

42(2), pp. 145-151, 2014

DOI: [10.3311/PPtr.7511](https://doi.org/10.3311/PPtr.7511)

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RESEARCH ARTICLE

RECEIVED 18 APRIL 2014

Abstract

Greece is among the worst performing countries in Europe in terms of road safety with one of the highest annual rates of fatalities per million inhabitants in the EU. However, a gradual decrease has been recorded over time. The bad performance of Greece in road safety is partially due to institutional problems such as inefficient organization of public administration, lack of organized structures of the State with responsibility for road safety, non-accountability of stakeholders in relation to the implementation of actions and inadequate funding for road safety. The most critical, road user behavior related, accident factors include speeding, low usage rates of seat belts and helmets, unorganized and unprotected traffic of vulnerable road users, drink-driving, use of mobile phones while driving and generalized aggressive driving. In Greece, a great potential for safety improvement exists, if serious effort for tackling the above major critical factors is made.

Keywords

Greece · road safety · problems

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1 Introduction

In 2012, the annual number of road fatalities was estimated equal to 1,3 million, worldwide, to 27.000 in the EU27 and to 1.000 in Greece, thus making road accidents, one of the most important social problems internationally. During the last decade, Greece is constantly ranked among the two or three worst performing countries in EU27 (Yannis, 2007; Yannis et al., 2007) as a result of, mainly, the insufficient policy and overall efforts for road safety in the country. Based on estimations made by transportation engineers, the financial and social cost of road fatalities, injuries and material losses due to the recorded road accidents in Greece is over 3 billion euro per year. This may even be tripled if non-recorded road accidents are taken into account. The objective of this paper is to present the basic road safety trends and to discuss key road safety issues in Greece.

2 Basic road safety figures

In Greece, in the second half of the last century, the number of road accidents and casualties continuously increased until the mid- 90s, as a result of the large increase in the number of vehicles, unconstrained traffic management, shortage of infrastructure and lack of responsible driving behavior. Since 1996, the annual number of fatalities in road accidents (2.500) began to decline and stabilized, at first, at the level of 1.600 fatalities in the middle of the last decade. During the last four years, it decreased again and reached its current level of 1.000 fatalities. This significant decrease during the last fifteen years is due to the doubling of vehicles and the consequent changes in traffic characteristics and traffic education of drivers, as well as to the partial activation of the State (especially of the Traffic Police during the period 1998-2004). In addition, the upgrade of the main highway network of the country, during the last decade, and the development of vehicle technology (passive safety) which helps reduce the consequences of accidents, also had an important role to the decrease of road accidents. The significant reduction in the last four years is also due to the introduction of new traffic laws, in 2007, and to the economic crisis and the consequent significant change in traffic and driver behavior.

Tab. 1. Basic road safety indicators in Greece and in EU27 (Hellenic Statistical Authority (ELSTAT), EC-CARE)

Greece	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change 2002-2012
Fatalities	1.634	1.605	1.670	1.658	1.657	1.612	1.553	1.456	1.258	1.141	1.027	- 37%
Injuries	22.459	20.737	20.179	22.048	20.675	19.766	19.010	18.641	19.108	17.259	15.724	- 30%
Accidents	16.809	15.751	15.509	16.914	16.019	15.499	15.083	14.789	15.032	13.849	12.353	- 27%
Vehicles (mil.)	5.693	5.968	6.302	6.641	6.996	7.380	7.729	7.911	8.249	8.408	8.570	51%
Fatalities/mil. inhabitants	149	146	151	150	149	144	138	129	112	102	91	- 39%
EU-27												
Fatalities	53.090	49.857	46.836	45.131	42.952	42.495	38.877	35.041	30.895	30.145	27.821	- 48%
Vehicles (mil.)	223,99	211,70	220,89	226,66	237,61	313,35	305,38	307,69	309,72	301,58	292,53	31%
Fatalities/mil. inhabitants	110	102	96	92	87	86	78	70	61	59	55	-50%

However, these achievements have not yet proved able to improve the ranking of Greece among the EU27 countries since the performance of the other countries was even better, as a result of systematic efforts of their authorities and of the general improvement in the living level and the resulting traffic education of European citizens. Unlike most Europeans, Greek citizens still have not realized that in the complexity of pedestrian and vehicle traffic, it is not possible for speed and safety to coexist (exception may be the public transport and, to some extent, motorways). They drive aggressively and at speeds which are inappropriate for the prevailing traffic conditions, considering road accidents as a possibility only for the other drivers and not for themselves.

