

„Friedrich List“ Faculty of Transport and Traffic Sciences
Chair of Integrated Transport Planning and Traffic Engineering
Prof. Dr.-Ing. Regine Gerike

Instruments for Designing Safe Streets and Roads



Co-funded by the
Erasmus+ Programme
of the European Union



Instruments for Road Safety Management

Legal Framework: European Union

- Directive 2008/96/EC of the European Parliament and of the Council on **road infrastructure safety management** (RISM), November 2008

Article 1

Subject matter and scope

1. This Directive requires the establishment and implementation of procedures relating to road safety impact assessments, road safety audits, road safety inspections and network-wide road safety assessments by the Member States.
2. This Directive shall apply to roads which are part of the trans-European road network, to motorways and to other primary roads, whether they are at the design stage, under construction or in operation.
3. This Directive shall also apply to roads and to road infrastructure projects not covered by paragraph 2 which are situated outside urban areas, which do not serve properties bordering on them and which are completed using Union funding, with the exception of roads that are not open to general motor vehicle traffic, such as bicycle paths, or roads that are not designed for general traffic, such as access roads to industrial, agricultural or forestry sites.
4. Member States may exempt from the scope of this Directive primary roads which have a low risk for safety, based on duly justified grounds connected to traffic volumes and accident statistics.

Figure [1]

- calls for the implementation of instruments for road safety management
- for roads of the trans-European road network (TERN)
- obligation of member states to transpose into national law by 2010 (in Germany implementation by ARS Nr. 26/2010)

Instruments for Road Safety Management

Legal Framework: European Union

- Directive 2008/96/EC of the European Parliament and of the Council on **road infrastructure safety management**, November 2008
- amended in 2019 (Directive (EU) 2019/1936):
 - extension of scope
 - roads of TERN + all motorways, primary roads and EU-funded roads outside urban areas
 - network-wide safety assessment
 - greater focus on vulnerable road users (VRU), e.g.:
 - training curricula for road safety auditors includes aspects related to vulnerable road users
 - report shall cover the improvements in terms of protecting vulnerable road users, every 5 years
 - improvement of recognizability and legibility of road markings and traffic signs
 - obligation to transpose into national law by 2021

Instruments for Road Safety Management

Legal Framework: European Union

- Directive 2008/96/EC of the European Parliament and of the Council on **road infrastructure safety management**, November 2008, amendment 2019:
- *“Member States shall pay specific attention, in their existing and future procedures for road markings and road signs, to readability and detectability for human drivers and automated driver assistance systems.”* [EU, Article 6c]
- *“[...], Member States shall ensure that the training curricula for road safety auditors includes aspects related to vulnerable road users and the infrastructure for such users”* [Article 9: 1a, appointment and training of auditors]
- *“Member States shall provide a report to the Commission by 31 October 2025 on the safety classification of the entire network assessed [...] the report shall also cover the list of provisions of national updated guidelines, including in particular the improvements in terms of technological progress and of protection of vulnerable road users. From 31 October 2025, such reports shall be provided every five years”*
[Article 11a: Continuous improvement of safety management practices, reporting]

Instruments for Road Safety Management

Legal Framework: European Union

- Directive 2008/96/EC of the European Parliament and of the Council on **road infrastructure safety management**, November 2008, amendment 2019:
- Vulnerable road users are included in all annexes that list indicative elements for all instruments, for example:
- Annex I, road safety impact assessment:
[..] „traffic (e.g. traffic volume, traffic categorisation by type), including estimated pedestrian and bicycle flows determined from adjacent land-use attributes”
- Annex II, road safety audits:
[..] Criteria at the draft design stage: [..] provision for vulnerable road users:
 - *provision for pedestrians;*
 - *provision for cyclists, including the existence of alternative routes or separations from high-speed motor traffic;*
 - *provision for two-wheelers;*
 - *density and location of crossings for pedestrians and cyclists;*
 - *provision for pedestrians and cyclists on affected roads in the area;*
 - *separation of pedestrians and cyclists from high-speed motor traffic or the existence of direct alternative routes on lower class roads.*

