					
Null Log-likelihood	-11,376				
Final Log-likelihood	-20,335				

*Note: *indicates a significant effect at 95%. Parameters are bootstrap estimates based on 2000 samples*

Table 4.21. Beta regression model (fixed dispersion) for the composite SPI in the European countries

All parameter estimates are significant (although in some cases marginally), revealing the following effects of variables on the composite SPI index:

- Countries of group 2 (i.e. economically stronger countries) have a higher operational level of road safety
- Countries with a higher score on RSM dimension 1 (i.e. regular measurement of road safety attitudes and behaviours) have a higher operational level of road safety

- Countries with a higher score on RSM dimension 2 (i.e. dedicated road safety budget, systematic evaluation of measures and reporting) have a higher operational level of road safety – this effect is marginally significant.
- Countries with a higher score on RSM dimension 3 (i.e. road safety vision and strategy) have a lower operational level of road safety – this effect is also marginally significant.

A simple GLM was also tested, and these effects of RSM on SPI scores were confirmed in terms of sign and magnitude, however only the effect of Dimension 3 was significant. However, the GLM results are to be considered with particular caution, due to the several inappropriate assumptions involved. The variance of the data is heteroscedastic, and that by itself may strongly affect the parameter estimates. On the other hand, the beta model allows for the variance to be jointly analysed by means of the same predictors, and this was attempted in the present analysis. The results are presented in Table 4.22.

The variable dispersion model converged smoothly and the fit was improved. The RSM Dimension 3 was found to significantly affect only the variance of the SPI (which can be naturally seen as the country distance from the overall average). This finding does not only contribute to the interpretation of the results, but is also proved critical for the overall efficiency of the model.

	Estimate	Std. Error	95% Confidence Interval		
Location sub-model			Lower Bound	Upper Bound	
Constant	-1,223	,741	-2,677	,231	*
Background indicator	1,306	,432	,460	2,153	*
RSM Dimension 1 score	,221	,339	-,444	,886	
RSM Dimension 2 score	,741	,395	-,034	1,515	*
RSM Dimension 3 score	-,727	,320	-1,355	-,099	*
Dispersion sub-model					
Constant	-2,619	,409	-3,421	-1,816	*
RSM Dimension 1 score	1,757	,895	,001	3,513	*
RSM Dimension 2 score	-,874	1,743	-4,293	2,545	
RSM Dimension 3 score	1,372	1,500	-1,569	4,313	
Models fit					
Null Log-likelihood	-11,376				
Final Log-likelihood	-28,179				

*Note: *indicates a significant effect at 95%. Parameters are bootstrap estimates based on 2000 samples*

Table 4.22. Beta regression model (variable dispersion) for the composite SPI in the European countries

More specifically, a higher score on RSM dimension 1 (measurement of road user attitudes and behaviours) is associated with an operational level of road safety for a country that is significantly higher than the EU average. It is thereby indicated that the dispersion sub-model takes the interpretation one step further, i.e. comparing a country's score with the EU average. Most importantly, developing the dispersion sub-model has allowed to strengthen the statistical significance of the other RSM components, this time on the mean (location) sub-model.

Summarizing, the following relationships between RSM and the operational level of road safety were identified:

- Countries of group 2 (i.e. economically stronger countries) have a higher operational level of road safety
- Countries with a higher score on RSM dimension 1 (i.e. regular measurement of road safety attitudes and behaviours) have a higher operational level of road safety than the EU average.
- Countries with a higher score on RSM dimension 2 (i.e. dedicated road safety budget, systematic evaluation of measures and reporting) have a higher operational level of road safety.
- Countries with a higher score on RSM dimension 3 (i.e. road safety vision and strategy) have a lower operational level of road safety.

These results suggest that RSM indicators are associated with the operational level of road safety in the European countries, as expressed by SPIs. It is somewhat surprising that such a link was established, while practically no link between RSM and outcomes could be established. On the other hand, the SUNflower pyramid suggests that, by definition, road safety programmes and measures affect directly the operational level of road safety, which in turn determines the outcomes.

While most of the effects identified are intuitive, the effect of RSM dimension 3 is not, as it is suggested that the existence with a road safety vision and strategy in the European countries are associated with a lower score on SPIs. This result may be partly due to the fact that the “presence” of a vision and strategy may not necessarily imply implementation of that vision and strategy – indeed, several Europan countries have road safety visions and strategies which are very incompletely, if at all, implemented (e.g. Greece, Poland). On the other hand, some of the best performing countries do not have high scores on vision and strategy (e.g. UK, Netherlands, France). In contrast, the other RSM dimensions concern more practical aspects of road safety management (i.e. budget, evaluation, surveys etc.) and therefore the country scores may be considered to reflect more precisely the maturity and effectiveness of the road safety management system.

4.3.6. Summary

The present analysis aimed to investigate whether a link exists between road safety management and road safety performance in the European countries. For that purpose, the SUNflower pyramid was considered, as an overall framework for linking the various components of RSM systems.

The first step of the analysis concerned the identification of RSM components on the basis of the /DaCoTA/ETSC-PIN dataset. After excluding several ‘consensus’ questions or unusable questions due to many missing values, three different dimension reduction techniques were tested for the estimation of RSM indicators:

- Calculation of average values of correlated variables
- Principal Component Analysis
- Categorical Principal Component Analysis

All three techniques provided an identical solution, despite their different theoretical assumptions, resulting in three RSM indicators (dimensions):

- <u>Dimension 1</u>: Systematic measurement of road user attitudes and behaviour.
- <u>Dimension 2</u>: Dedicated budget for road safety, regular evaluation and reporting on programmes and measures.
- <u>Dimension 3</u>: National vision and strategy of road safety.

The results of the Categorical PCA as regards the country scores on the three RSM dimensions were selected for the next steps of the analysis, as they were based on the optimal scaling of the ordinal responses to the questions.

The next step concerns the development of models linking RSM dimensions with road safety performance. Road safety performance was expressed by several different variables, namely:
- Mortality and fatality rates
- Percentage reduction in fatalities between 2001-2010
- A composite road safety outcomes score
- A composite SPI score, reflecting 'intermediate outcomes'.

Depending on the properties of the dependent variable in each case, two dedicated modelling techniques were applied:
- Quasi-Poisson regression, for modelling rates (e.g. fatalities per million inhabitants)
- Beta regression, for modelling values that fall within the unit interval [0,1] (e.g. percentage reduction, composite index)

The modelling results are summarised in Table 4.23, with the model in the last column being the best model for the examined data.

Dependent variable	Fatalities per million inhabitants	Fatalities per million passenger-kilometres	% reduction in fatalities 2001-2010	Composite index of road safety outcomes	Composite index on SPI
Dependent variable type	rate	rate	percentage	Values within [0,1]	Values within [0,1]
Model	Quasi-Poisson	Quasi-Poisson	Beta regression	Beta regression	Beta regression
Dispersion	Fixed	Fixed	Fixed	Fixed	Variable
Explanatory variables	- Background indicator - Composite SPI - RSM Dimensions 1, 2, 3	- Background indicator - Composite SPI - RSM Dimensions 1, 2, 3	- Background indicator - Composite SPI - RSM Dimensions 1, 2, 3	- Background indicator - Composite SPI - RSM Dimensions 1, 2, 3	- Background indicator - RSM Dimensions 1, 2, 3
Significant effects	- Background indicator - Composite SPI	- Background indicator	None	- Background indicator	- Background indicator - RSM Dimensions 1, 2, 3

Table 4.23. Summary of models development

The results suggest that RSM indicators are not directly related to road safety outcomes. In all the models tested, the background indicator reflecting GDP per capita and level of motorisation was found to be highly significant, revealing a dominant effect of these indicators on road safety outcomes. However, RSM indicators are associated to the operational level of road safety, as reflected by the SPIs. This is what is in fact suggested by the SUNflower pyramid, that the policy

output in terms of implementation of programmes and measures affects the 'intermediate' outcomes (SPIs), which in turn determine the final outcomes (road accidents and related casualties).