The basic characteristics of road fatalities in Greece, during the period 2001 – 2011 show that a reduction over 20% has been achieved in every sub-category of road fatalities based on various characteristics of the road user, the road environment or the vehicle. The only case for which an increase has been recorded is that of older drivers killed (over 65 years old) who have increased by 65% between 2001 and 2011. Among different road user types, moped riders and cyclists are those showing the greatest decrease of 56% and 55% respectively. Examining different age categories reveals a reduction over 50% of road fatalities of young drivers (18-24 years old) as well as of children (0-14 years old). Between men and female drivers the reduction is greater for men. When fatalities of foreigners are examined, it is found that foreigner riders killed have been reduced more than foreigner drivers. The reduction of fatalities is also greater outside built-up areas than inside, either in junctions or not. Regarding natural lightning conditions, the reduction of road fatalities during daylight and night-time is almost the same (Tab. 2.).

The annual change of total fatalities shows that during the two last available years (2010 and 2011) the annual change is much higher than in the previous years. On the other hand, in 2005 and 2006, the annual change was the minimum. The severity numbers show that a decrease of severity is recorded after 2009 while between 2001 and 2008 the severity was

generally increasing. It is noted that severity is equal to the rate of fatalities per 100 injury accidents (Yannis and Laiou, 2013).

3 The national road safety management system

In Greece, although there are several governmental bodies (mainly Ministries) as well as universities/research institutes and non-governmental organisations (NGOs) that support the need for action, road safety has not been given the necessary attention and is not dealt with on a systematic basis. 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 practice, the Committee has no decision making power and no budget of its own. Furthermore, though a Secretariat for the support of the Committee exists, outputs so far show limited efficiency. Similarly, an existing structure for consultations of stakeholders, including NGOs and some experts, appears to be more an opportunity for discussion and information rather than for decision making.

Although all three administrative levels (national, regional, local) have specific responsibilities for road safety, and the regional authorities are represented in the Inter-ministerial Road Safety Committee, there is no process to integrate national and regional road safety activities neither any reporting from the regional/local levels to the national one.

The main road safety output is the Strategic Plan for the improvement of road safety, 2011-2020 (NTUA, 2011), based on the Safe System approach and including a vision and targets for 2015 and 2020. However, this strategic plan has not yet been 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.

The lack of a formally adopted national road safety programme, normally leads to the lack of an identified road safety budget. Nevertheless, fragmentary interventions are implemented and financed by the authorities and some NGOs coordinate their activities with them. The monitoring process