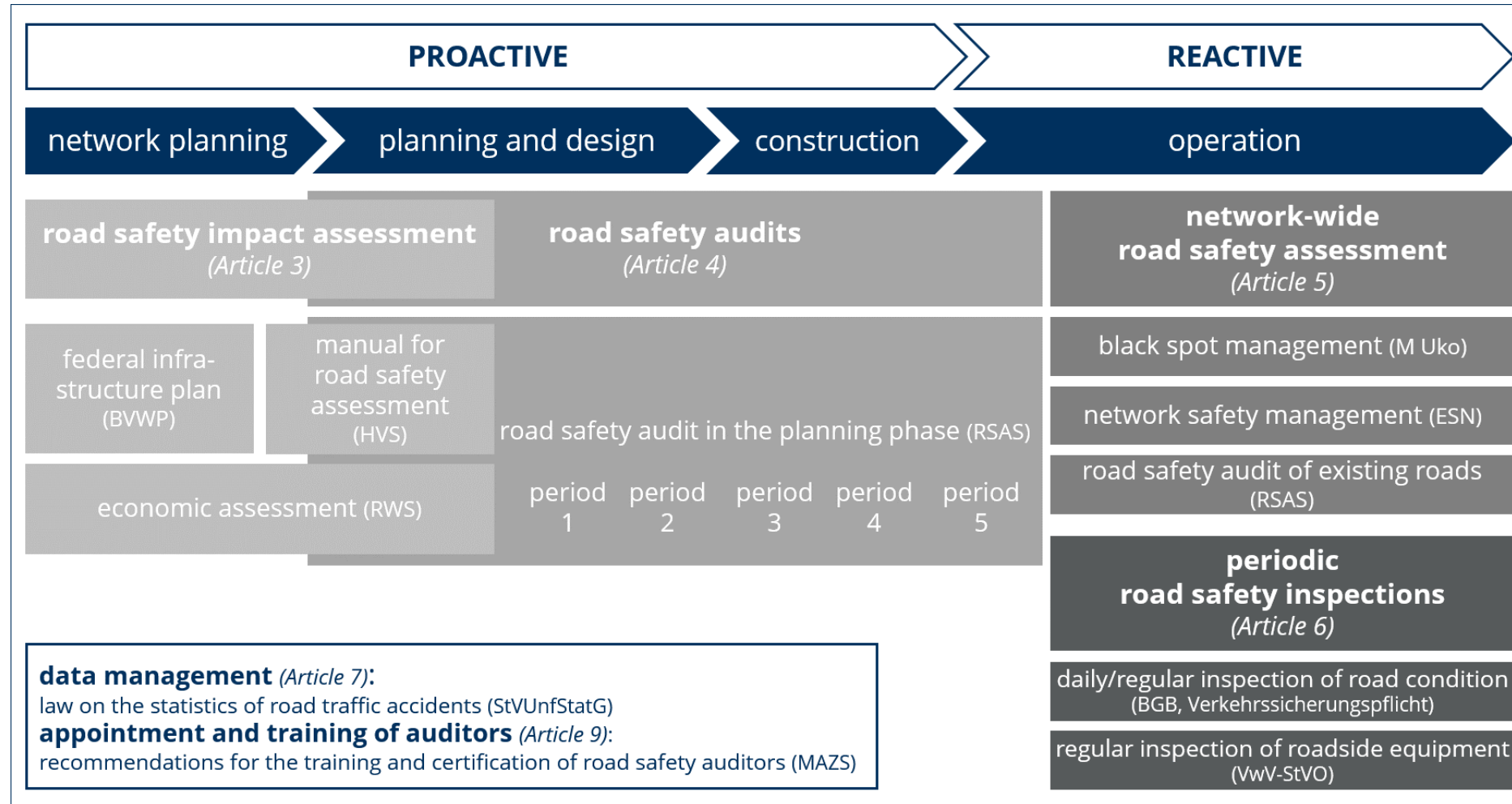
Instruments for Road Safety Management

Legal Framework: European Union

- Directive 2008/96/EC of the European Parliament and of the Council on **road infrastructure safety management**, November 2008, amendment 2019:
- Commission shall provide guidance:
- *“The Commission shall provide guidance for the design of ‘for giving roadsides’ and ‘self-explaining and self-enforcing roads’ in the initial audit of the design phase, as well as guidance on quality requirements regarding vulnerable road users. Such guidance shall be developed in close cooperation with Member State experts.”*
[Article 4: road safety audits for infrastructure projects]
- *“The Commission shall provide guidance on the methodology for carrying out systematic network-wide road safety assessments and safety ratings.”* [Article 5: Network-wide road safety assessment]

Instruments for Road Safety Management

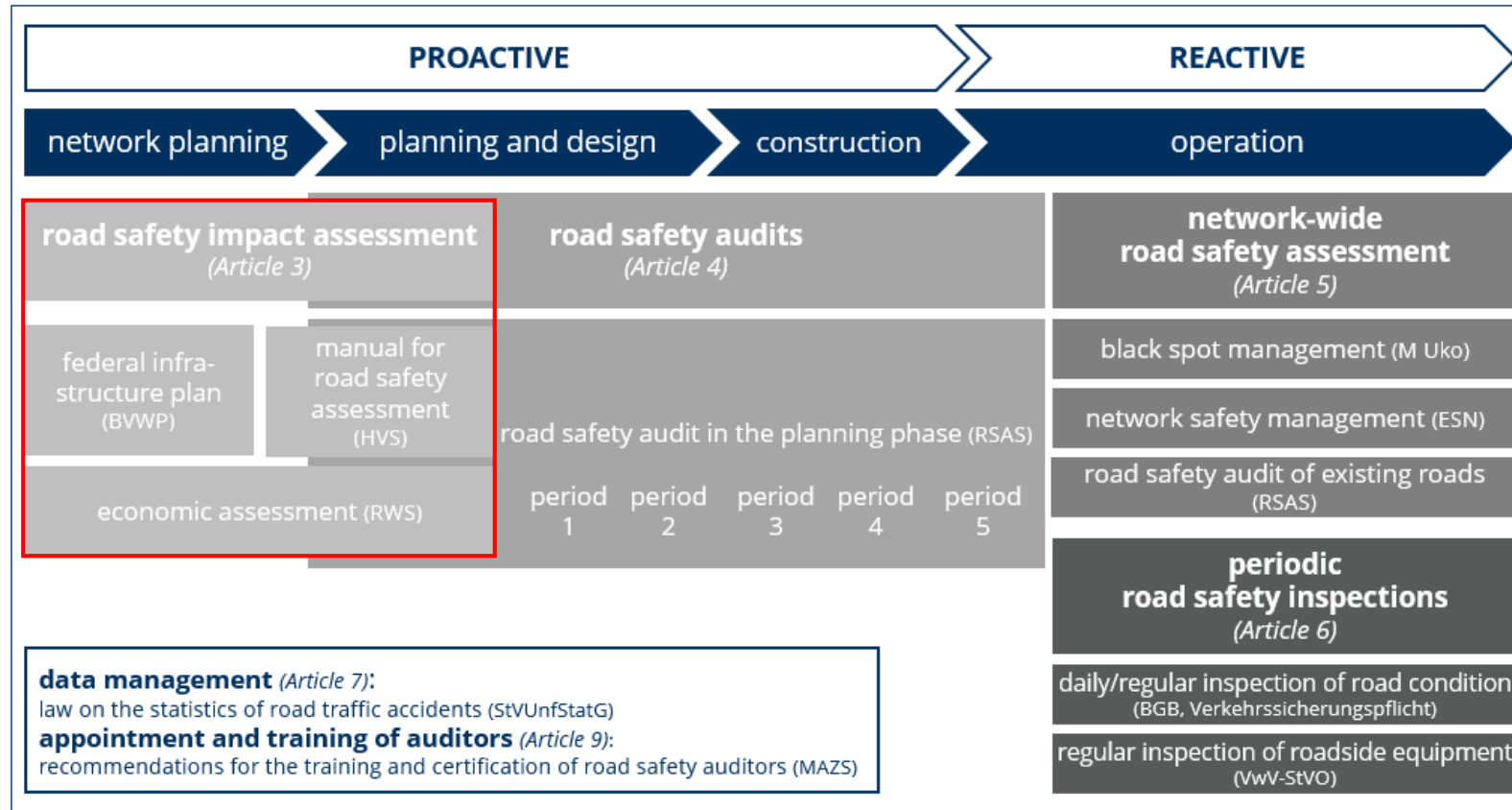
Legal Framework: Transposition of Directive 2008/96/EC into German law



