

**RESEARCH AT THE NATIONAL AND
EUROPEAN LEVELS ON THE MAIN FIELDS OF
INTERVENTION COVERED BY THE EU
DIRECTIVE ON ROAD INFRASTRUCTURE
SAFETY MANAGEMENT - THE EXPERIENCE
OF A NATIONAL RESEARCH LABORATORY
(LNEC)**

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**RESEARCH AT THE NATIONAL AND EUROPEAN LEVELS ON THE MAIN FIELDS OF INTERVENTION
COVERED BY THE EU DIRECTIVE ON ROAD INFRASTRUCTURE SAFETY MANAGEMENT**

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Abstract

In November 2008 the European Parliament and the Council of the EU have adopted a Directive aimed at the improvement of road infrastructures safety management within the Trans-European Road Network, that can also be extended as a set of good practices to other national networks, through the implementation by the Member States of procedures relating to: “road safety impact assessments” and “road safety audits” of infrastructure projects; the “safety ranking and management” of the road network in operation; “safety inspections”; and “data management”.

In the same Directive it is stated that research activity and the dissemination of its results play an important role in this process. At the Transportation Department of the National Laboratory for Civil Engineering (LNEC), in Portugal, a special attention has been given, over the time, to these and other safety related research topics. In this context, the participation in European projects and collaboration agreements with national road and traffic administrations, have given a support to the studies carried out and a practical ground for the application of their results.

Based upon this experience, in this paper a concise description is made on the main aspects of the EU Directive and on their relation with research studies, either already completed or on-going, at the European and national levels, showing how they can provide relevant contributions to the overall objective of a continuous improvement of road traffic safety.

1. INTRODUCTORY BACKGROUND

In road safety theory and practice, the influence of road infrastructure characteristics on the occurrence of accidents and on their severity, as well as on the risk level posed to the road users, is a known issue, which is taken into account either independently or in conjunction with other relevant factors, such as those related to the vehicles and to human behavior.

In fact, within the analysis of the complex process conducting to a single accident, or when overall assessments are made based upon statistical accident data concerning the whole traffic system, the part played by the road infrastructure becomes apparent.

Road safety research has evolved as an autonomous scientific area mainly after World War II, in the most developed countries, following a huge increase in road transport of people and goods, with inherent consequences, such as the widespread growing number of deaths in road accidents, which reached their peak in the 60's and 70's. The studies carried out in this area, as far as the infrastructure was concerned, started to focus separately on physical elements of the road (geometric layout, pavement surface characteristics, roadside features and equipments, etc.), for assessing the potential danger they posed and to provide best practice recommendations for design and construction.

Considerable progress was achieved since then on the reduction of the number and consequences of road accidents, whilst traffic volumes continued to show a strong increase. This was possible through a large set of actions, undertaken at national, regional and local levels, and cannot be dissociated from the investments and efforts put into the rehabilitation and construction of new roads in the main networks, according to modern standards, having safety as one important design criteria. However, a large number of the effective actions were mainly directed to the human component, namely in education, training, public awareness, legislation and

enforcement. Also in the vehicle side, considerable and continuous advances were attained on passive and, more recently, active safety equipments and technology.

Despite this progress, the death toll in road accidents has continued to represent a major problem for society, even in the most advanced countries in this field. Within this context, by the end of the XX Century the concept of “road safety management” was introduced and put into practice, as part of overall road management schemes, in urban and rural road networks, providing for the integration of safety measures and for their priority ranking, optimizing the use of available resources, with the underlying consideration of the infrastructure and traffic operation as a dynamic and open system.

The road safety issue has been in the agenda of the EU with growing emphasis since the publication, in 2001, of the “White Paper” on the European transport policy for 2010, setting the target of halving the number of deaths within the EU in this period. For that purpose a “European Road Safety Action Programme” was published by the Commission in 2003, where road infrastructure was identified as one of the three main pillars of the road safety policy. The objectives set forth by these initiatives involve a shared responsibility with the Member States, who, in turn, develop their own road safety plans with specific targets. The special focus of the Commission is, therefore, put into ensuring a high level of safety on the “trans-European road network”.

The Directive 2008/96/EC of the European Parliament and of the Council, of 19 November 2008, on road infrastructure safety management is in line with the above strategic course of action, following other initiatives on different areas related to road safety. In chapter 2 of this paper the main aspects of this Directive are presented.

The types of interventions in road safety which are covered by the Directive, pertaining to the various stages of the life cycle of road infrastructures (from planning to construction and operation) have been the subject of previous research studies and development work carried out over time, and on-going, at different levels, for instance, in joint European R&D projects, and through national research studies directed to the specificity of each road traffic system.

The Transportation Department (DT) is one of the seven operational units of the National Laboratory for Civil Engineering (LNEC), in Portugal. Among its areas of expertise is “traffic and road safety” in which considerable scientific work has been carried out for more than 30 years, at the national and international levels. One of the main focus of this research activity has been precisely on topics closely related to the road infrastructure, such as those covered by the Directive. In chapter 3, mention is made to relevant contributions in this context.

Finally, in chapter 4, some major remarks and expected developments in the field under consideration, are pointed out.

2. THE DIRECTIVE ON ROAD INFRASTRUCTURE SAFETY MANAGEMENT

By the Directive 2008/96/EC it is required to the Member States to develop a road infrastructure management system for application to the links which are part of the trans-European road network, through the establishment and implementation of the following main procedures (1):

- **Road safety impact assessment for infrastructure projects** - “a strategic comparative analysis of the impact of a new road or a substantial modification to the existing network on the safety performance of the road network”; to be carried out at the planning or initial stage of the project, allowing for alternative choices and providing relevant information for cost-benefit analysis at this level.
- **Road safety audits for infrastructure projects** – “an independent detailed systematic and technical safety check relating to the design characteristics of a road infrastructure project and covering all stages

from planning to early operation”; to constitute an integral part of the design process (draft design, detailed design, pre-opening and early operation), carried out by auditors qualified with the necessary competence and training.

