PROJECT IMPLEMENTED BY JV NTU/EPTISA

FINANCED BY GOA AND COFINANCED BY WB

ALBANIAN ROADS AUTHORITY

Results-based Road Maintenance and Safety Project (RRMSP)

World Bank Loan No. No. 8489-AL

Contract No: CS 02

Consultant Services

for

Road Safety Technical Assistance

Guidelines for improving infrastructure safety network-wide

D-2.6 Appendix 2

Version Preliminary

April 2021

PROJECT IDENTIFICATION DATA

Project Name:	Consultant Service for Road Safety Technical Assistance under Results–Based Road Maintenance and safety Project (RRMSP) for Albania National Road (RRMSP)
Project Contract Reference Number:	WB2400-05/17, IBRD 84890TF 14761, P132982, CS 2, 8489 – AL
Country:	Albania
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DOCUMENT CONTROL

Project Contract Reference Number:	WB2400-05/17, IBRD 84890TF 14761, P132982, CS 2, 8489 – AL Consulting Services for Road Safety Technical Assistance under Result – Based Road Maintenance and Safety Project (RRMSP)
Country	Albania
Date	30.04.2021
Version	N°01

Version	Date	Prepared by	Reviewed by
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EXECUTIVE SUMMARY

This document constitutes one of the outcomes of the Activity 2.5 of Component 2 of the Road Safety Technical Assistance (TA) under the Results-Based Road Maintenance and Safety Project (RRSMP) aimed to evaluate the efficiency and effectiveness of improved rural and urban road infrastructure safety programs in high-risk corridors and areas.

In particular, this document contains guidelines for improving the road infrastructure safety network-wide. The contents are fully in line with Directive 2008/96/EC on road infrastructure road management as amended by Directive 2019/1936 and take into account the analyses and documents prepared in Task 2.1 and 2.3.

The specific objective is to combine the concept of network ranking (Task 2.1.3) with an analysis of the 'in-built' characteristics of the road (Task 2.3.2). In practice this means combining a reactive approach with a proactive approach (such as iRAP) as provided for in Article 5 of the amended Directive.

The objective of these guidelines is to propose a methodology for a network-wide road safety assessment in accordance with the amendments to Directive 2008/96/EC on Road Infrastructure Safety Management (revised Directive 2019/1936). The findings of this network-wide road safety assessment will enable a follow up by targeted road safety inspections or, if possible and cost-efficient, by direct remedial action aimed at eliminating or reducing the road safety risks without imposing an undue administrative burden. In this way, the safety performance of existing roads can be improved by targeting investment to the road sections with the highest crash concentration and the highest crash reduction potential.

Therefore, as set out in the revised Directive (Art. 5), network-wide road safety assessments shall evaluate crash and impact severity risks of roads, based on:

- *primarily, a visual examination, either on site or by electronic means, of the design characteristics of the road (in-built safety); and*
- *an analysis of sections of the road network which have been in operation for more than three years and upon which a large number of serious crashes in proportion to the traffic flow have occurred*.

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LIST OF ABBREVIATIONS AND ACRONYMS

AADT	Average Annual Daily Traffic
ADF	Albanian Development Fund
ANPR	Automated Number Plate Recognition
ARA	Albanian Road Authority
ARC	Albanian Road Code
ARDCS	Albania Road Design and Construction Standards
ARDM	Albanian Road Design Manual
ASP	Albanian State Police
ATC	Automatic Traffic Counts
ATP	Albanian Traffic Police
BSM	Blackspot management
CBMIE	Controlling Body in Ministry of Infrastructures and Energy
CSG	Central Steering Group
DRST	Directorate of Road Safety and Traffic
DRST	Directorate of Road Safety and Traffic
EC	European Commission
EG	Expert Group at the local level
ERA	Emergency Response Albania
EU	European Union
GDRTS	General Directorate of Road Transport Services
GoA	Government of Albania
GRD	General Roads Directorate
IMRSC	Inter-ministerial Road Safety Committee
INSTAT	Institute of Statistics
IoT	Institute of Transports
IPA	Instrument for Pre-Accession Assistance
iRAP	International Road Assessment Program
ITS	Intelligent Traffic System
JV	Joint Venture
M&E	Monitoring and Evaluation
MI	Ministry of Interior
MIE	Ministry of Infrastructure and Energy
NGO	Non-Governmental Organization
NSM	Network Safety Management
PAMECA	Police Assistance Mission of the European Community to Albania
PIARC	World Road Association
QKUM	National Emergency Medical Center
RRMSP	Results-based Road Maintenance and Safety Project
RSA	Road Safety Audit
RSAIU	Road Safety Audit and Inspection Unit
RSI	Road Safety Inspection
RSIA	Road Safety Impact Assessment
RSM	Road Safety Management
RSS	Road Safety Sector