[FGSV, 2019]

Instruments for Road Safety Management

Legal Framework: Transposition of Directive 2008/96/EC into German law



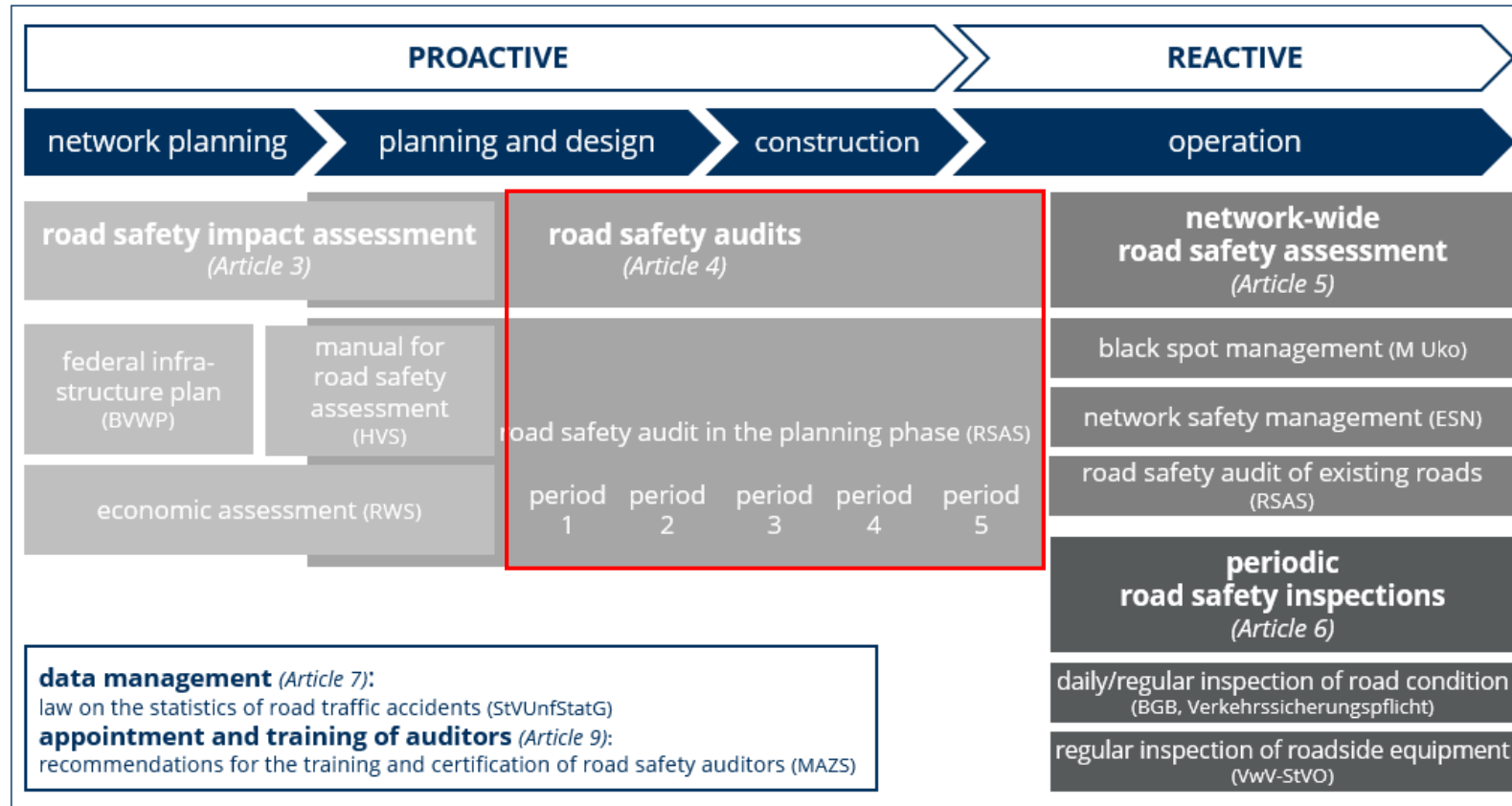
“Road safety impact assessment’ means a strategic comparative analysis of the impact of a new road or a substantial modification to the existing network on the safety performance of the road network.”
 [Article 2 Definitions]

[FGSV, 2019]

- economic efficiency studies, road safety as one impact of many (e.g. travel time, greenhouse gas emissions), comparison of variants
- information on road safety based on generalized values

Instruments for Road Safety Management

Legal Framework: Transposition of Directive 2008/96/EC into German law



“Road safety audit’ means 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.” [Article 2 Definitions]

[FGSV, 2019]

- identification of safety deficits in the planning process
- independent evaluation of the planning documents by expert auditor (search for defects and deficits in safety)

Instruments for Road Safety Management

Road Safety Audits, Directive 2008/96/EC, Annex II

ANNEX II

INDICATIVE ELEMENTS OF ROAD SAFETY AUDITS

▼B ↓

1. Criteria at the draft design stage:

- (a) geographical location (e.g. exposure to landslides, flooding, avalanches), seasonal and climatic conditions and seismic activity;
- (b) types of and distance between junctions;
- (c) number and type of lanes;
- (d) kinds of traffic admissible to the new road;
- (e) functionality of the road in the network;
- (f) meteorological conditions;
- (g) driving speeds;
- (h) cross-sections (e.g. width of carriageway, cycle tracks, foot paths);
- (i) horizontal and vertical alignments;
- (j) visibility;
- (k) junctions layout;
- (l) public transport and infrastructures;
- (m) road/rail level crossings;

▼MI ↓

- (n) provision for vulnerable road users:
 - (i) provision for pedestrians;
 - (ii) provision for cyclists, including the existence of alternative routes or separations from high-speed motor traffic;
 - (iii) provision for powered two-wheelers;
- (iv) density and location of crossings for pedestrians and cyclists;
- (v) provision for pedestrians and cyclists on affected roads in the area;
- (vi) separation of pedestrians and cyclists from high-speed motor traffic or the existence of direct alternative routes on lower class roads.