Tab. 2. Road Fatalities Basic Characteristics, Greece 2001 – 2011 (Hellenic Statistical Authority (ELSTAT), Processing: NTUA - Road Safety Observatory)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2011 %	Change 2001-2011
Total road fatalities	1.880	1.634	1.605	1.670	1.658	1.657	1.612	1.553	1.456	1.258	1.141	100%	-39%
Pedestrians killed	338	279	257	293	234	267	255	248	202	179	223	20%	-34%
Motorcyclists killed	426	341	310	379	399	440	420	394	405	367	305	27%	-28%
Moped riders killed	77	55	53	55	58	57	43	41	28	36	34	3%	-56%
Cyclists killed	29	14	21	24	18	21	16	22	15	23	13	1%	-55%
Killed in accidents with HGV	174	175	188	154	134	133	116	114	91	102	68	6%	-61%
Young drivers killed (18-24)	263	188	202	198	225	221	186	186	171	134	109	10%	-59%
Older drivers killed (65+)	158	127	126	128	128	130	138	132	124	138	260	23%	65%
Children killed (0-14)	47	47	45	43	44	36	42	35	43	30	22	2%	-53%
Men drivers killed	1.064	921	958	951	986	1.021	945	956	919	778	661	58%	-38%
Women drivers killed	65	56	50	65	65	53	64	64	44	60	52	5%	-20%
Non national drivers killed	136	112	109	111	116	127	118	129	131	109	107	9%	-21%
Non national riders killed	77	57	40	58	58	73	48	59	56	51	49	4%	-36%
Inside built up areas	830	718	716	766	758	774	724	744	646	593	559	49%	-33%
Outside built up areas	1.050	916	889	904	900	883	888	809	810	665	582	51%	-45%
In junctions - Inside built up areas	272	244	201	209	210	222	191	196	151	169	140	12%	-49%
In junctions - Outside built up areas	163	112	101	96	93	101	78	69	83	77	54	5%	-67%
On motorways	86	69	58	116	111	147	140	120	108	87	81	7%	-6%
When raining	178	172	197	172	186	144	161	132	175	149	119	10%	-33%
During daylight	983	873	782	832	875	870	882	825	789	675	609	53%	-38%
During nighttime	793	676	714	741	701	715	649	632	608	554	484	42%	-39%
Killed in single vehicle accidents	976	809	817	879	850	900	852	812	737	662	657	58%	-33%
Annual change of total fatalities	-7,7%	-	-1,8%	4,0%	-0,7%	-0,1%	-2,7%	-3,7%	-6,2%	-	-		
Severity	9,6	9,7	10,2	10,7	9,8	10,3	10,4	10,3	9,8	8,4	8,2		

included in the Strategic plan has not been implemented. The main problem for not implementing the necessary road safety measures seems to be related mainly with organizational problems and to a less extent with lack of the appropriate human resources.

The base of knowledge used in policy formulation is limited, which is to be expected as policy has not been adopted. 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 (Yannis and Laiou, 2013; Papadimitriou et al., 2012b).

4 Road Safety Related Data and Information

4.1 Availability to road safety stakeholders in Greece

In order to develop and implement successful road safety policies and measures, the availability of the necessary data and information is crucial. In Greece, road safety stakeholders express significant demand for data and knowledge to be used in road safety-related decision making. Furthermore, they are quite discontent with the actual poor availability of such information. On the other hand, stakeholders generally appear to ignore the availability status of items that they consider to be irrelevant for their work and also seem to be poorly informed about the availability of data and tools in general (Yannis and Laiou, 2013; Papadimitriou et al., 2012a).

More specifically, and based on the results of the “ROSEE-Road safety in South-East European regions” project, co-funded by the South East Europe Transnational Cooperation Program, as far as the availability of data and information is concerned, there are several road safety issues that are not covered. For example, data on the underreporting of road crashes are partially available to most respondents while crash databases that link police and hospital data are not currently available in Greece. More than half of the stakeholders have partial access to information on road users’ behaviour and exposure data.

Statistical methods for priority setting (e.g. to rank road safety measures) are available to approximately seven out of ten stakeholders while examples of the successful integration of road safety policies with others (e.g. environmental or health policies) is partially available to most stakeholders.

Three out of five stakeholders also stated that information on the socio-economic cost of crashes, fatalities and injuries are partially available.

Concerning the availability of data and resources for the development of road safety related programmes, almost half of the respondents answered that information on the impacts of road safety measures on other sectors’ policies are partially available while standardized procedures and methods for carrying out evaluations of road safety measures are not currently available.

Regarding the comparison of policy frameworks, policies, rules and measures it was found that comparisons of the frameworks in which road safety policies and measures are implemented as well as comparisons of road safety policies and measures regarding specific road user groups are currently not available to more than half of the respondents. On the other hand, comparisons of safety rules and regulations are partially available to more than 50% of the respondents.

