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Roadmaps for future research

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Executive summary

The present document (Deliverable 3.5) provides the final result of the project ESTEEM as synthesis of the activities realised in the so-called Work Packages 2 (surveys) and 3 (workshops). Especially the present document is focussed on:

- synthesising the actual situation of transport safety and security in the countries involved with the project (namely, Algeria, France, Italy, Morocco, Spain and Tunisia);
- synthesising the main recommendations for future development on transport safety and security in the Mediterranean Partner Countries (MPCs) obtained from survey activities and workshops;
- reporting the roadmap for future research to be undertaken in the near future in the MPCs.

The document reports the main results of the analysis phase of the project which allowed to identify the more urgent needs of the MPCs to be surveyed and on which the future research should be focused. The analysis phase allowed to identify the four sub-areas and the related key points to be treated.

The sub-areas analysis has shown that the transport security issues in the MPCs are not considered as relevant as the safety aspects are. It also appeared the necessity to focus the attention, within the four sub-areas, on precise interesting topics, in order to avoid the risk to obtain too generic information from the surveys activities, not sufficiently detailed for defining correctly the future research roadmaps.

In summary, the analysis phase has shown as the four sub-areas mainly relate with specific road safety aspects (e.g. data collection, management, infrastructure design, vulnerable users, enforcement). The most interesting transport mode appears to be the road one, while other modes (i.e. maritime and rail) are concerned regarding to specific issues (e.g. port operations, ITS, rail crossing safety).

The final definition of the four sub-areas is:

**Sub-area 1: Road safety management aspects**
- Accident data collection and analysis
- Road safety management process

**Sub-area 2: Human factors in road safety**
- Road users education and training
- Enforcement

**Sub-area 3: ITS to improve transport safety and security**
- ITS for road safety enhancement (information and management systems)
- ITS for safety and security of ports operations

**Sub-area 4: Safety aspects of infrastructure design**
- Safety audit and safety inspection
- Rail crossing safety
- Maintenance
- Vulnerable road users

For each sub-area, survey actions have been carried out in order to identify the specific needs of the region, to find the existing best practices, to identify viable technical solutions and the priority research actions to be undertaken by policy makers and the EU.
The specific needs have been investigated by means of interviews addressed to stakeholders, dealing with transport issues of the South Mediterranean region, and desk analysis.

The information obtained from these analysis have been reported in “local integrated analysis” at country level. Information obtained at country level was also exploited in a complementary approach to the comparison at sub-area level (sub-are integrated analysis).

A complementary analysis was the systematic comparison between the different countries and groups of countries (i.e. EU and MCP) within each sub-area performed at “key point” level. It produced a clear picture of the relative positions of each country and the same approach between EU countries and MCP ones. It is the basic tool to configure the recommendations for future research as well as for the knowledge transfer.

Some of the main conclusions obtained from this Local Integrated Analysis are:

- The New Moroccan Legislation on road safety for interurban network is harmonised with EU directives. This new legislation is not yet fully implemented and results are not known.
- Spanish strategic plan has been implemented by DGT from 2005 to 2008. Actually, a new Plan from 2010 to 2015 is under production. The evaluation of the last plan is also in execution.
- Regular obligatory courses in Italian schools are not implemented, as well as no specific laws or rules about road safety education (e.g. courses, arguments, etc.) have been prepared to date.
- Currently, the main Algerian actions undertaken in training are: Training action for taxi drivers; Training action for monitoring driving school; and Training action for professional drivers.
- In Tunisia, once the accident is produced, the quality of emergency service is poor in terms of response time. A lot of injured die on the spot or going to the hospital.
- The main French actions that have been adopted include: the augmentation of the infractions that are sanctioned; the strengthening of the fight against drunk driving; and the strengthening of the fight against speeding.

The key results obtained for the four sub-areas are:

**SA1- “Road safety management aspects”**

- The Maghreb countries have no targets on reducing accidents, but rather an indication of the need to reduce them. In the Maghreb countries some general goals are fixed but without global strategy (except for Morocco).
- All countries of the Maghreb there is a significant gap between the target and the reality. Indeed, concerning data collection and management of road safety aspects, significant lacks exist.
- Both in Europe and the Maghreb, the stated objectives (EU actions and PSUI for Morocco) did not put enough emphasis on improving data quality and analysis especially regarding accidents in tunnels and accidents involving professional drivers for example.
- It is necessary the creation, development or strengthening of existing structures to form an observatory on road safety in MPCs by following the best models in Europe. They must have sufficient weight to influence the modal shift (private cars to public transportation) and obtain the necessary financial resources.
- For the Maghreb countries, there is a clear benefit to computerize the process of data collection on road accidents. An opportunity of transfer of knowledge is to help Maghreb countries to introduce the appropriate software programmes and network platforms.
• Concerning the data collection, the most important is the implementation of methods of analysis to identify accurately the location of the accident, the cause, the conditions of the accident, time, vehicle type involved, etc.

SA2- “Human factor in road safety”

• The current level of road users’ education and training is considered low in all countries. Especially the road users (drivers and not) are few aware of the risks on the road.
• In MPCs, the awareness campaigns are considered very important, especially for young people. The direction is to increase the number of campaigns and to increase the risk awareness already in schools (in line with the European Commission objective).
• The implementation of the points driving license system is of topical interest in MPCs. Such system already exists in Tunisia, even if it is not yet applied. The experiences of systems implemented in France, Italy and Spain could be replicated also in MPCs. This enforcement measure should be accompanied by a periodic assessment of its effectiveness (i.e. in the EU countries it resulted very effective only close to its start up).
• In the framework of the revision of the driving license exams, in parallel with the researches realised in Europe, the attention can be focused on road safety questions with important weight in front of traditional approach to regulations. Specific issue like vulnerable road users (especially pedestrians) can be aspects to be included in the exams to make new drivers more sensitive to these issues.

SA3- “ITS to improve transport safety and security”

• There is a lack of developments concerning people with reduced mobility. However, research and development are on-going on the subject.
• Projects to develop the road infrastructure are underway in the three MPCs.
• The information and communication technologies begin to be implemented in transport in the Maghreb.
• Europe pushes to transnational research programmes at European level, in all domains of course, on the road traffic subject in particular. It should be profitable to MCPs to develop such cooperation also at the regional level.
• With a long term perspective, it would be interesting to establish negotiations and cooperation between stakeholders (including the authorities) in the Maghreb and stakeholder in Europe to prepare future ITS systems (e.g. access to all vehicles to the technology supported, similarity of actions related to infrastructure - V2X applications).
• The ACS system is under deployment in the MCPs, however, there are improvements made in Europe that can benefit to MCPs like the application of the ACS to control at the red lights.

SA4- “Safety aspects for infrastructure design”

• All countries suggest that audits be external, but in the MCPs, the methods of verification of infrastructures safety are still absent or insufficient.
• It is necessary to update the road maintenance regulation to define the minimum standards and to allocate more resources to the maintenance.
• Some specific measures/actions to reduce the risk for vulnerable users have been taken in some countries and may be used in other countries. In Spain for example, bikes have their own regulations in some cities. Algeria suggests providing driving licenses for motorcycles, and creation of circuits of road education for children. For
Tunisia, it is necessary to improve conditions of infrastructures, horizontal signals and pedestrian crossings and to improve the risk awareness of the pedestrians.

- The costs of the maintenance should be verified periodically. The financing for the maintenance should be increased basing on the effective necessity. The contracts for the infrastructure management should refer to what should be done in term of periodic maintenance, in order to oblige the road managers to realize periodic interventions.
- It is necessary to design and edit multidisciplinary and coordinated plans to get vulnerable road users are more protected.
- It should be necessary to include the vulnerable road users’ aspects in the design of infrastructures, to consider them as mobility users. Infrastructural devices for their protection should be fostered at national level. Clear guidelines should be prepared.
- Actually the situation concerning the development and use of methods for verifying the infrastructure safety is bad. There are problems of financing and mentality. Improvement must be done by training of personnel in charge of the controls and by defining strategies for a periodic control, and create an independent organism composed by different stakeholders for the control of infrastructure safety.
- The current situation of the rail crossings safety is insufficient. The crossings are not controlled and the systems used are old. The rail crossings safety should be increased by using new technologies in this field. The use of automatic barriers should be planned and adequately financed.

In addition to the survey activities, two workshops have been organised with the aim of bringing together actors and stakeholders in order to discuss and validate the results of the surveys. The objective of the workshops was to foster the coordination of research activities in the MPCs, bringing technical experts, researchers, institutions and companies, dealing with the selected sub-areas, in contact among them.

Institutions and companies from Europe and MPCs were invited to actively participate to the workshops connected to the sub-areas surveyed. During the workshops, organised in one of the MPCs, the survey results were presented and discussions about specific topics for future research were fostered.

Discussions held during the first workshop highlighted that in Maghreb countries, concerning the management aspects of road safety, the need for data collection on accidents is as fundamental as well as the data treatment and their availability. There is also a problem in managing and collecting the fines and in enforcing the traffic offences in short time. In European countries, things are better. Legislation in Europe is more harmonised and similar among countries. Application criteria are also similar and the tools for a strict application exist. In MCPs law is sometimes similar but not yet harmonised and the application is doubtful in some cases.

In Maghreb, human factor is considered as the dominant issue (e.g. it represents 85% of the accidents in Algeria). This factor should be considered as the most important lever to reduce accidents and casualties. Several aspects are included in this field: driver training, qualification of driving instructors, examiners and all the communication aspects. Some difficulties in enforcing the driver behaviours and in respecting the rules have been evidenced several times during the workshop. This lack of discipline is the cause of most of the accidents involving vulnerable users.

Discussions with the participants to the second workshop showed that the number of road accidents in Maghreb is still very high (about ten times higher than in European partners countries, and does not show a franc decreasing slope since 2001). The human factor is the most important cause of accident; however information systems may be used efficiently in safety and security of transportation systems, especially in their management and control.
On one hand, the problem may be related to users behaviour and some kind of unconsciousness. Although education actions and public awareness campaigns are taken, accompanied by repression, the number of accidents trend is not yet clearly decreasing in the MPCs.

On the other hand, modernization of the information technology for transport systems will certainly help to achieve the goals of a better management, control, education and training for an improved safety and security of transport systems. ITS presented during the workshop may be helpful for that purpose, especially for electronic management, electronic control and driver assistance.

Infrastructure management can be improved also by the use of new technologies, intelligent infrastructures for enforcement, travel information, emergency management, or real time security assessment. But in Maghreb countries, there is a lack of ITS hardware for signalisation, traffic management and control.

Infrastructure design safety standards seem to be missing, or unused, in some Maghreb countries. For instance, the workshop showed that specific safety audits and safety impact studies were not done for the tram in Rabat. Therefore, this aspect, taking into consideration safety in the studies phases of projects through standards is a major recommendation for these countries.

Basing on the results obtained from these activities several recommendations were obtained for improving, through research, the safety and security aspects of transport system. These recommendations have been synthesized in form of roadmap for future research representing the final outcome of ESTEEM.

The proposals for future research refer to development to be implemented in the South Mediterranean Region (extending the influence also to other countries not directly involved in the project). The research are intended to be developed through the support of the national bodies and of the European Commission and should involve not only universities and research centres but also public bodies (ministries, local administrations, etc.) and private companies (especially SMEs).

In synthesis, the proposals for future research concern the following topics:

- Definition of plans and tools for improving the quality and accessibility of data on road accidents.
- Implementation of a regional Road Safety Observatory.
- Definition of guidelines and tools for improving the mobility in the urban areas.
- Development of plans for effective and periodic awareness campaigns on road safety.
- Evaluation et modernization of the road driving training.
- Definition of plans and actions to make the rules applied.
- Revision of enforcement methods.
- Develop guidelines and tools for road safety verification.
- Development of measures for standardising the infrastructure maintenance.
- Analysis of road accident causes and definition of countermeasures.
- Technical control of vehicles.
- Increasing knowledge about ITS and their benefits.
- Development of an ITS architecture.
• Development of specific studies aiming at identifying needs and possible ITS solutions.
• Development of plans for increasing safety of rail crossings.
• Analysis of the management and coordination system of road safety.
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1 Introduction

This document is prepared for the Directorate-General for Research of the European Commission as deliverable of the project ESTEEM (Enhancing Safety and security aspects in Transport rEsearch in the EuroMediterranean region).

The general objective of ESTEEM is to enhance and strengthen the links between the Maghreb transport related research system and three Mediterranean neighbouring EU countries (namely France, Italy and Spain), focusing on the specific theme of safety and security of transport systems and infrastructures.

In order to do this, it is deemed necessary to implement a strong coordination action among the relevant actors in the two regions, ensuring that their future research policies on transport are defined at regional level and not only at the level of the individual countries.

The specific objective of the project is to bring the partners to share the identification of priority common research themes, responding to identified needs, which should be investigated in future research actions to be carried out at the regional level. Thus, the project will contribute both to the definition of the future research roadmaps for both the FP7 Transport programme and the Mediterranean Partners Countries (MPCs) governments and to the coordination of high quality research and policies on transport in the countries involved in the project in the area of safety.

The strategy implemented to achieve these objectives foresees four main Work Packages, as follow:

1. identification and selection of four thematic sub-areas to be investigated (WP1);
2. analysis of the above mentioned sub-areas in the form of structured surveys (WP2);
3. exchange of results and sharing of the knowledge acquired, in the form of workshops and production of roadmaps for future research actions (WP3);
4. creation of a Network among stakeholders and the project participants and a series of Dissemination Activities (WP4).

This deliverable relates to the activities of the Work Package 3, which was organised in three tasks.

The first two tasks deal with the organisation of workshops aiming to foster the coordination of research activities in the MPCs networking technical experts, researchers, institutions and companies. The first workshop deals with the thematic sub-areas 1 and 2, while the second workshop deals with the thematic sub-areas 3 and 4.

The third task relates to the preparation of future research roadmap for both the FP7 Transport programme and the MPCs governments, summarising the project results (i.e. recommendations from the workshops and surveys results).

The present Deliverable summarises the work done in the Work Packages 1, 2 and 3 of the project and presents the roadmap for future research. The document is organised in four main chapters, excluding the introduction.

In the “Analysis phase”, Chapter 2, a summary of the activities carried out at the beginning of the project to define the four main sub-areas considered of topical interest by the MPCs and to be investigated in the successive Work Packages is provided.

In the “Surveys”, Chapter 3, the analyses carried out concerning the countries involved with the project and the four sub-areas (desk analysis, interviews to stakeholders, etc.) are summarised. The main indications obtained from such analyses are also reported.

In the “Workshops”, Chapter 4, the main results obtained in the workshops organised during the project are summarised. Especially the discussions and the suggestions provided by the stakeholders which attended the events are reported.
In the “Roadmap for future research”, Chapter 5, a synthesis of all the project results is presented together with the details on the research which would be necessary to realise in the next future.

2 Analysis phase

This activity was related to the Work Package 1 of ESTEEM. The aim was to analyse the state of the art of safety and security of transports in the Mediterranean Region defined by the countries involved in the project. As a result, the relevant sub-areas deemed most promising for the definition of priority research topics have been identified. This first part of the WP1 is described in the Deliverable 1.1 of ESTEEM.

During the analysis phase, a methodology for the subsequent survey activities (see Chapter 3) has been designed, including information for surveys (sources, output data formats, type of data collection methods and so on, assignment of responsibilities). This part of the analysis phase is described in detail in the Deliverable 1.2 of the project.

The methodology for defining the four sub-areas started with propositions from all the partners (a first consultation has been performed during the kick-off meeting of the project, through a brainstorming session). Especially, the local MPCs situation concerning transport issues has been depicted, leading to propositions of possible sub-areas to be investigated during the project.

The strategy for defining the four most interesting sub-areas was based on the following steps:

- definition of criteria for sub-areas selection, representing the importance of the topics;
- application of a multi-criteria method to sort the sub-areas and to identify the most promising ones, according to the criteria;
- validation / revision of the sub-areas priority list, according to the opinion of MPCs stakeholders (in order to select the four sub-areas to be analysed according to specific needs of the MPCs).

The informal consultation process with local MPCs stakeholders (mainly decision makers) was basically an acknowledgement of the local programs and plans on safety and security (forecasted or considered interesting).

In Algeria the main concerns were found in the analysis of road traffic accidents (data collection and statistics) and in the public transports inefficiencies.

Also for Tunisia road accidents rates were considered relevant. The following topics were proposed to be investigated: urban transport quality planning and management, infrastructures quality, monitoring on the impact of the new regulation on driving license.

The Moroccan partner underlined the similarities between the three countries on road accidents rates. The sub-areas proposed were:

- maritime transport, with focus on logistic;
- rail transports, with focus on infrastructures management and safety at rail crossings;
- road transport, with focus on safety and security in urban transport and planning.

These considerations clearly stated the importance of road safety in MPCs, being probably the central problem of the MPCs. This consideration is also supported by the road safety statistics which show higher levels of road accidents in the MPCs compared with the situation in France, Italy and Spain (see Table 2.1).

Especially the number of deaths per million of inhabitants in the MPCs is 1.6 to about 2 time higher than in Europe while the number of deaths per million of vehicles is 8 to 10 time higher than in Europe.
Table 2.1 - Comparison of road safety statistics between MPCs and Europe (2006)

<table>
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<th>Country</th>
<th>N° deaths per mln. inhabitants</th>
<th>N° deaths per mln. vehicles</th>
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<td>Algeria</td>
<td>113</td>
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<td>Morocco</td>
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<td>Italy</td>
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<td>Spain</td>
<td>94</td>
<td>160</td>
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</table>

The final definitions of the four sub-areas and the main aspects to be treated are:

**Sub-area 1: Road safety management aspects**
- Accident data collection and analysis
- Road safety management process

**Sub-area 2: Human factors in road safety**
- Road users education and training
- Enforcement

**Sub-area 3: ITS to improve transport safety and security**
- ITS for road safety enhancement (information and management systems)
- ITS for safety and security of ports operations

**Sub-area 4: Safety aspects of infrastructure design**
- Safety audit and safety inspection
- Rail crossing safety
- Maintenance
- Vulnerable road users

The sub-areas analysis has shown that the transport security issues in the MPCs are not considered relevant compared to the safety aspects. This is mainly due to a strong difficulty in collecting the necessary data (i.e. usually confidential) and in contacting the main stakeholders. The security issues are usually treated in a very closed way and interaction with research is difficult.

It also appeared the necessity to focus the attention, within the four sub-areas, on precise interesting topics, in order to avoid the risk to obtain too generic information from the surveys activities (WP2), not sufficiently detailed for defining correctly the future research roadmap (WP3).

In summary, the analysis phase has shown as the four sub-areas mainly relate with specific road safety aspects (e.g. data collection, management, infrastructure design, vulnerable road users, enforcement). The most interesting transport mode appears to be the road one, while other modes (i.e. maritime and rail) are concerned regarding to specific issues (e.g. port operations, ITS, rail crossings safety).

3 **Surveys**

For each sub-area, survey actions have been carried out in order to identify the specific needs of the region, to find the existing best practices, to identify viable technical solutions and the priority research actions to be undertaken.