In particular, the existence of a dedicated budget for road safety, the systematic evaluation of the results of road safety programmes and the related reporting appear to be positively associated with the operational level of road safety. Moreover, the regular measurement of road user attitudes and behaviour also corresponds to better operational level of road safety. On the other hand, the presence of a national vision and strategy was found correlated with lower operational level of road safety, and this result is difficult to interpret. On the one hand, it may be attributed to the fact that the existence of a vision and strategy do not necessarily correspond to more efficient road safety management process and implementation.On the other hand, it is also possible that, in countries where the level of SPI is obviously low, policy makers are more likely to declare and promote a vision and a strategy for road safety.

These results are indicative of a relationship between RSM and the operational level of road safety. However, they are not sufficient to support a strong relationship. Moreover, they are based on a small sample of countries, marginally sufficient for statistical analysis. Consequently, they should be considered with some caution, and various aspects of the analysis background and methodology should be kept in mind. These are discussed in the following section.

4.3.7. Discussion

The small sample of European countries is a known problem for related statistical analysis. Elvik (2012) carried out a similar analysis for 17 European countries, finding no relationship between road safety management and road safety performance, and underlined that any statistical relationship would have to be very strong to attain statistical significance in such a small sample.

In the present analysis, particular emphasis was put in eliminating as much bias due to the sample characteristics as possible, by selecting the appropriate techniques that met the data properties. In each case, the data properties were thoroughly considered in relation to the theoretical assumptions of the available techniques. It was shown that, while overall the differences in the results between conventional techniques (PCA for dimension reduction, GLM for models development) and more advanced techniques (categorical PCA, Beta regression) were not striking, they were essential. In fact, the relationship between RSM and SPIs would have clearly not been revealed by means of conventional techniques.

The small size of the sample also posed the risk of over-fitting the models. On the other hand, it was necessary to account for as many confounding factors as possible (Elvik, 2012), as it can not be assumed that RSM is the sole determinant of road safety performance. In the present analysis, additional 'layers' of the SUNflower pyramid were examined as much as possible, by adding no more than two related variables in the models. Still, there may certainly be other factors affecting road safety performance, which have not been accounted for (e.g. mobility, economy development, long traditions, weather etc.).

In this context, it should be kept in mind that the present analysis concerns a 'snapshot' of the road safety system (as is the SUNflower pyramid in general). The time dimension was not taken into account. The RSM indicators identified concern the situation in 2010, and the other variables examined may be registered on 2008,

2009, or 2010, making it difficult to interpret the results. However, the evolution of the road safety management system may be a stronger determinant of the evolution in road safety performance. This is an important field for further research.

It should be also noted that the DaCoTA/ETSC-PIN data are not exhaustive in their description of the road safety management system; they mainly reflect the RSM structure in each country and include only a few variables on the implementation process – the latter ones were all included in the analyses. On the other hand, it is unlikely that an exhaustive description of road safety management would have been more efficient in such statistical analysis; the analysis of the extensive DaCoTA questionnaire for selected countries early concluded that such an option would not be possible and a 'section by section' analysis was opted for.

Finally, another aspect that may partly explain the difficulty in identifying strong relationships between RSM and road safety performance is the fact that European countries do not exhibit very big differences in road safety performance, and no 'very' big differences in RSM overall (a minimum acceptable level exists in both cases). If one included e.g. developing countries in the analysis, one might find a stronger relationship between RSM and road safety performance.

5. CONCLUSIONS

In the following sections, an overview and a synthesis of the results of both types of analysis is provided, followed by a discussion on the key elements identified and related recommendations for the improvement of road safety management systems, together with needs for further research.

5.1. Overview of results

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

5.1.1.1. 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 examined, revealing a large variation in the structures and processes at the higher level of road safety management.

The component "Lead Agency formally appointed to take responsibility for road safety" had a higher availability level among the countries. In general, a “Lead Agency” is a government agency mandated and funded by the government, which takes responsibility within government for the development of the national road safety strategy and its results. However, different types of Lead Agencies (from strong departments of ministries, to interministerial committees and road safety councils) and with different specific roles were identified. In several cases, it is not easy to identify the “lead agency”.

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 use government agencies specifically established for this purpose, with clear responsibility for the government’s road safety policy, are more effective. On the other hand, when road safety is managed by weaker bodies, such as inter-ministerial committees or road safety councils, the effectiveness is more likely to suffer.

A possible reason for the limited effectiveness of inter-ministerial committees and road safety councils is the fact that their roles and relationship are not always clear, creating uncertainty and possibly misunderstandings or overlaps in responsibilities, procedures etc. For example, in several cases, the road safety councils serve as an expert pool or consulting body for inter-ministerial committees, but in other cases they report directly to the minister responsible for road safety.

Another reason appears to be the fact 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, but especially for weaker ones, the lack of dedicated budget observed in most countries is a major limitation.

The DaCoTA results clearly indicate that the establishment of a structure and process alone is not sufficient for effective road safety management. In several countries coordination and budget are the most critical links for setting the processes going.

The effectiveness of road safety management systems can also be largely affected by the degree to which regional authorities, NGOs, stakeholders 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 and the specific changes taking place currently in several countries, overall and in road safety management in particular, make it difficult to evaluate the effectiveness of structures (e.g. recent reductions in fatalities may be more due to reductions in mobility, changes in structures may take several years to show any effects etc.).

5.1.1.2. 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, several inconsistencies 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, with the majority boasting the ambitious EU targets. However, it is quite unlikely that they will all perform to the same high levels. Moreover, there appears to be no unique procedure for drafting the road safety strategies and programmes. For instance, in some countries, the drafting of a programme is coordinated by inter-ministerial committees, or -somewhat more frequently- by road safety councils, whereas the involvement of the scientific communities varies.

It is also not always clear why a country adopted a specific main target or how the specific measures have been selected, how the implementation schedule was decided upon, and how the various responsibilities for the implementation have been assigned to different bodies or organizations. As a results, there is a lot of inconsistency in the design of the programmes, the setting of priorities and the implementation schedule, both in terms of time schedule and the specific measures to be implemented.

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

Another process on which information is lacking concerns the finalisation of the programmes in the ministries and in the government. This process typically consists of changes in some proposals, in the priorities set and in the implementation plan, for political or other reasons, which are in most cases unknown.

Finally, the formal adoption of road safety strategies and programmes takes place under quite different procedures in different countries - and in several countries it remains pending.

5.1.1.3. 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, a budget needed to move towards a long-term vision is very difficult to estimate – and is actually 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 measures implementation costs at national and international level, combined with a lack of knowledge on the methods appropriate to calculate these costs, makes the evaluation of the actual implementation expenses an estimation by itself, which is likely to be proved an under-estimation.

Moreover, formal procedures for budget allocation to the various actors are seldom in place, especially for the regional or local authorities. As a consequence, the agency responsible for implementation has to rely on its own budget, and the implementation itself depends on the resources available in this agency as well as on the priority it assigns to road safety.

In countries with a clearly designated “lead agency”, this agency takes over the majority of programme management duties, otherwise it is not always clear who is responsible for what part of the implementation. Indeed, in several countries programmes, the measures proposed are either too vague or too numerous, and the implementation roles and procedures of the various actors involved are not adequately defined.

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.

5.1.1.4. 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 in collecting 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 it involves collecting information when a programme ends; only a couple of countries monitor

programmes while they are still in progress. Moreover, it is not 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 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.

5.1.1.5. Scientific support and information, 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.

At this point, 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. Only in a few countries are road safety observatories part of the lead agencies, while in most cases this role 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 content of the training courses or on the way the graduates are then used for practical or scientific work to improve road safety.

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 interpretation of monitoring and evaluation results. A better use of the scientific capacity appears to be one of the major challenges for evidence-based road safety policy making in the European countries.

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

One of the basic hypotheses of the DaCoTA analysis of road safety management systems is that “good practice” criteria for road safety management are linked to road safety performance. One 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 in terms of road safety outcomes.

