EFFECTIVE AND COORDINATED ROAD INFRASTRUCTURES
SAFETY OPERATIONS

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ABSTRACT

The general objective of the ECOROADS project is to overcome the barrier established by the formal interpretation of the two Directives 2008/96/EC (on road infrastructure safety management) and 2004/54/EC (on tunnels), that in practice do not allow the same Road Safety Audits/Inspections described in the first Directive to be performed inside tunnels, ruled by the second one only. This implies that, while from the user (driver) point of view a road is a unique linear infrastructure generally in open terrain and sometimes in closed environment (tunnels), the strict application of the two Directives leads to a non-uniform approach to the infrastructure safety management outside and inside tunnels.

The ECOROADS project is establishing a common enhanced approach to road infrastructure and tunnel safety management by using the concepts and criteria of the Directive 2008/96/CE on road infrastructure safety management and the results of related European Commission (EC) funded projects. The direct involvement of different public and private stakeholders through dedicated workshops, discussion and exchange of best practices between European tunnel experts and road safety professionals are leading to common agreed procedures that will be tested in five European road sections which feature both open roads and tunnels.

The outcome of the project will be a set of commonly agreed recommendations and guidelines for a coherent application of safety procedures on the whole road network, both at the Member State and EU level, providing a valuable input to the work of the EC and the possible future revision of one or both Directives. ECOROADS started on June 2015 and is now approaching the first phase of the field visits, after having defined the procedures for the joint operations involving road and tunnel safety experts. This paper explains the basic concept and the criteria adopted for the test sites, together with the common approach agreed by the international stakeholders concerned.

Keywords: Road Safety, Tunnel safety, European Directives, Road Safety operations,
1. INTRODUCTION
The general objective of the ECOROADS project is to overcome the barrier established by the formal interpretation of the two Directives 2008/96/EC (on road infrastructure safety management) and 2004/54/EC (on tunnels), that in practice do not allow the same Road Safety Audits/Inspections to be performed inside tunnels, as shown in Figure 1.

The main problem is that, while from the user (driver) point of view a road is a unique linear infrastructure generally in open terrain and sometimes in closed environment (tunnels), the strict application of the two Directives leads to a non-uniform approach to the infrastructure safety management outside and inside tunnels.

This project is the follow-up of the initiative related to the European Road Safety Directives and the two workshops held at the European Social and Economic Committee (EESC) by a group of international stakeholders in February and May 2013: a debate that was initiated as a result of the coach crash in Switzerland that caused more than 28 fatalities, including 22 children.

The collision occurred in 2012 with the end wall of an emergency parking facility in the Sierre tunnel, Switzerland, which opened in 1999 and was rated as “good” in a 2005 European Tunnel Assessment Programme (EuroTAP) test. The end wall was placed at 90 degrees with respect to the direction of the adjacent traffic flow, without any adequate protection from collision.

This feature of tunnel design is typical of many European tunnels, as shown in Figure 2 – 90 degrees walls without any protection -, where operations such as RSA during the design process or RSI after opening to traffic, according to the prescriptions of the Directive 2008/96/EC, could be beneficial for risk prevention.

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Indeed, this Directive does not apply to road tunnels covered by Directive 2004/54/EC (Art.1, point 4 of the Directive 2008/96/CE, as shown in the following figure).

**Fig. 2. On the left the lay-by in the Sierre Tunnel; on the right similar situations in several tunnels**

On the other hand, Directive (2004/54/EC) does not deal directly with RSA or RSI inside the tunnels: There is only a general statement about taking "all aspects of the system composed of the infrastructure, operation, users and vehicles" into account in Annex 1. Different interpretation and application by Member States may further amplify the gap between the two Directives.

Some interested stakeholders organised a collection of signatures to address a petition\(^2\) to the EC at the beginning of the Decade of Action for Road Safety, in order to call for an initiative that aims to fill the gap between the two Directives and therefore contribute to the further reduction of road traffic collision fatalities in Europe.

Then, the ECORoads informal consortium submitted to the European Commission a proposal aiming at the deployment of mixed groups of tunnel and road safety experts performing joint safety inspections in both tunnels and open roads, in order to find a common agreed inspection methodology able to enhance safety in roads and tunnels.

The project has been financed by the European Commission and started on June 2015.

\(^2\) http://www.aipss.it/letter_to_the_commissioner.html
2. METHODOLOGY

The overall approach of the ECOROADS is based on the previous successfully project Pilot4Safety [1] and is divided into several phases, including a clear overview of the application of the two Directives in the Member States, a series of workshops with the stakeholders (European tunnel and road managers), and the exchange of best practices between European experts in the two fields:

Clear **overview of the application of the two Directives in the Member States** and the extent of the gap between them already described in the previous section.

The analysis/review of national practices regarding Road Safety Inspections (RSI) and Road Safety Audit (RSA) started from the results of the two studies recently launched by DG MOVE to assess the impact of the two Directives on road infrastructure safety management [2] and tunnels.[3]

**Workshops with the stakeholders** (European tunnel and road managers from at least 10 European countries), organised according to the following figure:

![Fig. 4. ECOROADS Methodology](image-url)
Test sites: during the first workshop the following test fields were chosen through a multi-criteria ranking procedure among 15 applications coming from several European countries.