The methodology defined in Work Package 1 was used to perform the survey activities on both the experiences carried out in Europe and those realised in the MPCs. The specific
needs have been investigated by means of desk analysis and interviews addressing to stakeholders, dealing with transport issues of the South Mediterranean Area.

Desk analysis provided a basis for the study and consultation of documents as well as basic information to characterise the situation in each country. A detailed quantitative analysis has been provided in the Deliverables 2.1 to 2.4. The analysis was performed at different levels (countries, sub-areas, groups of countries - EU and MPCs).

Interviewing process was a crucial source of data for the project. The interviews covered in all countries a selected list of stakeholder profiles (public administrations, universities, transport operators, etc.). The tool used for collecting the information in a homogeneous way was a common questionnaire, which has been used as a guideline for the interview. A total of 86 interviews has been realised in all the countries involved with the project covering quite all the stakeholders types identified. The emerging information from such interviews has been organised as “key points” in each country and analysed in common within the sub-areas to extract significant conclusions. A report on the interviewing process is provided in the Deliverables 2.1 to 2.4.

The information obtained from these analysis have been reported in “local integrated analysis” at country level. Information obtained at country level was also exploited in a complementary approach to the comparison at sub-area level (sub-area integrated analysis).

A complementary analysis was the systematic comparison between the different countries and groups of countries (i.e. EU and MCP) within each sub-area performed at “key point” level. It produced a clear picture of the relative positions of each country and the same approach between European countries and MPC ones. It is the basic tool to configure the recommendations for future research as well as for the knowledge transfer.

In the following paragraphs the key outcomes of the “local integrated analysis” and of the “sub-area integrated analysis” are reported.

### 3.1 Local integrated analysis

Information obtained at country level (from desk analysis and interviews) was exploited in order to realise a synthesis of each country situation, covering all the aspects of the transport safety and security analysed and following an approach leading to a small report named “Local Integrated Analysis”. This allows to have a complete image of the country situation.

The objective of the Local Integrated Analysis was to develop the analysis of each country. A group of items have been selected to develop it: legislation; plans and planning tools; education; training; accident registration; basic statistic ratios; general policy; research lines; specific measures and effects; enforcement; vulnerable road users; Infrastructures; professional drivers.

In the following paragraphs a synthesis of the situation of the countries analysed is presented.

#### 3.1.1 Algeria

Currently, the Algerian population is over 35 millions and it is expected to reach 53 millions by the year 2025. The Algerian road network is one of the largest road networks in Africa, its length is estimated at about 110.000 km of roads providing nearly 90% of trade volume.

The Algerian rail network does not exceed 4.200 km, with 200 stations. There is a trivial density of railway network comparing to land area. From 1990 to 1999, the volume of freight traffic by rail declined by 26%. For travelers, it is even worse: the decline was 63% over the same period.

The road transport is facilitated by the increase of car ownership and use of private cars. According to the National Office of Statistics (ONS), the fleet car has been estimated for 2008 to 5,6 millions of vehicles.
During the period from 2001 to 2006, the road accident have slightly decreased. This was a consequence of the setting up of a new regulatory (Law 16-04 relating with loss of license). Today, it is observed a certain relaxation in the system of license withdrawal especially outside the capital.

In term of cost, road accidents in Algeria are estimated annually at more than 40.000 accidents, 4.000 deaths and 60.000 injured. There are 3.000 disabled and more than 100 billion Dinars losses per year. However, the budget allocated to prevention remains low. In 2002 it was estimated at 0,4 million U.S. dollars (less than 0,03% of losses).

In general, the urban sprawl and the increased number of travels in interurban area have caused the increase of accidents. Indeed, the number of accidents rose in 2008: at national level 40.081 accidents are recorded, with 17.534 accidents in urban areas (43 %) and 22.947 accidents in rural areas (57 %).

The main measures aiming to promote road safety in Algeria were taken during the implementation of the Law No. 87-09 of 1987 concerning organization, safety and police traffic. The Law also concerns the control of roadworthiness of vehicles, driver training and the creation of the National Center for Road Safety. The impact expected by the Law No 87-09 was initially reached, since the number of accidents reduced from 34.300 in 1987 to 20.000 in 1994. The positive effects were temporary because from 1995 the situation worsened again and the number of accidents and casualties have steadily increased.

The problem is of behavioural nature, characterized by human carelessness and especially the failure of road traffic rules. This situation required the introduction of new measures aiming to change the behaviour of road users through education, training and prevention and to establish an efficient system of sanctions, adapted to the environmental conditions. This aspects were reached by the new Law No 01-14 of 2001.

The Law No 01-14 also provided for the compulsory introduction of teaching the road rules at school level. The objective is to prepare children to better face the road environment but, in fact, there are no applications until today. In parallel, the police have intensified the awareness campaigns in collaboration with road safety associations but given their occasional nature, their impacts are very limited.

Given the difficulties characterizing the driver training system (e.g. limited skills training in driving schools, inadequate program contents) and taking into account the conditions of exams for obtaining the driving license, the quality is poor and the novice drivers find difficulties in driving in real traffic conditions.

The data collection system on road accidents has many shortcomings including underreporting and reporting errors. In Algeria, by comparing data collected by police forces with those from hospital emergency, differences appear. Many accidents are still unreported and it is estimated that in urban areas only 76% of injuries are reported in the national statistics.

In addition, the actual figures could be much higher as fatalities are defined as victims died on impact place or during their transfer to the hospital while in most countries injured is followed during 30 days after the accident.

The policy against road unsafety is generally centralized at national level. The efforts are not sufficient due to the absence of an effective enforcement of rules and to insufficient human and financial resources. These shortcomings are a consequence of the absence of a national strategy and of a lack of coordination between stakeholders.

Accidents involving pedestrians in urban area constitute the most serious aspect of road safety. People involved are especially young, due to the lack of education programmes on road safety and of adequate urban planning for this category of users.

According to studies about the road accident causes, realised by the CNPSR, 5% of the accidents are due to road conditions. The statistics also show that the situation is more serious in rural area. Indeed, if the road network has evolved in the recent years, the overall accident rate on the entire country and particularly in rural areas has continued to grow.

In recent years, buses and trucks are more involved in rural area accidents. Indeed, the
professional drivers were involved in 20 to 25% of serious accidents. This is particularly due to non compliance with the road code, the vehicle conditions and the working conditions of these drivers (e.g. non-compliance with driving times and rest periods).

Furthermore, the increased number of road accidents has drawn some companies to rethink their strategies in the fight against road accident. Some companies have, for instance, launched awareness campaigns.

**Algeria: specific recommendations**

Despite the tangible positive results achieved in the fight against road unsafety in Algeria, the results are still insufficient. Road safety in Algeria is seen as a national priority, hence the importance of strengthening this option by setting up an integrated national strategy highlighting a coordination mechanism between various stakeholders.

The government continues to implement actions and some programs are being implemented concerning all aspects of road safety (e.g. training, qualification, strengthening compliance and enforcement of sanctions, supports concerning infrastructures and vehicles) but we believe that, for sake of efficiency, these actions should be integrated as part of an overall strategy with targets to be achieved. These targets must be reviewed and evaluated periodically. This new strategy should take into account the shortcomings in coordination because the issue of lack of coordination and definition of the prerogatives of each other is always a problem.

The first priority is to identify the body responsible for managing and monitoring the various road safety measures planned (which maybe the CNPSR or other inter-sectorial committees) but with powers and resources to perform its tasks.

In addition to actions already underway, the following aspects have special importance:

- continue all efforts to strengthen the system of controls and sanctions by the provision of adequate human, financial and technological means;
- improving the road network especially in respect to black spots and signals;
- develop infrastructure facilities according to requirements of different categories of vulnerable road users: disabled, pedestrians, cyclists;
- strengthen the control of imported vehicles in term of approval and homologation and fight against the importation and use of counterfeit spare parts;
- refine the data collection and recording on road accidents;
- creating accident databases to make comparisons possible (national and even international);
- encourage research in the field of transport safety and promote international cooperation.

Given the increasing use of private cars, also in order to reduce road accidents, it is necessary to encourage a modal shift towards public transport and to rationalize the use of private cars. For the non-urban travels, the rail transportation should be developed and completed by a system of high quality buses.

### 3.1.2 France

In France, the road safety policy is a subject of concern since 1893, the year when a ministerial circular defined a certificate obligatory to drive a vehicle. This certificate became the driving licence in 1922.

The Economic and Social Council published, in 1968, three fundamental recommendations:

- the necessity to fix a legal limit to the concentration of alcohol in the blood of drivers;
- the obligation to put the seat belt, including at the rear seats;
• a requirement to limit the speed of the vehicles.

In the early 70's, it became urgent for the authorities to react given the figures of road deaths, 16,445 in 1970 and an increase of 1,000 more deaths per year in subsequent years. A policy control and enforcement has begun to be implemented.

A major factor in those years has been the important media coverage of the measures. This had an impact on people. As a consequence of these actions, accidents and road deaths have decreased dramatically. We can note a regular decrease of the deaths between 1980 and 2000, these passed from 13,672 to 8,079.

Since the worse statistics of the 70's, road traffic deaths, injuries and accidents decreased over the years. At first glance, between 1987 and 2008, the number of deaths has been divided by nearly 2,21. Also, the number of injured has been divided by 2,45 and in the same time, the number of accidents has been divided by 2,22.

The actions taken by the authorities evolved over the time towards a step by step reinforcement of the legislation. The main target was the passengers cars. Legislation has been strengthened to fight against alcohol, push to the usage of seatbelts and speed limits. In order to make the laws effective, information campaigns (such operations started in the 70's) have been launched and their effect have been really influent.

From the organization point of view, the structure established involves various individuals and groups. The state services coordinate and supervise safety actions at national and local levels:

• The coordination of actions is guaranteed by the "Comité interministériel de la sécurité routière" and the "Délégué interministériel à la sécurité routière":

• For supervision and execution, there is:
  - The "Observatoire National interministériel de sécurité routière" which gathers the information from the ministries produces analyses and broadcasts the results.
  - The "Conseil national de la sécurité routière" launches studies, evaluates the efficiency of actions on road safety and emits recommendations to the ministers.

The above organisation is complemented by different structures within each involved ministry.

The application at local levels of the road safety policy is handled by the prefects, assisted by a project manager, a coordinator and departmental observatories for Road Safety. These observatories have in charge the management of the BAAC files (the gathering, correction of data, their exploitation and publication of results). There are regional observatories which structure the activity of the departmental ones.

Mayors of municipalities and presidents of groups of municipalities have the power to manage the road security within their municipalities (e.g. management of the traffic and parking, reinforcement of limitations of the road rules). They can also nominate a local elected personality who will be the "correspondent" with the prefecture. This correspondent establishes the road security situation, which will serve to specify the appropriated road safety actions; these must cope with the departmental road safety plan.

The organisation of the road safety involves also associations and socio-professional stakeholders, for instance, driving schools, companies, health establishments etc.

The education to the road risks, as driver of a vehicle or as pedestrian, starts at school. In the primary school, children learn the way to behave in the roads. This learning allows them gain the "certificate of first education to the road". The level 1 and level 2 "school certificate of road safety" are passed respectively during the first year of the college and during the final year. Also, several organisms, associations and holiday centres organize awareness days for the youths.
Accident data are collected by different unit forces: Police, “Gendarmerie”, CRS units, the border police (PAF). Each of these forces is involved in its own zone, draw up a report of all accidents on which it operates. These reports are called BAACs files.

The number of accidents, and their consequences, has been clearly reduced. The major cause of the fatalities remains the traffic of the passengers cars. The repartition of the fatalities differs also according to other considerations: the road network, the mean of transportation, the age, etc.

The road safety policy often returns to act on individual behaviours of road users (i.e. drivers, pedestrians, motorcyclists, etc.). The positive results of the recent years, that is the reduction of the road fatalities, show that there is political will and involvement of individuals.

For instance, people have accepted the speed cameras (they have a positive opinion on these) and have rejected alcohol while driving (the opinions are negative on the subject).

The context has been also appropriate from the technical point of view. For instance, it is now possible to analyse a driver's blood, directly on the road, to measure its concentration of alcohol or check whether there was drug use.

The main actions that have been adopted include:

- The augmentation of the infractions that are sanctioned. The sanctions are financial, can lead to lose its driving licence, and there could be a penal sanction.
- The strengthening of the fight against drunk driving. A particular effort has been made to fight against alcohol, preventive controls have thereby reached 8,9 millions tests in 2007 while they were 6,8 millions in 1998.
- The strengthening of the fight against speeding.

The reduction of the fatalities corresponds in fact to the reduction of the deaths that are due to the passengers cars (so in fact more is done for passengers cars). Thus, the evolution of the fatalities is not as "positive" for other categories of roads users.

The risks of fatal accidents are higher for moped riders and motorcyclists than they are for drivers of light or heavy vehicles. The risks have also augmented for the two first categories over the years. Actually, risks are 24 times more higher for the motorcyclists than for the light vehicles and consequently, if the motorcyclists represent just 1,1% of the road traffic, they represent 19% of the deaths (in 2008).

Pedestrians represent also an important proportion of the road fatalities. Considering the data according to the age of the people, one may see that older pedestrians pay a larger tribute than the rest of the pedestrians of the other ages. It appears thus that particular population (youths and aged persons) are more vulnerable.

The motorways are safer than the rest of the network. The departmental roads have the worst statistics in terms of deaths while most of the accidents occur in the local roads. Fixed obstacles (trees, poles) are an important factor of these accidents. The additional factor is the length of these roads that makes more difficult their surveillance and control.

There exist several procedures to control the infrastructure. Concerning the inspection of the routes, a new procedure that has been experienced on the field is now implemented. According to this procedure, the inspection is required by locals managers, is prepared by these with the assistance of inspectors. The first inspections using this procedure are scheduled in 2009, they will be realised every three years.

**France: specific recommendations**

Road safety, first considered from a technical point of view (e.g. development of passive and active systems), is now part of political and societal fields, at national and European levels. The actual context pushes to a new organization of transports, aimed at taking into account environment and energy, not firstly in term of economics. Road safety in this complex context requires thus a novel approach, a policy that is dedicated to it. Accordingly, at least there is three directions that can base such policy:
• Continue to improve safety of vehicles and infrastructure. The first aspect implies to maintain the efforts for the development of innovative systems; the second aspect requires redefining more safely the sharing of the road network among all its users. Take into account both points should help improve the protection of road users.

• Maintain effort on education to orient, guide the society, so that everyone contributes to the safety of all.

• Improve the cooperation of all stakeholders of road safety. A requirement here is to be able to evaluate the efficiency of the measures (i.e. consider feedback). It should be gained a better coordination of the efforts of the localities (in a context of a decentralized administration) and of the rules coming from the European administration.

3.1.3 Italy
The Italy has a total area of 301,230 kmq, of which 294,020 kmq is land and 7,210 kmq is water. At the end of 2008, the Italian population surpassed 60 millions. The Italian population living in cities with a density higher than 200 people per square kilometre is about equal to 42 millions, corresponding to about the 73% of the total population. The 70% of the people travels are concentrated in the urban and metropolitan areas.

Regarding to the national road network, in 2004 there were about 670,000 km of serviceable roads in Italy, including about 6,500 km of motorways, about 22,000 km of main national roads (i.e. highways), about 420 km of motorway ramps, 23,000 km of regional roads and 120,000 km of secondary roads (provincial roads). In 1999 the urban roads accounted for about 670,000 km.

The national railway network in 2004 totalled about 16,000 km of which 69% electrified. The quality of the rail infrastructure has enhanced in the last years due to the increase of the lines equipped with an automatic block system and a diminution of the rail crossings. The national inland waterways network comprised 1.477 km of navigable rivers and channels in 2002.

In 2004, about 34 millions of passenger cars (equal to 590 cars per 1,000 people) and 4 millions of road good vehicles circulated on the national road network. The number of buses in Italy was about equal to 93,000, while the number of motorcycles was about equal to 4,5 millions. The total number of vehicles circulating on the national roads was about equal to 44 millions, with a continuous growth from 1991 of about 26%.

A constant growth of the demand of mobility can be explained by the continuous increase of the number of private cars, while, for the freight transport sector, by the evolution of the economy and of the production systems. The increase of mobility on the Italian territory is the consequence of different social and economic phenomenon. Among these, the process of economic integration of the Europe, allowing the unlimited movement of people and goods, has significantly facilitated the people mobility.

Between 2000 and 2004 the public transport services increased of about 2% (in term of millions of passengers per km). Especially, the rail transport has decreased of about 0.6%, the urban public transport increased of about 5.7% and the extra-urban public transport decreased of about 0.3%.

The safety and security issue is common to all the transport modes, even if the dimensions are different due to differences in the technological levels of infrastructures, vehicles, control devices and the level of professionalism of the personnel.

For the transport modes more organised and technologically advanced (e.g. rail, maritime), the safety is highly related with the automatic, centralised and standardised controls. In the road transport, the safety is referred initially to the manufacturers and successively to the sensibility of the users. For this reason the number of accidents referred to the road transport are higher than the other modes.
Every day, in Italy, 633 road accidents occur, causing the death of 14 people and the wounding of 893 people. In 2007, 230,871 road accidents have been collected, which caused the death of 5,131 and the wounding of 325,850 people.

Compared with 2006, a decrease of the number of accident (-3%), injured (-2,1%) and deaths (-9,5%) is registered. The death rate (number of deaths per 100 accidents) in 2007 was equal to 2,2%, while the seriousness rate was equal to 1,6 death per 100 injured.

The road accident trend from 2000 to 2007 shows a decrease of the number of accidents equal to 10%, corresponding to a decrease of 9,5% of injured and 27,3% of deaths. In the same period the number of vehicles increased of 15,7%.

The main cause of accidents, according to the National Institute of Statistic (ISTAT), are the not correct driving behaviours (about 93%), the altered psychophysical status of the driver (3.1%), not correct pedestrian behaviours (3%) and the vehicle failures or defects (0,38%). Anyway, the data collection procedure does not allow to account correctly the accident causes. For instance the procedure does not allow to evaluate eventual infrastructural problems and underestimate the rate of accidents caused by altered psychophysical status of the drivers.

Concerning road accidents involving freight vehicles, in 2004 about 27,000 accidents involved them. The number of road accidents with freight vehicles increased from 9,8% in 1995 to 12,1% in 2004.

In the rail transport the number of accidents occurred in 2003 were 180 (77 deaths and 72 injured people) on the national railways and about 1,500 (14 deaths and 177 injured people) on the regional railways.

In the maritime transport, the accidents involving ships with gross tonnage higher than 100 tonnes, in 2003, were 80 (54 deaths and two injured people). From 1999 to 2003 there were 403 accidents with 84 deaths and 30 injured.

The safety of the transport modes can be compared analysing the number of deaths per the annual distance covered by the passengers with the mode (passengers-km). The Table 3.1 shows the passengers-km and the injured people per million of passengers-km for the different transport modes during the period from 1999 to 2003.