The extensive qualitative analysis of the questionnaire responses revealed early on that the comparison of countries, even with respect to road safety management systems alone (i.e. without attempting to link these with road safety performances), is not at all straightforward. The quantitative (clustering) statistical analyses carried out

confirmed that the complexity and variability of road safety management systems is such, that the task of ranking the countries in terms of road safety management is very demanding.

It was revealed that all the countries are completely different when road safety management systems are considered as a whole, making it impossible to propose a single overall ranking of countries' road safety management systems. However, it is possible to compare the countries when parts of the road safety management system are considered separately. The clusters of countries recognized by the separate analyses of each part of the road safety management questionnaire actually present the forms of road safety management systems common in the European countries.

However, even when examining the various parts of road safety management systems separately, no two countries were found to belong to the exact same ranking. 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, however, the countries that were ranked systematically at the top of road safety management components were not always those that are known to be the best road safety performing countries. More specifically, according to the clustering results, Switzerland, Israel, Finland were found to be consistently ranked best in the various stages of the road safety policy making cycle, whereas UK and Netherlands were not always ranked best in road safety management components. Moreover, for the first 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 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 found to be consistently ranked at the lowest of the scale were Poland and Greece, which is in full accordance with these countries' ranking on the basis of fatality rates.

Overall, it appears very difficult to rank the European countries in terms of the whole road safety management system; however, it is possible to rank the European countries for parts of the road safety management systems. 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.

5.1.3. 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, as identified by the analysis of the DaCoTA questionnaire responses, this analysis was based on a shorter version of the questionnaire, namely the common DaCoTA/ETSC-PIN questions.

The results suggest no direct relationship between road safety management and the final outcomes of the road safety 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 do suggest a relationship between road safety management and road safety performance indicators (composite index including indicators such as the number of alcohol controls per 1000 inhabitants, the rate of renewal of the car fleet, etc.). This is what is in fact suggested by the SUNflower pyramid, namely 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 are a results of these operational conditions.

This approach appears to be confirmed by the results of DaCoTA, which indicate that the effect of road safety management on road safety performance is indirect, and conditional to the operational level of road safety, i.e. the safety performance indicators.

Of course, the fact that European countries constitute a small sample, do not allow for the identification of strong relationships, but rather to the indication of the presence of relationships. Moreover, there are some confounding factors that which could not be accounted for, such as mobility, economy developments, weather, long traditions etc. Further research is required to confirm and fully interpret these findings.

Two additional possible reasons for the difficulty to link road safety management with road safety performance can be considered: first, the DaCoTA road safety management analyses concern a “snapshot” of the situation in 2010, not taking into account the evolution of road safety management systems, or, in several cases, being biased by recent changes not representative of the overall trends; however, the evolution of road safety management may be a stronger determinant of the evolution of road safety performance. On the other hand, some of the data used in the analysis (e.g. SPIs) concern year 2008. In this sense, the association between the RSM data and the SPIs can be translated as follows: “countries with a higher level of SPIs on 2008 were found to have better road safety management systems on 2010”. The lack of the “time” dimension, in a sound chronological sequence, in the DaCoTA analyses may have compromised the results.

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 developing countries, making it difficult to establish a relationship between these two parameters within their relatively narrow scales. It is also possible that better performing countries are also more ‘strict’ with themselves, providing thus a slightly under-estimated level of their road safety management.

5.2. Synthesis

Several links between measures and performances in road safety have been thoroughly explored by research over the recent years. The road safety impact of road safety management structures and functions, however, remains largely unknown (i.e. institutional organisation, policy formulation & adoption, policy implementation & funding, monitoring & evaluation as well as scientific support & information and capacity building).

Therefore, one of the main objectives of DaCoTA WP1 was to explore this link and its mechanisms in more detail: A set of interviews based on an extensive questionnaire related to the above five dimensions of RSM was carried out with government representatives and independent experts. On the basis of the responses, comparative visualisations of countries' RSM structures were set up, along with summaries of their arrangements, including achievements and deficiencies. In addition, a grouping (clustering) of countries with similar road safety management components was attempted, based on quantitative analysis of both government and expert responses, along five dimensions of road safety management. In a second step, an attempt was made to identify common road safety management components and to link those with road safety performance

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 national level. Best performing countries, such as UK and Netherlands 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.

One clear finding is that similar performance in road safety management can be achieved by means of differing structures and implementation processes. Similarly, similar road safety performance in terms of final outcomes (i.e. fatalities) may be the "result" of substantially different road safety management systems. At this point, it may be useful to note two specific examples highlighting this finding. First, it is observed that Austria and Switzerland have very similar road safety management systems, according to their responses to the DaCoTA questionnaire; however, Switzerland boasts consistently around 40% lower fatalities, regardless of the indicator used to compare the two countries (e.g. per population, per vehicle fleet etc.). The picture is further complicated by the fact that significant differences are observed in Switzerland internally, namely in the different language regions.

On the other hand, UK and France show a long lasting gap in their risk rates, but risks in both countries decrease at almost the same decay rate of 5% per year over nearly 60 years, while their road safety management systems are significantly different. The elements towards which further research should be oriented for explaining and interpreting such differences may be a research question by itself. There is strong indication that economic and cultural elements may be key determinants of both road safety management and road safety performance, and the link between those two.

As mentioned previously, the DaCoTA results indicate that clustering the countries according to a typical road safety management structure as whole does not seem to be feasible. Clustering along the five dimensions separately, however, seems possible, although the number of clusters and countries therein vary.

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.

The DaCoTA results confirm the fact that the existence of an organisation or function does not necessarily imply that if functions 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.

In several countries, a large proportion of responses in all sections of the DaCoTA road safety management questionnaire, but especially in the implementation parts were neither “yes” nor “no”, but rather “partially”. Specifying and interpreting the actual situation on the basis of a “partially” response was one of the most demanding tasks while cross-checking the responses to the questionnaire, and the large diversity in the country responses is clearly linked to such incomplete structures and processes in several countries.

When examining the relation between road safety performance and road safety management in the different countries, there appeared to be little or no effect of road safety management features on safety performance, and background indicators (GDP, level of motorisation) were dominant over road safety management effects. However, road safety management was found to be associated with safety performance indicators, reflecting the operational level of road safety in each country – these are considered “intermediate” outcomes, affecting in turn the “final” outcomes, i.e. road safety casualties. The weak relationship between road safety management and road safety performance is attributed to the fact that the European countries do not exhibit big differences in road safety performance, and no big differences in road safety management overall - a minimum acceptable level exists in both cases.

Another factor that should be taken into account is the time of observation. In some countries, road safety management components may be so recent that they hadn’t yet had the time to deploy their full potential; or they may have been around for such a long time that their impact has already gradually faded away.

Another finding that warrants further discussion concerns the differences observed between expert’s and government’s responses, the latter tending to be more positive, especially as regards the role of the parliament, the availability of programmes, the resources and funds allocation, the reporting procedures, the information of citizens etc. It was concluded that expert responses may reflect an independent and more objective view and that future analysis might better use experts’ opinion as a prime source.

However, neither the independent experts nor the governmental representatives may have the exact picture of road safety management. It is very unlikely that there exists a single person in the country that might know perfectly the situation, and it is strongly suspected that the discrepancies are due to different visions of the situation.

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 particularities. 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. These are analysed separately in the next section.

5.3. Messages and recommendations

5.3.1. Recommendations at national & local level

Develop objective knowledge of RSM within countries

As noted above, disagreements between the views of experts and governmental representatives suggest that countries themselves do not have a clear representation of the structure of their road safety management, of the procedures involved in the various components, or of the presence/absence of coordination between them. Such an objectification of the RSM systems within the countries – maybe departing from the WP1 analysis framework - themselves should be encouraged. Indeed, this is the best way for countries to become aware of the strength and weaknesses of their respective systems, to critically assess them, and hence to improve them.

Decentralisation with care

The national and regional authorities should cooperate on a legal basis to define a target, prepare a national road safety programme, and allocate targets for regional programmes, which may often constitute the bulk of implemented interventions. When road safety policy is formulated at the national level and regional/local authorities are, either required to fit into it, contribute to its objectives, or left to their own resources and plans, it is unlikely that the policy making cycle will operate smoothly.