<table>
<thead>
<tr>
<th>Test sites</th>
<th>Selected test sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kennedy tunnel, Antwerp - Belgium</td>
<td>Inspection Planned on March 2016</td>
</tr>
<tr>
<td>Krraba tunnel, Tirana – Elbasan highway - Albania</td>
<td>Inspection Planned on April 2016</td>
</tr>
<tr>
<td>BAB A71/ Rennsteig Tunnel - Germany</td>
<td>To be planned after the 2nd Workshop</td>
</tr>
<tr>
<td>Belgrade bypass Strazevica tunnel, Corridor X - Serbia</td>
<td>To be planned after the 2nd Workshop</td>
</tr>
<tr>
<td>Demir Kapija tunnel, Corridor X - FYROM</td>
<td>To be planned after the 2nd Workshop</td>
</tr>
</tbody>
</table>

2.1. Joint Audit/Inspection procedures

During the Seminar for exchange of best practices on RSA/ RSI at open roads and tunnels, and during dedicated meetings among the ECOROADS partnership, held between November 2015 and January 2016, a preliminary procedure has been agreed, based on the following considerations:

The Directive 2008/96/EC applies to road sections of the Trans-European Transport Network, whether they are at design stage, under construction or in operation. Its provisions may also be applied to national road transport infrastructure, not being part of the TEN-T but constructed - entirely or partly - using Community financial assistance.

Based on a large literature review the Pilot4Safety Project Handbook [4] concluded to the following consolidated definitions of RSA and RSI:

Road Safety Audit describes a systematic and independent examination of a project designed to highlight potential safety issues at the earliest possible stage of planning and construction, to reduce or eliminate these problems and limit the risk for different types of road users.

Road Safety Inspection is a preventive safety management tool implemented by road authorities/operators as part of a global Road Safety Management. An RSI is a systematic field survey organised sufficiently frequently on all existing roads or sections of a road to secure adequate safety levels. It is carried out by trained road safety experts to identify hazardous conditions and deficiencies that may lead to serious accidents. RSI results in a formal report on detected road hazards and safety issues.

The Directive on Tunnels (2004/54/EC) makes reference to periodic inspections carried out by the tunnel’s Inspection Entity at maximum intervals of 6 years for any given tunnel. Parallelizing with the Road Safety process, the RSA during planning, design, construction and pre-opening phases, the tunnel Directive requires a Safety Documentation (Annex II), which describes the processes for approval of the design, for opening of a tunnel, for modifications in the physical and operational characteristics of a tunnel and for performing periodic exercises for tunnel staff and emergency services, and includes the content and results of a Risk Analysis.

Regarding the typical processes of the distinct Road/ Tunnel Safety procedures described above, both RSA/ RSI and tunnel safety inspection (TSI) contain the assignment from the Client/ Assignor (responsible authority/ body/ unit) and an independent approach by the assignee (Auditor/ Inspection
To perform the appropriate activities and report back, with interaction between two sides before and after the duration of these activities and reporting,

Therefore, compared to RSA/RSI, other procedures are foreseen for safety assessment of tunnels that are subjected to the Tunnel Directive.

To this end, the ECOROADS objective is to experiment on the incorporation of the tunnels safety procedures in an integrated approach for joint safety operations at both tunnels and open roads, with focus on road safety. The ECOROADS approach is purely “operational” and finalised to an integrated practical approach that will be substantiated in practical guidelines and recommendations.

On the basis of the feedback from the 1st project Workshop held in September 2015 and the Seminar for exchange of best practices held in November 2015, and considering the experimental approach of the project, the following categories of involvement in the field tests process are foreseen:

**Infrastructure (Road/ Tunnel) Manager(s):** the administration/ authority/ manager(s) of the road/ tunnel infrastructure of each of the ECOROADS field tests.

**Host organisation:** The organisation/ authority that organises and facilitates the field test (State or Regional Road Authority/ Agency, Infrastructure Manager, Ministry of Infrastructure or Public Works).

**Audit/ Inspection Group:** the mixed international team of (road/ tunnel) experts and other stakeholders that will take part in a field test. It consists of the Core Audit/ Inspection Team, the “External” observers, the Facilitator and the ECOROADS “Internal” observer, and it may be enhanced with other ECOROADS consortium experts interested and representative of the host organisation/ infrastructure manager(s) provided this is allowed in order to maintain a specific number of team members on site.

**Core Audit/ Inspection Team:** the mixed international team of experts that are assigned/ authorised to jointly and independently (from the infrastructure managers) perform an audit/ inspection at a designated road/ tunnel infrastructure and report on their findings.

**“External” Observers:** stakeholders with different competences, representing different authorities accompanying the Core Audit/ Inspection Team in a field test.

**Facilitators:** local/national expert ensuring organisation, communication and cooperation between the infrastructure manager(s) and the project.

**ECOROADS “Internal” Observer:** A member of the ECOROADS consortium, who takes part in the field test, ensures the conformity of each joint audit/ inspection with the common procedures and reports to the WP5 leader and the consortium.