- **Safety ranking and management of the road network in operation:**
 - Ranking of high accident concentration sections – “a method to identify, analyse and rank sections of the road network which have been in operation for more than three years and upon which a large number of fatal accidents in proportion to the traffic flow have occurred”;
 - Network safety ranking – “a method for identifying, analysing and classifying parts of the existing road network according to their potential for safety development and accident cost savings”.

- **Safety inspections** – “an ordinary periodical verification of the characteristics and defects that require maintenance work for reasons of safety”; undertaken by the competent entity over the roads in operation, safeguarding adequate safety levels and calling upon interventions when necessary for preventing accidents.

- **Data management** – to ensure that for each fatal accident occurring on the road network under consideration, a report is drawn by the competent entity, including each of a set of data elements which are listed; further information on the average social costs of fatal and severe accidents, calculated at each Member State, shall also be included.

3. ROAD SAFETY RESEARCH CONTRIBUTIONS

Road engineering interventions represent an important part of road safety measures. Experience has shown that their effectiveness is highly dependent on the adoption of sound principles and methods based upon the results of applied research. Furthermore, the monitoring and the evaluation of the safety consequences of the interventions play an important role in this process, and must be pursued according to scientific approaches.

The activity carried out at LNEC in this area is based on the above assumptions. It has started in the 70’s with a project study on the influence of the road in accidents, which was further developed, namely by introducing drivers’ speed as an intermediate variable for the consideration of the human factor, and deriving adequate statistical accident frequency prediction models. This approach, together with the development of an accident data base, have enabled the setting up of advanced methodologies for the identification of inconsistent road curves and for the definition and detection, at the Portuguese national road network, of hazardous locations where the influence of road infrastructure features (including its close environment) is assumed as an accident factor, taking into account road class and exposure data.

This line of research was also developed, through the participation, by the end of the 90’s, in European research actions, such as COST Transport Action 329 (“Models for Traffic and Safety Developments and Interventions”) and in the SAFESTAR Project (“Safety Standards for Road Design and Redesign”), of the EU 4th Framework Program. Within the latter, mention should be made to a work package on the subject of “road safety audits” where main underlying concepts and technical aspects were analysed.

Some practical results of this research were thereafter adapted by LNEC for their application to the Portuguese road traffic system, through protocol agreements with national road and traffic administrations. These gave rise to the publication of best practice guidelines, namely on: “Low cost engineering measures for accident reduction”; “Road safety audit on the design of national roads”; and “Roadside safety measures”.

The development of the research in this area at the European level reached a further stage with the RIPCORD-ISEREST Project (“Road Infrastructure Safety Protection – Core Research and Development for Road Safety in Europe; Increasing Safety and Reliability of Secondary Roads for a Sustainable Surface Transport”), under the 6th Framework Programme, from 2005 to 2008 (2). The RIPCORD-ISEREST Project aimed at providing scientific support to the European transport policy, by establishing best practice tools and guidelines for managing safety interventions intended to reduce the risk and severity of accidents during the whole life cycle of road infrastructures. The participation of LNEC covered five work packages dealing with important aspects of the Directive: road safety impact assessments; self-explaining and forgiving road and roadside design; the safety audit of road schemes; road safety inspections; black spot management and the safety analysis of road networks. The deliverables produced contain helpful suggestions for EU Member States on how to develop their own national guidelines and procedures to fulfil the Directive technical requirements (3 to 5).

Recently, within the ERANET program, projects were initiated to develop more in-depth guidance on how to implement some infrastructure safety management procedures which are less widespread in the EU space. One such project is RISMET (“Road Infrastructure Safety Management Evaluation Tools”), which aims at developing suitable road safety engineering evaluation tools that will allow road authorities to improve their decision making and to implement intervention measures to improve the road safety situation. This will be made through the identification of both registered and potentially unsafe locations in a road network, and the calculation of potential benefits from interventions at the local and the network level. Current practices are being reviewed to appraise their data requirements, their merits as a quantitative safety assessment tool, and to select those more suitable for use in pilot tests to be carried out in the participating countries. As a final result of the project, guidelines and codes of practice will be drafted, outlining all aspects related to the development and application of evaluation tools, with special focus on accident prediction models and on their application by European road authorities.

4. FINAL REMARKS

The Directive 2008/96/EC, of the European Parliament and of the Council, of 19 November 2008, has set the framework for a much needed policy for rational management of safety interventions on the road infrastructure. Although it is primarily directed to the trans-European road network, its purposes and procedures can be extended as a set of good practices to national and regional networks.

At the same time, it poses a major challenge to traffic management agencies (in-depth investigation of fatal accidents), road administrations (adoption and implementation of new procedures and cost-benefit analysis) and research institutions (expanding quantitative knowledge and improving methods for sound and useful evaluation of effects).

It also tests the ability of Member States governments and organizations to collaborate in an inter-disciplinary and inter-agencies framework, namely in order to collect and explore the relevant data, according to common procedures.

Safety research, in the area of road infrastructures, which has been undertaken over the past decades, has given the necessary scientific support to the definition and operational requirements of the procedures covered by this Directive. Research actions should continue to be a means of improvement and validation of the existing procedures and a prerequisite for new developments, such as, for example, those related to the use of ITS for safety purposes. Within this context, the dissemination of results and new findings should be a permanent concern.

All stakeholders will be increasingly networked and, yet, more accountable for their contribution to the common goal of improved road safety levels in Europe.

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