Independent Lead Agency

The concept of Lead Agency put forward as a “good practice” item in the literature, does not currently seem to have much meaning in the European countries. A Lead Agency has to be efficient in harnessing all potential forces to road safety work. In countries where a fair amount of road safety activities are carried out at the regional/local level, the concept of leading from the national level becomes less critical. In most countries, however, the limits of competencies of the Lead Agencies are such that pose important compromise in the policy making cycle.

Inter-sectoral and vertical coordination

The existence of an inter-sectoral coordinating structure at the higher decision-making level does not seem to be a determining criterion of “good practice”. On the contrary, an inter-sectoral coordinating structure at the planning and implementation level seems to be critical (i.e. medium level technical coordinating structure).

Continuous stakeholders consultation

The consultation of stakeholders, wether formal or informal, but nevertheless systematic at the decision-making level, should be continuous throughout the policy making cycle.

Vision and strategy vs. implementation

A Vision is a long-term tool, and its impacts are not visible in the short term. However, it is extremely useful for creating a road safety culture and standing as a reference for all road safety activities in a country. On the other hand, the presence of a strategy does not necessarily imply that the policy is effectively adopted or implemented. These two aspects deserve particular attention from the countries.

Policy adoption

In several countries, there is a gap in the policy making cycle exactly from the point of policy adoption onwards. Sometimes a long time elapses between programme design (policy formulation) and programme adoption at high level, which indicates that the road safety management system is not fully integrated.

Implementation, monitoring and evaluation

Countries should develop effective coordination structures or procedures to implement their multi-sectoral programme; when implementation is dispatched between different government sectors, the lack of coordination will have important effects on the effectiveness of the programme. Monitoring of where, when, how and to whom in the road transport system the remaining deaths and injuries occur is required. Making the case for existing and new interventions requires knowledge of their cost-effectiveness and measurement of their impact at a routine level.

Resources and funding

A major discrepancy is found in the fact that funding is usually annual, whereas programmes are multi-annual. In most countries, implementation of road safety interventions is neatly divided between sectors and partners at the regional/local level, so the annual budgets of all partners contribute. Thus, there is no centralized decision-making where funding is concerned and no way to ensure that measures planned in a programme are going to be equally implemented in all sectors.

Knowledge-based policies

Even in some of the countries where policies are highly knowledge-based, it does not seem that full advantage is taken of the scientific evidence that is available internationally or nationally for policy formulation.

Capacity building & training

Road safety training plans for personnel, especially at medium decision-making level or those in charge of implementation need to be established and financed. Lack of professionalism of road safety actors and the need for state-of-the-art training has been mentioned in several countries.

Road safety management in times of recession

Recession and more than 10 years of successful efforts have put road safety at a lower priority. A different long term vision may be needed to re-motivate policy makers and other stakeholders. More efficiency in road safety public spending is likely to become a key issue.

5.3.2. Recommendations at European level

The safe systems approach

The safe systems approach has been gaining popularity among the European countries, in order to serve as a long-term vision of their road safety system. The further promotion of this approach may significantly enhance those elements of road safety management systems that appear to be particularly problematic, namely the implementation, monitoring and evaluation aspects.

Synergies of road safety and environmental policies

The current economic recession, together with the ongoing climate change, are expected to be key issues for road safety policies in the next decade, due to the possible budget constraints and shifts towards other priorities. However, it may also be an opportunity to exploit the synergies between road safety and environmental agendas, towards a more integrated and efficient approach.

Serious injury reduction targets

The adoption of the EU Road Safety Action Programme with serious injury reduction strategies will be an added value of road safety to society.

Focusing on the essentials

One key finding of DaCoTA is that similar performance in road safety management can be achieved by means of differing structures and implementation processes. Therefore, practice and performance may be best influenced at the pan-European level by focusing strongly on the essentials, while being relaxed enough about the details to leave these to the individual countries.

Central role of ERSO

ERSO may become the platform for exchanging knowledge and data on all aspects of road safety and at all stages of road safety management. Apart from the various road safety facts, figures and tools, ERSO is the first platform to provide detailed data on road safety management systems in Europe. It should therefore be further promoted, not only to support benchmarking and fact finding, but to eventually fully support evidence based decision making in the countries and in Europe as a whole.

Road Safety Management Good Practice Manual

The DaCoTA road safety management investigation questionnaire can be already used as a self-assessment checklist for European countries. Moreover, a road safety good practice manual needs to be provided, with revised good practice criteria and concrete implementation guidelines, taking into account the possible particularities of different countries.

Build on the existing framework

The level of understanding of road safety management systems has improved considerably during the last few years. In order to fully exploit the existing knowledge, it is necessary to build on the existing road safety management frameworks and promote amendments to this approach and framework or change the way they are expressed only where the need for change is very clearly demonstrated, and therefore assist decision-makers and practitioners to progress road safety management despite the current and foreseeable financial climate

Political will and commitment

Progress in road safety management and road safety in general strongly depends on political will, leadership, resources and the commitment of all stakeholders.

5.3.3. Needs for further research

A number of research questions have emerged from the DaCoTA WP1 research on road safety management. These can be outlined as follows:

- *Is the evolution of road safety management systems more strongly associated with the evolution on road safety performance, than the comparison of two "snapshot" situations?* Things have already changed since

2010, where the investigation took place, in several countries (e.g. lead agencies), so it would be necessary to repeat the analysis on a regular basis in order to update the country profiles and examine the time dimension of the systems.

- *What other factors affect the relationship between road safety management and road safety performance?* There are several other factors, apart from road safety management, that affect road safety outcomes e.g. mobility, economy, long traditions, weather etc. - these have not been accounted for in the present research.
- *If developing countries were included in our analysis, would a stronger relationship between RSM and fatalities be found?* European countries do not exhibit striking differences either in road safety management or in road safety outcomes, and this relatively little variability does not allow for strong relationships to be established.
- *What are the factors that could further improve an already optimised system, as the one of the EU?* In the same context, it should be examined which are the key elements for further improvement within that narrow (and in a way acceptable) range of road safety performance shown in the European countries.
- *Develop the investigation of RS management at local/regional level:* The data collected in this framework did not take the local and regional level into account. The description of the management at these levels is nevertheless essential to derive a full and coherent picture of RS management in a country, especially in countries where RS appears to be largely decentralized from the start. The fact that the process could not be investigated at “lower levels” might also explain why implementation appears to be the weak point of the management system in so many countries: a larger part of implementation aspects is likely to happen at a more local level.
- *How to handle the different views and perceptions of road safety management systems between governmental and independent experts?* An optimal methodological approach would be to interview several independent and governmental experts in each country and make a qualitative analysis of their responses.
- *Are the relationships suggested by the SUNflower pyramid more complex?* The DaCoTA results suggest that the effect of road safety management on road safety performance (final outcomes) is conditional on its effect on performance indicators (intermediate outcomes). Furthermore, there may be elements of road safety management systems with a positive or negative effect on road safety performance. On the other hand, cultural and background indicators appear to have a strong direct effect on road safety outcomes. There is an indication that the SUNflower pyramid hierarchy may involve more complex relationships than the ones originally suggested.
- *Is there a link between culture, economic reliability and road safety?* The DaCoTA results do not support a strong relationship between road safety management and road safety performance. On the other hand, there appear to be some characteristics of best performing countries which are related to cultural elements (e.g. norms, religion etc.) and economic reliability (e.g. solid public finances, at lest before the recession), which have not been adequately

investigated. Future research should address these issues and propose culture-sensitive road safety strategies.

- *A single good practice model, or a collection of good practices?* As it appears not to be possible to identify one single road safety management model (with regard to its impact on safety performance) it is suggested to collect good practices for the various road safety management components from different countries. From this collection, a Good Practice Manual should be compiled and be made available on ERSO. Such a manual should shed light on all aspects of RSM structures and functions, as identified in DaCoTA WP1.

