



Support for implementing measures for the South East Europe Core
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COLLECTION OF RESULTS AND EXAMPLES FROM THE RSA PILOTS IN THE SEETO REGION

Annex 4 to Road Safety Audit Manual

(FINAL)

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1. Collection of results and examples from the Road Safety Audit pilots in the SEETO Region

1.1. Overview about the findings

The RSA experts of the project team have conducted in every SEETO Participant an RSA of the audit stage 1 or 2. The pilots were solved together with local engineers. The basis for the RSA was the design documents of a preliminary or detailed design according to the RSA Manual which were provided by the SEETO Participants.

The projects for audit and the content of the documentation were quite different. This was on one hand very good to get an overview about the problems in different fields of road design tasks (rehabilitation projects, new motorways, interurban link sections, intersection projects). On the other hand in few cases not all design documents were available according to the demands of the RSA Manual. For conducting the pilot the project tasks were successfully solved, but for future RSA the necessary design documentation should be complete. The different character and the different content of the documentation has to be taken into consideration when comparing the number and character of findings.

The table below shows in chronological order the RSA pilots and their findings.

Table 1.1: RSA pilots and findings

SEETO-Participant	Project data, characteristics	Findings
Montenegro	National road M2, between km 1034+613 - km 1035+490 Length: about 0,8 km, Interurban character, 2-lane, one carriageway, Rehabilitation project, Part of the European network (E 65/80) Rehabilitation project, Date: 03/04/2009	<ul style="list-style-type: none"> • Number of problems: 16 • Number of remarks: 4 • Main deficiencies: passive safety installation and marking and signing
Serbia	Motorway M 1 (E 75) Section from Grabovnica – Grdelica Subsection Interchange Grdelica km 872+080 – 872+930 ("red variant"), Length: about 0,85 km, New Motorway with 2-lane, 2 carriageways, Preliminary design, Date: 21/04/2009	<ul style="list-style-type: none"> • Number of problems: 10 • Number of remarks: 6 • Main deficiencies: drainage problems on the motorway, design of the interchange and the adjacent inter-sections in the secondary network with critical solutions in detail
Albania	National Road E 852 (SH 3)	<ul style="list-style-type: none"> • Number of problems: 26

	(part of European Corridor 8) Section 1: Korca – Ploca (from km 21+250 to km 29+143) Length: about 7,9 km, Interurban character, some short through road section, 2-lane, one carriageway, Detailed design, Rehabilitation project, Date: 15/05/2009	<ul style="list-style-type: none"> • Number of remarks: 3 • Main deficiencies: unsafe cross section, deficiencies in the alignment, intersection solutions and pedestrian facilities, partly lack of necessary passive safety installations
former Yugoslav Republic of Macedonia	Regional road R-409, between km 34+666,53 to km 37+699,22, Length: about 3,0 km, Interurban character, Detailed design, Reconstruction project, 2-lane, one carriageways, +Date: 21/05/2009	<ul style="list-style-type: none"> • Number of problems: 14 • Number of remarks: 3 • Main deficiencies: unsafe narrow cross section, intersection solution and pedestrian facilities, partly lack of necessary passive safety installations
Croatia	Motorway A11, Zagreb-Sisak Subsection - Interchange Buševac from km 8+000 to km 9+000, Length: about 1,0 km, New Motorway with 2-lane, one carriageways, Detailed design, Date: 28/05/2009	<ul style="list-style-type: none"> • Number of problems: 5 • Number of remarks: 2 • Main deficiencies: details of intersection design of the interchange with secondary network
Kosovo (under UNSCR 1244/1999)	Separate graded roundabout at entrance of Pristina, junction of roads M2 and M9, Length: - km, New intersection of two main arterials, incl. one roundabout, Detailed design, Date: 22/06/2009	<ul style="list-style-type: none"> • Number of problems: 7 • Number of remarks: - • Main deficiencies: solutions regarding the foreseen roundabout design
Bosnia and Herzegovina	Magistralni put M4 Kalesija bypass (design-km 0+000 to km 5+779), Length: 5,7 km, New bypass with two lanes, Detailed design, Date: 09/07/2009	<ul style="list-style-type: none"> • Number of problems: 12 • Number of remarks: 2 • Main deficiencies: problems regarding the consistency of the alignment, details of intersections design, signing, safety barriers

1.2. Conclusion from the RSA pilots

In the seven RSA reports of the pilots, in total 90 problems regarding the road safety were identified.