SEETO	South-East Europe Transport Observatory
TA	Technical Assistance
TERN	Trans European Road network
ToR	Terms or Reference
TS	Technical Secretariat
WB	World Bank
WHO	World Health Organization

1. Introduction

This document constitutes one of the outcomes of the Activity 2.5 of Component 2 of the Road Safety Technical Assistance (TA) under the Results-Based Road Maintenance and Safety Project (RRSMP) aimed to evaluate the efficiency and effectiveness of improved rural and urban road infrastructure safety programs in high-risk corridors and areas.

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The specific objective is to combine the concept of network ranking (Task 2.1.3) with an analysis of the 'in-built' characteristics of the road (Task 2.3.2). In practice this means combining a reactive approach with a proactive approach (such as iRAP) as provided for in Article 5 of the amended Directive.

2. Rationale for the guidelines

So far, most of the countries – including Albania - usually limit road safety assessments mainly to the identification of road sections with high crash concentrations - hence ex-post - by using statistical crash data. Proactive approaches, such as detailed Road Safety Inspections, are primarily used as targeted measures towards selected road sections of usually small length, or towards specific road elements (e.g., intersections, interchanges, etc.), and not at a large scale. The revised Directive 2019/1936 complements this approach by introducing a new proactive approach, assessing also the in-built safety of roads on the basis of their design characteristics - hence ex-ante, before crash even happen - that can be applied at network level and not only as a targeted measure.

The objective of these guidelines is therefore to propose a methodology for a network-wide road safety assessment in accordance with the amendments to Directive 2008/96/EC on Road Infrastructure Safety Management (revised Directive 2019/1936). The findings of this network-wide road safety assessment will enable a follow up by targeted road safety inspections or, if possible and cost-efficient, by direct remedial action aimed at eliminating or reducing the road safety risks without imposing an undue administrative burden. In this way, the safety performance of existing roads can be improved by targeting investment to the road sections with the highest crash concentration and the highest crash reduction potential.

Therefore, as set out in the revised Directive (Art. 5), network-wide road safety assessments shall evaluate crash and impact severity risks of roads, based on:

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3. In-built safety assessment

In-built safety assessment methods provide an estimation of the safety levels of a road based on its design (e.g., number of traffic lanes and presence of shoulders) and operational (e.g. speed limit and intersection control type) characteristics and do not rely on crash records analysis. In that sense, in-built safety methods are proactive methods as the safety assessment as well as any follow-up actions are not initiated due the presence of crashes; these methods can also be mentioned as 'ex-ante'.

In-built safety assessment methods can be separated in two broad categories: those that are applied at a site-specific or segment-specific level and are detailed, and those that are applied at the network-level.

Under the first category, procedures similar to Road Safety Inspections can be found. These are detailed procedures and could be time and resource consuming if they were applied to large road sections. It is therefore considered that they are not applicable for the purposes of a network wide assessment.

In the latter category, the following subcategories may be defined: (a) the accident prediction models, (b) the iRAP protocols, and (c) various methods for the classification on networks based on geometric design and operational characteristics.

