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Abstract

The objective of this paper is the analysis of road safety management in European countries and the identification of "good practice". A road safety management investigation model was created, based on several "good practice" criteria. Road safety management systems have been thoroughly investigated in 14 European countries on 2010, by means of interviews with both governmental representatives and independent experts, who filled in an extensive questionnaire. A reliable and accurate picture ("profile") was created for each country, allowing country comparisons. Then, statistical methods were used to make rankings of countries, and analyse the relationship between road safety management and road safety performance. The results of the analyses suggest that it is not possible to identify one single "good practice". Nevertheless, there were several elements that emerged as "good practice" criteria. On the basis of the results, recommendations are proposed at national and European level.

Keywords: road safety management ; good practice.

Résumé

L'objectif de cette étude est l'analyse de la gestion de la sécurité routière dans les pays européens et l'identification de «bonnes pratiques». Un modèle d'enquête de la gestion de la sécurité routière a été créé, en fonction de plusieurs critères de «bonnes pratiques». Les systèmes de gestion de la sécurité routière ont été examinées en détail dans 14 pays européens en 2010, au moyen d'entretiens avec des représentants gouvernementaux et des experts indépendants, qui ont rempli un questionnaire. Un tableau fiable et précis («profil») a été créé pour chaque pays, permettant des comparaisons entre pays. Ensuite, on a utilisé des méthodes statistiques pour identifier le classement de pays, et la relation entre la gestion et la performance de la sécurité routière. Les résultats des analyses indiquent qu'il n'est pas possible d'identifier un modèle unique de «bonnes pratiques». Néanmoins, il y a plusieurs éléments de «bonnes pratiques» ressortis. Sur la base de ces résultats, des recommandations sont proposées au niveau national et européen.

Mots-clé: gestion de la sécurité routière ; bonnes pratiques.

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1. Introduction

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.

Effective organization of road safety management is assumed to be one of the conditions for obtaining good road safety results at country level (DaCoTA, 2012; Elvik, 2012). 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 the DaCoTA research project, a 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 objective of this paper is to present the analysis of road safety management framework in European countries and the identification of "good practice" for the optimisation of road safety management processes, carried out within the DaCoTA research project.

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. A shorter version of the DaCoTA questionnaire has also been prepared in collaboration with the European Transport Safety Council (ETSC) and dispatched to the ETSC-PIN panel of experts. The data was then analyzed by means of both quantitative and qualitative analysis.

This paper is structured as follows: In section 2, the road safety management investigation model is presented, and the data collection and handling procedures are described. In section 3, the results of qualitative analysis of the data are presented, while section 4 concerns the results of quantitative analysis. Section 5 presents the conclusions of the research in terms of road safety management "good practice" in Europe. Finally, section 6 summarises the DaCoTA key messages and recommendations for the improvement of road safety management systems in Europe.

2. Methodology

2.1. Road safety management investigation model

The investigation model of Muhlrad et al. (2011) 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 (Fig.1). The most complete RS management system which would be obtained for a country fulfilling all the "good practice" criteria identified was used as a reference (Fig. 2). For each country, "good practice" elements, lack of such elements and peculiarities can be then summarised in a 'diagnosis' including structures, processes, policy-making tasks and outputs according to the investigation model.

2.2. Data collection and handling

On the basis of the investigation model, an extensive DaCoTA questionnaire was developed, 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