Figure [2]



Instruments for Road Safety Management

Road Safety Audits, Directive 2008/96/EC, Annex II

▼B ↓

2. Criteria for the detailed design stage:

- (a) layout;
- (b) coherent road signs and markings;
- (c) lighting of lit roads and intersections;
- (d) roadside equipment;
- (e) roadside environment including vegetation;
- (f) fixed obstacles at the roadside;
- (g) provision of safe parking areas;

▼MI ↓

(h) provision for vulnerable road users:

- (i) provision for pedestrians;
- (ii) provision for cyclists;
- (iii) provision for powered two-wheelers;

▼B ↓

- (i) user-friendly adaptation of road restraint systems (central reservations and crash barriers to prevent hazards to vulnerable users).

3. Criteria for the pre-opening stage:

- (a) safety of road users and visibility under different conditions such as darkness and under normal weather conditions;
- (b) readability of road signs and markings;
- (c) condition of pavements.

4. Criteria for early operation: assessment of road safety in the light of actual behaviour of users.

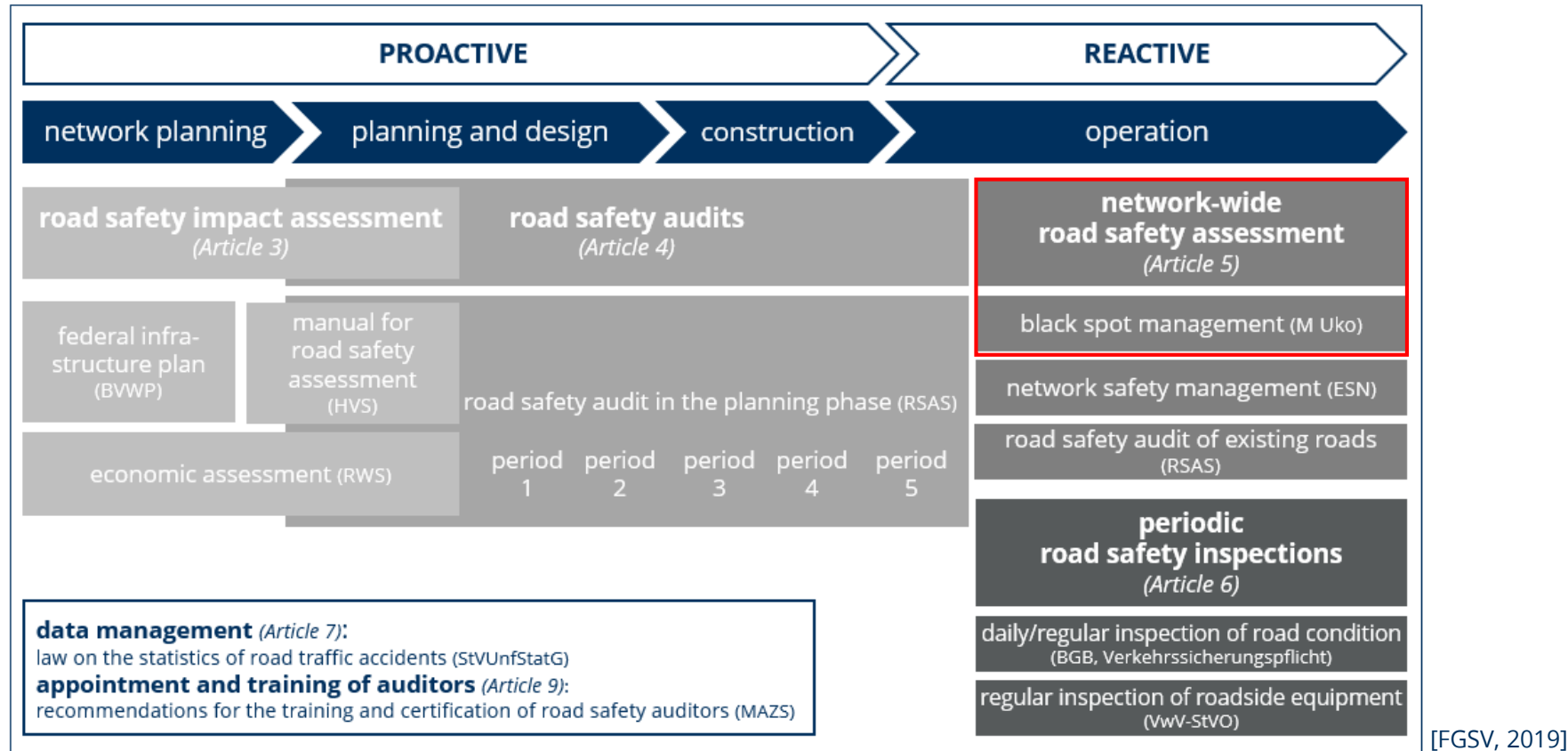
Audits at any stage may involve the need to reconsider criteria from previous stages.