**Other “External Experts” and Stakeholders:** other local and national interested parties (incl. road user groups) providing complementary information to each Core Audit/ Inspection Team and may be present only at the briefing meeting.

The roles and responsibilities of the actors involved in the field tests and their interactions are schematically presented in Figure 5.
The Deliverable D5.1, available in the web site of the ECOROADS project [5], describes the common organisational and technical details for the performance of the ECOROADS joint road safety operations. In the same deliverable it is also explained how these procedures are built on the basis of the basis of the Audit and Inspection approach agreed during the Pilot4Safety project.
3. EXPECTED RESULTS

At the time of the submission of this paper, the Audit/Inspection procedure (first practical result of the project) has been just agreed and the field visit in the test sites are not yet initiated: the second dedicated workshop, open to all interested stakeholders, will analyse and discuss the feedback provided by the two Audit/Inspection groups in order to fine tune the procedures and going ahead with the further three site visits.

This project is expected to contribute in a common approach towards infrastructure safety monitoring: the life span of ageing infrastructure, particularly in the transition areas between tunnels and the open road, will therefore be extended, due to better attention being given to their inspection. The Guidelines and Recommendations that will be delivered by the project are an effective tool to meet cost-effectiveness and sustainability goals

3.1. Future aspects

Since its beginning, ECOROADS collected a very high interest from the stakeholders and the first performed tasks highlighted a series of relevant issues that cannot be faced by complying at the same time with both the Description of Action in the Grant Agreement with the commission and the budget:

- Private tunnel operators, represented by partner ASECAP\(^3\) inside the project, welcomed the initiative but underlined that each tunnel has its particular characteristics and a more extensive action is needed to ensure a common approach at European level.

- PIA\(^4\)RC discussed the first outcomes of the ECOROADS project during their 25th World Road Congress in Seoul on November 2015: their Tunnel Committee was charged to explore the possibilities of cooperation with the project on some specific fields of investigations related to tunnel safety approaches: a meeting between ECOROADS and PIA\(^4\)RC representative is under scheduling after the first round of site visits.

- Western Balkan Countries, represented by partner SEETO\(^5\) inside the project, have a huge interest in these operations, due to their need to adequate their road infrastructure safety approach to the EU standards: 3 of the 5 scheduled test sites are located in this area (Albania, Macedonia and Serbia). However, the other SEETO countries plus the former one (Croatia) are asking for inspections in their tunnels or at least to participate in the joint operations in the 5 selected sites: this could be difficult, because the groups actually operating in the test sites should be limited, for both safety and operational reasons.

- One task of the ECOROADS project was a “Report on the application of the two Directives and road user needs”, for which the project partners analysed the study commissioned on the effectiveness of the Directive 2008/96/EC\(^2\), where it is underlined that: “uniformity can be read more on a formal level that on a substantial one as the Directive does not provide any detailed guidance on the application of the RISM\(^6\) procedures, nor harmonisation between Member States is prospectively foreseen” and “the Directive has not favoured the mobility of road safety professionals across Member States and, at present, there is no evidence indicating that such mobility is taking place”

- The above mentioned study\(^2\) clearly underlined that the deployment of ICT can produce benefit on the infrastructure, like the information about infrastructure safety, the use and maintenance of infrastructures, safe design of infrastructures and traffic management. Consequently, ICT should

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3 European Association of Operators of Toll Road Infrastructures www.asecap.com
4 World Road Association – www.piarc.org
5 South East Europe Transport Observatory - www.seetoint.org
6 Road Infrastructure Safety Management
be part of the assessment to be performed when implementing the road infrastructure safety management procedures stipulated by the Directive.

- There is a need of a major focus on urban tunnels and vulnerable users, as highlighted during several official and unofficial meetings

The ECORoads partners have therefore applied for a further H2020 project dealing with the above issues.

4. CONCLUSIONS

ECORoads was submitted under the Horizon 2020 call 2014 - topic MG-8.1b-2014 “Smarter design, construction and maintenance” and was selected for financing with a start date of June 2015. It will lead to a fruitful exchange of experiences, the cross-fertilisation between the two disciplines of tunnel safety and road safety and better implementation of all safety operations along road infrastructures.

The project will allow good practices to be shared and define a common agreed approach for applying the concepts of the Directive 2008/96/CE on road infrastructure safety management in tunnels and in the transition areas between tunnels and open roads, without affecting (but completing) the usual tunnel safety management operations.

Thanks to the high transferability of the ECORoads results, the present formal gap between the Directive 2008/96/EC and the Directive 2004/54/EC will be bridged, thus leading to faster, more sustainable and better planned interventions with maximum safety for the workers and other traffic participants, according to needs of “Effective and COordinated ROAD infrastructure Safety operations”. The project will thus contribute to the implementation of coherent safety procedures on the whole road network, both at the Member State and EU level.

REFERENCES

[1] Pilot4Safety “Pilot project for common EU Curriculum for Road Safety experts: training and application on Secondary Roads (http://pilot4safety.fehrl.org)