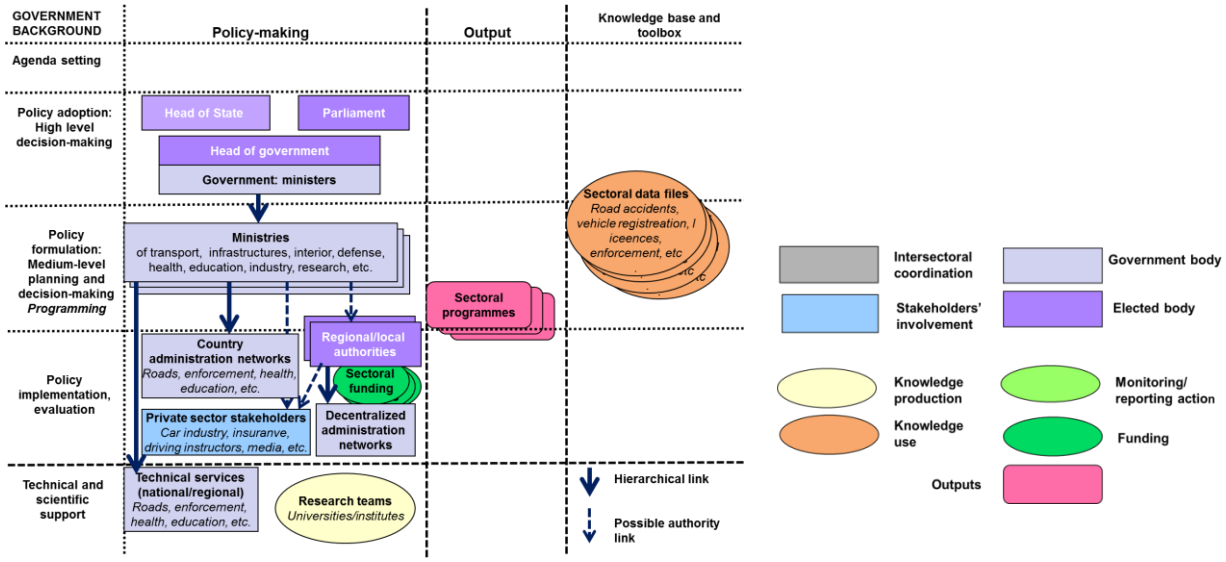

Fig.1: Government organization background

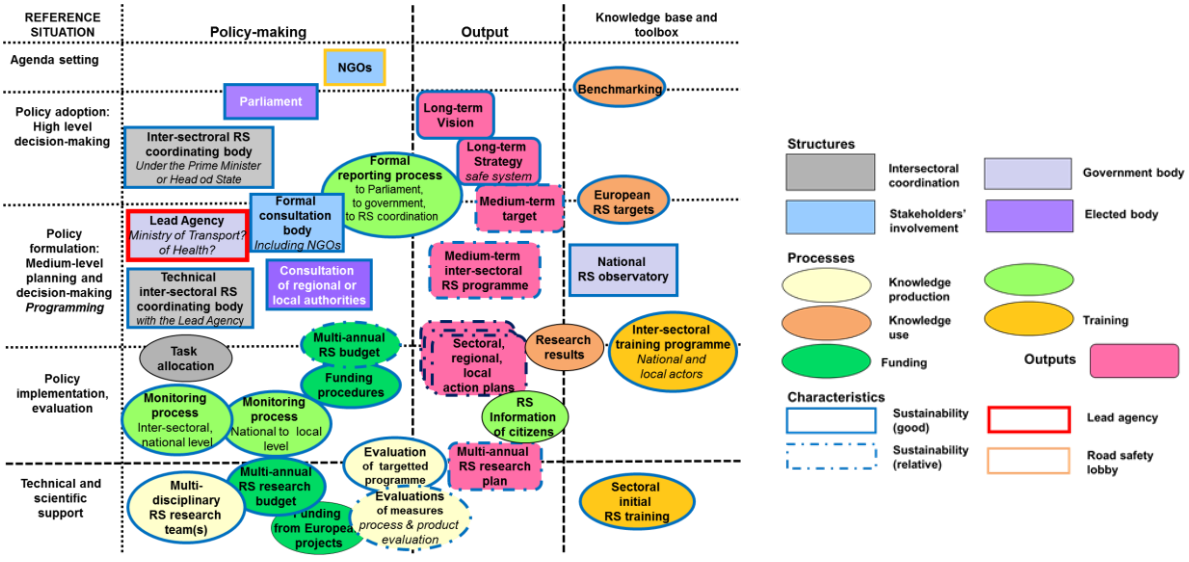

Fig. 2. 'Reference' country meeting all the "good practice" criteria

The questionnaire was filled for 14 countries. More specifically, the DaCoTA 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.

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. This gave a general overview of the Road Safety Management system in 30 countries, although in much less detail than the DaCoTA data.

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).

3. Qualitative analyses of road safety management systems in Europe

Within the qualitative analysis of the DaCoTA research project, a thorough analysis and cross-checking of the questionnaire responses and related comments was carried out, for 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. For details the reader is referred to Papadimitriou et al. (2012).

3.1. Road safety management profiles

Country profiles of the road safety management systems in the 14 European countries were analysed and compared to the reference "good practice" system (Fig. 2). 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. 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"), as the one presented in Fig.3 for Belgium, and the identification of "good practice" elements, as those presented in Fig. 4 for Belgium. 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.