Concerning availability of data and resources for the implementation of road safety related measures, availability of detailed information from road safety audits and road safety inspections or detailed road databases providing descriptions of road layouts etc is very limited. On the other hand, a common methodology for identifying high risk sites and a common

methodology for in-depth crash analysis is fully or partially available to 65% and 47% of the stakeholders respectively.

Comparisons of driver training programmes across Europe are fully or partially available to more than two thirds of the stakeholders. However, they expressed lack of availability or ignorance of methods to assess the training needs of individuals involved in road safety implementation processes.

Good practice collection on how countries have implemented specific road safety measures is partially available to most stakeholders. However, availability of good practice and methodologies for monitoring implementation as well as on information on potential funding sources for road safety measures is not that clear.

At the end, the availability of data and resources for the monitoring and evaluation of road safety related measures was explored. Methods for evaluation of safety impacts of road safety measures and statistical methods for following trends are partially available at a percentage of 53% and 41% respectively. But, a common methodology for the evaluation of costs and benefits of road safety measures is currently not available to 41% of the respondents.

Statistical methods for isolating effects of specific policies or measures are not available to almost half of the stakeholders although a comprehensive monitoring of implemented measures across Europe is partially available to 50% of them.

4.2 Priorities for road safety stakeholders in Greece

Apart from the availability, it is also necessary to know the priorities and needs of road safety stakeholders. Based on the results of the ROSEE project, data on the underreporting of road traffic crashes is mostly a high priority. The same applies to crash databases that link police and hospital data, though to fewer respondents.

Four out of five respondents stated that information on road users’ behaviour is a high priority. Also, seven out of ten set exposure data as a high priority.

Statistical methods for priority setting (e.g. to rank road safety measures) are of high priority to a 62% of the stakeholders.

Moreover, three out of four stakeholders consider information on the socio-economic cost of crashes, fatalities and injuries as a high priority.

Regarding priority of data and resources for the development of road safety related programmes, four out of five respondents stated that information on the impacts of road safety measures on other sectors’ policies (environment, health, mobility etc.) and/or vice versa is of high priority to them. Standardized procedures and methods for carrying out evaluations of road safety measures is of high priority to three out of four stakeholders while information on the impacts of road safety measures on other sectors’ policies is given a little less priority.

Comparisons of the frameworks in which road safety policies and measures are implemented were given high and medium

priority equally. Comparisons of safety rules and regulations and comparisons of road safety policies and measures regarding specific road user groups were ranked of high priority by most stakeholders, however in both cases medium priority was also given by a significant percentage of stakeholders.

A good practice catalogue of measures including implementation conditions seems to be important as the percentage of stakeholders who consider it of high priority reached 89%.

The examination of the priority regarding data and resources for the implementation of road safety related measures showed that detailed road databases providing descriptions of road layouts etc. and a common methodology for identifying high risk sites are considered of high priority by the same percentage of respondents (68%). A common methodology for in-depth crash analysis was also given high priority by most respondents. On the contrary, detailed information from road safety audits and road safety inspections was given medium priority by approximately three out of five respondents.

Also, high priority was given to the comparisons of driver training programmes across Europe by 50% of the stakeholders and to detailed data on the costs of road safety measures across Europe by 74%. Approximately half of the stakeholders also consider methods to assess the training needs of individuals involved in road safety implementation processes and user-friendly interfaces to assist new users in finding road safety materials on the internet to be of high priority for their work.

Good practice collection on how countries have implemented specific road safety measures has high priority to the respondents.

Methods for evaluation of safety impacts of road safety measures and common methodology for the evaluation of costs and benefits of road safety measures have a percentage of 65% as a high priority. Moreover, statistical methods for following trends are almost equally identified as of high or medium priority.

Forecast models (short, medium, long) are split as a high or medium priority. It looks that the difference between high and medium priority is increasing with time related to forecast models.

Statistical methods for isolating effects of specific policies or measures and crash prediction models for various road types and layouts are equally given high and medium priority.

Finally, comprehensive monitoring of implemented measures across Europe is given high priority by approximately half of the respondents.