<table>
<thead>
<tr>
<th>Transport mode</th>
<th>Passengers-km</th>
<th>Deaths</th>
<th>Injured</th>
<th>Deaths per million of passengers-km</th>
<th>Injured per million of passengers-km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cars</td>
<td>3,530,252</td>
<td>20,913</td>
<td>1,057,425</td>
<td>5,92</td>
<td>299,53</td>
</tr>
<tr>
<td>Motorcycles</td>
<td>341,750</td>
<td>6,947</td>
<td>412,523</td>
<td>20,33</td>
<td>1,207,09</td>
</tr>
<tr>
<td>Rail</td>
<td>245,545</td>
<td>490</td>
<td>1,371</td>
<td>2,00</td>
<td>5,58</td>
</tr>
<tr>
<td>Buses</td>
<td>502,456</td>
<td>203</td>
<td>18,266</td>
<td>0,40</td>
<td>36,35</td>
</tr>
<tr>
<td>Maritime</td>
<td>17,300</td>
<td>84</td>
<td>30</td>
<td>4,86</td>
<td>1,73</td>
</tr>
<tr>
<td>Total</td>
<td>4,637,303</td>
<td>28,637</td>
<td>1,489,615</td>
<td>6,18</td>
<td>321,22</td>
</tr>
</tbody>
</table>

The main policy action undertaken in Italy for the transport safety and security is the National Plan for Road Safety (PNSS) for the period 2002-2011. Its main objective is the reduce the number of mortal road accident of 40% within 2010. The plan was elaborated basing on four documents of the European Commission and specifically the White Paper “European Transport Policy for 2010: Time to Decide”.

The most successful actions carried out in the last two years (even if a sound evaluation of the results of each action has been carried out only partially) can be identified as follows:

- Strong increase of the BAC controls. The number of controls has risen from some 300,000 in 2006, to some 1,200,000 in 2007, to some 1,500,000 in 2008.
Wide implementation of section control systems (so-called “Tutor” in Italy) on the motorway network. In about three years a total of 1,835 km of roads (26% of the road network) have been put under the control of such automatic tools (it is planned to achieve 2,500 km by the end of 2009). The results are encouraging: 50% reduction of the fatality rate in the first 12 months of operation on the controlled sections, with a 15% reduction of the average speed and a 25% reduction of the maximum speed.

More restrictive laws concerning driving under the effect of alcohol. Among others, also the seizure of car property in case of BAC > 1.5 g/l has been introduced.

Concerning the last point, further measures are under development by the Parliament. A zero limit should be introduced for young drivers.

It can be said that most of the improvement of the road safety situation in the last years in Italy has been due to enforcement measures (along with vehicle improvement), while, on the other hand, much more has to be done on infrastructure safety.

The lack of adequate resources (the investment on road safety per person in Italy is from two to ten time lower than in best performing European Countries) did not allow to reach an adequate infrastructure safety level. Moreover, a main source of problems is represented by the very high number of mopeds and motorcycles circulating on the Italian road network.

In the framework of the rail transport safety and security, the more recent policy action undertaken in Italy is the Legislative Decree n. 162 of 2007 implementing the European directives relating with the safety and the development of the Community’s railways. The maintaining and improvement of the safety of the national railway system should be realised through:

- adaptation and harmonisation of the national regulation structure with the community one;
- the progressive adoption of common safety objectives and methods;
- creation of a national body for the safety and of a investigative body for surveys on the accidents and rail problems;
- assignment of tasks and responsibilities the above mentioned bodies and sharing of the responsibilities.

Several urban road safety plans have been prepared, due to the fact that towns have to prepare a traffic urban plan which includes road safety considerations. Few news about the application of these plans and their contents are available.

The rail safety and security is regulated by a specific National Agency which perform the tasks foreseen in the European directive 2004/49/CE about safety and security on European Community railways. The agency aims to maintain the actual safety and security levels and promotes their constant improvement. The main operative tasks of the agency consist in:

- regulating the safety of the rail circulation;
- verifying the application of the laws adopted;
- promoting authorization and homologation procedures of systems, sub-systems and components;
- giving safety certificates to the rail companies and safety authorizations to the rail network managers.

Concerning the road safety education, regular obligatory courses in schools are not implemented in Italy, as well as no specific laws or rules about road safety education (e.g. courses, arguments, etc.) have been prepared to date. On the contrary several education courses are organised in the framework of specific projects (especially road safety project financed by the Italian Transport Ministry).
The training courses about road safety are not regulated and obligatory. The only obligatory training is the driving license course to be done the first time the license is asked for. The course consists in learning how to drive a vehicle and what are the rules (highway code). A periodic revision of the driving license (every 10 years) is also mandatory, even if it only consists in a medical verification of the drivers capacities. The road safety aspects are in most of the cases not well teach during these phases.

Concerning the training courses for professional drivers, some projects are implemented like the "heavy transport project". This project focuses on road safety related with heavy vehicles (goods transports) through a training course for professional drivers realised through a simulator. Moreover drive safety courses and seminaries on road risks are also offered.

The road accident data collected in Italy are mainly macroscopic and allow to provide a global vision of the phenomenon and a general description of the accident causes by mean of factors like the meteorological conditions, the type of infrastructure, the use of alcohol or drugs, etc.

At national level the statistics about the road accidents are provided annually by the National Statistical Office (ISTAT), which is responsible for the data input in the national road accident database. The accidents with injuries to people (dead or injured) are obligatory collected by the Police forces (Police, Carabinieri, Municipal Police). The data collected are standardized through a form (filled in on paper or electronically) which contains accident information such as type of road, weather condition, lighting, type of accident and so on. Once the form is completed, it is sent to the Provincial Capital Statistical Office and then to ISTAT.

Such kind of macroscopic data do not allow for a complete investigation of the accident causes and for understanding the interactions between road safety, users, vehicles and environment.

From 2003 the main aspects which contributed to improve the road safety in Italy, on which the national policy concentrated the attention, are:

- a more attentive and rigorous normative action;
- the increase of the number of controls against risky driving behaviours;
- starting a systematic process through the adoption of the national plan for road safety (PNSS), with the participation to its preparation of regions, provinces, cities;
- the creation in regional, provincial and municipal offices of a first network of technical structures for monitoring and management of the road safety;
- the creation of the General Direction of road safety within the Ministry of Transport and Infrastructures;
- a greater information and awareness about the road safety topics.

The policy is concentrated on increasing the enforcement of dangerous driving behaviours. The effects of the actions taken were rapid. For instance, in 2003, during the first six mounts of adoption of the point driving system a diminution of about 600 deaths was registered. In 2005 and 2006 the decrease of victims was more limited. The number of deaths and injured restarted to decrease rapidly due to further interventions of rationalisation and hardening the sanctions. For instance an effective action was the seizing of the vehicles when driving under the effect of alcohol with rates higher than 1.5 g/l.

Since the actuation of the PNSS in 2003, 2,600 intervention proposals for improving the road safety were undertaken and about 1,100 projects have been financed.

In the last five years the informative and awareness actions about road safety has been even more clear and direct. Such campaigns has been developed not only by public bodies but also by an increasing number of companies, associations and social parties.

One of the main weakness factor for transport safety is due to a traffic normative that can be largely improved and that should become organic. For instance, often the speed limits are not coherent with the traffic situations and with the infrastructure conditions.
Concerning the road infrastructures, a systematic monitoring of the network status, of the traffic flows and of the road safety (i.e. safety inspections) should be started in order to connect their results to the interventions programmes.

Concerning the rail safety, the main future policy action (already begun) regards the elimination of all the rail crossings in the national territory.

Regarding the vulnerable road users, Italy is the European country with the highest number of pedestrians and cyclist victims of road accidents. For this reason and due to the dangerousness of the urban networks, the vulnerable users are considered in Italy as the sector on which to operate with priority in the next years.

The future perspectives of the Italian policy will concentrate on:

- reforming the highway code in order to make the driving rules and the sanctioning system more homogeneous;
- making the rules requiring frequent updates (due to the technological evolutions and the European directive) no bounded by laws;
- updating the national plan for road safety and revising the implementation mechanisms in order to foster the adoption of strategic projects for improving the road safety;
- reinforcing the coordination offices about the road safety measures adopted in order to accelerate the process of implementation of the most effective solutions;
- realising a monitoring system of the interventions and of the results obtained;
- improving the level of road safety education in all the schools and to introduce the training courses for road safety.

The accidents involving vulnerable users represent a considerable social cost in Italy. In 2007, the number of accidents which involved pedestrians and cyclists were the 14% of the total (about 980 victims equal to the 19% of the total). Several obstacles make difficult the implementation of concrete and effective actions: lack of resources, incapacity of understanding completely the causes, few knowledge of effective countermeasures. Actually there are few specific guidelines supporting the decision makers in implementing an effective strategy in this field.

In the last ten years the number of pedestrians deaths decreased of some 25% while the cyclists deaths decreased of about 3%. Even if this reduction makes to think to an effective policy of intervention, the trend if the last ten years demonstrate a different situation. Especially the number of pedestrians and cyclists injured in road accidents is quite constant. This indicates that the phenomenon is not faced adequately.

Systematic actions to protect vulnerable users are not undertaken to date at national level. On the contrary, various projects have been realised and implemented in several cities. Such actions concern infrastructural changes (like cycles paths, pedestrian areas, etc.), protective devices (speed humps, dedicated traffic lights, etc.).

To date the safety verification of the road infrastructures (audit for new roads or inspection for the existing one) is not mandatory. Also during the maintenance operations a safety inspection is not performed systematically. As well as the verifications are not realised systematically, the results of the few examples of safety audit or inspection are not used in deciding the interventions to be make with priority.

Despite the few number of road safety verification, the Ministry of Transport and Infrastructures has edited in 2001 specific guidelines for road safety analysis of new and existing infrastructures. The guidelines provide the road safety standards to be followed.

The main way to define the dangerousness of a road is the black spot concept, related with the number and type of accidents occurred during a certain period on the road.

In April 2007 the European regulation n°561 of March 2006 about the social implications in the road transport field was adopted in Italy. This regulation updates the rules concerning the
driving and resting times of professional drivers of vehicles having a mass higher than 3.5 tonnes. The regulation is valid within the whole European Community and defines, for instance, the daily and weekly maximum driving time (respectively 9 hours and 56 hours), the duration of the rests (at least 45 minutes), the number of stops necessary (every 4.5 hours), the daily and weekly rests. The controls are realised basing on the chrono-tachigraphs (analogical or digital) of the drivers.

**Italy: specific recommendations**

The situation of transport safety and security in Italy is variable according to the transport mode considered.

While in the rail and maritime sector the safety and security aspects are well developed (very effective tools have been developed), the same is not true for the road sector.

Concerning road safety several areas can be improved. The data collection appears to be insufficient (the data are not fully reliable and not available soon) as well as the laws and guidelines. The data collection methods should be standardised between the various bodies charged for the collection. A coordination body should be created, having the possibility of giving rules and eventually sanctions. The data collection process should be computerised, so that to reduce delays and errors. Anyway these improvements depend on political willingness and financing, and could not be realised in short time.

Similar problems have been registered concerning the road safety management process, which appears to be not coordinated (as above a body charged for this, with decision powers, is missing). There are few guidelines and tools allowing an effective road safety management and the financing for road safety management is low. On the contrary, recently a new directorate for road safety has been created within the Ministry of Transport and Infrastructures, providing a step forward for improving road safety aspects.

In term of training and education of road users, in general the level is not considered sufficient. Especially the training for professionals (e.g. on road safety aspects) is done only on a voluntary basis. The road users (especially the young) don’t receive a specific education about road safety aspects or about risk awareness of road. The aim is to introduce the road safety education directly during the scholastic courses and to improve the periodic verifications. Despite these issues some good practices has been realised, especially in the framework of national research projects.

In term of enforcement, some important improvements has been realised in the last years (e.g. introduction of the point driving system, increase of number of controls, reduction of the alcohol tolerance, etc.). More improvements could further be obtained increasing the number of controls, enforcing more the use of specific devices like seatbelts and helmets. A clear regulation about enforcement should be introduced in order to specify the methods that can be adopted.

Concerning the ITS for transport safety and security, the main concern for all the transport modes is related with the diffusion of the existing systems (and by consequence with the high implementation costs) and with the awareness on the possibilities from the decision makers, public authorities and, in general, the stakeholders.

The vulnerable users protection is one of the main concern in Italy. The level of awareness about these topics has increased in the last years, anyway the vulnerable users are in general few protected. There are few guidelines relating with the improvement of vulnerable users road safety, while the laws are quite absent.

Concerning the transport infrastructures, some problems exist concerning the maintenance, mainly due to few financing and absence of a clear regulation at national level. The same issues exist concerning the safety verification of infrastructures which is quite not done. An enforcement for realising periodic verifications and maintenance should be introduced.
3.1.4 Morocco

Since its independence, Morocco granted a particular interest to the transport sector while working with the development of the infrastructures and preparation of laws and regulations. The transport sector in Morocco supported territorial and social cohesion and accompanied the development and promotion of the various sectors of the national economy. Fifty years after its independence, the realizations in this sector are considerable.

With independence, the “Ministère des Travaux Publics et des Communications” is created, and in 1977 the transport sector is set up as a Government Department. In 2002 the Departments of the Equipment and Transport are gathered, and the decree n° 2-06-472 fixing the missions and the organization of the Ministère de l’équipement et des Transports is published in the official bulletin in 2008, making official the fusion of the structures inherited from the Equipment and Transport Departments.

As regards to infrastructures of transport, the investments realized by Morocco made it possible to carry out a broad covered road network, a leader highway network in North Africa, modern railroads and a network of ports and airports extended to cover the totality of the territory of the Kingdom and to ensure a large opening onto the world, in particular onto Europe which is its principal trade partner. The recent studies and important investments carried out in urban environment (PDU for the large cities, reorganization of the urban networks, lines of tram, etc) show the willingness of the Kingdom to modernize the management and the exploitation of its urban transport sector. The activity of transport contributes today for approximately 6% of the GDP of the Kingdom. It employs nearly 10% of the urban working population and takes part at a rate of 35% in the national consumption of energy.

In order to develop an instrument of planning and management as regards to road safety, and to federate energies and efforts of the various stakeholders of the sector, the National Committee of Prevention of the Accidents of Circulation (CNPAC) has been created since July 15th, 1977, as a public utility company instituted by decree n° 2-72-275 of the 27 Rajab 1397.

Morocco has a powerful information system composed of several databases relating to the accidents, the vehicles and the drivers. For the case of the personal injuries of the road traffic, a national commission is made up of the representatives of the Gendarmerie Royale, Sûreté Nationale, Direction des Routes et de la Circulation Routière, Direction de la Sécurité des Transports Routiers, Direction des Transports Routiers, and of CNPAC. This national commission validates the statistics with a monthly frequency.

In order to reinforce the inheritance in this field, the Ministry for the Equipment and Transport plans to create a National Observatory of the Road safety having for missions of ensuring the data collection and management, the interpretation and the distribution of the various national and international statistics, to ensure the monitoring of the studies on the road insecurity, to evaluate the impact of the road safety measures taken or considered and to follow the behaviour of the road users through suitable indicators.

The car fleet in circulation on the Moroccan road network is evaluated in 2007 to 2.284.060 units. This fleet is composed of 72% of vehicles of tourism and 1% of motor cycles.

In spite of a big raise from one year to another, the vehicle ownership (about 74 vehicles for 1.000 inhabitants) remains very weak as compared to other countries, in particular the European countries and of North America. Especially the population in Morocco was equal to 30.841.000 inhabitants in 2007.

The Direction des Routes et de la Circulation Routière annually carries out road counting on a representative sample of the national road network. The mean daily traffic on an annual basis (TMJÀ), on the whole of the road network, was evaluated in 2007 to 59,7 million of vehicles kilometres per day.

The number of traffic accidents in 2007 was equal to 58.924, with 3.838 people died and 12.406 injured.
Globally, in spite of the aggravation of the road safety indicators in 2007, the strategy against the road unsafety is able to give good results, since the objective of stabilization of the numbers of killed is achieved. Indeed, this number in 2007, in spite of the recorded increase, remains lower than that recorded in 2003, year under review for the strategy. When one considers the period of implementation of the 1st Strategic Plan of Integrated Road Safety Emergency (PSIU), April 2004 to March 2007, compared with the same previous period, April 2001 to March 2004, one notes a light reduction in the number of killed, (-1,83%) while passing from 11.338 to 11.130 killed.

With category of users, an important fall of mortality in 2007 concerns especially the users of coaches and the pedestrians with a reduction respectively in 17,83% and 8,23%, which consolidates the efforts made in the field of sensitizing and control with regard to this category of road users. There is no improvement for the users of private cars (+4,45%) which remain the most implied category and which records the greatest number of the victims with 789 killed as well as for the motorcycles (+16,79%).

The main Moroccan policy consists in the Integrated National Strategy of Road Safety, spread out over 10 years, having two objectives:

- To reverse the upward trend of the annual number of killed and severely wounded persons.
- To reduce in a continuous and durable way the number of killed and severely wounded persons.

This strategy was adopted by the Government during the meeting of the Interdepartmental Committee of Road Safety of November 3, 2003. However and in front of the extent of the road insecurity in Morocco, and to stabilize the phenomenon and to activate the achievement of the objectives of the strategy, an Integrated Strategic Plan of Emergency (PSIU I), spread out over three years 2004-2006, was prepared and implemented as from April 2004, with the objective to reverse the above mentioned tendency quickly. This plan which draws its bases in the above mentioned strategy articulates around seven strategic axes comprising each realizable concrete action in the short term and immediate added value.

Conscious of the importance of the communication for the implementation of the strategy of the Government in the field of the road safety, the National Committee of Prevention of the Accidents of Circulation prepared a plan of total communication multidimensional, accompanying the PSIU II 2008-2010, being articulated around the following strategic axes:

- To sensitize the road users through two types of actions: targeted aiming at well defined categories and sets of themes treating the recurring factors and worsening traffic accidents.
- To educate the young road users, in particular the children at school and extra-school activities, and to take care of the generalization of spaces of road education to all the areas of the Kingdom.
- To popularize the new texts of law and regulation in bond with the road safety.
- To develop the efforts provided by the various speakers and To imply more other actors of the civil company in the fight against the road insecurity.
- To develop the expertise in the field of the road safety through targeted scientific studies and the technical council with the profit of the actors concerned at the national and regional level.

The CNPAC took actions of communication and education during period PSIU and PSIU II through various medias.

The training axis of the PSIU pays a detailed attention at the following points:

- automation of the theoretical examination system;
• equipment of the centres of registration with audio-visual material for the theoretical examination;
• automated theoretical examination since the posting and the reading of the questions until the correction of the answers and the advertisement of the results;
• levelling of the examination practises;
• construction of training track;
• introduction of the system of points driving licence;
• attribution of the title of professional driver on the basis of law n° the 52-05;
• attribution of the title of professional driver conditioned by obtaining, in addition to the driving licence, of a certificate of professional capacity;
• certificate of professional capacity issued by the proper authority with the applicant having followed a formation of initial qualification sanctioned by a certificate and after having undergone successfully an examination of professional capacity.

Morocco has a powerful information system composed of several data bases relating to the accidents, the vehicles, the drivers. These databases are updated regularly and offer a very important potential of information. For the case of the personal injuries of the road traffic, a national commission validates the provisional statistics of each month and the final statistics of each year. Studies are also carried out by the various actors and come to reinforce the inheritance in this field.