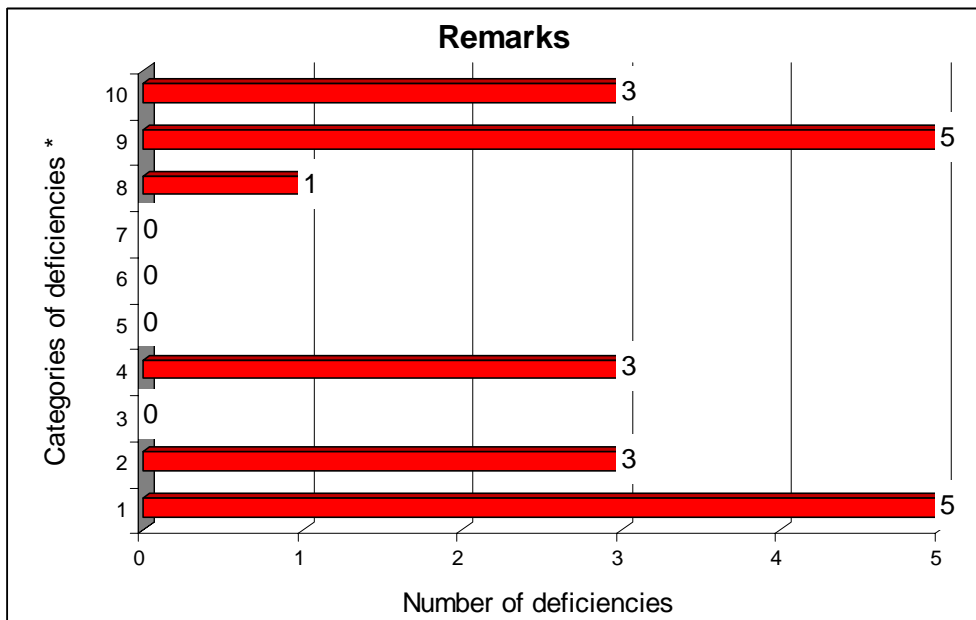
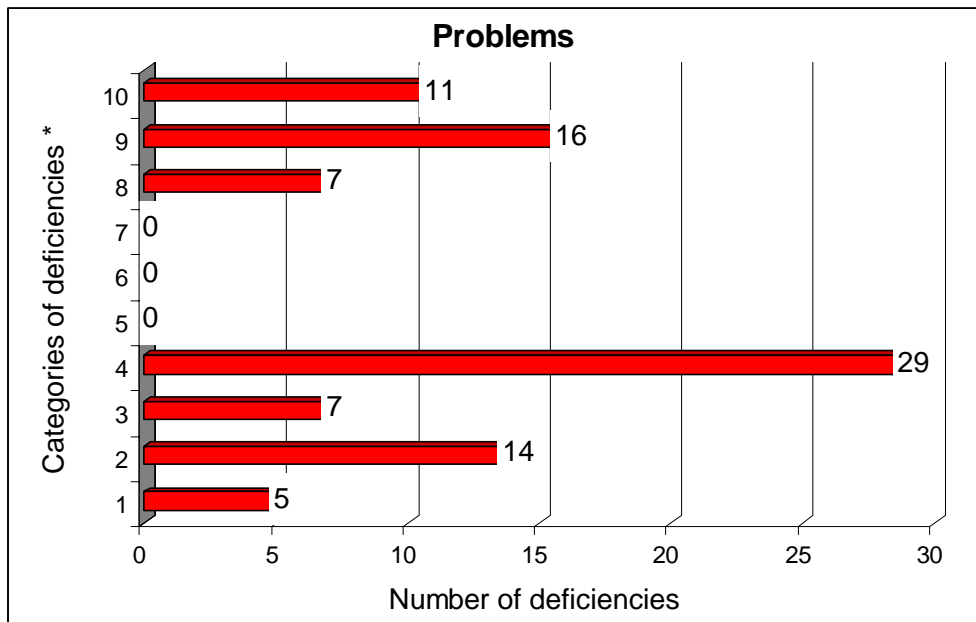
The main deficiencies are typical design mistakes and with some minor differences in details, the problems were quite similar.

In the following table the findings are sorted by the RSA Manual categories:

Table 2.1.: RSA finding sorted by RSA Manual categories

	MNG	SRB	ALB	MK	CRO	KS	BiH	Total
Problems	16	10	26	14	5	7	12	90
1 Function, Operating elements	1	0	0	1	0	0	3	5
2 Cross section	2	2	4	3	1	0	2	14
3 Alignment	0	0	3	2	0	0	2	7
4 Intersections, Interchanges	0	6	7	2	3	6	5	29
5 Traffic signals, ITS	0	0	0	0	0	0	0	0
6 Railway crossings	0	0	0	0	0	0	0	0
7 Service and rest areas	0	0	0	0	0	0	0	0
8 Need of vulnerable road users, Public transport	0	0	4	2	0	1	0	7
9 Traffic signing, marking, lighting	4	2	5	3	0	0	2	16
10 Civil engineering structures Passive safety installations	6	0	2	1	1	0	1	11
Remarks	4	6	3	3	2	0	0	18
1 Function, Operating elements	1	2	1	1	0	0	0	5
2 Cross section	1	0	0	0	2	0	0	3
3 Alignment	0	0	0	0	0	0	0	0
4 Intersections, Interchanges	0	3	0	0	0	0	0	3
5 Traffic signals, ITS	0	0	0	0	0	0	0	0
6 Railway crossings	0	0	0	0	0	0	0	0
7 Service and rest areas	0	0	0	0	0	0	0	0
8 Need of vulnerable road users, Public transport	0	0	1	0	0	0		1
9 Traffic signing, marking, lighting	1	0	1	1	0	0	2	5
10 Civil engineering structures Passive safety installations	1	1	0	1	0	0	0	3

In the following graph the contribution of the problems and remarks is illustrated:



* Categories like in the table above

The need of a sufficient Road Safety Audit system is evident by the findings. Although there is in almost all SEETO Participants a quality assurance system like the official Revision Commissions installed in the level of the Ministry of Transport there is a big potential to improve the safety performance of the projects.