5 Key road safety problems and their causes

The list of road safety problems in Greece is long. But other problems have contributed enormously to the numbers of road accidents and fatalities and other problems have less to minimal contribution. According to expert analysis of accident data in Greece and their comparative examination with corresponding analyzes (EC-ERSO, ITF-IRTAD) from Europe, the most

critical factors (in order of importance) that contribute to road accidents and especially to serious accidents in Greece are (Hellenic Institute of Transportation Engineers, 2014):

- driving at high speeds
- the high rates of motorcyclists in traffic
- the low usage rates of seat-belts and helmets, especially by passengers
- the unorganized and unprotected circulation of vulnerable road users,
- driving under the influence of alcohol
- the use of mobile phones while driving
- the generally aggressive driving.

The main causes of the high number of road accidents in Greece are the following :

- Enforcement is not sufficient (in space and time) and is not perceived by the driver to change his behavior.
- The road infrastructure and the overall organization of space and traffic in cities is oriented to accommodate private cars and high speed, ignoring vulnerable road users (pedestrians, cyclists, etc.) and their safety.
- The interurban road network (especially the rural) is inadequately maintained and shows several imperfections that hold many dangerous surprises for drivers while it also does not forgive their mistakes.
- The shortcomings of the State are a bad example for the citizens.
- Both the State and the citizens show indifference to respect the rules and to adopt a proper traffic behavior.
- Often, poor driving behavior patterns are promoted (by prominent persons, through car commercials, etc.).

The main institutional road safety problems in Greece are:

- Inefficient organization of public administration which results to the inability for long-term implementation of any action for road safety.
- The lack of organized State structures with responsibility for road safety and the non-accountability of the stakeholders for the implementation of their actions which result to limited actions without the desired results.
- The lack of a central structure with substantial road safety responsibility and authority on State services, and accountability for its actions.
- Inadequate funding for road safety which often runs out quickly with no actual results.
- Failure to understand that road safety is a science, and indeed includes several different disciplines, and that a correct and constant research and documentation of any kind of decisions is necessary.

In addition, it must be noted that in order to substantially upgrade the safety of road infrastructure, it is necessary to implement a comprehensive program for road safety infrastructure management, as applied in several developed, in terms of road safety, countries and which has been established

at European level by Directive 2008/96/EC and recommended for the TEN-T. In particular, it is necessary to develop and implement a series of procedures to ensure the safety of road infrastructure in all phases of planning, design, construction, operation and maintenance. These procedures concern RSA and RSI, the identification of and intervention in hazardous locations, as well as to road safety impact assessment for each new project and intervention. It is necessary to directly adjust the Greek legislation to the Directive 2008/96/EC. In Greece, although the specific Directive has been adopted, the foreseen procedures are not fully implemented yet.

6 Conclusion

Greece is among the worst performing countries in Europe in terms of road safety with the highest annual amount of fatalities per million population in the EU. However, a gradual decrease has been recorded over time. The number of fatalities was decreased by 39% since the start of the century. Greece is characterized by increased traffic of motorcycles and pedestrians. As a consequence, in 2011, 30% of the fatalities concerned moped or motorcycle riders and 20% of the fatalities concerned pedestrians. The share of motorcyclists is significantly increased compared to other countries' and their trend has remained practically unchanged. Fatalities in built-up areas are over-represented in Greece compared to the European average. Especially middle aged men have a high share in fatalities per population. The passenger car fleet in Greece is somewhat older than the average European car fleet and mandatory vehicle inspection periods are twice as large as the period in most countries.

In Greece, the coordination of all the Ministries involved in road safety management, is ensured by the Inter-Ministerial Committee on road safety chaired by the Minister of Citizen Protection. However, its role remains limited as the corresponding coordination secretariat has never been established.

The Greek strategic plan for the improvement of road safety in the period 2011-2020 has adopted the vision of sustainable road safety and its safety principles: functionality of roads, homogeneity of mass and/or speed and direction, forgivingness of the environment and of road users, predictability of road course and road user behaviour by a recognizable road design, and state awareness by the road user. The objective of the strategic plan is the development of a road safety culture among Greek road users while the quantitative target is in accordance to the one set by the EU for halving the fatalities by 2020. That means that road fatalities in Greece should be less than 640 in 2020.