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APPENDICES

Appendix I. The road safety management questionnaire

Preliminary information

Date of interview:

Person interviewed:

Name:

Current position, previous positions if relevant:

Preliminary question:

Can you describe in a few words how the responsibilities for road safety management are divided between the national, regional and local levels in your country:

1. Institutional organization, coordination and stakeholders' involvement

	Yes	**No**	Un-known	Please elaborate !
1. Has a high level inter-sectoral **decision-making** institution been established to prepare policy orientations or directions for RS?				*(Name of the institution?) Ex: France, Intersectorial Ministerial Road Safety Committee under the Prime Minister*
If yes: 1a) has it been created legally (law, decree)?				*(Since when?)*
1b) Does it operate :				
- Under the Prime Minister?				*(Does it have authority over ministries, road agencies, etc?)*
- Under the President, etc.?				
- Other?				
1c) Does it represent all governmental sectors potentially involved in RS in the country:				
- Urban planning?				*(Are all sectors represented actually involved in road safety decisions?)*
- Transport and traffic planning?				
- Road infrastructure?				
- Enforcement?				
- Justice?				
- Health?				
- Vehicles and ITS (Intelligent transport Systems)?				

- Research?				
- Education?				
- Others?				
1d) Are some non-governmental stakeholders represented in the high-level decision-making institution, in particular from:				
- Research institutions				
- Private businesses				
- NGOs				
1e) Has a periodical schedule for meetings been specified?				*(What period?)*
1f) Is the high-level decision-making institution meeting regularly?				*(How often?)*
A1. D2. I1. E1.				
2. Does Parliament have a prominent role in initiating decision-making on road safety orientations or directions? **I3.**				*(Parliament may introduce laws on its own initiative, or may request specific policy components)*
3. Is Parliament involved in adopting road safety orientations or directions? **I2**				*(Parliament may vote a vision or a programme)*
4. Has a Lead Agency been formally appointed to take responsibility for road safety (direct the national road safety effort)? If yes: 4a) Is it				
- A ministry?				*(Which one?)*
- A road safety dedicated structure?				
- An agency (roads, transport, etc.)?				
- A personality?				
A8. D1.				
5. Has a technical inter-sectoral road safety institution been established to coordinate policy formulation and implementation?				*(Under whose authority?)*
If yes: 5a) Has it been created legally (law, decree)?				*(When was the law or decree passed?)*
5b) Is it integrated into the decision-making hierarchy (as opposed to having been created as an association, a foundation or other non-governmental structure)?				*(Does the policy-making institution have authority to get a programme adopted? To get it implemented by all the stakeholders involved?)*

5c) Does it come under:				
- the Prime Minister or other higher level decision-maker,				
- the inter-sectoral decision-making institution, or				
- the Lead Agency?				
5d) Does it include the agencies responsible for road safety interventions in each one of the following fields:				
- Rural infrastructure				
- Urban infrastructure				
- Transport and traffic planning				
- Vehicles				
- Traffic education				
- Driver training and licensing				
- Road safety campaigns				
- Enforcement				
- Health				
- Research				
- Others				
5e) Are some relevant non-governmental actors or networks represented in the institution?				*(for example, teachers, driving instructors, health personnel, etc.)*
5f) Are the members of the technical inter-sectoral institution individually nominated (as opposed to generic nominations by position?)				
5g) Is the duration of the mandate of the members precisely defined in order to ensure continuity of RS activities?				*(Is the coordinating institution stable enough that its members can acquire adequate expertise?)*
5h) Is the technical inter-sectoral institution endowed with a statutory (law or decree established) budget				
- for "fact-finding" (studies, research, preparation of decisions)?				
- to implement some road safety interventions?				*(For experimentation? for measures which would not otherwise be implemented?)*
If yes: 5i) Does the statutory budget include:				
- Public funding?				
- Private funding?				

A9. D3. E2				
If it exists: 6a) is the technical inter-sectoral RS institution also empowered to coordinate implementation of interventions horizontally across agencies?				*(Ensuring that implementation is on schedule? Helping with problems? Ensuring that connected measures are all implemented?)*
6b) If yes, does the coordination actually works across all sectors of interventions?				
If it does not exist or if not empowered: 6c) Are all interventions being coordinated horizontally across agencies through other means or structures?				
6d) Are some types of interventions otherwise coordinated?				*(For example: through bi-sectoral cooperation on specific policy components)*
D4.				
If it exists:				
7a) Is the technical inter-sectoral institution also empowered to coordinate interventions vertically between national, provincial and/or local road safety institutions or agencies involved?				*(For example: do provincial authorities participate in national policy formulation? in policy adoption?)*
7b) If not, are interventions being coordinated vertically across agencies through other means or structures?				
D5.				
8. Has an institutional structure for the consultation of stakeholders been formally established (by law or decree)?				*(Since when?)*
If yes: 8a) Does it include representatives of:				
- Elected bodies at the national level representing the citizens				*(For example: representatives, senators, etc.)*
- Regional authorities				*(Elected councils? technical services?)*
- Local authorities				
- Professional organizations (related to Health, Transport, Traffic, Enforcement, etc.)				*(Which ones?)*
- NGOs				*(Which ones?)*
- Businesses related to transport or traffic (vehicle manufacturers or importers, insurance companies, etc.)				*(Which ones?)*
8b) Does it include, or can it call upon,				

scientific experts?				
8c) Does it have its own statutory budget :				
- To operate?				
- To sponsor research or studies?				
D5. I8.				
9. Are the legislative instruments defining inter-sectoral road safety management functions periodically reviewed and reformed,				
- Regarding the higher level decision-making institution?				
- Regarding the policy formulation and implementation institution?				
- Regarding the stakeholders' consultation structure?				
D6.				

2. Policy formulation and adoption

	Yes	**No**	Unknown	Please elaborate !
10. Are some government agencies actively advocating the need for taking road safety action:				
- The health sector?				
- The transport sector?				
- The enforcement sector?				
- Others				
B4.				
11. Are there NGOs actively promoting road safety? **B3.**				*(Which NGOs?)*
12. Are regional authorities consulted as to the part they are called to play in national road safety policy, before:				
- Setting up targets?				*(Which ones?)*
- Finalizing an inter-sectoral programme?				
- Adopting specific policy components?				*(Which ones?)*
I4.				
13. Are regional road safety programmes or policy components integrated into the national road safety policy? **I5.**				*(This concerns regional targets, measures taken at the regional level, etc.)*

14. Are local authorities (municipalities, counties) consulted as to the part they are called to play in national road safety policy before:				*(This may deal in particular with specific interventions in urban areas)*
- Setting up targets?				
- Finalizing an inter-sectoral programme?				
- Adopting specific policy components?				
I6.				
15. Are local road safety programmes or policy components integrated into the national road safety policy? **I7.**				*(This may involve generalizing or legalizing local innovative or experimental practice)*
16. Has a national "vision" for improved RS performance in the long term officially been set?				
If yes: 17a) Has it been voted in Parliament?				
17b) Is it otherwise compelling for the government?				
17c) Has it already triggered:				
- Action?				
- Research?				
A2. B1. F1.				
17. Have national medium-term (four to ten years) quantitative targets been set for improved safety performance?				*(Is each target realistic, attainable?)*
If yes: 17a) Have the targets been defined:				
- on a purely national political basis?				
- on the basis of the European road safety target?				
- using a rational process based on known key problems and potentially efficient measures?				
17b) Are the targets based on:				
- fatalities?				
- serious injuries?				
- other injuries or accidents?				
17c) Have intermediate performance indicators been defined to check progress towards the target?				
17d) Have sectoral quantitative targets or performance indicators been set to mobilize RS actors in the fields of:				
- Rural infrastructure				

- Urban infrastructure				*(Are these targets compelling for the actors concerned? Are sectoral responsibilities clearly established?)*
- Transport and traffic planning				
- Vehicles				
- Traffic education				
- Driver training and licensing				
- Publicity campaigns				
- Enforcement				
- Health				
- Others				
A3. A10. F2.				
18. Has a national RS Strategy (or national Policy Directives) been produced based on a Safe System approach (as opposed to primarily improving behaviour)? *Def.: a Safe System approach involves a long term target or vision and addresses all elements of the road transport system in an integrated way, which implies shared responsibility between system designers and the road users* **C2.**				
19. Has a national medium term road safety programme been elaborated?				
If yes: 19a) Is it inter-sectoral?				
19b) Does it focus on the Safe System approach (integrating measures addressing all elements of the road transport system as opposed to primarily improving behaviour)?				*(Does the programme reflect the will of the State to provide road users with a safe environment?)*
19c) Have some preliminary institutional strengthening measures been specified :				
- Enabling laws (for implementation)?				*(please describe)*
- Changes in the institutional organisation?				
- Others?				
19d) Have implementation tasks and responsibilities been distributed between the key actors (government, local authorities, NGOs) within the programme?				
A4. F3.				
20. Has a national medium term road safety programme been adopted at high level?				
If yes: 20a) Has it been adopted :				
- by the Head of State/President of the Republic?				
- by the Prime Minister				
- by Parliament?				