The thorough analysis of the country profiles, together with additional information from the DaCoTA/ETSC-PIN data, allowed for an in-depth analysis and comparison of countries, leading to several observations and conclusions. These are summarised in the next section 3.2.

3.2. Synthesis of country analyses

3.2.1. Institutional organization, coordination and stakeholders' involvement

A large variation was observed 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. 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".

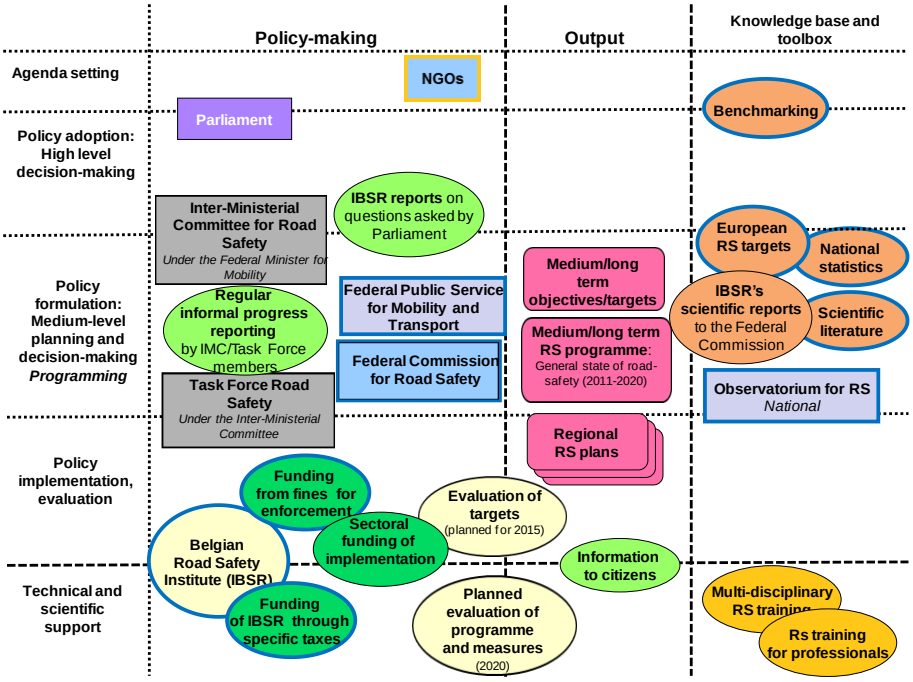

Fig.3. Structures, processes and outputs in Belgium, 2010

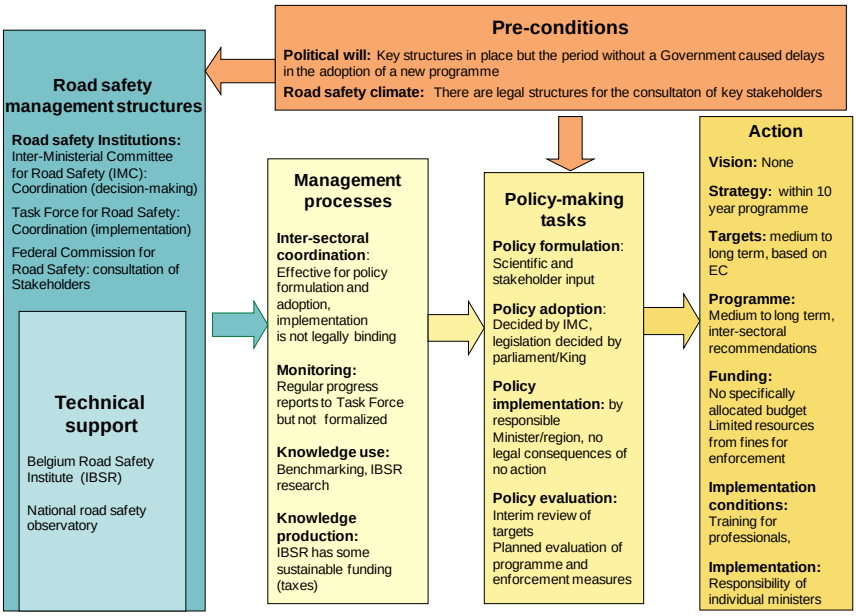

Fig. 4. Overview of road safety management good practice elements in Belgium, 2010

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.

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.

3.2.2. 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.

There is a lot of inconsistency in the design of the programmes, the setting of priorities and the implementation schedule. Proposals coming from regional or local authorities are hardly ever integrated into national road safety programmes. 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. 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.