Although these data are rich and varied, they remain insufficient to follow in an objective way the evolution of the road safety in Morocco. Indeed, the road safety cannot be apprehended only on the quantitative level. It needs to be qualitatively approximate to give to the statistical figures their true value. Thus, the follow-up of the behaviour of the road users via targeted and quite selected indicators remains also a major element in the explanation of the tendencies of the Road safety. Then, the Ministry for the Equipment and Transport considers the possibility to create a National Observatory of the Road Safety.

Road control is carried out in Morocco by three Bodies of Control raising respectively of the Royal Gendarmerie which operates in open country, Directorate-General of National Safety which operates in urban environment and of the road controllers who belong to the Ministry for the Equipment and Transport for the control of the freight vehicles public travellers and goods and take care of the respect of the regulation relating to transport. They are charged to note the infractions and to charge the contraveners with the laws and the payments governing transport and the provisions contained in the highway code.

The three bodies elaborated, within the framework of the implementation of the PSIU, a National Plan of Control (PNC) which objective is to contribute to achieve the goal laid down for the PSIU, namely “To achieve a continuous decreasing tendency of the annual number of killed and severely wounded persons”. Within this framework, it was decided to continue the effort of modernization of control by considering certain measurements, in particular:

• reinforcement of manpower and competences of the agents of control;
• modernization of the tools and methods of control;
• introduction of the control of driving under the influence of alcohol.
• continuation of the levelling of the Technical Centres of Visit (CVT).

The first victims of the road accidents in Morocco are the vulnerable road users (pedestrians and two wheels users) who remain the most touched category, recording more half of killed. In 2008, these two categories accounted for 53,15% of killed. In urban environment this proportion reaches more than 79%. In the light of these results, it arises that the situation of the vulnerable users requires many efforts and that until today all the efforts which were authorized do not manage to improve their safety. The causes behind this report are multiple:
• carelessness of the pedestrians who often walk near the roadway, even on the roadway;
• practised speeds and which are high in places very attended by the pedestrians;
• absence of reserved way for the two wheels;
• lack of specific installations to protect the pedestrians in urban environment, in particular at the most neuralgic places of the cities;
• lack of the use of the safety equipments by the users of the two wheels (e.g. total absence of the helmet use).

Morocco: specific recommendations
The improvement of the quality of the road infrastructure is one of the main objectives of the Moroccan strategy. In open country, in 2008, 113.7 million Dirham was allocated to ensure 90 adjustments of safety. The MET also launched in 2005 the second construction schedule of roads rural during the period 2005-2015 for the realization of 15.000 km roads at a total cost of 10 billion Dirham.

In urban environment, the situation is disparate from one city to another taking into account the multitude of the stakeholders. The communal charter fixes and specifies attributions and competences of the local communities which have the responsibility for the creation and the management of the communal public services. This makes that certain cities lay out of more than financial means and human ones and are more committed than others in the improvement of the local road safety.

The road controllers who raise of the MET and who ensure a control of the professionals of transport focus on the control of the freight vehicles of goods and travellers, in particular with regard to the respect of the regulation of transport, the fight against the excess of travellers and the technical overload. In order to ensure the implementation of the PNC, important means were mobilized: 419 radars of last generation portables and embarked on fixed vehicles, 150 radars for the automatic check speed, construction of 3 stations of automatic weighing on the level of the poles transmitting overload and 4 others are in the course of construction.

3.1.5 Spain
Remote references on traffic regulation and related road safety aspects comes from 1778 where the word “safety” appear for the first time in the Law. In 1897 the administrative conditions for a Vehicle circulation have been established. Other disperse legislation were launched in 1900, 1918, 1926 and 1928, but the first complete circulation code was issued in 1934 including Road Safety as mandatory subject in schools (in fact this obligation will not be really effective until 1970). Modern code is from 1990, updated each year from 2003 till now. Road Safety actions started in Spain in parallel with the first motor vehicles at the beginning of 20th Century (first car plate in 1900 in Palma de Mallorca). In these initial steps, the Automobile Clubs play a crucial role in a sort of self-regulation. Those Clubs were founded to improve the use of automobiles and to help drivers with problems on road.

During 20th century the number of cars and licences grew very fast, roads become crowded and cars were faster and faster. However, the drivers training, the road infrastructure and the consciousness of the road safety responsibility from drivers have not grown at the same rate. Number of accidents and fatalities grew very fast in this time. In early 60’s, there was 1 million vehicles in Spain (now more than 31 million). In addition to enforcement measures educational aspects has also been introduced as well as different campaigns dealing with alcohol, speed and self protection measures. A long term effect is now achieved with young drivers who are really change the view of the act of driving in comparison with the previous generation. Now, the dangerous driving behaviour definitively are not socially accepted. Training has also change a lot in both private and professional drivers and has been
harmonised with the EU countries. Now people is much more concerned with all self protection measures and have much more prudent driving behaviour.

As a summary, we could say that people is moving from an initial belief that driving was a private act to understand that driving is really a public act.

Key data of Spain (referring to 2007) show about 32 million vehicles circulating with 24.7 million of drivers and 166,000 km of roads.

In 2007, there were 100,508 road accidents with victims in Spain. In those accidents, there were 3,823 fatalities and 142,521 injuries, and 19,295 of them were seriously injured. The death rate for the accidents is about equal to 3.8 fatalities per 100 accidents with victims.

About evolution in time of the accidents, in seven consecutive years, the number of fatalities has decreased by 34% which represents 1,953 fatalities less than in 2000. In 2006, a new data collection system was established in Spain using new technologies, which has increased data base with lighter accidents. Infrastructure improvement (design, maintenance) has also been developed in parallel with these actions, contributing to reduce accidents.

Policy of DGT in the recent past is focussed on fatalities reduction as quantitative target. Tools are oriented to this key aim. Strategic plans are the basic tool since they include a set of multidisciplinary actions covering all aspects of road safety problem and a time frame to reach them as well as control and follow up tools. The main action axes are: speed control, alcohol and drugs control and self protection measures.

At the end of 2004, DGT created the National Observatory for Road Safety to centralize the expertise on road safety. Some of the competences are: proposing, supporting and evaluating road safety policies, follow-up and analysis of statistics on accidents, undertaking research and development activities, promoting road safety congresses and seminars, international relationships with similar foreign institutions and providing support to other national or local institutions and agencies devoted to the promotion of road safety.

It is also important to mention the radical change happened in the infrastructure from 1982 with the new freeway plan from the Government. This plan moved Spain from a relatively poor situation in road infrastructure to become now the country with the most extensive high capacity network in Europe, free of charge. It has also been invested a lot in the maintenance and improvement of the existing road network with a clear improvement in road safety. Besides systematic approach in the roads projects (both new ones and improvement & maintenance of existing roads) are subject to safety audits & inspections now. Road safety criteria is included in the design.

Lessons learned are focussed on the important effect of enforcement at short term and the necessary actions in education and training to make enforcement much more effective adding in mid–long term the effects. Other lesson is how important is to adapt the actions to the real problems in order to increase the social acceptability of the actions taken. The situation today is the result of the long term effects from the plans implemented years ago. The behaviour change is a reality and makes much more effective (due to social acceptability) the advanced strategies taken today. The reduction of fatalities is much more difficult once all factors are closer to the optimum. Finally, co-ordination actions with all stakeholders have demonstrated very effective in the strategic plans.

Policy for the future is to go depth in the combined strategy implemented by now, being more selective and refining certain actions as well as improving the evaluation of the plans already implemented and the improvement of the co-ordination among all stakeholders, looking for the new possibilities from the ITS technology in vehicles and in the I2V and V2V exchange of information. The “Swedish model” is the framework “road map” for the future.

As a summary we can say that the effects on road safety basic parameters has been very important when a quantitative strategy is adopted (with target in fatalities reduction), a consequent strong enforcement measures are applied and when infrastructure is improved, all under the continuous improvement of training and education framework. Short and long term effects are here combined to produce good results.
Today in Spain the road safety education is mandatory in the subject “Education for the citizenship”. This cover the secondary education. In addition, the schools are strongly encouraged to include this subject as optional or in the extra scholar activities in all levels, supporting these actions from the Local and Regional Authorities offering to schools the programmes, material and teachers (from Local Police, among other). An important effort is done by the Administrations to study the best way to influence young people with this matter with the support of the victims associations, among other. In such way specific material is produced and effects controlled to improve and modify the approach if required. Courses specific for drivers who lose the points and other focussed on elderly drivers has also been regulated and implemented. Coordination with all stakeholders is crucial in this important task which effects are medium–long term.

The mission statement of the Plan is to achieve a better road user conduct and more responsible, civic and safe driving habits with two focal points:

- Increase road safety training for all road users, with special emphasis on road safety education in the school-aged population with the goal of promoting safer road habits. Also, improve drivers' abilities through better training.
- Improve the procedures for obtaining and renewing the administrative authorizations required to drive the various vehicle type.

Training for new drivers is now harmonised with EU countries. The exams can be improved but this is not a key factor, in the present situation, for the road safety. An additional aspect is emerging in Spain from the last years: The immigration is introducing an important group of new drivers with different skills and with less level of training which is producing an additional risk in our roads. Co-validation of driving licenses criteria has to reviewed for certain countries. Professional continuous training is also a key point to organise within the sector as well as other regulation concerning retirement age. All are under discussion according to the adaptation of Spanish Legislation to EU Directives in this matter.

The Royal Decree 339/1990 which approved the consolidated text of the Law of Traffic, Motor Vehicle Use, and Liability Insurance established that DGT was the organization which coordinates statistics and traffic accident investigations. DGT prepares the accidents statistics helped by General Direction of Civil Guard (national police force), Autonomic and Local Police. The Ministerial Order of 18th February of 1993, establishes the process to follow about data collection, definitions of traffic accidents depending on level of seriousness (fatal, with victims, etc.) and definitions of injury level (fatalities, seriously injured and light injured). This Order establishes statistic questionnaires to complete. It exists two types of questionnaire: accident with victims and accident with material damage.

DGT has introduced a new way of data collection to use by Civil Guard. It involves using a web questionnaire directly inside of accidents data base. The next step will be implementing this way at the rest of polices. Catalonian and Basque autonomic police sends accidents data through magnetic and optical way.

Since 2002, DGT boosts the ARENA project, a new information system of accidents, with a easier process and integrating all ways of data collection of traffic accident.

General Policy in Spain has been reviewed and a new strategy has been issued from 2004. Main actions have developed in the field of legislation and enforcement, as well as using planning tools with committed quantitative results (reduction of fatalities). They have been: Points driving license, much more speed control radars, the introduction of penal code for some strong violations, special enforcement on red light (urban level) and self protection measures as well as alcohol and other drugs. The environment has to be kept or improved (technical control on vehicles, infrastructure design and maintenance, driving license exams, etc…) to guarantee the success of new measures. Other technological actions have been done like VMS, information systems via radio, SMS, etc… and publicity campaigns to fix the ideas on citizens and remind that all of the issues concerning road safety must be live in our minds, to become really safe users of the road system.
Finally, we have to mention the necessary harmonisation between mobility policies and road safety policy. Sometimes, especially in urban areas, this is a critical issue due to some design problems and interferences with road safety criteria. Furthermore, education and training strategies have also been harmonised between two aspects in order to give a consistent message. In this case the co-ordination among different Administrations and Stakeholders, again, emerges as a key issue to guarantee the success of plans (i.e. between Local and Regional or National Administrations).

Concerning the enforcement measure, application of law is rigorous now in the road safety actions. Quick trials are important tool to enforce the penalties since perception of the Law effect is higher when the response from the Administration is faster. Some legal restrictions make difficult to apply other control systems like speed control in a road section (using a plate reading technology). In other cases the restrictions are technological like in the case of drugs control due to the difficult to use easy test to evaluate if a driver has consumed a certain drug.

Different actions have been taken for vulnerable users in both environments: urban and interurban. Besides the self protection measures control, specific action have been taken like the adaptation of infrastructure to motorbikers (specific protection in sensitive areas). This is an example from a general approach based on modifying the infrastructure in the way to make it less aggressive. In urban areas things are more difficult but traffic calming measures combined with restricted platforms for bikers are the most relevant action combined with other urban design measures as well as traffic lights regulations (minimum green time and distances, etc..) in order to protect all users. The impacts in some cases are quantified, like with the motorbikers when the accidents has been reduced as well as fatalities, although the number of this kind of vehicles has been incremented a lot.

The percentage of motorcycle riders and passengers who died because they were not wearing crash helmet in roads has decreased by 10% in 2003 to 7% en 2007. Studies show that the percentage of the use of crash helmet by motorcycle riders is 99%.

The percentage of moped riders and passengers who died because they were not wearing the crash helmet in roads has decreased by 49% in 2003 to 29% in 2007. Studies show that the percentage of the use of crash helmet by moped riders in roads is 94%.

The number of motorcycles has increased in Spain by more than three times as compared with cars. From 2003 and 2007 motorcycles have increased by 53% whereas cars have increased by 16% - figures speak for themselves.

According to recent studies, the risk to die in a motorcycle road traffic accident is 17 times higher than in a car traffic accident. Although the total number of fatalities in road traffic accidents has decreased by 31% in Spain, the number of fatalities in motorcycle traffic accidents has increased by 77%. The summer of 2007 was of special concern because motorcycle fatalities increased by 53%. The problem is not only ours, it also affects all Europe, where one out of four fatalities in road traffic accidents were in motorcycles.

We have admitted that road design was made according to the vehicle and, in an environment with more and more motorcycles we should rethink road design in order to tailor it to the new reality. Measures such as double white lines, a wider lane, bus lane for motorcycles, etc. This is a challenge for engineers. We value that automobile industry has evolved and it has gone from selling power to selling safety; motorcycle industry was still in the power, it had not taken a step forward as society was demanding. ABS, airbags, side protection, three wheels, etc. This is a challenge for manufacturers.

Therefore, in the course of 2007, the Government, counting on the active participation of the sector's main actors (manufacturers, dealers, insurers, local administrations, user associations, etc.) has been preparing the Strategic Road Safety Plan for mopeds and motorcycles. The preparation of the Plan has been an excellent experience regarding the coordination between all actors, and it allows counting on a consensus-based framework of measures and actions specifically designed to reduce the accident rates of motorcycles and mopeds.
Concerning the infrastructure actions has been focussed on: (1) To implement safety audits for new road projects, according to EU recommendations; (2) to carry out safety inspections in all existing roads in order to evaluate the safety situation and include it as a criterion to plan maintenance and improvement works; (3) The use of black spots as a criterion of priority in maintenance actions; (4) the use of an accident analysis to characterise the road safety in addition to quantitative approach of the black spots; (5) to indicate explicitly the black spots in the road with informative panels in order to warn drivers that they are in a dangerous area.

Concerning the professional drivers the number of deaths is high in Spain in comparison with other risk jobs. When a professional driver is involved in an accident the treatment of the accident is the same than in other cases. Then is not easy to evaluate other remote causes like labour conditions, etc… Specific studies show that some specific illness affecting professional drivers are related to their labour conditions and recommend to advance retirement age. Control is some difficult in some cases, although there is a specific regulation (now adapted to EU Directives). The structure of the sector, the work conditions and the different criteria applying the control for different vehicles and services makes difficult to improve the safety in this sector.

Spain: specific recommendations

Road safety is defined as a priority in the Spanish Constitution. Legal scenario is complex since different Administrations (Local, Regional, Provincial, National) have competence in the matter. However, the real capability (technical, financial, etc…) from these Administrations is very different both: Within the same level and between levels. In addition to it, urban and interurban environments have different demands.

The most important Administrations has developed tools with the target of reducing fatalities and implement different measures in the fields of enforcement and education & training, including support campaigns. Results of these actions have been very positive with a new social view and acceptance of the new scenario as well as the change in drivers behaviour. Stakeholders are now better organised and the involvement of them is growing. Specific structures have been created to ensure their participation.

Technology has also been widely applied to provide information to drivers and to improve in vehicle safety systems. Infrastructure has also been considered from the point of view of road safety and specific design tools and maintenance criteria have been established. Improvement in making it as soft as possible to avoid secondary effects in accidents is an important aim in any plan.

Attention has also been paid to vulnerable users by groups of risk with variable intensity depending on the possibilities of the Administration responsible, but a definitive integration of the reasonable demands from these groups has progressively incorporated in the strategic plans and subsequent actions. Bikers and motorbikers have relevant groups and the promotion of this vehicles as part of the global mobility strategies makes them crucial to make compatible the mobility guidelines with the necessary road safety measures to ensure the compatibility between both strategies. In the same way other vulnerable users has been taken into account like disabled, elderly or children. Other groups have also targets in the accident reduction like professional drivers.

Future trends are focused on: (1) Continue and going depth in the enforcement measures applying new technology to allow the effective prosecution of the law violation, specially ones involving fatalities; (2) improving co-ordination measures among Administrations in order to improve the road safety in all networks with common criteria as far as possible; (3) improving tools to have better information in order to make easy the work of different agents working with accident data; (4) improving the action tools and evaluation systems of the actions taken; (5) improving the ITS systems to provide valid tools to drivers and road operators to improve road safety; (6) Survey the social sensitiveness concerning road safety and take the opportune actions in the education and training field as well as the informative campaigns; (7) increase the involvement of the stakeholders in the road safety policy making and in the implementation as relevant agents which can contribute with ideas from their knowledge and
direct experience and actions to improve road safety; (8) continue increasing the resources and the plans to make sure the quality of the infrastructure and the protection of the vulnerable users and (9) to make compatible the road safety measures with the new trends and demands from the mobility strategies (promotion of public transport and non motorised modes, like bikes, protection of pedestrians, etc...).

3.1.6 Tunisia

Key socio-economic data for Tunis are: population: 99.910.872; surface: 164.000 kmq. The country is organised in 6 regions and 24 Provinces. Road network has been evolved a lot from the 90’s when the quality was generally poor due to a narrow roads (less than 5 meters), bad state in the pavement with low maintenance, etc. The Government decided to define a specific network (3.000 Km) for immediate actions.

Today the strategic network, defined before, has a total length of 19.371.173 km where more than 75% are equipped with rigid pavement. The local networks are in process of restoration and improvement with a total affection of round 4.000 Km.

Road network is a key transport element in Tunisian mobility, since 80% of the goods transport is by road and close to 100% of the passengers demand.

The total number of vehicles in Tunisia (data of year 2006) is round 1.205.000 vehicles where private vehicles are 58%. The growing rate of the number of vehicles is 6% per year. The number of driving licenses is growing by a rate of 4,7 per year.

A relevant data from the point of view of the road safety is the variety in the types of vehicles using the road network. In Tunis the industrial vehicles (just different types of trucks) is round 41.000 and there is also a big number or vans (270.000).

Concerning the road accidents the situation is not good since the number of accidents has not decreased. The campaigns to make people more sensitive to this problem has not succeed.

Figures are very relevant, specially taking into account the population. Each year the number of accidents are round 11.000, with 15.000 injured and 1500 death. It means 4 fatalities per day and more than 30 accidents with injured people, in the average. The cost of this situation is 180 millions of Dinar per year, without taking into account indirect cost. Accident data is provided by the Police and include only accidents with injured people.