- Others?				
A5. F4.				

3. Policy implementation and funding

	Yes	**No**	unknown	Please elaborate !
21. Have partnerships or agreements been established at the national level with the private sector for a contribution in terms of:				
- Management of particular activities				*(Which partners?)*
- Expertise?				
- Research?				
- Funding?				
- Communication on key RS issues?				
- Other?				
D8, D7				
22. If a national road safety programme has been elaborated and adopted, has the budget needed for programme implementation been **estimated**?				*(Have all potential costs been considered?)*
If yes: 22a) Have funding capabilities and opportunities been explored?				
A6. F3.				
23. If a long term vision has been adopted, has a budget been estimated to move towards this vision (distinct from the road safety budgets allocated to medium-term inter-sectoral programmes)?				*(Have all foreseeable costs been considered?)*
If yes: 23a) Is it:				
- A budget for research?				
- A budget for implementation?				
F1.				
24. Has a high level engagement (decision) been taken to ensure availability of a budget for road safety:				
- For a medium term programme?				*(Is it in line with the estimated necessary budget? Was the decision voted in Parliament?)*
- For a long term vision?				
A7.				
25. Does the government allocate the product of fines (or any funds collected from RS measures) to road safety interventions or related activities?				
If yes: 25a) Is it legalized (law or decree)?				
25b) Is the public informed of the use of funds?				

C4. G4.				
26. Is there a budget specifically allocated to road safety activities, interventions and capacity building from the national budget (Treasury)? **G3.**				*(Is there a line for RS in the national budget? Is RS partly or totally funded through ministries?)*
27. Is there a sustainable funding structure for road safety, independent from the Treasury (RS Fund, RS Foundation)?				*(The national RS budget may be allocated directly (question 27) or through the RS funding structure)*
If yes: 27a) Has it been legally created (law, decree, statutes, etc.)?				
27b) Is the financing coming from one or several of these sources:				
- Treasury?				
- Taxes?				*(For example: a percentage of the tax on petroleum products, specific taxes on driver licenses, vehicle registration, etc.)*
- Tolls?				
- Revenue from road safety interventions?				*(The measures which may bring in a revenue include fines, technical control of vehicles, driver licensing, etc.)*
- Insurance companies?				
- Private sources?				
G5.				
28. Are there formal resource allocation procedures to support road safety management tasks and interventions? **G6.**				*(Is there a list of "fundable" activities? A list of criteria to get funding?)*
29. Is funding allocated to evaluation? **H6.**				
30. Are the funds allocated sufficient to implement the programme or policy components adopted in each area:				
- Rural infrastructure				
- Urban infrastructure				
- Transport and traffic planning				
- Vehicles				
- Traffic education				

- Driver training and licensing				
- Road safety campaigns				
- Enforcement				
- Health				
- Others				
G8.				
31. Are the human resources needed to implement the programme or policy components adopted sufficient in each area:				
- Rural infrastructure				*(Has the manpower been adapted to the tasks at hand? Was it there or has it been increased?)*
- Urban infrastructure				
- Transport and traffic planning				
- Vehicles				
- Traffic education				
- Driver training and licensing				
- Publicity campaigns				
- Enforcement				
- Health				
- Others				
G1.				
32. Are the legislative instruments and procedures regularly reviewed and improved as regards?				
- Government (Treasury) funding?				
- Fund allocation procedures?				
- The road safety funding structure?				
G7.				
33. Have training plans been designed to support implementation of the national road safety programme or policy components?				
If yes: 33a) Have the plans been designed after exploring the needs for knowledge of the road safety actors involved in implementing the policy ? *(for example, actors can be teachers, policemen, road engineers, etc.)*				
33b) Have the contents of the training plans been established with, or validated by, scientific institutions?				
33c) Has funding been allocated to the training activities planned?				
G2. J8.				

4. Monitoring and evaluation

	Yes	**No**	Unknown	Please elaborate !
34. Are sustainable systems (durable, funded, maintained) in place to collect and manage data on road accidents, fatalities and injuries? **H1. J1.**				*(police records, health records, others?)*
35**.** Are sustainable in-depth accident investigations for road safety purposes in place?				
36. Are sustainable systems in place to collect and manage data on behavioural indicators:				
- Vehicle speeds				
- Safety belt wearing rates				
- Alcohol-impaired driving				
- Others				
H2.				
37. Is there a national Observatory centralizing the data systems for road safety?				
If yes: 37a) Does it include data on:				
- accidents, fatalities or injuries?				
- in-depth accident investigations?				
- behavioural indicators?				
- exposure (traffic)?				
- violations or fines?				
- driver licensing?				
- vehicle registration?				
- Other?				
H3.				
38. Has a reporting procedure been set up to monitor the road safety interventions carried out in the country?				
If yes: 38a) Is the reporting				
- periodical?				
- linked to intermediate phases of the RS programme?				
38b) Does it apply to all areas of intervention:				
- Engineering measures on rural roads				
- Planning and engineering interventions in urban areas				
- Enforcement operations				

- Traffic education				
- RS campaigns				
- Driver training				
- Vehicle related measures				
- Others				
38c) Does it address:				
- Delivery by the authorities (actors) concerned				
- Compliance with the timetable of implementation				
- Implementation of the needed legal changes				
- Identified needs for programme modification or changes in implementation conditions				
38d) Is it performed “horizontally” at the national level (covering ministries and government agencies)?				
38e) Is it performed “vertically” to cover activities at the regional and/or the local level?				
38f) Is the information addressed to?				
- the Lead Agency?				
- the high level inter-sectoral decision-making road safety institution?				
- the technical inter-sectoral road safety institution				
- the government?				
- the Parliament?				
38h) Has some action been taken on the basis of the outcome of this information:				
- limited changes in the action programme?				
- allocation of funds or human resources?				
- training?				
- others?				
A11. H4. E3.				
39. Has a procedure been set up to evaluate safety performances of the global programme or policy?				
If Yes: 39a) are the performances assessed				

- on the basis of performance indicators?				
- against national quantitative targets?				
E4. H7.				
40. Is "benchmarking" used to monitor progress in the road safety situation relatively to other (European) countries? **H8.**				
41. Does some "process evaluation" of safety interventions take place during the implementation period of the programme? (checking that measures work as expected and do not generate undesired side-effects)				
If yes: 41a) is the evaluation for interventions addressing:				
- all areas?				
- infrastructure?				
- vehicles?				
- enforcement?				
- road safety campaigns?				
- other areas?				
41b) Does it involve:				
- performance indicators?				
- observations and/or field surveys or measurements?				*(Please give examples)*
41c) Are scientific teams involved in performing process evaluation?				
41d) Are the evaluation results available to all stakeholders?				
41e) Has some action been taken on the basis of the outcome of this information such as:				
- partial changes in the action programme?				
- improvement of implementation conditions? **H5**				*(This may involve legal or institutional changes, increased budget or human resources, training, etc.)*
42. Has an evaluation process been planned to assess the effects on accidents and injuries of some policy components (“product” evaluation)?				
If yes: 42a) Which areas of intervention are				

covered by the evaluation plan:				
- infrastructure?				
- enforcement?				
- vehicle related measures?				
- others?				
42b) Is the evaluation actually being performed?				
42c) Are scientific teams involved in the evaluation process?				
42d) Are the results available to all stakeholders?				
42e) Are the results formally published?				*(Through which media? Under which initiative?)*
H6.				