3.2.3. Policy implementation and funding

In general, implementation of programmes and measures appears to be the weakest component of road safety management systems in Europe, 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. A decision is seldom taken to ensure the availability of a budget for road safety activities from the national budget. Moreover, 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.

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

3.2.4. Monitoring and evaluation

A satisfactory level of availability was identified with respect to "benchmarking" for monitoring progress in the road safety situation in relation to other countries. 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.

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.

3.2.5. 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. 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. 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.

4. Quantitative analyses

The quantitative analyses carried out within DaCoTA used statistical methods to identify patterns and rankings of countries, as regards both the road safety management characteristics, and the relationship between road safety management and road safety performance. For details the reader is referred to Papadimitriou et al. (2012).

4.1. Clustering of countries on the basis of road safety management components

Statistical clustering techniques were 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 (see section 2.2). Figure 5 presents, as an example, the clustering results concerning the first area of the questionnaire, namely 'institutional organisation'. A ranking of countries in terms of their road safety management system, per area and as a whole, was also presented.

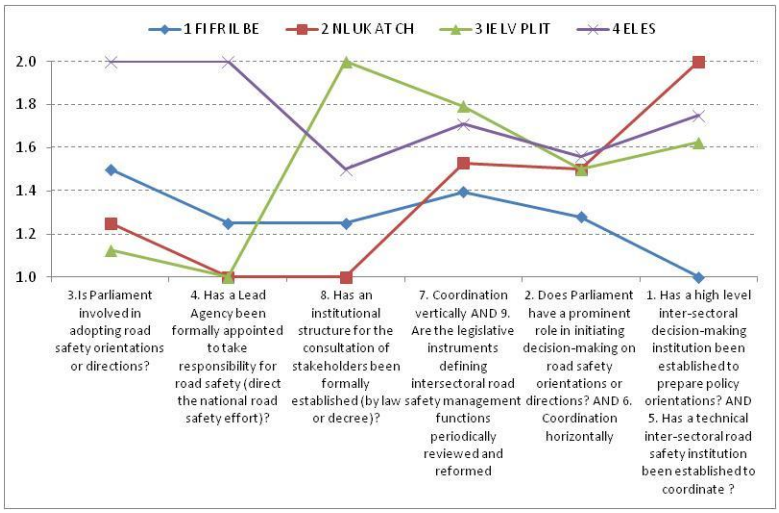

Fig. 5. "Institutional organization": mean values of availability of road safety management elements, by clusters of countries.

The analyses 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.

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.

For example, 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. 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.

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.

4.2. Statistical models linking road safety management with road safety performance

In this analysis, regression models were developed in order to test whether road safety management is associated with road safety performance. 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. Composite indicators were also used both as dependent and explanatory variables (Bax et al., 2012).

The dedicated analysis of road safety management and road safety performance was based on the SUNflower pyramid (Koornstra et al. 2002) 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 various models developed are summarised in Table 1.

Table 1. Summary of models linking road safety management (RSM) with road safety performance

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
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 Safety Performance Indicators (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
Explanatory variables	- Background indicator - Composite SPI - RSM	- Background indicator - Composite SPI - RSM	- Background indicator - Composite SPI - RSM	- Background indicator - Composite SPI - RSM	- Background indicator - RSM
Significant effects	- Background indicator - Composite SPI	- Background indicator		- Background indicator	- Background indicator - RSM

The results suggest no direct relationship between road safety management and the final outcomes of the road safety systems. However, they do suggest a relationship between road safety management and road safety performance indicators (Papadimitriou & Yannis, 2013). 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 results of these operational conditions.

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, weather, long traditions etc.

5. Conclusions

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.

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, road safety management was found to be associated with safety performance indicators (SPIs), reflecting the operational level of road safety in each country.

However, a 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.

Finally, it was indicated that expert responses may reflect an independent and more objective view and that future analysis might better use experts' opinion as a prime source.

6. Key messages and recommendations

The improvement of road safety management systems is a key component for the improvement of road safety at national and European level, through improved structures, processes and training. The present research revealed that there is no single ideal road safety management model, but there are several good practice criteria which may be adapted to the national conditions in each case. 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.On the basis of the DaCoTA analysis of road safety management systems in Europe, a number of key messages and recommendations are outlined in Table 2.

Table 2. Key messages and recommendations for the improvement of road safety management in Europe

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

Acknowledgements

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