Figure [3]



Instruments for Road Safety Management

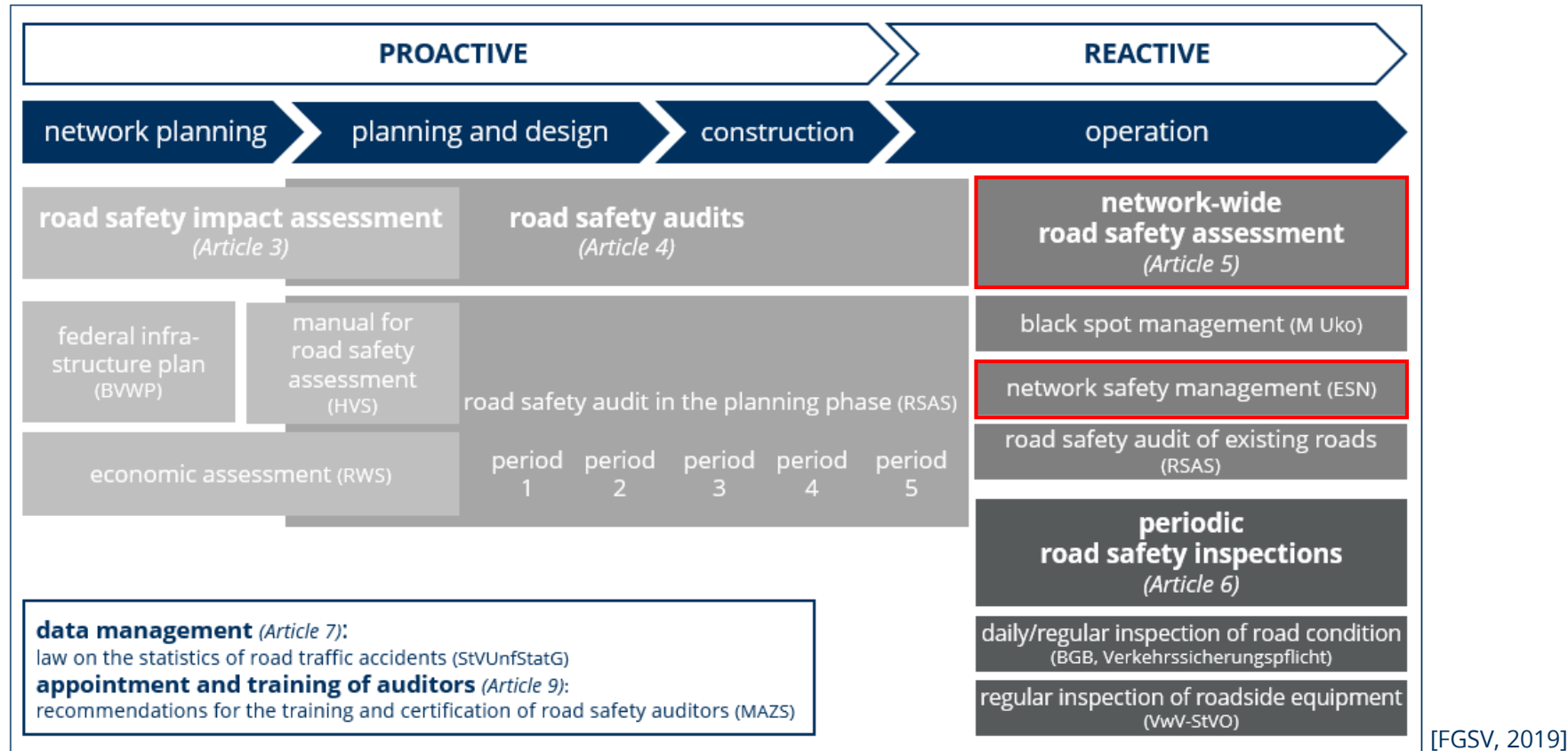
Legal Framework: Transposition of Directive 2008/96/EC into German law



- based on the analysis of accidents (number, severity)
- obligatory investigations when thresholds are exceeded
- goal: recognize, analyze, combat accident accumulations through appropriate measures

Instruments for Road Safety Management

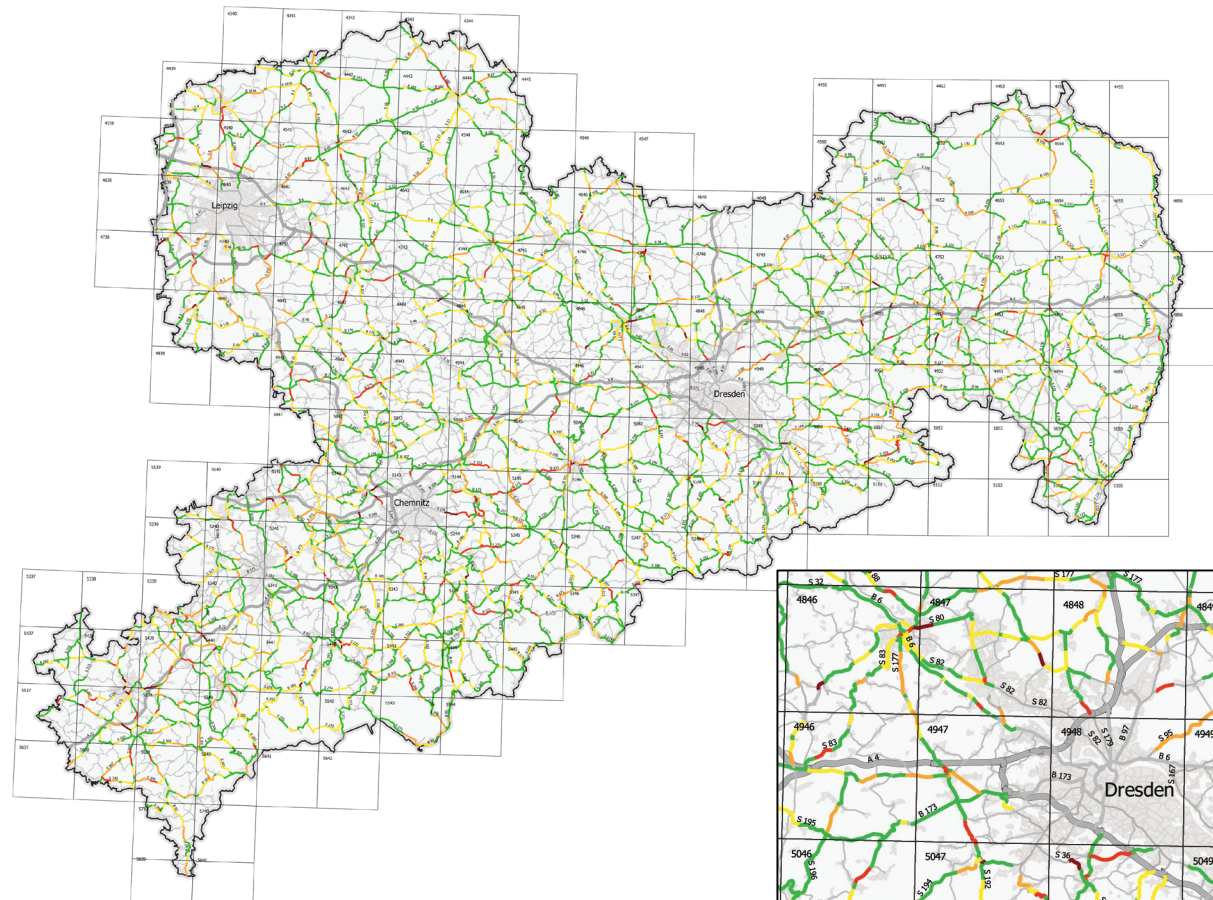
Legal Framework: Transposition of Directive 2008/96/EC into German law