In some cases is there a need of improvements of the design although the design was done according to the existing but mostly obsolete design norms. In other cases the design was not following the demands of existing norms. If the norms will be renewed and further developed in the future on a basis of international best practice, some typical design deficiencies can be avoided.

The typical problems sorted by the categories of the RSA Manual are identified as follows:

1.2.1. Function

In the audited project documentation only few problems regarding the function of road were identified. A typical situation is for example the choice of the legal speed in intersection (legal speed to high). That means regarding the audited projects obviously the road administration and the designers made right decisions regarding the function and operation of the road.

1.2.2. Cross section

According to the findings in the pilot work it is obvious that problems regarding the cross section can be found quite often. In some case the designed dimensions of the road can lead to safety deficiencies. For example the cross section is too narrow for the expected traffic. In an other case the 2 –lane cross section should have asphalted hard shoulders in addition.

Another quite common problem is the lack of sufficient drainage conditions for the case of the transition of the cross fall of the carriageway in front of curves.

Finally it is recommended to have in future projects generally with gravel stabilized shoulders along the carriageway to reduce the risks of run off incidents.

1.2.3. Alignment

Few RSA problems occur due to alignment. A lack of alignment consistency regarding the curve design was identified, that was quite surprising because the rules for a consistent curve design are well known since decades. Of course sometimes it is unavoidable to have an alignment designed not in accordance with the consistency principles because of some space restriction. But in that case at least some assistance to the driver like chevron sign¹ etc. should be foreseen. In one case of an audit, in a mountainous road section with steep gradients climbing lanes were missing.

1.2.4. Intersections, traffic lights, railway crossings

In the pilot audits most findings were regarding this topic. With the exception of one audit, project intersections were always included in the audited project. Obviously, road safety issues are not well catered for the intersection design and the difference in the design philosophy as well in detail solution of intersections and interchanges is in most SEETO Participants quite different from the best practises used in Western Europe. That could be because of the fast advances of the intersection design principles in Western Europe in the last 20 years for improving road safety at intersections which are the most critical points. In one RSA, traffic signals were included. No pilots was conducted at railway crossings.

The typical findings regarding intersections were:

- lack of left turning lane in high speed section;
- inconsistency of the design principles with adjacent intersections;
- the design of the intersection does not support hierarchy of road and right of way. There are missing islands at canalized junctions;
- insufficient sight conditions;
- difficult multilane roundabout solutions.

1.2.5. Public and private services, service and rest areas



Facilities for rest areas were not included in any of the audited projects.

1.2.6. Vulnerable road user needs

Since the emphasis of project is in intercity road, only few pilots included evaluation of the needs of pedestrian traffic. In some projects it was not quite clear if pedestrians have to walk along or cross the road or not. It is obvious but not unusual that the needs of pedestrians from settlements near by or along the road are not in the main focus of Road Administrations. As conclusion, in future road design should provide more attention to the needs of the vulnerable road users. Especially in the case of rehabilitation and reconstruction projects with a higher traffic speed level than before, the risks for pedestrians is usually higher than in the previous time.

1.2.7. Traffic signing, marking and lighting

In the ranking of the most common deficiencies, signing and marking issues are on the top. Although the number of findings was high, the identified problems were in every case almost the same. The typical, but not unusual findings were:

- Missing regulating signs for speed limit, overtaking forbidden etc.;
- Contradictions between signing and marking;
- Missing warning signs like curve warning signs and chevrons.

1.2.8. Roadside features and passive safety installations

There is without any doubts a big potential to increase the road safety by a sufficient usage of passive safety installations. But in the audited projects, a remarkable number of problems regarding road safety was identified.

Typical mistakes in the design of passive installations are:

- Missing guardrails in the case of high embankments;
- Missing guardrails in bridge sections;
- Lamp poles as fixed obstacles.

In general there is an urgent need to introduce the European Norms (EN 1317) with all its 5 parts² to ensure the necessary performance of the safety barriers. This would also help to avoid mistakes in the design process.

² List of parts of the EN1317

EN 1317-1 : Terminology and general criteria for test methods

EN 1317-2 : Performance classes, impact test acceptance criteria and test methods for safety barriers

EN 1317-3 : Performance classes, impact test acceptance criteria and test methods for crash cushions

EN 1317-4 : Performance classes, impact test acceptance criteria and test methods for terminals and transitions of safety barriers

EN 1317-5 : Product requirements, durability and evaluation of conformity