Probably the most well known internationally accident prediction model, extensively researched and supported, is the predictive method of the AASHTO Highway Safety Manual[1]. The concept of this method is to use a simple algorithm, called Safety Performance Function (SPF), to estimate accident frequency for a base scenario, and then adjust the estimation for specific geometric and operational conditions using Crash modification Factors (CMFs) and even use local accident data to further calibrate the results. The method is powerful as it can detect accident-prone sites across a network in a proactive manner, and it has been extensively used and verified by independent researchers worldwide. Yet, as a detailed method, research on the models' transferability has shown that the existing SPFs cannot always be transferred to different conditions (e.g. another country) and in this case, the development of local SPFs is recommended. For this reason it is not considered to be easily implementable in Albania in the short term.

Another large family of 'in-built' safety assessment methods are the Road Assessment Programme (RAP) Star Rating protocols that have been extensively used worldwide. The protocol considers multiple in-built safety attributes of a road to create a safety score (known as Star Rating Score). The protocol also implies and utilizes an accident prediction model, which however has not been explicitly developed for RAP, but instead it has been based on previous pertinent research on various countries and at different time periods in the past. Combining the in-built safety characteristics and use of crash data, the protocol assigns a road to one of 5 classes, with 1 being the least safe class. Guidelines for iRAP project development in Albania were produced in Task 2.1.3 of this Technical Assistance (see *D-2.5 The International Road Assessment Programme (iRAP) Guidelines*)

Methodologies based on examining specific critical safety related aspects of roads also used worldwide to assess road safety without using crash data. These methodologies are based on examining if the network fulfils specific criteria - e.g. for Swedish two-lane rural roads the criteria refer to the speed limit, the median barrier and the roadside zone, with options varying on the AADT. Based on how the road performs against these criteria, the road is characterized either qualitatively or quantitatively (with a score), depending on the

[1] AASHTO. (2010). Highway safety manual, 1st Edition, American Association of State Highway and Transportation Officials, Washington, DC, USA.

method. These methods offer a simple, low-cost alternative to more detailed methods, but the exact ranking algorithms and the weights of criteria might need adjustments for use in a different geographical area.

It is therefore considered that the iRAP method is the one that to date can guarantee greater methodological soundness against an implementation effort that is considered to be balanced against the expected benefits.

4. Crash-based assessment

Crash-based methods assess road safety in a reactive manner, i.e. by relying on the identification of sites and/or parts of the road network that are considered hazardous because of high concentration of crashes.

The network under evaluation is divided into smaller sections and this process is known as segmentation.

After the network has been divided into smaller parts, the objective is to determine what is the safety performance of each part. This is the selection of the safety performance metric, which essentially is a (short) mathematical formula to estimate the safety of a section. In the procedures developed in Task 2.1.3 the following metrics were selected:

- **Collision Density** (*CD*) *[crashes per km]*
- **Collision Rate** (*CR*) *[crashes per 100 million veh-km]*

In addition to the selection of the safety performance metric, a threshold needs to be selected. The threshold value serves as a means of classification; the safety performance metric value of the studied section is compared against the threshold and the outcome of this comparison determines whether the section is hazardous or not.

In the use of the above metrics two bias can be identified:

- **Collision rate:** there is a bias towards low volume traffic sites
- **Collision density:** there is a bias towards high traffic volume sites

To help reduce the effect of the bias inbuilt in both types of analysis, sites are marked as high-risk locations when both thresholds are exceeded.

More details are given in the *D-2.3 Appendix 1 - Procedure for network safety analysis and management.*

5. Integrated network-wide assessment method

An integrated network-wide assessment methodology will combine re-active and pro-active approaches as described above.

The matrix below shows the four possible cases resulting combining the proactive with the reactive approach where '*High'* and '*Low'* refers to safety performance, with '*High*' being the desired target.

Table 1 Proactive vs. reactive approach

		Proactive	
		High	Low
Reactive	High	A	B
	Low	C	D

When a section is found as *'Low'* by both approaches, then it belongs to area D and is subject to a targeted Road Safety Inspection to identify the safety problems.

Between areas B and C, higher priority for follow-up actions/interventions should be given to area C, because reactive assessment is limited due to inaccurate crash location data and variation in crash occurrence.