- network related analysis
- provides information on possible deficiencies in routing and road design
- based on the evaluation of accident occurrences (number, driving performance)

Instruments for Road Safety Management

Safety Analysis of Road Networks



Safety Potential:

- avoidable accident costs per kilometer of road and year
= existing costs – expected costs
- calculation for individual network sections
- prioritization for further analysis and identification of measures (level 3-5)
[SMWA 2020]



Level	Costs [1000€/km·year]
1	no Safety Potential
2	1 - 50
3	50 - 110
4	110 - 210
5	≥ 210

Figure [4]

Instruments for Road Safety Management

Safety Analysis of Road Networks

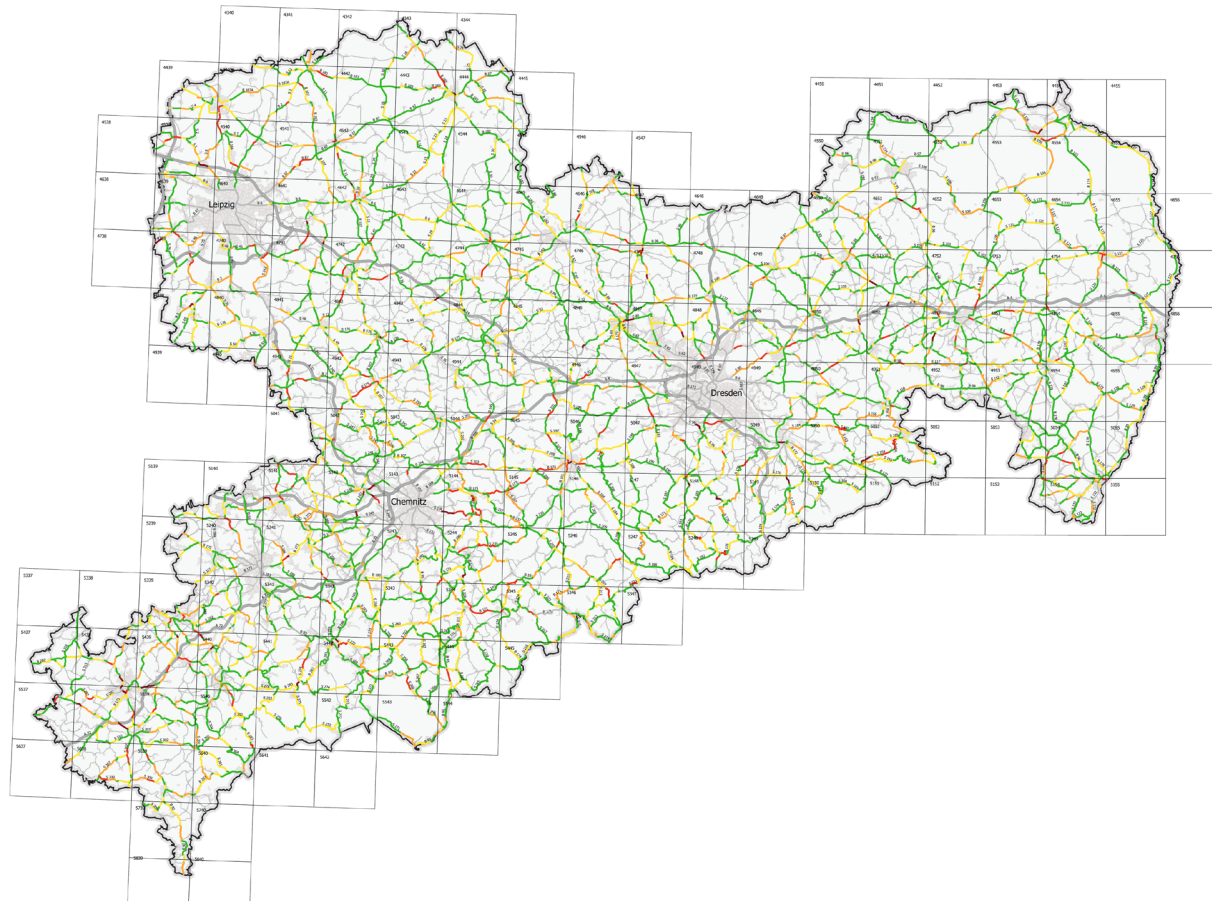


Figure [4]

Safety Potential:

- avoidable accident costs per kilometer of road and year
= existing costs - expected costs

existing costs

= number of accidents * accident cost rates
(cost rates specified by regulations)

expected costs

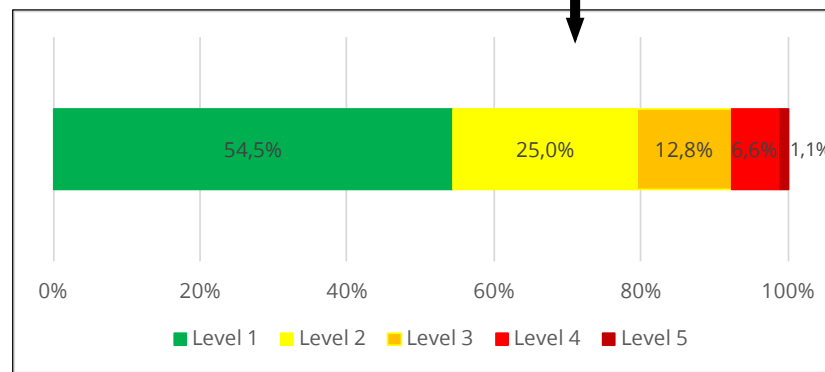
= basic accident costs if the road were designed in accordance with the regulations
(costs specified by regulations)