The distribution of accidents between urban and interurban environments is 60 / 40%, but in terms of fatalities 66% of the total dead are produced in interurban areas.

The distribution of the interurban accidents among different types of roads are not homogeneous. National roads concentrates close to 40% of accidents and 53% of the fatalities. Regional and local roads are similar in terms of fatalities and accidents distribution.

Concentration of accidents in main roads are due to the traffic concentration as well as the bad condition of the pavement (including irregularities in width and shoulder) and the above mentioned diversity of vehicles going together in the same road. Alignments and general road conception (very old) are critical factors. Finally speed are so high taking into account the traffic and infrastructure conditions.

Once the accident is produced, the quality of emergency service is poor in terms of response time. A lot of injured dead in the place or going to the hospital.

In addition to the other factors, mentioned above, the human factor is also important: Distraction and inadequate speed are principal causes.

Furthermore, an statistic analysis of available data show that the number of accidents are related to traffic, the road section dimensions, population of the zone, the number of driving licenses in the zone as well as the number of registered vehicles.

As a conclusion of this part concerning accidents we could say that, although the bad figures, Tunisians are understanding the magnitude of the problem and started to change their behaviour when they drive a vehicle. This has been reported as a reduction of the number of
fatalities in the last recent years. But reductions are not enough and a stronger measures are required.

Such measure are oriented to the vehicles and the drivers as well as the infrastructure. Concerning the vehicles to stimulate the good maintenance, concerning the driving behaviour the actions will be focussed on the target groups of highest risk (drivers between 20 and 40 years old) and for the infrastructure to improve the network conditions specially in ones with poor standards.

The development of a road safety strategy needs for the strong prevention policy, oriented to changing drivers behaviour. This is a long term strategy, but absolutely needed. The idea is to combine education measure with enforcement keeping the pressure as constant as possible to make such strategy credible within the drivers and also to young people and the rest of population. Coordination actions among different Administration and other stakeholders are considered essential.

In the framework of the road safety there is an specific risk factor in Tunis related to hazardous goods, specially hydrocarbons and other oil derivatives. This risk is actually controlled by a set of measures concerning this transport. The most relevant issues concerning this point are:

- The fuel distribution system is mainly carried out by road. Routes are flexible according to demand.
- The risk factors identified are: (1) human aspects with 96% of incidence, major part due to driver, but in other cases —up to 25%— due to pedestrians, (2) the vehicle is 3% influence and, (3) the road environment just 0.5%.
- Within human factor the following aspects has to be taken into account: The reduction of psychological capacities (drivers so tired, alcohol, distractions, etc.); the speed and other risky behaviour, the lack of respect to the regulations (basically the priority in the intersections and the mandatory resting time), the vehicle.
- The infrastructure contributes sometimes to the accidents, in particular due to: bad signing, traffic control in the intersections, slipping surfaces, dangerous curves (small radius, not transition, etc.).
- Concerning regulations, the fuel transport is following the European ADR standards and it is complemented by a specific national regulation.
- Technical control of vehicles is also a key point and scheduled controls are established.
- Concerning the drivers there is a strict regulation for recruitment and training stages, before the drivers take the responsibility of a truck with hazardous goods.
- There is a specific protocol for the safety in the fuels transport, including a sort of “check list” of different points to be carefully checked before departing (e.g. documents on board, check the critical points of the vehicle, check that drivers has rest for at least 8 hours, emergency procedures according to goods, etc.) and during the transport (e.g. no smoking, no alcohol, respect the technical limits of the truck, etc.).

**Tunisia: specific recommendations**

As conclusion and guidelines for the future:

- Concerning the driver, distractions are the key issue to be attended, since is the direct cause of one third of the accidents. Actions in training are fundamental as well as continuous monitoring of the accident causes with good information to understand the causes of the accidents.
Concerning the infrastructure the improvement of the signs and the information to the drivers (by means of ITS systems, for instance) are actions which contribute to reduce the accidents.

Concerning the vehicle, the technical regulations for periodic inspections is an action line to go depth reinforcing the present system.

The better knowledge of the accidents and the political commitment to co-ordinate all services of the State and the stakeholders is the way for a good prevention policy which must be established with different time horizons covering the measures for short, medium and long term.

For the short and medium term, the policy has to based on actions leading the drivers and the civil society to be more sensitive to the problem as well as to the different stakeholders by means, among other, by seminars and mass media campaigns.

For the long term to improve the road conditions in all aspects (safety audits, inspections, etc.) and, in particular, to include the ITS systems, encouraging the research in this sector.

The following conclusions can then be depicted:

- The transport of hazardous goods, and specially the fuels, are a risk for the people and for the environment.

- Tunisia has taken all the strict measures to reduce this risk, by means of the obligation to the companies involved in this transport to comply strictly with this regulations.

- As a consequence, the number of accidents involving this kind of vehicles are very small (in the recent years only one serious accident has happen, without victims).

### 3.2 Sub-area integrated analysis

Specific analyses at sub-area level have been carried out covering three main aspects:

- Extraction of Key Points (most important aspects within each sub-area) and preparation of Key Points sheets.

- Quantitative analysis based on the level of coincidence of the Key Points in the different countries at sub-area level.

- Qualitative analysis, as a sub-area diagnosis, oriented to compare the situation in the different countries and the EU and MPC groups, leading to identify:
  - commonalities and differences;
  - harmonisation with EU view of the problem;
  - opportunities for transferability;
  - research;
  - SWOT analysis;
  - common approach for future development of actions in transport safety and security.

A total of 22 Key Points (see Table 3.1) has been defined and studied.
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Finally, a diagnosis has been developed for each sub-area, including:

- Extraction of conclusions from commonalities and differences.
- Analysis of the opportunities for transferability of knowledge, based on the previous analysis as well as in the information from the “Local Integrated Analysis”.
- Analysis of the convergence process with EU policy.
- Horizontal SWOT (strengths, weaknesses, opportunities threats), including the EU and MCP separately and comparing them.
- Proposed future actions.

In the following paragraphs a synthesis of the results of the sub-area diagnosis, including commonalities and differences between the countries involved with the project, is presented.

### 3.2.1 Sub-area 1

The main commonalities and differences between European and Maghreb countries concerning the road safety management aspects are:

- **Data collection**
  - **Accident data availability.** The problem is common, with different degrees, in European and Maghreb countries. If in the Maghreb, information may not exist because it is not produced, in Europe information is not available to users for others reasons such as lack of information from insurance companies or from hospitals because of confidentiality issues. Another aspect common to all countries is the delay in obtaining information on accidents.
  - **Quality of information.** If information quality is better in Europe, there is a significant weakness in this field in Maghreb. The common point in the Maghreb countries is the need of computerization to systematize information and standardize the process of accident data recording. This should solve the problem of uniformity of information, under-reporting, lack of detail on accidents, etc. Finally, in different proportions, all countries have a common problem related with the coordination between different stakeholders. This problem has an impact on the quality of information and it is amplified in Maghreb countries.

- **Analysis of accident causes.** Analysis of accident causes depends on the quality of information available. In all countries there is obviously a need for analysis of accidents, which level of detail evolves over time. The analysis process is relatively better controlled in Europe. For MPCs, the need becomes more vital because of the unavailability of the same information and their quality problem. This issue was also confirmed during the exchanges in workshops (Batna, Rabat and Sousse) and accident analysis should be, according to stakeholders, realised and developed by scientists and experts through the use of dedicated models.

- **Labor audit in situ for accidents involving professional drivers.** It appears that the accidents involving professional drivers are not studied in suitable manner. There is not also a specific criteria for this type of accident. This problem seems common to all countries and it must be supported mainly through the analysis of working conditions and their effect on accidents.

- **Road Safety Management Process.**

- **Road safety management.** The investigations show clearly the problem of lack of coordination in all the countries. In Europe, the needs are related with investment and additional financial resources to support public transport. Besides this, there is always a need for more discipline on the roads and a better system for transport management. Regarding MPCs, there is a set of
common points: i) different tools (legislation, institutions dedicated, etc.) exist but there is a need to update and modernize them taking into account the constraints and the economic and social development in these countries; ii) on another level, there is a gap between regulations and practice; iii) the surveys highlight the fact that the funds allocated can be further optimized.

- **Stakeholders involvement in road management strategies.** There is an overall consensus on the significant deficiency concerning the involvement of stakeholders in road management strategies. All countries report that there are significant gaps in communication, organization and consultation system. If there are exchanges between a few actors selected, there is no systematic consultation with all stakeholders. However, in Spain things seem to evolve better as the strategic plan for 2009-2015 proposes to improve this aspect.

- **Road safety management plans and implementation tools.** Regarding plans and tools for managing road safety, the results show that in Northern Countries the situation can be further improved. Anyway, there is a lack of coordination. The difficulty is mainly related with many prerogatives from various jurisdictions. There are also financial problems. Funds remain inadequate and they do not allow to realise the planning process adequately. In the case of Spain, there is a lack in evaluating the effectiveness of actions. In Southern Countries, the transport and traffic plans exist but they do not take enough care of road safety issues. Programmes and multi-year plans exist also (Morocco is better than other countries of the Maghreb as it develops a “PSUI Strategy”) but they do not determinate quantitative targets and often suffer from inadequate assessment and control.

- **Insurance cost of victims.** The value of victims of road accidents should be accurately estimated basing on standards of live of each country in order to assess the losses and shortfalls. This is especially necessary in the Maghreb countries, where the figures are approximate. Research on economic evaluation of accident costs would be appropriate.

A SWOT analysis about the road safety issues, for Europe and Maghreb, can be extracted.

- **Europe**
  - **Strengths.** Legislation in Europe is harmonized and is more similar among countries. Application criteria are also similar and tools for applications exist. The accident data are collected, processed and disseminated.
  - **Weakness.** There remains a lack of coordination between stakeholders. There is also an absence of certain information (information from insurance companies, issues of confidentiality in hospitals and medicine field, and sometimes accidents involving professional drivers, etc.). Another common aspect which is the delay for available information on accidents.
  - **Opportunities.** Overall, all European countries expressed the need for more detailed analysis of accidents causes. An opportunity consists in starting coordination actions between stakeholders and in developing innovative tools in the field of data collection, analysis and monitoring.
  - **Threats.** The main problem is the inadequacy of financial resources allocated which may limit projects and actions.

- **MPCs**
  - **Strengths.** In the Maghreb countries there is a real awareness of the problem of road safety so that it became a national priority. Action programs and strategies are being developed in three countries.
  - **Weakness.** Road safety management is far from the optimal. A lack of coordination between the various parties involved in road safety is observed.
There is a problem for data collection and quality of information. In addition, there is a problem of low processing and dissemination of existing data.

- **Opportunities.** The Maghreb countries agree to make investments in the high quality transport which will have a positive impact on road safety. Actions are under way such as the computerization of driving licenses (points license) which should improve behaviour and allow better information on drivers involved in accidents. International cooperation will boost transfer of know-how in road safety management.

- **Threats.** Lack of funding could not allow to continue with the current policies. Other threat is related with the increasing use of private cars.

Basing on the analysis of current situation and research in MPCs and comparing them with the EU status, a number of research actions focusing on the aspects related with accident data collection and road safety management process can be extracted. Possible future actions are:

- **Computerization of the data collection process.** The objective is to guide research in the direction of improving the quality of information with the standardization of registration procedures, with a systematic transfer of information to be stored in a database on road accidents (e.g. ARENA software). The goal is to have reliable information almost in real time.

- **Planning and monitoring of road safety measures.** It is interesting to focus research on issues concerning the development of dedicated tools for accident analysis (e.g. SFINGE software), planning and control measures in road safety (e.g. ISIDE software) or other tools concerning the decision support.

- **Improving coordination among stakeholders at the central, regional and local.** Research projects should focus more on mechanisms to ensure better coordination between the various stakeholders involved in the road unsafety improvement. It is also important to define innovative policies on safety at regional and local level, like for instance the municipal plans for road safety in Spain.

- **Implementation of innovative safety plans.** The aim is to develop innovative approaches concerning the establishment of monitoring mechanisms and procedures for assessing road safety plans based on quantitative goals and targets to be achieved. These research topics should take into account local constraints and resources available.

- **Setting up or changing existing structures into an observatory dedicated to road safety.** In connection with the previous topics, this type of research should be devoted to the development and strengthening of structures supporting the strategies and programmes about road safety. The aim is to find the optimal organization for the future structure. The structure should also enjoy of power and prerogatives that can allow a degree of coordination between all stakeholders involved. The creation (evolution) of a national observatory, and its organization, can be based on some experiences of European countries (e.g. EuroRap, SafetyNet). The functional observatories in Maghreb could eventually lead in the future to the creation of a Maghreb observatory for the integration of information.

### 3.2.2 Sub-area 2

The main commonalities and differences between Europe and Maghreb countries concerning the human factors in road safety are described below.

**Education & Training**

The main problem for education and training about road safety is cultural. The attention to road safety issues and to the consequences of road accidents is of topical interest only from
some years, especially in MPCs. Anyway, even if several measures have been undertaken and the awareness about road safety has greatly increased, the culture is still far from the optimal. In fact the current level of road users’ education and training is considered in all the countries low. Especially the road users (drivers and not) are few aware of the risks on the road.

Common indications to foster the development of suitable culture and to improve road safety education and training focus on two aspects:

- training of trainers to make them more aware about road safety issues and to allow them to put attention on road safety aspects and not only on driving;
- improvement of the tests for obtain driving licenses in order to increase driving skills also in case of particular situations (e.g. emergency conditions).

Some differences between Europe and MPCs on education and training exist indicating a different level of awareness about these topics.

In Europe the focus is on developing a culture of road safety since youth and in promoting the introduction of rules defined according to safety aspects. Furthermore, on driving licenses, the European countries has to follow the standards of the European Community, which is not necessary the case of MPCs.

A remarkable difference between Europe and MPCs appears concerning the education campaigns. In Europe the focus is on changing the way to make the campaigns (especially working on the messages to be provided to users). As people have seen too many campaigns, there is a lack of effectiveness.

Instead, in MPCs, the awareness campaigns are considered very important, especially for young people. The direction is to increase the number of campaigns and to increase the risk awareness already in schools. Another common aspect of the MPCs is related with the strict application of the road code. The rules are in fact considered sufficient but they are very few applied. Moreover the road code is not well known by the drivers.

Despite these commonalities, in each country specific aspects emerge confirming different point of view of the same topic.

In Algeria the trainers are not sufficiently paid, so that their knowledge and willingness to teach correctly is in general not sufficient. Moreover the number of candidates in the driving schools is high compared with the number of training schools. This impacts seriously the quality of the training.

In France, the training is considered a way to escape sanctions and not a way to learn how to behave safely. Also this issue is related with a cultural problem and a lack of explanations about the importance of training.

In Italy, the road rules are considered obstacles instead of measures to improve safety. This is related with a lack of education about road safety. To this aim, similarly to MPCs, the suggestion is to foster the introduction of road safety education in school, during the first education level.

In Morocco, the efforts should be focused on improving the awareness on the road dangers, especially against high speeds and consequences of alcohol and drugs consumption.

In Spain, it is of topical interest to change the way to make campaigning, focusing also on vulnerable road users safety. The main concern is the coordination of the actors involved with education and training and the reduction of these actors. Another concern is related with immigration which introduce new type of drivers, with new habits and behaviours. It is then necessary to foster the cooperation among countries to develop common road safety plans.

In Tunisia, the training of normal drivers (not professionals) is considered not sufficient. The driving schools are not coordinated so that differences in knowledge and skills appear. Another problem is related with the low financing for training.
Concerning the enforcement topic the analysis have highlighted several differences and few common aspects.

In Europe it is recognised that two of the main causes of accidents are speed and consumption of alcohol. This was not the case in MPCs, even if high speed is one of the main aspects on which to base the drivers education.

In MPCs it is commonly recognised that there is a lack of rigorous application of rules. The enforcement system is considered efficient and sufficient but the rules are very few applied.

In Algeria, most of the actions are oriented to drivers of cars but there is a loss of actions enforcing behaviour of pedestrians and motorcyclists, even if both these categories behave wrong.

In France, legislation and regulations are perceived too restrictive, even if the general opinion is that it is necessary to continue with this kind of severity.

In Italy, the enforcement measures are considered not sufficient, even if several steps forward have been done in the last years. The sanctions should be increased together with certainty of punishments. Enforcement should be done with the aim of educating on road risks rather then to punish. In this sense systems like “Tutor” are good practices. Another important aspect concern the coherence of measures adopted for enforcement, especially at urban level.

In Morocco, the current measures are considered not sufficient, especially the system of penalties is not sufficiently dissuasive. The focus is on applying enforcement methods allowing to diminish the corruption (in this sense the point driving system is not considered a good measure).

In Spain, the current enforcement measures and penalty system are right. Anyway it is necessary to get the drivers obey to the rules. One way of improving the enforcement is using radars with no fines, providing information to people on their driving behaviour. This should get users more aware of the risks.

In Tunisia, the main problem is the non application of the law. There is a lack of repressiveness against wrong behaviours and also some existing laws (e.g. point driving license) are not applied.

A SWOT analysis about the human factors in road safety issues, for Europe and Maghreb, has been extracted.

- **Europe**
  - **Strengths.** Several awareness campaigns are realised at national level. Several projects include education activities for young people. In Spain, education on road safety is now established by Law within the regular school. In France, the trainings at school are structured with certificates that are delivered. Assisted driving is a positive measure. The ACS demonstrated its efficiency, showing that speeding is a major factor of accidents. Enforcement measures and number of controls have been increased in Europe, also through the use of effective tools (e.g. “Tutor” system in Italy, point driving system, etc.).
  - **Weakness.** Most of the accidents come from drivers that commit offences (e.g. speeding and / or are drunk). The content of the training (for the candidate to the driving licenses) do not deal sufficiently of road risks and of the transmission of values. Enforcement systems are not yet optimal. This mainly depends on the level of financing for road safety which is still too low, to legal (speed control by sections) and technological aspects (drug detection) and also need improvements to reach higher degree of social acceptance. Clear guidelines on the kind of tools to be used for enforcement and the way they are used are necessary. A periodic training to professional drivers, with road safety courses,
should be introduced not only on voluntary base. Continuous training is not easy and some aspects could be improved in driving licenses issuing and renovation as well as the regulation to ensure the adequate labour conditions for professional drivers.

- **Opportunities.** Concerning the education aspect, give voice to the scientists. The results of the ACS offer the opportunity to develop training and awareness campaigns against causes of the accidents. It would be beneficial for politicians in general and ministers in particular to give the example of good behaviour. Strategic plans include actions in human factor and the opportunity to survey social feelings as well as co-operate with stakeholders to improve the present policies. Several awareness campaigns and education courses on road safety are realised providing a good basis for further developments of these methods, also on large scale. Enforcement systems like the “Tutor” in Italy have provided encouraging results.

- **Threats.** The road safety education and the awareness campaigns have to be realised continuously. The risk is to introduce a sort of habit in the users so that the message become no more useful. The measures undertaken have to be evaluated periodically and revised according to the users behaviours. Precautions must be taken to implement the devices appropriately (these must remain a deterrent tool), homogeneously and dense (which should strengthen controls). Avoid application of outlier rules: encouraging greater responsibility rather than far. Training and education must be surveyed.