5. Scientific support and information, capacity building

	Yes	**No**	Unknown	Please elaborate !
43. Is there at least one institute or university department performing multi-disciplinary road safety research and/or studies?				
If yes: 43a) Are there steady research teams				*(Do at least some of the researchers have a permanent or long-term appointment)?*
43b) Is evaluation of safety measures, interventions and/or programmes part of the research and studies carried out in the country?				
43c) Are road safety research results published at the international level?				*(this would mean in English language)*
43d) Are road safety research results systematically made available to the decision-makers and policy-makers in the country?				*(Do researchers or research institutions translate their scientific findings into applicable results?)*
43e) Is there sustainable funding available for road safety research?				
B5. J3. J4.				
44a) Are results of safety analyses and research actually used in formulating the country's RS policy?				
44b) Are the teams of road safety researchers in the country systematically requested by policy-makers to contribute knowledge for policy formulation?				
J5. J6.				

45. Are the government or road safety institutions providing factual and valid information on road accidents, injuries and risk to the citizens?				
If yes: 45a) Is it communicated:				
- Through reports?				
- Through the media?				
- On internet?				
C1. B2.				
46. Are the government or road safety institutions systematically (or periodically) informing the citizens of the national road safety policy and interventions and their effects? **C3.**				
47. Are there articles or programmes in the media on road accidents and/or on road safety activities which review, criticize or challenge current policies? **B6.**				*(How often do such articles appear?)*
48. Is there at least one university (or other superior education structure) providing a **multi-disciplinary** course on road traffic safety for students?				
If yes: 48a) At which level:				
- under-graduate?				
- post graduate?				
48b) Does the course lead to a diploma or a certificate?				
J2.				
49. Do universities or other educational institutions offer specialized courses addressing future professionals who may be involved in road safety:				
- Urban planners?				*(Courses integrated in initial training)*
- Road engineers/technicians?				
- Teachers?				
- Enforcement officers?				
- Driving instructors?				
- Health personnel?				
- Others?				
J7.				
50. Do universities, research or other educational institutions offer further-training sessions addressing key professionals currently involved in road safety:				
- Urban planners?				
- Road engineers/technicians?				

- Teachers?				*(Training sessions may be part of continuing education programmes)*
- Enforcement officers?				
- Driving instructors?				
- Health personnel?				
- Multidisciplinary?				
- Others?				
J7bis.				

Appendix II. The mean values of variables on the RSM components' availability

By clusters of countries recognized in the analysis of each part of the RSM questionnaire (Expert responses)

Part 1 - Institutional organisation, coordination and stakeholders' involvement:
estimates of the RSM components' availability (1 corresponds to "yes", 2 to "no")

Cluster	V1_3 3.Is Parliament involved in adopting road safety orientations or directions?	V1_4 4. Has a Lead Agency been formally appointed to take responsibility for road safety (direct the national road safety effort)?	V1_8 8. Has an institutional structure for the consultation of stakeholders been formally established (by law or decree)?	V1_79 7. Coordination vertically AND 9. Are the legislative instruments defining intersectoral road safety management functions periodically reviewed and reformed	V1_26 2. Does Parliament have a prominent role in initiating decision-making on road safety orientations or directions? AND 6. Coordination horizontally	V1_15 1. Has a high level inter-sectoral decision-making institution been established to prepare policy orientations? AND 5. Has a technical inter-sectoral road safety institution been established to coordinate ?	Average among the RSM components, by cluster
1 FI FR IL BE	1.5	1.3	1.3	1.4	1.3	1.0	1.28
2 NL UK AT CH	1.3	1.0	1.0	1.5	1.5	2.0	1.38
3 IE LV PL IT	1.1	1.0	2.0	1.8	1.5	1.6	1.51
4 EL ES	2.0	2.0	1.5	1.7	1.6	1.8	1.75
Average among the country groups	1.4	1.21	1.4	1.6	1.4	1.6	--

Part 2 - Policy formulation and adoption: estimates of the RSM components' availability (1 corresponds to "yes", 2 to "no")

Cluster	V2_5*	V2_6	V2_1011	V2_34*	V2_79	Average among the RSM components, by cluster
	14. Are local authorities consulted as to the part they are called to play in national road safety policy	15. Are local road safety programmes integrated into the national road safety policy?	19. Has a national medium term road safety programme been elaborated? AND 20. been adopted at high level?	12. Are regional authorities consulted as to the part they called to play in national road safety policy AND 13. Are regional road safety programmes integrated into the national road safety policy?	16. Has a national "vision" for improved RS performance in the long term officially been set? AND 18. Has a national RS Strategy been produced based on a Safe System approach ?	
1 AT CH	1.0	1.0	1.5	1.0	1.5	1.2
2 ES FI IL NL	1.2	1.9	1.0	1.5	1.1	1.3
3 IE LV PL UK	1.8	1.8	1.0	1.9	1.9	1.7
4 BE EL FR IT	2.0	1.8	2.0	1.6	1.3	1.7
Average among the country groups	1.6	1.68	1.36	1.6	1.4	--

Part 3 - Policy implementation and funding: estimates of the RSM components' availability (1 corresponds to "yes", 2 to "no")

Cluster of countries	V3_1* 21. Have partnerships or **agreements** been established at the national level with the **private sector**	V3_2 22. If a national road safety programme has been elaborated and adopted, has **the budget** needed for programme implementation **been estimated**?	V3_5 25. Does the government allocate **the product of fines** (or any funds collected from RS measures) to road safety interventions or related activities?	V3_7 27. Is there a sustainable **funding** structure for road safety, **independent** from the Treasury ?	V3_8 28. Are there **formal resource allocation** procedures to support road safety management tasks and interventions?	V3_13 33. Have **training plans** been designed to support implementation of the national road safety programme or policy components ?	V3_91011 29. Is funding allocated to evaluation? AND 30. Are the funds allocated **sufficient** to implement the programme adopted in each area AND 31. Are the human resources needed to implement the programme adopted **sufficient** in each area	V3_4612 24. Has a high level decision been taken **to ensure availability of a budget** for road safety AND 26. Is there a budget specifically allocated to road safety from **the Treasury**? AND 32. Are the legislative instruments regularly improved	Average among the RSM components, by cluster
1 CH FI	1.5	1.0	1.5	1.0	1.5	1.0	1.93	1.9	1.4
2 NL	1.8	2.0	2.0	1.0	2.0	1.0	1.03	1.2	1.5
3 ES IL LV	1.4	1.0	1.8	1.7	1.3	2.0	1.57	1.4	1.5
4 AT BE	1.7	2.0	1.0	1.0	1.5	2.0	1.50	2.0	1.6
5 FR IT UK	1.7	1.3	1.0	2.0	1.8	1.8	1.97	1.5	1.6
6 EL IE PL	2.0	2.0	2.0	2.0	2.0	1.7	1.59	2.0	1.9
Average among the country groups	1.7	1.5	1.5	1.6	1.7	1.7	1.7	1.7	--

Part 4 - Monitoring and evaluation: estimates of the RSM components' availability (1 corresponds to "yes", 2 to "no")

Cluster	V4_2 35. Are sustainable in-depth accident investigations in place?	V4_5 38. Has a reporting procedure been set up to monitor the road safety interventions carried out in the country?	V4_6 39. Has a procedure been set up to evaluate safety performances of the global programme or policy?	V4_7 40. Is "benchmarking" used to monitor progress in the road safety situation relatively to other (European) countries?	V4_34 36. Are sustainable system in place to collect and manage data on behavioural indicators AND 37. Is there a national Observatory centralizing the data systems for road safety?	V4_89 41. Does some "process evaluation" of safety interventions take place during the implementation period of the programme? AND 42. Has an evaluation process been planned to assess the effects on accidents and injuries of some policy components?	Average among the RSM components, by cluster
1 BE CH ES FI FR IE IL LV NL UK	1.5	1.5	1.4	1.2	1.2	1.2	1.3
2 AT EL IT PL	2.0	1.8	1.8	1.5	1.9	2.0	1.8
Average among the country groups	1.64	1.6	1.5	1.25	1.37	1.4	--