Instruments for Road Safety Management

Safety Analysis of Road Networks

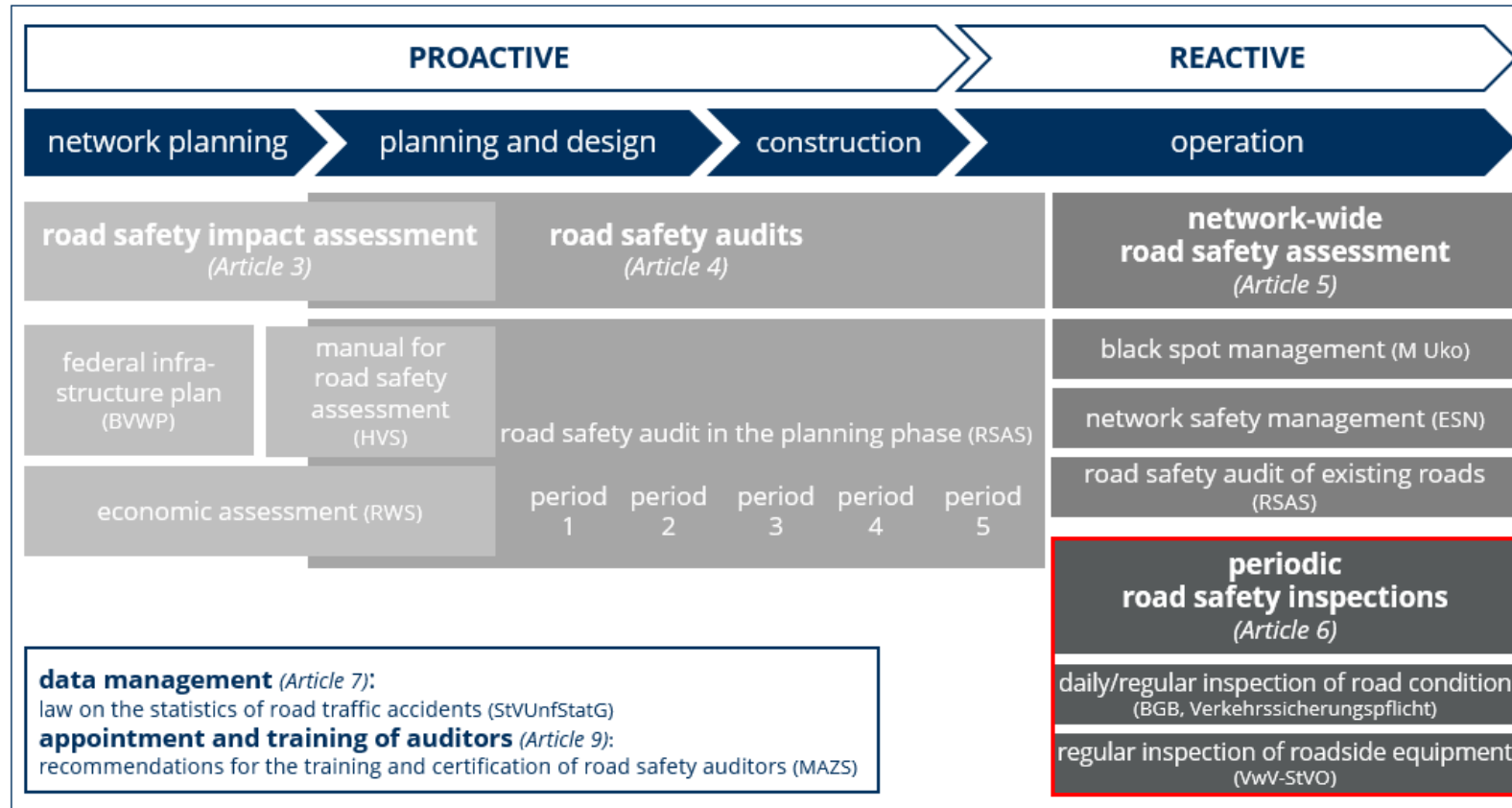
Level [1000€/(km·year)]		Federal Roads			State Roads		
		Number of Sections	Length [km]	Distribution of Length [%]	Number of Sections	Length [km]	Distribution of Length [%]
no Safety Potential	1	851	1.099,8	54,5	1.952	2.333,5	54,2
1 - 50	2	286	503,8	25,0	641	1.132,9	26,3
50 - 110	3	154	257,8	12,8	386	634,3	14,7
110 - 210	4	88	133,5	6,6	111	165,7	3,8
≥ 210	5	24	23,2	1,1	32	40,4	0,9

[SMWA 2020]



Instruments for Road Safety Management

Legal Framework: Transposition of Directive 2008/96/EC into German law



[FGSV, 2019]

- regular inspections, not on an ad hoc basis
- daily/regular control of the road
- independent of accidents

Instruments for Road Safety Management

Regular Road Safety Inspections

type of road safety inspection	objects to be inspected	road category	cycle
Regular Road Inspection	roadside equipment including road markings and traffic facilities, hazards at the roadside and in the side space	Federal highways, federal roads, state roads, county roads	every 2 years
		all other roads, roads and streets with public transport	every 4 years
Road Inspection in the Dark (Road Inspection at Night)	roadside equipment including road markings and facilities, routing, lighting of crossing points, hazards at the roadside and in the side space	Federal highways, federal roads, state roads, county roads	every 4 years
Inspection of Level Crossing	traffic signs and traffic facilities in connection with level crossings	all roads	every 4 years
Inspection of Signposting	signposting	all roads	every 4 years