- **MPCs**
  - **Strengths.** In Morocco, since the first PSIU, a drastic decrease of fatalities has been observed in 2005. Although it is again increasing, PSIU has show a change in the users’ behaviour that is an effect of the application of the plan and tools of PSIU programme. The majority of actions taken by public authorities for road safety are oriented towards the human factor (the law enforcement, training).
  - **Weakness.** Enforcement systems are not yet optimal due to legal and technological aspects and also need improvements to reach higher degree of social acceptance (certain radar locations or fines are not accepted by citizens and point the Administration need for finance).
  - **Opportunities.** Strategic plans include actions in human factor. Campaigns are opportunities to show improvements. New measures will be taken to the conditions of access to certain occupations particularly taxi drivers and monitors driving schools. There are also other measures provided for professional drivers.
  - **Threats.** The actions in human factor need a continuous evaluation and adaptation of actions in order to keep the level of consciousness in the citizens and the behaviour of the drivers. Financial resources and resistance to change. Programs suitable for each category must be established and the institutions ha to provide support these courses.

Basing on the analysis of current situation and research in MPCs and comparing them with the European status, some future actions to improve the road safety aspects related with human factors can be depicted.

**Education & training**

Concerning the education and training aspects about road safety, the main key point relates to policies and actions to be undertaken to improve the situation.
The main issue on education and training about road safety is of cultural character. Future actions to be undertaken should have the objective to produce a gradual change of mentality of the road users (drivers, pedestrians, authorities, etc.) through effective measures. To this aim the main aspects to be considered are the road safety awareness, the training of road users, the rules of driving licenses, the education of road users.

Possible future actions are:

- **Increase road risks awareness by means of road safety campaigns:** research should be focused on defining the most suitable and effective campaigns to be realised according to the local conditions and habits (how to give the message, what kind of message, where to make campaigns). Campaigns have to be considered a key issue since they strengthen and anticipate effects of other measures (e.g. enforcement).

- **Increase training of trainers as starting point to improve cultural aspects:** trainers are those who will educate and train the people. Research should be focused on defining adequate quality standards of training and on including road safety awareness in the teaching. Furthermore it is necessary to execute an integration of initiatives on a homogeneous plan at national and, possibly, at regional level.

- **Revise rules for obtaining driving licenses:** in close relationship with training of trainers, research should focus on defining minimum standards for obtaining driving licenses, focusing on aspects like road safety culture, respect of vulnerable users, driving behaviours, road code knowledge, in addition to driving skills.

- **Education to road safety issues in schools:** research should focus on developing programmes to systematically teach the road safety, rules, correct behaviours in schools, as a way to foster a mentality change and to increase risks awareness.

- **Coordination of education and training activities:** in parallel to the implementation of measures to improve the road safety education and training, the implementation of coordination activities of such measures is fundamental. Plans for managing and controlling the training centres, for improving communication among stakeholders should be envisaged. This activity should put the basis for the creation of national coordination bodies for road safety aspects.

**Enforcement**

The main issue in the MPCs is the application of existing rules. Laws and regulations are considered effective but they are not applied.

The main aspects to be considered are application of rules, fostering the use of more actual rules, introducing repressive actions in all the road fields.

Possible future actions are:

- **Making the rules applied:** research should be focused on defining plans and actions to foster the application of the laws and rules. Improvements can come from development of fines management systems in order to minimise the time between violation and receiving the penalty notification. Use of automatic systems should also be fostered. It is necessary to increase the awareness of users and police forces about the importance of applying rules (e.g. through campaigns).

- **Revising road code and regulation:** this action focuses on the updating and harmonisation of the national road codes and of the rules. Studies on how to implement and adapt European practices should be undertaken (e.g. how to introduce point driving systems, how to re-educate in case of points loss, etc.). Plans for implementing gradually new rules (and new behaviours) could be developed.

- **Revision of the enforcement methods:** research should be developed with the aim of revising the current system of penalties (e.g. cost of the fines, loss of points...
associated with the licence, etc.) which is considered not sufficiently dissuasive. It is necessary to introduce new applying strategies, enforcing also wrong behaviours of non drivers (e.g. pedestrians). Research should then focus on defining plans for updating the current enforcement methods. Harmonisation of rules and methods at national and regional level should be studied, as well as transferability of European methods (e.g. use of innovative systems). Finally the coordination between stakeholders for an efficient application of all the operational axes of road safety should also be a topic for research.

### 3.2.3 Sub-area 3

Concerning the “ITS for transport safety and security”, the stakeholders share the opinion that ITS solutions are not homogenously deployed and certainly not to the level one could expect mainly because of financial reasons. However, a supplementary reason for MCPs is a need to be convinced of the appropriateness of such solutions according to the available infrastructures, vehicles and competencies.

Considering “ITS applications oriented to vehicle and infrastructure”, the stakeholders bring different and complementary point of views. Technical considerations outline the need to improve embedded systems technologies (i.e. light weights are the target), and the importance to digitize maps (and to add information that allow navigation) of the countries (especially in the MCPs) which are required to the development of geolocation services. It is also estimated that more has to be done to analyze the impact that can have ITS systems, for instance it is important to define the interactions with drivers (e.g. what action the system should perform to alert a driver when the vehicle touches a solid line? Launch a sound, vibration…). Effective systems and development of induced services should require appropriated measures and time, their achievement are expected at long term. The long term is also needed in order to have a stock of vehicles that are predominantly equipped and infrastructures that allow V2X communications.

Point of views on “ITS applications oriented to RMP” are close to each other, stakeholders estimate that there is a lack of developments concerning people with reduced mobility. However, research and development are on-going on the subject. It is hoped more interaction with social environment in order to push and foster these developments.

Concerning “ITS for port operations”, it is outlined the poor developments of ITS systems in this sector even if such solution demonstrate they are effective elsewhere (e.g. at the port of Shanghai). Much rest to be done, in terms of organization (e.g. development of a harbor community) and measures which can help to improve some port operations.

The SWOT analysis about ITS issues, for Europe and Maghreb, can be synthesized as below.

- **Europe**
  - **Strengths.** There is a basis in terms of (1) infrastructures (they are globally well developed and in a good state), (2) state of vehicles (repressive measures have been adapted to detect damaged vehicles, incentive measures to renew vehicles – recent ones benefit then from improved assistance systems), (3) awareness of road users to the road risks (education start since young ages, awareness courses are offered for drivers who lost points, awareness campaigns are regularly launched in the media). The automotive sector benefits from a strong industry and is supported by the political will. Research is then active for years within laboratories of both private and public structures and the legislation evolves to take into account the evolution of the behaviours and to adapt to the available technologies. Consequently, information and communication technologies are more and more present at the different levels (to control the traffic, in the management of vehicles, to the enforcement of the regulation – the ACS systems). ICT are also developing towards ITS.
Methodologies (i.e. architectures) are developing to guide the development of services (e.g. towards multi-modal transport). As a recall, ITS services are already operating (AID and fleet management services).

- **Weakness.** Road traffic accidents are important outside the agglomerations. This is mainly due to the difficulty to control the corresponding roads (i.e. national and local ones). Figures for vulnerable road users are not evolving in the right sense, becoming worse while for instance the fatalities of passengers cars are reducing. In fact, since the proportion of fatalities is more important in this last category of road users, the repressive measures have more concentrated on them. Also, for economics reasons and because it is more easy to add assistance systems, the vehicles (four and more wheeled) have benefit more from technological improvements. So here, much more has to be done to protect the vulnerable (in terms of legislation, education, development of awareness campaigns and protection systems). More generally, it seems clear since these decades of efforts that repression shouldn’t be the first response; more has to be done on education (to better share the roads among all the users) and in the usage of new technologies. ITS are not implemented at a large scale and in all sectors. Important financial investments are for instance required to equip more areas with AID systems. For similar reasons and also because of lack of standards, V2X based services are not yet operating on the roads even if research results and large scale experiments have demonstrated their feasibility. Last, road traffic data collection is not completely homogeneous (e.g. detailed data are not available in all countries) and the data are not reliable to the same level in the EU countries.

- **Opportunities.** The automotive sector is well structured, stakeholders from different areas are present, and the technology is mature (even it evolves rapidly) and research is active. Moreover, the context is changing since decision makers have now to take into account environmental and energetic questions. There is thus an opportunity to go further in order to improve the safety for all road users and to develop services (i.e. based on ICT and ITS) in order to support the new needs and constraints. New technologies can also be considered for inspection procedures of the road infrastructure to enhance their safety. Moreover, the different means of transport are available (fluvial, fret, road, and air), for which the development of ITC and ITS systems should allow effective multimodal transport.

- **Threats.** The education at school to adopt safe behaviours on the roads should be generalized (e.g. as the pedagogical projects in Italy) with more hours dedicated to it (e.g. as in France). Concerning vulnerable, improve the infrastructure (e.g. more dedicated lanes when feasible, better visibility at the intersections etc.) to help a better sharing of the roads, generalize the ACS to control the speeds of the motorized two and three wheeled as it is on-going in France and develop awareness campaigns which are currently more concentrated on passengers cars. Push also the development of safety equipments for vulnerable (e.g. equivalent air-bag of four and more wheeled vehicles, assistance to drivers). Besides the financial aspect, ITS needs more collaboration between the industry and researchers. Projects (at national and transnational level) and patents are required here to define standards and thus to push the production of systems.

- **MPCs**

  - **Strengths.** The political will exist to “reduce” the risks on the roads. The authorities have set up (or renew) the official structures, and make use more and more of ICT tools, for instance (1) to the collection of road traffic data (a project is under generalization at the national level in Algeria), (2) to the
management of the vehicles (the technical control in Morocco) and (3) for the exam of the driving license (still in Morocco). Web-based information systems are also more and more available, bringing information on the roads (i.e. their categories and length), the stocks of vehicles, the regulations and the accidentology data. Services are also developing. Fleet management services are offered in Algeria, traffic buses tracking using ICT is available in Tunisia with a related information service made available to the users. The point system is applied in both Morocco and Algeria, meaning the corresponding infrastructure is in place. Tunisia is also ready to establish the point system. From a repressive point of view, radars are also already operating (in all three countries) to control the speeds. Also, associations are active in the three countries, performing education actions and participating to the awareness campaigns. Last, exchanges exist at the international level allowing comparisons and the transposition of best practices and systems.

**Weakness.** The main problems are: (1) Human factor, with drivers that do not respect the regulations (major infractions concern speed, alcohol, safety equipments which are not always put). In this frame of mind, the authorities in Algeria have recently adopted a plan to enhance the training of the inspectors (among other measures, see §4.3) and adapted the conditions of the delivery of the driving license. Also a reinforced application of the laws allowed pushing the drivers (and occupants) to put (more) their safety equipments. (2) The state of the vehicles (Morocco has improved the technical control with the implementation of an ICT system). (3) The state of the road infrastructure, the improvement of which is required to allow ITS solutions. On another issue, research is less organized than in Europe, it misses here some networking at least at a regional level, which may involve researchers (and other stakeholders).

**Opportunities.** The Moroccan realizations highlight some benefits of ICT based solutions to control the state of vehicles and of the training of the drivers. Such examples can be considered for implementation in the other countries, from which also can be taken results of their own actions (the road data collection in Algeria, once it demonstrates its effectiveness, the bus information system in Tunisia). The three countries are developing their road infrastructures, the opportunity is offered thus to take care of the quality of these works, and to consider the implementation of ITS services like AID systems. The east-west motorway under construction in Algeria, which will be followed by the high-lands highway, will connect the three countries. This future infrastructure should lead to the development of transnational traffic. Here, ITS solutions could be considered in order to enhance the traffic fluidity at the frontiers. The improvement of existing roads requires the development of inspection methods and maintenance services.

**Threats.** Networking involving researchers, police forces, administrations, decision makers, companies (each community alone or mixing different stakeholders), first at a regional level as mentioned above could enhance the exchanges of best practices. Such networking can concern road safety but also the development of ITS services. Cooperation at the Euro-Mediterranean level could be developed similarly, besides of course the cooperation which already exist for instance among researchers. Besides the improvements of the quality of the roads, the implementation of effective ITS services require the development of methods which must be common to the Maghrebian countries, and coping also with the ones in Europe. Lastly, the development of web based information systems (including ICT application) should help the education to the road risks; which of course must start at school in order to modify durably the behaviors.
According to the different studies fulfilled within the ESTEEM project (analysis by sub-areas, questionnaires, interviews and surveys), proposed future actions could consist in developing:

- Specific studies aiming at identifying the needs and the possible solutions (focusing on specific aspects like transport safety & security).
- The technical feasibility of a emergency phone number at the MCP level.
- An ITS architecture at the MCP or Euro-Mediterranean levels.
- Multimodal transport services at the MCP or Euro-Mediterranean levels.
- Accidents data collection at the MCP or Euro-Mediterranean levels.
- Exchanges under different forms (training, bilateral visits, scientific seminars / ateliers, etc.) involving the stakeholders (including companies and the decision makers at local and national levels) in order to increase knowledge and awareness about ITS and their usefulness.

However, issues which are wrong (in the regulations) must be reviewed before investing in some sophisticated systems like v2v or v2i applications. Indeed, the improvement is to join technology and social environment, with the adequate intensity.

3.2.4 Sub-area 4

Safety audits & inspections

Spain has taken actions to implement safety audits for new road projects which are now mandatory according to the recommendations of the European Commission. In the other European countries, Italy and France, where the safety verification of the road infrastructures is not mandatory, the stakeholders opinion is that the state of the audits and inspections is quite bad in these countries.

However, since European regulations define, at planning level, that new infrastructure and projects must include an impact study to select the best alternative, Italy and France are taking actions to implement this regulation.

In the MCPs, Morocco lays out of laws and guidelines which are close to the European standards, in particular French ones, and tends to benchmark on European countries.

All countries suggest that audits be external, but in the MCPs countries, the methods of verification of infrastructures security are still absent or insufficient.

In urban areas of European countries, road safety management should be necessary, especially to solve the problems of the vulnerable road users. This objective has been also identified by Moroccan authorities since the first victims of the road accidents in Morocco are the vulnerable users; however, the lack of geographical information systems in Moroccan cities makes difficult to identify black spots in complex urban street networks.

Rail crossing safety

Rail crossings are critical sites for road safety, and these are more critical in European countries that have an important rail network (particularly in France that has about 16,000 rail crossings, among which some 600 risky, while the total number of rail crossing in Morocco is less than 600). Therefore, if the problematic is the same, the importance of the problem has no common measure between Europe and MCPs.

Common aspects exist between all countries and refer to the necessity to redesign the present crossings at different level and, where not possible, improve the situation and control.

In MCPs, and because of financial considerations and the non criticality of the situation, rail crossings are badly signalled, not supervised, not controlled, often unprotected, and car drivers do not respect the rules. As a consequence, the authorities have adopted measures for reducing the number of rail crossings. In Morocco, a budget of 150 millions € has been
allocated to the protection of rails crossings and their reduction by a half in the horizon of 2025. Similar actions were adopted in Italy.

In France, taking account of the huge number of rails crossing, tunnels do not represent a solution; rather technological solutions and enforcement are preferred.

**Maintenance**

This topic tries to find out the maintenance management aspects for infrastructure design and road safety criteria used in maintenance actions.

Concerning the management aspects of maintenance, it is necessary to update the road maintenance regulation to define the minimum standards and to allocate more resources to the maintenance.

To date in all countries, the lack of regulation and minimum standards does not force the authorities to reserve sufficient resources to maintenance. As a consequence, curative maintenance is more often applied instead of preventive maintenance which guaranties better technical and financial results over time.

Even in European countries, the situation is worse in urban areas where maintenance is of the resort of local authorities which often have not the required organization and resources.

In MCPs, other considerations contribute negatively to the management aspects of maintenance and are related to the poor financial resources and personnel qualification.

Concerning the road safety criteria used in maintenance actions are not unified in Europe, neither in MCPs.

The road safety criteria used in maintenance actions are the road safety criteria included in all phases of the road production process. Unifying these criteria in Europe and MCPs would require unifying regulations and standards in the phases of road production process, including the road itself, its geometry, signals, and all protection elements (barriers, covers in the water canals in the edges, pavement in edges, etc.). Distinction should be made also between the last generation of freeways and the elder secondary or provincial network, and also between urban and rural roads.

To date, there are not data relating with maintenance criteria with accidents, and there are not any systematic measures of quality.

**Vulnerable road users**

Vulnerable users are a very important factor inside road safety since the accidents involving vulnerable users represent a considerable social cost. In MCPs several obstacles make difficult the implementation of concrete and effective actions: lack of resources, incapacity of understanding completely the causes, few knowledge of effective countermeasures.

Common aspects are related with the identification of vulnerable users, the main risk factors for vulnerable users (e.g. vehicles speed) and the laws related to them which are not considered in the highway codes; therefore, it is necessary to advance in rules, they must be mandatory.

In European countries, it is necessary to dedicate more economic resources, coordination, and develop an educational system oriented to this group, while in MCPs where the current status of vulnerable users’ safety is very poor, it is necessary to adapt infrastructure design for all users (drivers and vulnerable users), to introduce road education in schools, to sensitize all users and to force drivers to change their behaviour and to comply to speed limits.

Systematic actions to protect vulnerable users are not undertaken to date at European and MPCs level. On the contrary, various projects have been realized and implemented in several countries.

Some specific measures/actions to reduce the risk for vulnerable users have been taken in some countries and may be used in other countries. In Spain for example, bikes have their own regulations in some cities for a safety and right traffic. This regulation informs how to traffic safety by the city in your bike. Algeria suggests providing driving licenses for
motorcycles, and creation of circuits of road education for children. For Italy, promotion of the public transport modes is a safer alternative to the non-safe modes. For Tunisia, it is necessary to improve conditions of infrastructures, horizontal signals and pedestrian crossings, and to improve the risk awareness of the pedestrians.

The SWOT analysis about road safety in infrastructure design, for Europe and Maghreb, can be synthesized as below.

- **Europe**
  - **Strengths.** Accidents caused by the infrastructure are very reduced. In Spain, safety audits are mandatory for the new road designs, and in Italy, some guidelines and tools have also been realized concerning the vulnerable users safety. Safety inspections increased in the last years and are nowadays a regulated practice. Investment in maintenance is growing and close to the optimal values generally accepted. Maintenance tools are implemented and they take into account the road safety criteria in the annual maintenance programme elaboration. Furthermore, recent technologies can help enhance the safety of categories of the infrastructure which are unsafe (e.g. tunnels, rail crossings). Also, measures have been launched in France concerning the rail crossings with the objective to enhance the security of the risky ones. In Italy, the rail crossings protection is in the vanguard, with plans for the total elimination of the rail crossings.
  - **Weaknesses.** In France, the state of the audits and inspections for interurban roads is quite bad, and safety audits are not yet mandatory for the new road designs. In European countries, in the urban areas the design is much more difficult to control, and the urban development is disconnected from traffic planning; road design should integrate the traffic. Apart Spain, the safety verification of existing infrastructure is not a habit and is rarely realized. A clear regulation about this is missing. Similarly the maintenance of the infrastructures is done case by case according to the necessity and quite never basing on well defined maintenance plans. The main cause is the low financing in this field.
  - **Opportunities.** In Spain, actions must be taken in the urban areas, vulnerable users and the improvement of existing roads, as DGT is already doing in some of these aspects. In France, when treating dangerous rail crossings, infrastructure projects should be avoided (e.g. tunnels) which are expensive; rather, recent technologies can help enhance the safety of these infrastructure projects. In fact, security is improved when they are removed. In Italy, main opportunities relate with the extension of the existing guidelines and tools (e.g. for vulnerable users) at national level. The knowledge gained concerning the infrastructure safety can be a good basis for developing plans for increasing the safety.
  - **Threats.** Financial restrictions could cause a slow down effect in the infrastructure maintenance and improvement ongoing process. In Italy, main threats are represented by the financing aspects. The investments in the field of road safety verification and maintenance have to be increased and supported by central administration. The financing is also crucial for improving the rail crossing safety, as the measures to be undertaken for their elimination at national level are expensive.