Although Traffic enforcement has increased during the last decades, speed and helmet wearing enforcement are somewhat less effective in Greece than in other countries in Europe. Still seat-belt wearing rates are lower in Greece than on average in Europe. Enforcement of drinking and driving has increased during the last years. The general allowed BAC level in Greece

is 0.5‰ but it is lowered to 0.2‰ for novice and professional drivers, as well as for drivers of motorcycles and mopeds.

In the current difficult conditions, of the economic and social crisis in Greece, it is even more necessary to give priority to serious efforts to improve road safety, since the reduction of road accidents not only can result to economic benefits, but also includes investments that lead to the development of the country (new road projects etc). Moreover, several important road safety measures, such as enforcement, do not require significant budget, but can lead to spectacular results.

An effective road safety policy should be based on the fundamental principle that provides for the incorporation of safe driving at the expense of speed. The citizens must reclaim safer traffic conditions everywhere and local, regional and central authorities have to develop and implement plans for sustainable mobility by incorporating all the necessary priority actions for road safety. The ultimate objective must be both a new way of management and operation of public space and the medium-term improvement of the behavior of all road users. The concepts of the safe system and of road safety culture are indeed the basic directions of the Strategic Plan for the improvement of road safety in Greece, 2011-2020 (Hellenic Institute of Transportation Engineers, 2014).

The Hellenic Institute of Transportation Engineers (2014), recommends the following priority actions (in order of importance):

1. The creation and operation of a central government authority with overall responsibility for all actions of road safety in Greece and regular accountability for the progress of the actions and their influence on the improvement of road safety.
2. Intensification of road safety enforcement focusing on the most dangerous infringements related to road user behavior, such as speeding, use of seat-belts and helmets, driving under the influence of alcohol and using a mobile phone.
3. Systematic monitoring of the implementation of the actions, the level of road safety and all the factors that affect it.
4. Development and implementation of effective management of road infrastructure for establishing not only safe driving conditions on the roads of the country but also the confidence of the user that in a road environment in which he is respected, he should also respect himself and the others.
5. A radical redesign of road infrastructure and traffic in cities to stop the current operation of the city with total priority to cars, the speed and hence the accidents. Indeed, the redesign must be incorporated in integrated plans for sustainable urban mobility.
6. Designing and implementing a comprehensive policy to promote safe driving behavior that aims both to

understand the inherent hazards of driving and to raise the awareness of each driver, passenger and pedestrian that the right traffic behavior is an ongoing effort of both the State and citizens themselves targeting a society of responsibility and prosperity.

For short-term results, it is necessary to engage both public and private organizations with a common and powerful communication message for everyone to realize that accidents concern all road users and that it is necessary to change behavior, lower speeds everywhere, avoid drink-driving and the use of mobile phones while driving and maximize the use of seat-belts and helmets. Such campaigns should be targeted not only to all groups of vulnerable road users (pedestrians, motorcyclists, children, young and older drivers) but also those who threaten these groups (car drivers, trucks, etc.). To achieve increased efficiency,

these campaigns should always be combined with other actions such as enforcement, interventions in infrastructure, etc.

Long-term results will be achieved with both better training of drivers and with strengthening of road safety education with any possible way, at school, at home, at work and throughout the daily routine, so that everyone adopts the correct behavior on the road from an early stage in life.

In order for all these priority actions to have short and long term effects on the improvement of road safety in Greece, it is necessary to be applied systematically and always in the context of wider political plans for space and mobility in and out of the cities. At the same time, all relevant governmental and non-governmental bodies should intensify their efforts to implement the above actions and all other actions within their competence.

Acknowledgement

This research was carried out within the project ROSEE-ROad safety in South-East European regions, co-funded by the South East Europe Transnational Cooperation Program. The publication of the research results have been supported by KTI Institute for Transport Sciences, Centre for Road Safety.

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