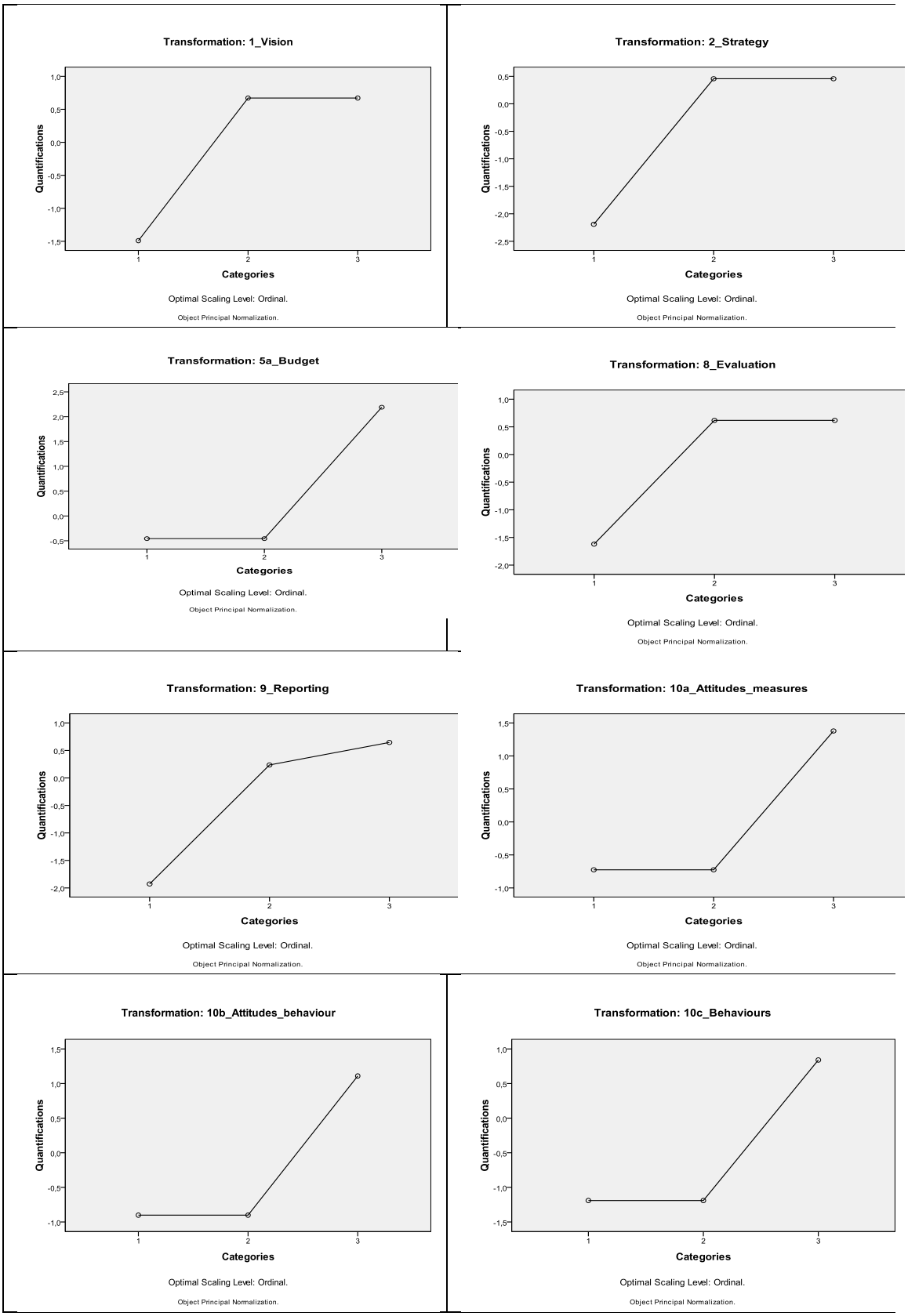
Part 5 - Scientific support and information, capacity building: estimates of the RSM components' availability (1 corresponds to "yes", 2 to "no")

Cluster	V5_5 47. Are there articles or programmes in the media on road accidents and/or on road safety activities which review, criticize or challenge current policies?	V5_6 48. Is there at least one university providing a multi-disciplinary course on road traffic safety for students?	V5_78 49. Do universities or other educational institutions offer specialized courses addressing future professionals who may be involved in road safety. AND 50. Do universities or other offer further-training sessions addressing key professionals currently involved in road safety	V5_24 44. Using research results AND 46. Are the government or road safety institutions systematically informing the citizens on the national road safety policy and interventions and their effects?	Average among the RSM components, by cluster
1 BE, FR, IL, IT, LV, UK	1.0	1.0	1.4	1.5	1.2
2 AT, CH, EL, ES, IE	1.0	1.9	1.7	1.1	1.4
3 FI, NL, PL	2.0	1.7	1.5	1.3	1.6
Average among the country groups	1.21	1.5	1.5	1.32	--

Appendix III. Road safety outcomes, exposure and SPI data

Country	Background Group	Fatalities (2010)	reduction 2001-2010	Composite index road safety outcomes (2008)	Composite index SPIs (2008)	Passneger-kilometres (billion, 2010)	Population (million, 2010)
AT	2	552	0,43	0,8415	0,7434	73,00	8,38
BE	2	840	0,43	0,8541	0,7316	109,10	10,84
CH	2	327	0,45	0,9773	0,8098	85,50	0,80
CY	2	60	0,46	0,7034	0,6845	5,90	10,53
CZ	1	802	0,46	0,6994	0,7200	63,60	5,53
DE	2	3.648	0,51	0,9613	0,8253	887,00	1,34
DK	2	255	0,49	0,7589	0,7457	51,00	5,35
EE	2	79	0,61	0,7406	0,7695	10,10	64,72
EL	2	1.281	0,37	0,6183	0,5857	99,60	81,82
ES	2	2.478	0,57	0,9451	0,8559	341,60	11,31
FI	2	272	0,31	0,8759	0,9992	64,70	9,88
FR	2	3.992	0,51	0,9743	0,9201	727,30	4,47
HU	1	822	0,38	0,6148	0,6948	52,60	9,87
IE	2	212	0,49	0,9124	0,9062	46,00	60,34
IL	2	352					7,70
IT	2	3.934	0,44	0,8945	0,4504	700,20	3,33
LT	1	300	0,58	0,6127	0,5999	29,90	0,50
LU	2	32	0,58	0,9897	0,6893	6,50	0,41
LV	1	218	0,66	0,6613	0,5417	16,50	16,57
MT	2	15	0,06	0,8432	0,6064	2,20	4,86
NL	2	640	0,41	0,9755	0,8604	141,20	38,17
NO	2	208	0,39	0,8628	0,9919	59,80	10,64
PL	1	3.907	0,29	0,5050	0,5113	297,90	21,46
PT	1	854	0,54	0,9010	0,6440	83,70	5,42
RO	1	2.377	0,04	0,1363	0,3682	75,50	2,05
SE	2	266	0,55	0,9807	0,9947	99,20	45,99
SI	2	138	0,56	0,7356	0,7574	25,60	9,34
SK	1	353	0,44	0,5818	0,6096	26,90	7,79
UK	2	1.905	0,47	0,9586	0,6970	653,80	62,03

Appendix IV. Optimally scaled RSM variables



Appendix V. Country abbreviations

BE	Belgium
CZ	Czech Republic
DK	Denmark
DE	Germany
IE	Ireland
EL	Greece
ES	Spain
FR	France
IT	Italy
LU	Luxembourg
NL	Netherlands
AT	Austria
PL	Poland
PT	Portugal
RO	Romania
SI	Slovenia
FI	Finland
SE	Sweden
UK	United Kingdom

EE	Estonia
LV	Latvia
HU	Hungary
MT	Malta
SK	Slovakia