- **MCPs**
  - **Strengths.** The Improvement of road network and particularly by the development of highways with international standards is a positive point for future road safety in MCPs. Although the part of accidents due to the infrastructure is very low, the investment in maintenance is growing. In Morocco,
the strategic plans (PSUI) integrate an action for the improvement of the road infrastructures and urban roadway systems.

- **Weaknesses.** The state road network, especially on certain roads, is a real danger to road users. This situation is aggravated by the absence of strict control of specialized services concerning design of roads. No guidelines and tools are used in MCP countries for safety audits for the new road designs. The safety verification of existing infrastructure is not a habit and the maintenance of the infrastructures is done case by case according to the necessity. The main cause is the low financing in this field. GIS are not developed in urban areas, and urban planning is realized only in the largest cities.

- **Opportunities.** The development of road network must be followed by a program of quality improvement in urban and rural areas by putting in place adequate signalling and necessary facilities to meet the particularities of different road users.

- **Threats.** Financial restrictions could cause a slow down effect in the infrastructure maintenance and improvement of the ongoing process. Some problems of coordination remain between various administrations. In MCPs, very often budgets are given once for investment, but it is necessary to ensure sustainable financial resources for maintenance.

Basing on the analysis of current situation and research in MPCs and comparing them with the EU status, future actions to improve the safety aspects related with infrastructure design are indicated below.

**Safety control design in urban areas**

- It is necessary to improve quality of urban planning. The general planning is defined by the Administration, but this planning is not good enough. The transport needs are neglected. The distribution of land use does not take into account transport. Detailed planning is defined by private sector without control from the Administration.

**Maintenance management aspects**

- Improvement of information tools. Using them, the different stakeholders could successfully manage the control actions.

- The costs of the maintenance should be verified periodically. The financing for the maintenance should be increased basing on the effective necessity. The contracts for the infrastructure management should refer to what should be done in term of periodic maintenance, in order to oblige the road managers to realize periodic interventions.

- It is necessary to change the political vision and to allocate more resources to the maintenance. The road maintenance regulation, defining the minimum standards to be obtained by the road owners, according to the resources, should be updated.

**Road safety criteria used in maintenance actions**

- Strong improvements must be focused on the secondary network (fatalities reductions in this network has been less than in arterial network –freeways -), although social impact is less.

**Vulnerable road users in front of infrastructure design**

- It is necessary to project and edit multidisciplinary and coordinated Plans to achieve a greater protection of vulnerable road users.

- It is necessary to establish specific regulations and training, with a higher control of executions.
• Improve laws concerning security and safety of vulnerable road users and take them into account in the planning process; develop safer circuits, and improve awareness and education of all users for respect of traffic indications and crossings for pedestrians.

• It should be necessary to include the vulnerable road users aspects in the design of infrastructures, considering them as mobility users. Infrastructural devices for their protection should be fostered at national level. Clear guidelines should be prepared.

• The current situation of vulnerable users’ safety is very low. There is especially a lack of assistance to such users. Two main actions should be undertaken: improvement of the vehicle fleet and improvement of the infrastructure conditions with particular attention to protection of vulnerable users. Plans should be developed. It is necessary to increase the risk awareness of the pedestrians (e.g. education to the use of pedestrian crossings).

**Design aspects**

• To develop the use of methods of safety audits. The improvement of the infrastructures safety passes by the reinforcement of the engineering and design specifications, and the raising of competences of the departments in charge of control and checking of the infrastructures safety.

• Actually the situation concerning the development and use of methods for verifying the infrastructure safety in the MPCs is bad. There are problems of financing and mentality. Improvement must be achieved by training of personnel in charge of the controls and by defining strategies for a periodic control, and create an independent organism composed by different stakeholders for the control of infrastructure safety.

**Rail crossing safety**

• To improve the signalization in non guarded rails crossing and continue the policy of rails crossing elimination (tunnel, bridge or close the crossing).

• Improvements are needed for elimination of the rail crossings near cities and implementation of technological devices (few used to date) in rural areas.

• The current situation of the rail crossings safety is insufficient. The crossings are not controlled and the systems used are old. The rail crossings safety should be increased by using new technologies in this field. The use of automatic barriers should be planned and adequately financed.

**Infrastructures**

• The development of road network must be followed by a program of quality improvement in urban and rural areas by putting in place adequate signaling and necessary facilities to meet the particularities of different road users.

• To continue all efforts to strengthen the system of controls and sanctions by the provision of adequate human, financial, and technological resources.

• Improving the road network especially in respect of blackheads and signaling.

• To develop infrastructure facilities according to requirements of different categories of vulnerable users: the disabled, pedestrians and bicycles.

**Laws & guidelines**

• Strengthen the control of imported vehicles in terms of the approval and homologation and fight against the importation and use of counterfeit spare parts.

• Given the increasing use of private cars, it is necessary to encourage a modal shift towards public transport and to rationalize the use of private cars. For the non-urban travels, the rail transportation should be developed and completed by a
system of high quality bus. So there will be fewer cars under use and there will be fewer accidents on the road.

4 Workshops

In addition to the survey activities, two workshops have been organised with the aim of bringing together actors and stakeholders in order to discuss and validate the results of the surveys.

The objectives of the workshops was to foster the coordination of research activities in the MPCs, bringing technical experts, researchers, institutions and companies, dealing with the selected sub-areas, in contact among them. Institutions and companies from Europe and MPCs were invited to actively participate to the workshops connected to the sub-areas surveyed.

During the workshops, organised in one of the MPCs, the survey results were presented and discussions about specific topics for future research were fostered.

4.1 Workshop in Batna

The first workshop of ESTEEM, held on the 9th and 10th of June 2009, was hosted by the University El Hadj Lakhdar of Batna (partner of the project) focusing on sub-area 1 (Road safety management aspects) and 2 (Human factors in road safety).

The discussions with the participants to the workshop evidenced as the numbers and costs of road accidents in Maghreb are still very high. The human factor is the most important cause of accident, due mainly to the non-respect of the driving rules. A trend was reported in Algeria concerning the ever increasing use of private car, while urban public transports are not yet sufficiently attractive in terms of quality of service despite the fact that many efforts were made. Regarding transport infrastructures, there is a need to review how to design, adjust and control them. There is also a real problem to enforce the law against not disciplined drivers. This also seems to be the result of social, psychological and cultural factors.

On the other hand, the comparative approach between European and Maghreb countries has identified a number of points in notable contrast in the field. These differences can be naturally explained by the economic, social and technological levels of development. For European countries, it is clear that there is some convergence on treatment of road safety in the three countries involved in the project. This is obviously consequence of the integration into the European Union based on the adoption of common strategies and directives and the commitments made by each other. So, the practices tend ultimately to be the same everywhere. Globally, there is a greater struggle for the respect of road rules, a fight against the high speed of vehicles, better training, better planning, and implementing stricter controls (e.g. against alcohol, drugs and vehicles). It should be also noted that the implementation of ITS in Europe have an impact on reducing road accidents.

In terms of comparison, an obvious conclusion was obtained: the problem of road safety is a step that every country, whether developed or developing, must go through. European countries have experienced the same problems some years ago. In the Maghreb countries things are under construction and Europe can help significantly in this regard. A large potential of know-how, experiences and best practices which can be transferred have been identified during the workshop in Batna.

The discussions provided useful indications for elaborating the roadmaps for the future research on these topics. Regarding the sub-areas treated in priority at the workshop, the following main conclusions can be retained. The aspects indicated in Table 4.1 should be considered during the preparation of the recommendations and roadmaps for future research.
### Table 4.1 - Conclusions of Batna workshop

<table>
<thead>
<tr>
<th>Sub-area</th>
<th>Conclusions</th>
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<tbody>
<tr>
<td><strong>SA1</strong></td>
<td>In Maghreb countries, concerning the management aspects of road safety, the need for data collection on accidents appeared as fundamental as well as the data treatment and their availability. Another important issue, also common to several countries all over the world, is the lack of coordination between the various parties involved in road safety. There is also a problem in managing and collecting the fines and in enforcing the traffic offences in short time. In European countries, things are better. Legislation in EU is more harmonised and similar among countries. Application criteria are also similar and the tools for a strict application exist. In MCP countries Law is sometimes similar but not yet harmonised and the application is doubtful in some cases. There are no tools to ensure enough enforcement. Accident data from urban areas are not included in the accountancy with the same criteria since it depends on different Administrations. This also happens in EU but a higher level of harmonisation is reached and some efforts are oriented to improve the situation with technical and financial support. As integrated conclusion, information system has to be improved in all countries and harmonise the tools and criteria of accountancy have to be harmonized. Experience from EU is transferable in this field in terms of harmonisation and implementation of law.</td>
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<tr>
<td><strong>SA2</strong></td>
<td>In Maghreb, human factor is considered as the dominant issue (i.e. it represents 85% of the accidents in Algeria). This factor should be considered as the most important lever to reduce accidents and casualties. Several aspects are included in this field: driver training, qualification of driving instructors, examiners and all the communication aspects. Also some difficulties in enforcing the driver behaviours and in respecting the rules have been evidenced several times during the workshop. This lack of discipline is the cause of most of the accidents involving vulnerable users. In Europe, control of accidents has gone through considerable effort in terms of regulation, training, communication, enforcement, etc. All these aspects can be transferred to the Maghreb countries but with taking into account certain institutional, social and cultural constraints including compliance with the rules of conduct and behaviour on the road (enforcement). Also the methods of training and assessment in driving schools, the level of skills required for instructors examiners, etc. are easily transferable.</td>
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<tr>
<td><strong>SA3</strong></td>
<td>Innovation both in the field of transport safety as well as innovations in other fields are developed in the North. Thus, European countries are naturally better equipped for ITS as the Maghreb. Very good results are achieved through the implementation of these techniques in European countries including the establishment of information systems and speed cameras. The Maghreb countries are now evaluating the benefits of implementing intelligent transportation systems (embedded on cars or not). While the embedded systems depend mainly from the car manufacturers, more interest was given to others systems like those for information to users and traffic management. The ITS are easily transferable.</td>
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<tr>
<td><strong>SA4</strong></td>
<td>In Maghreb countries, the infrastructures and their relationships with road safety was also a topic largely discussed during the workshop. There are some mismatches between the capacity of actual infrastructure and the fleets of vehicles, especially in urban area. Problems related with black spots were repeatedly reported.</td>
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Concerning these partials results, the human factor in all its components appears as the most important for the Maghreb countries (85% of cases on average). Considering this issue, the following priorities can be proposed:

- an assessment of the current training of drivers, ways of doing the trainings, with proposals for introducing new approaches to promote ICT introducing interactivity in training;
- the training of driving instructors, including arrangements for accessing to the profession;
• road safety education in schools, prevention campaigns and their impacts (their relevance, assessment, etc.).

In addition to human factors, other important aspects concern the accident data collection, the logic of actors and the coordination problems, the results achieved, the assessment of the existing good practices, etc.

The actions to be undertaken in the field of road safety in Maghreb countries are numerous. The first is to conduct a comprehensive assessment of the situation by countries (Algeria, Morocco, and Tunisia) because significant differences can be defined. This could be done in the call for independent research projects by country. Topics of future research would be to carry out specific audits on the different components and aspects of transportation safety, with the key proposal of solutions by subject. The goal is to get a coherent whole that can contribute to the building of an overall national strategy.

The transfer of European know-how through future research is fundamental. Future research projects once completed, closed and implemented, even in a localized area, will contribute to enhancing safety in transportation directly or indirectly, and generally will help to the development of local skills.

4.2 Workshop in Rabat

The second workshop of ESTEEM, held on the 20th of October 2009, was hosted by the Ecole Mohammadia d’Ingénieurs (EMI) of Rabat (partner of the project) and by the Comité National de Prévention des Accidents de la Circulation (CNPAC) of Morocco (stakeholder supporting the project) focusing on sub-area 3 (ITS to improve transport safety and security) and 4 (Safety aspects of infrastructure design).

Discussions with the participants to the workshop showed that the number of road accidents in Maghreb is still very high (about ten times higher than in European partners countries, and does not show a franc decreasing slope since 2001). The human factor is the most important cause of accident; however information systems may be used efficiently in safety and security of transportation systems, especially in their management and control.

On one hand, the problem may be related to users behaviour; some kind of unconsciousness, and even ill will is quiet generalized. Although education actions and public awareness campaigns are taken, accompanied by repression, the number of accidents trend is not yet clearly decreasing in these countries. Therefore common tools of safety and security of transport in Europe should be immediately implemented in Maghreb countries, including legislation and road code.

On the other hand, modernization of the information technology for transport systems will certainly help to achieve the goals of a better management, control, education and training for an improved safety and security of transport systems. ITS systems presented during the workshop, may be helpful for that purpose, especially for electronic administration, electronic control, and driver assistance.

Infrastructure management can be improved also by the use of new technologies, intelligent infrastructures for enforcement, travel information, emergency management, or real time security assessment. But in Maghreb countries, there is a lack of ITS hardware for signalisation, and traffic management and control. However, this technology is intensively used in rail and maritime sectors were international standards imposes their use. In road and urban transport we start seeing such tool with the last structuring projects such as the tram of Rabat.

Finally, infrastructure design safety standards seem to be missing, or unused, in some Maghreb countries. Especially, the workshop showed that specific safety audits and safety impact studies were not done for the tram in Rabat. Therefore, this aspect, of taking into consideration safety in the studies phases of projects through standards, is a major recommendation among infrastructure actions for these countries.
5 Roadmap for future research

The results of the surveys and the discussions held during the workshops (summarised in the previous chapters) about the four sub-areas allowed to understand the current situation about the transport safety and security aspects in the MPCs. Also the differences between European countries and MPCs have been examined, allowing to understand what researches, tools and best practices could be transferred from a region to the other. The analysis carried out during the project allowed to define the actions that should be undertaken in the future to improve the current situation. Moreover, the analysis allowed to understand what actions are considered more urgent.

5.1 Summary of key results

The key results obtained for the four sub-areas analysed during the project are reported below.

SA1- “Road safety management aspects”

- The accidents involving professional drivers are not studied in suitable manner. There is not also a specific criterion for this type of accident.
- The Maghreb countries have no targets on reducing accidents, but rather an indication on the need to reduce them. In the Maghreb countries some general goals are fixed but without global strategy (except for Morocco).
- All Maghreb countries there is a significant gap between the target and the reality. Indeed, concerning collection of data and management of road safety aspects, significant lacks exist.
- Both in Europe and the Maghreb, the stated objectives (EU actions and PSUI for Morocco) did not put enough emphasis on improving data quality and analysis especially regarding accidents in tunnels, accidents involving professional drivers for example.
- It is necessary to create, develop and strengthen the existing structures to form in MPCs an observatory on road safety by following the best models in Europe. They must have sufficient weight to influence the modal shift (private cars to public transportation) and obtain the necessary financial resources.
- For the Maghreb countries, there is a clear benefit to computerize the process of collecting data on road accidents. An opportunity of transfer of knowledge is to help Maghreb countries to introduce the appropriate software programmes and network platforms.
- Concerning the collection of data, the most important is the implementation of methods of analysis to identify accurately the location of the accident, the cause, the conditions of the accident, time, vehicle type involved, etc.
- In the MPCs, where there is a potential for research in transport in general, it seems difficult to find a potential research really specialized in the field of security. Main focus is on road and specifically road safety management and accident data analysis.
- The aim is to develop innovative approaches concerning the establishment of monitoring mechanisms and procedures for assessing road safety plans which based on quantitative goals and targets to achieve. These research topics should take into account local constraints and resources available.
SA2- “Human factor in road safety”

- The current level of road users’ education and training is considered low in all countries. Especially the road users (drivers and not) are few aware of the risks on the road.
- Common indications to foster the development of suitable culture and to improve road safety education and training focus on two aspects:
  - training of trainers to make them more aware about road safety issues and to allow them to put attention on road safety aspects and not only on driving;
  - improvement of the tests for obtain driving licenses in order to increase driving skills also in case of particular situations (e.g. emergency conditions).
- In MPCs, the awareness campaigns are considered very important, especially for young people. The direction is to increase the number of campaigns and to increase the risk awareness already in schools.
- In Spain, the current enforcement measures and penalty system are right. Anyway it is necessary to get the drivers obey to the rules. One way of improving the enforcement is using radars with no fines, providing information to people on their driving behaviour. This should get users more aware of the risks.
- Concerning the education and training aspects, the needs identified in the MPCs are in line with the European Commission measure relating with the implementation of education programs and the improvement of road users awareness of road risk (i.e. education and publicity).
- The use of helmets, seatbelts and children seats should be included, as well as in EU, as violation which causes point loses in MPCs laws.
- The implementation of the points driving license system is of topical interest in MPCs. Such system already exists in Tunisia, even if it is not yet applied. The experiences of systems implemented in France, Italy and Spain could be replicated also in MPCs. This enforcement measure should be accompanied by a periodic assessment of its effectiveness (i.e. in the EU countries it resulted very effective only close to its start up). In the MPCs policy measures and plans for its implementation should be developed.
- In the framework of the revision of the driving license exams, in parallel with the researches realised in Europe (a work is ongoing to improve the conditions for driving license renew), the attention can be focused on road safety questions with important weight in front of traditional approach to regulations. Specific issue like vulnerable road users (especially pedestrians) can be aspects to be included in the exams to make new drivers more sensitive to these issues.
- Policy should be focused on points driving license, speed control, drugs and alcohol control, self protection measures, penal code for critical road safety laws violations. Moreover researches about enforcement can help to focus the attention on specific aspects like, high speed on secondary roads, violations in urban areas, etc.

SA3- “ITS to improve transport safety and security”

- The information and communication technologies begin to be implemented in transport in the Maghreb.
- Europe has reserved the phone number 112 to the road emergencies. Such initiative is technically easy to implement at a regional level, it needs of course a political will, which can be pushed to some extent by Europe.
Europe pushes to transnational research programmes at the European level, in all domains of course, on the road traffic subject in particular. Besides of course Euro-Mediterranean projects that are necessary, it should be profitable to MCPs to develop such cooperation also at the regional level.