Figure [5]

Instruments for Road Safety Management

Road Safety Inspection



Figure [6]

Instruments for Road Safety Management

Legal Framework – Evaluation Study

- evaluation study on effectiveness and on improvements of EU Directive 2008/96/EC [TML 2014]

EQ1	To what extent were Road Safety Impact Assessments (RSIAs) and Road Safety Audits (RSAs) integrated into the planning, designing and construction phases of Member States?	RSIA and RSA <u>procedures are fully established in the national law systems</u> of the Member States. Preferred pathway was found to be the integration of the provisions laid down by the Directive on these two techniques with pre-existing national streams; only a minority of Member States have entirely replaced pre-existing regulatory settings. This confirms that national systems were already broadly in line with the requirements set by the Directive.
-----	--	--

Figure [7]

EQ8	Were the procedures applied beyond the trans-European road network?	<u>RISM procedures are applied also on non TEN-T roads and RSA is the most extensively applied technique.</u> The degree of compulsion is variable. In the vast majority of Member States, the application to the non TEN-T roads considers national roads, dual carriageways and motorways.
-----	---	--

Figure [8]

EQ25	In the light of the target of halving the road traffic fatalities established in the Policy Orientation for road safety, and with a view of a future similar target for seriously injured, can the current Directive considered an adequate instrument?	The Directive has led to the establishment of RISM procedures in all Member States, thus increasing their use in comparison with a pre-Directive context. In particular, it has increased use of cost-effective procedures (RSAs and RSIs) which have proven to yield <u>positive results in terms of reduction of road casualties</u> were applied. Further, there is <u>indication of a correlation between having lower fatality rates and having road safety procedures</u> , indicating that the Directive will most probably positively impact road safety, and certainly in countries which did not have these procedures in place before.
------	---	---

Figure [9]

References

The extract from FGSV book number 298, *Richtlinien für das Sicherheitsaudit von Straßen. RSAS*, edition 2019, is quoted with permission of Forschungsgesellschaft für Straßen- und Verkehrswesen e.V. (Road and Transportation Research Association). Decisive for the use of FGSV books is the latest edition, which is available from FGSV Verlag (FGSV Publishing House), Wesselinger Str. 15-17, 50999 Köln, www.fgsv-verlag.de. (content translated into English)

Sächsisches Staatsministerium für Wirtschaft, Arbeit und Verkehr SMWA (en: Saxon Ministry of Economic Affairs, Labour and Transport) (2020): *Sicherheitsanalyse 2020. Bewertung der Verkehrssicherheit von Bundes- und Staatsstraßen in der Baulast des Freistaates Sachsen nach den Empfehlungen für die Sicherheitsanalyse von Straßennetzen*. (content translated into English)

European Cyclists' Federation: *Safe road infrastructure for cyclistst in Europe*. https://ecf.com/sites/ecf.com/files/RISM-poster-print3_0.pdf (last access: 03-2022)

List of Figures

- [1] European Parliament, European Council (2008): *DIRECTIVE 2008/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on road infrastructure safety management*. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02008L0096-20191216&from=EN> (last access: 03-2022)
- [2], [3]
European Parliament, European Council (2008): *DIRECTIVE 2008/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 November 2008 on road infrastructure safety management*. URL: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008L0096-20191216> (last access: 03-2022)
- [4] Sächsisches Staatsministerium für Wirtschaft, Arbeit und Verkehr (en: Saxon Ministry of Economic Affairs, Labour and Transport) (2020): *Sicherheitspotential auf Bundes- und Staatsstraßen im Freistaat Sachsen. Betrachtungszeitraum 2017-2019*. Map. (background map: Straßeninformationsbank Sachsen. Stand Straßennetz 01.01.2017. ATKIS-Basis-DLM, Staatsbetrieb Geobasisinformation und Vermessung Sachsen)
- [5] The extract from FGSV book number 389, *Merkblatt für die Durchführung von Verkehrsschauen*. MDV, edition 2013, is quoted with permission of Forschungsgesellschaft für Straßen- und Verkehrswesen e.V. (Road and Transportation Research Association). Decisive for the use of FGSV books is the latest edition, which is available from FGSV Verlag (FGSV Publishing House), Wesselinger Str. 15-17, 50999 Köln, www.fgsv-verlag.de. (figure translated into English)
- [6] Image by [Undine Damus-Holtmann](#) from [Pixabay](#) (last access: 03-2022)
- [7], [8], [9]
Transport & Mobility Leuven (2014): Final Report. SPECIFIC CONTRACT. MOVE/A3/350-2010 IMPACT ASSESSMENTS AND EVALUATIONS (EX-ANTE, INTERMEDIATE AND EX-POST) IN THE FIELD OF TRANSPORT. *Study on the effectiveness and on the improvement of the EU legislative framework on road infrastructure safety management (Directive 2008/96/EC). Ex-Post Evaluation*. URL: <https://transport.ec.europa.eu/system/files/2016-09/2014-12-ex-post-evaluation-study-road-infra-safety-mgmt.pdf> (last access: 03-2022)

„Friedrich List“ Faculty of Transport and Traffic Sciences
Prof. Dr.-Ing. Regine Gerike
Regine.gerike@tu-dresden.de



Co-funded by the
Erasmus+ Programme
of the European Union

The European Commission's support for the production of this publication does not constitute an endorsement of the contents, which reflect the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein

Grant Agreement No.:
2019-1-PL01-K1203-065244



Licence notice



„Instruments for Designing Safe Streets and Roads“ (2022)

by „Friedrich List“ Faculty of Transport and Traffic Sciences, Chair of Integrated Transport Planning and Traffic Engineering, Prof. Dr.-Ing. Regine Gerike, is licensed under a [Creative Commons Attribution 4.0 International Licence](https://creativecommons.org/licenses/by/4.0/).

The logos and figures are copyright protected and are not included in the free license.

Methoden-Verkehrssicherheitsarbeit_TUD16-9.pptx