With a long term perspective, it would be interesting to establish negotiations and cooperation between stakeholders (including the authorities) in the Maghreb and stakeholder in Europe to prepare future ITS systems (e.g. access to all vehicles to the technology supported, similarity of actions related to infrastructure - V2X applications).

The ACS system is under deployment in the MCPs, however, there are improvements made in Europe that can benefit to MCPs like the application of the ACS to control at the red lights.

Issues which are wrong (in the regulations) must be reviewed before to invest in some sophisticated systems like V2V or V2I applications. Indeed, the improvement is to join technology and social environment, with the adequate intensity.

SA4- “Safety aspects for infrastructure design”

- Spain has taken actions to implement safety audits for new road projects which are now mandatory according to the EU recommendations.

- All countries suggest that audits be external, but in the MPCs, the methods of verification of infrastructures security are still absent or insufficient.

- It is necessary to update the road maintenance regulation to define the minimum standards and to allocate more resources to the maintenance.

- Some specific measures/actions to reduce the risk for vulnerable users have been taken in some countries and may be used in other countries. In Spain for example, bikes have their own regulations in some cities for a safety and right traffic. This regulation informs how to traffic safety by the city in your bike. Algeria suggests providing driving licenses for motorcycles, and creation of circuits of road education for children. For Italy, promotion of the public transport modes is a safer alternative to the non-safe modes. For Tunisia, it is necessary to improve conditions of infrastructures, horizontal signals and pedestrian crossings, and to improve the risk awareness of the pedestrians.

- The costs of the maintenance should be verified periodically. The financing for the maintenance should be increased basing on the effective necessity. The contracts for the infrastructure management should refer to what should be done in term of periodic maintenance, in order to oblige the road managers to realize periodic interventions.

- Education and training is the main action to promote learning about adequate driving in each type of roads. Strong improvements must be focused on the secondary network (fatalities reductions in this network has been less than in arterial network - freeways-), although social impact is less.

- It is necessary to project and edit multidisciplinary and coordinated plans to get vulnerable users are more protected.

- It should be necessary to include the vulnerable road users’ aspects in the design of infrastructures, to consider the vulnerable users as mobility users. Infrastructural devices for their protection should be fostered at national level. Clear guidelines should be prepared.

- Actually the situation concerning the development and use of methods for verifying the infrastructure safety is bad. There are problems of financing and mentality.
Improvement must be done by training of personnel in charge of the controls and by defining strategies for a periodic control, and create an independent organism composed by different stakeholders for the control of infrastructure safety.

- The current situation of the rail crossings safety is insufficient. The crossings are not controlled and the systems used are old. The rail crossings safety should be increased by using new technologies in this field. The use of automatic barriers should be planned and adequately financed.

5.2 Strategic plan for future research

Basing on the results obtained, a strategic plan for the future research to be realised in the MPCs can be developed. Such roadmap considers the indications obtained in all the countries about the existing plans, best practices, etc. and about the main problems and solutions indicated by the stakeholders.

The roadmap contains an indication of the timing for this research (short, medium or long term) indicating the priority according to which the research should be implemented (i.e. what actions should be done more or less urgently).

Among the three transport modes (road, rail, maritime) analysed, the road has been recognised as that requiring more attention. This is due to its strong impact on the society in the MPCs, while rail and maritime, even if considered important, are seen as more “closed” systems in which the rules are already sufficiently well defined.

This consideration is reflected by the four sub-areas selected as the most interesting ones for the analysis. In fact, the rail and the maritime modes are considered only in relation with their interaction with the road mode. For the rail mode the aspect concerning the rail crossings has been retained, while for the maritime only the aspect concerning the ports operations has been considered.

The road safety issues have been clearly indicated as the most urgent aspect on which to concentrate the attention. The number of road accidents are recognised to be too high compared with the EU situation and there is a strong need to adopt actions to reduce them, as they have a direct and strong impact on the society.

More in detail, the most urgent aspect on which to intervene is related with cultural and societal aspects. In fact most of the accidents are due to wrong users behaviours. Also the improvement of safety related with infrastructures is considered of topical interest, especially in urban areas. On the contrary the development of innovative technologies is considered a less urgent topic.

The practical implementation of the recommendations for future research should require an active involvement from the main stakeholders (especially the decision makers) in the Mediterranean Partners Countries. The project activities, especially the surveys, have highlighted that the research execution in the South Mediterranean Countries have to be fostered and supported directly at national level (e.g. by Ministry of Transport, Ministry of Education, etc.). Thus the involvement of decision makers to foster the research is important. Moreover the support for the research activities should also consist in financing the project at national level.

The research implementation also depends on the involvement of the European counterpart to provide indications on knowledge and experiences already acquired (e.g. some research consists in adapting experiences developed in Europe in the MPCs). On another hand, several aspects can also be interesting for the European research, especially concerning the transferability of practices and tools, the implementation of common standards, etc. In this framework, the future research could then be financed by the European Commission through its Programmes.

An important aspect concerns the involvement of European companies (universities, public bodies, SMEs, etc.) in the future research. In fact most of the developments to be fostered in
the MPCs have been already treated in Europe and the experience gained can help to replicate best practices and to avoid bad ones.

It will be fundamental to include in the future research, when supported by Europe, specific transferability studies allowing to evaluate what solutions can be adopted in the MPCs and how.

Such future research should be initiated by the same MPCs involved in ESTEEM, in order to develop research according to the needs identified as result of the survey activities. In any case, it would be useful to foster the cooperation with Europe.

The cooperation should also be enlarged to other South Mediterranean Countries having similar transport safety conditions and which could then benefit of the research results. Moreover, the participation of other research centres and universities, as well as private companies (especially SMEs) and public bodies (e.g. ministries, national councils about road safety, etc.) should be considered as fundamental. As highlighted during the surveys, the result of the research depends strongly on the involvement of main stakeholders in all the countries.

In the following paragraphs future research to be developed is reported, together with an indication of possible timing (short, medium and long term), even if most of the actions should be undertaken at short term.

At this stage the division between sub-areas has been avoided, as the possible actions are often interrelated. The proposed research has not to be considered exhaustive but, on the contrary, as a basis for developing further actions. In general the important aspect to be considered relates with fostering the collaboration with other research centres and universities on the transport issues.

**Short term**

**Definition of plans and tools for improving the quality and accessibility of data on road accidents.**

The research should analyse the actual process of data collection about the road accidents in the south side of the Mediterranean sea, in order to define suitable plans for increasing the quality of data on accidents. Analysis should also concern the revision of the data collection and registration systems and evaluate the use of innovative methods and tools. The research should lead to the definition of a standardised process of road accident data collection suitable for the countries of the south side of the Mediterranean sea.

Research projects involving stakeholders from both sides of the Mediterranean Sea, focused on this particular subject, should allow analysis, comparisons and production of recommendations and solutions which should fit with local contexts. Extensions should also be favoured to deal more generally with all transport data.

**Implementation of a regional Road Safety Observatory.**

Research should be focused on implementing a Road Safety Observatory at regional level (i.e. south side of the Mediterranean sea) allowing to foster the standardisation of the road safety management in the region. The Observatory should allow to support the management aspects (e.g. providing guidelines or advices on laws), to contain and compare data on road accident and measures adopted. The Observatory could be based on the experiences realised at national level (e.g. Morocco and Tunisia) and in Europe.

The installation of such a regional Observatory should also help the deployment of solutions (e.g. implementation of appropriated departments) in order to centralise data on transport, making thus easy the access to these for all stakeholders.
Definition of guidelines and tools for improving the mobility in the urban areas.

Given the increasing use of private cars, it is considered necessary to rationalize their use. The aim is to increase the road safety in the urban areas by applying suitable mobility measures. The research should analyze the current situation and develop mobility plans focused on road safety improvement. The measures to be adopted should focus, at least, on:

• modal shift towards public transport;
• rationalization of private cars use;
• protection of vulnerable road users (pedestrians, two wheels drivers, etc.);
• infrastructure devices;
• information and communication tools;
• effective public transports (e.g. adaptation of infrastructures – development of bus lanes for a fluid traffic);
• improvement of offers of public transports (e.g. development of multi-modal transport offers, that is more rails, metros, etc.);
• rationalization of private cars use (e.g. development of car-sharing services);
• information and communication services (e.g. ICT to improve the information that is given to the transport users).

The development of pilot studies should also be fostered.

Development of plans for effective and periodic awareness campaigns on road safety.

The aim of the research should be to increase the road risks awareness by means of road safety campaigns. Research should be focused on defining the most suitable and effective campaigns to be realised according to the local conditions and habits (e.g. how to give the message, what kind of message, where to make campaigns). Campaigns have to be considered a key issue as they reinforce and anticipate effects of other measures (e.g. enforcement). The research should include a complete evaluation of the communication and education actions on road safety undertaken in order to set up future plans of development. Also the analysis of the psychological and social underlying the road users behaviour should be fostered the research.

From a practical point of view, efforts of European associations have produced some key results, for instance: the development of banks of films dedicated to the road risks awareness; the involvement of youths to fight against the road risks, etc. It is to mention that associations are also currently promoting the development of such actions at Euro-Mediterranean level. Scientific cooperation involving both sides of the Mediterranean Sea should thus integrate such associations in order to benefit from their field experiences.

Evaluation et modernization of the road driving training.

The Moroccan Ministry of Infrastructure and Transportation has deployed several information systems that are related to major causes of accidents: driver training and state of vehicles. For instance, a multimedia system for the driving license exam has been implemented recently, integrating a database of questions and answers and computer and audio-visual equipments.

Among the actions being considered in Algeria are the following measures: (1) the creation of national training schools for inspectors, (2) control of driver training, (3) increased number of hours of driver training, (4) increasing controls on the roads, (5) education at younger ages, (6) improved collection of fines.
Research should be focused on analysing and defining suitable measures to improve the current driving training, with the aim of defining a training curriculum standardised at regional level. Aspects to be considered during the research should be:

- Increase training of trainers as starting point to improve cultural aspects (definition of adequate quality standards of training, inclusion of road safety awareness in teaching).
- Revise rules for obtaining driving licenses (definition of minimum standards for obtaining driving licenses, focusing on aspects like road safety culture, respect of vulnerable users, driving behaviours, road code knowledge, in addition to driving skills).
- Education to road safety issues in schools (developing programmes to systematically teach the road safety, rules, correct behaviours in schools, as a way to foster a mentality change and to increase risks awareness).
- Coordination of education and training activities (definition of plans for managing and controlling the training centres, for improving communication as basis for the creation of coordination bodies for road safety aspects).

**Definition of plans and actions to make the rules applied.**

Research should be focused on defining plans and actions to foster the application of the laws and rules. Improvements can come from development of fines management systems in order to minimise the time between violation and receiving the penalty notification. Use of automatic systems should also be fostered. It is necessary to increase the awareness of users and police forces about the importance of applying rules (e.g. through campaigns). Research also focuses on updating and harmonising the national road codes and of the rules. Plans for implementing gradually new rules (and new behaviours) could be developed.

**Revision of enforcement methods.**

Enforcement methods in the MPCs are inspired from the European ones; however, there are differences from the application point of view. The rules are not always applied to the level they should be (e.g. seat-belts are not always mandatory in the rear seats). Research should be developed with the aim of revising the current system of penalties (e.g. cost of the fines, loss of points associated with the licence, etc.). It is necessary to introduce new applying strategies, enforcing also wrong behaviours of non drivers (e.g. pedestrians). Research should then focus on defining plans for updating the current enforcement methods. Harmonisation of rules and methods at national and regional level should be studied, as well as transferability of European methods (e.g. use of innovative systems). Finally the coordination between stakeholders for an efficient application of all the operational axes of road safety should also be a topic for research.

**Develop guidelines and tools for road safety verification.**

Research should focus on developing methods of road safety audit and inspection adapted to the situation of the countries of the south side of the Mediterranean sea. The improvement of the infrastructures safety passes by the reinforcement of the engineering and design specifications, and the raising of competences of the departments in charge of control and checking of the infrastructures safety. Transferability of experiences and practices from other countries should be fostered. The status of road and rail infrastructures should be analyzed from the point of view of safety.
Development of measures for standardising the infrastructure maintenance.
The research should concentrate on analysing the current maintenance process in the
countries of the south side of the Mediterranean sea (e.g. minimum standards, tools,
organisation of resources, training of experts, etc.) with the aim of standardising the
infrastructure maintenance process.

Medium term
Analysis of road accident causes and definition of countermeasures.
The research should investigate the use of in-depth road accident data collection methods
allowing to understand the causes of accidents and to define correct countermeasures to be
applied. The research should include actions concerning:

- training of accident data collectors;
- definition of black-points;
- reconstruction of accidents;
- definition and evaluation of countermeasures against road accident;
- definition of plans of road safety management;
- implementation of tools for road safety management (accident data collection,
analysis, definition of countermeasures, etc.).

The research should be standardised a regional level.

Technical control of vehicles.
A system has been implemented in Morocco for the management of technical controls of
vehicles. It allows reducing the intervention of human operators, increasing then the reliability
of the controls and data on the stock of vehicles.

Research should focus on the evaluation of the current technical controls of vehicles realised
in the countries of the south side of the Mediterranean sea (e.g. type of controls, periodicity,
tools, etc.). The aim is to develop plans to make the controls homogenous and standardised
at national and regional level.

Increasing knowledge about ITS and their benefits.
Research should foster the exchanges about ITS under different forms (e.g. training, bilateral
visits, scientific seminars / ateliers, etc.) involving the stakeholders (including companies and
the decision makers at local and national levels) in order to increase knowledge and
awareness about ITS and their usefulness. Research should also focus on transferability of
tools existing in other countries (i.e. action plans with timing for progressive introduction).

The techniques underlying “Automatic Incident Detection” applications are for instance good
candidates to help decision-makers understand the improvement that can bring ITS to make
transports safer.

Development of an ITS architecture.
Research should concentrate on the development of standardised plans and guidelines for
the implementation of ITS at regional level. The objective of the research should be to
develop an ITS architecture for the south side of the Mediterranean sea, basing on similar
European experiences.
Research should also be developed to foster the deployment of corresponding ITS services (e.g. a Euro-Mediterranean project dealing with fleet management and multimodal transports performed at a trans-national level).

**Development of specific studies aiming at identifying needs and possible ITS solutions.**

Research should concentrate on analyzing the current transport safety & security situation with the objective of defining the most suitable ITS to be introduced at long term in the countries of the south side of the Mediterranean sea. Research should focus on:

- systems for the improvement of safety and security of port operations;
- systems for the improvement of information to users;
- enforcement systems;
- systems for improvement of safety and security of transport users at national and/or trans-national levels (e.g. call services dedicated to emergencies);
- integration of ITS according to the infrastructure characteristics and its use.

**Development of plans for increasing safety of rail crossings.**

Research should focus on defining plans, guidelines and tools for increasing the rail crossing safety supported at regional level. Specific aspects to be considered are:

- improvement of the signalization in non controlled rails crossing;
- fostering the policy of rails crossing elimination;
- improvements to eliminate the rail crossings near cities and implementing the technological devices in rural areas;
- deployment of ITS services (e.g. AID based solutions);
- planning of use of automatic barriers.

**Long term**

**Analysis of the management and coordination system of road safety.**

Research should be focused on the analysis of the current management and coordination process of road safety with the aim of fostering the creation of coordination structures charged of the road safety management at national level. The research should include a revision of the road safety actions (enforcement methods, data collection process, etc.) to make it standardised at regional level.

**6 Conclusions**

This deliverable relates with the final outcome of the project ESTEEM (Enhancing Safety and security aspects in Transport rEsearch in the EuroMediterranean region) concerning the identification of priority common research themes, responding to identified needs, which should be investigated in future research actions to be carried out at the regional level. Thus, this document relates to the preparation of future research roadmap for both the FP7 Transport programme and the Mediterranean Partner Countries (MPCs) governments.

The deliverable synthesises the actual situation of transport safety and security in the countries involved with the project (namely Algeria, France, Italy, Morocco, Spain and Tunisia) and the main recommendations for future development in the (MPCs) and then
describes the roadmap for future research to be undertaken in the near future in the South Mediterranean Area.

The strategy adopted during the project to build the roadmap consisted in:

- identifying and selecting four thematic sub-areas to be investigated (Work Package 1);
- analysing the sub-areas in the form of structured surveys - desk analysis and interviews to stakeholders - (Work Package 2);
- exchanging results and sharing knowledge through two workshops aimed at collecting recommendations and opinions from MPCs stakeholders (Work Package 3).

The four sub-areas identified for the analysis mainly relate with specific road safety aspects (e.g. data collection, management, infrastructure design, vulnerable users, enforcement). The most interesting transport mode appears to be the road one, while other modes (i.e. maritime and rail) are concerned regarding to specific issues (e.g. port operations, ITS, rail crossing safety). The four sub-areas selected are:

- Road safety management aspects (accident data collection and analysis; road safety management process).
- Human factors in road safety (road users education and training; enforcement).
- ITS to improve transport safety and security.
- Safety aspects of infrastructure design (safety audit and inspection; rail crossing safety; infrastructure maintenance; vulnerable road users).

For each sub-area, survey actions have been carried out in order to identify the specific needs of the region, to find the existing best practices, to identify viable technical solutions and the priority research actions to be undertaken by policy makers and the Europe.

The specific needs have been investigated by means of interviews addressed to stakeholders, dealing with transport issues of the South Mediterranean Region, and desk analysis.

In addition to the survey activities, two workshops have been organised with the aim of bringing together actors and stakeholders in order to discuss and validate the results of the surveys. The objective of the workshops was to foster the coordination of research activities in the MPCs, bringing technical experts, researchers, institutions and companies, dealing with the selected sub-areas, in contact among them. Institutions and companies from Europe and MPCs were invited to actively participate to the workshops connected to the sub-areas surveyed. During the workshops, organised in one of the MPCs, the survey results were presented and discussions about specific topics for future research were fostered.

Basing on the results obtained from these activities several recommendations were obtained for improving through research the safety and security aspects of transport system. These recommendations have been synthesized in form of roadmap for future research representing the final outcome of ESTEEM.

The proposals for future research refer to development to be implemented in the South Mediterranean Region (extending the influence also to other countries not involved directly in the project). The research are intended to be developed through the support of the national parties and of the European Commission and should involve not only universities and research centres but also public bodies (ministries, local administrations, etc.) and private companies (especially SMEs).

The proposals for future research concern the following topics:

- Definition of plans and tools for improving the quality and accessibility of data on road accidents.
• Implementation of a regional Road Safety Observatory.
• Definition of guidelines and tools for improving the mobility in the urban areas.
• Development of plans for effective and periodic awareness campaigns on road safety.
• Evaluation et modernization of the road driving training.
• Definition of plans and actions to make the rules applied.
• Revision of enforcement methods.
• Develop guidelines and tools for road safety verification.
• Development of measures for standardising the infrastructure maintenance.
• Analysis of road accident causes and definition of countermeasures.
• Technical control of vehicles.
• Increasing knowledge about ITS and their benefits.
• Development of an ITS architecture.
• Development of specific studies aiming at identifying needs and possible ITS solutions.
• Development of plans for increasing safety of rail crossings.
• Analysis of the management and coordination system of road safety.