

**UNECE**

# Road Safety Audit and Road Safety Inspection on the TEM network



**UNITED NATIONS**

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

# Road Safety Audit and Road Safety Inspection on the TEM network



**UNITED NATIONS**

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# Notes

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# United Nations Economic Commission for Europe

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The United Nations Economic Commission for Europe (UNECE) is one of the five United Nations regional commissions administered by the Economic and Social Council (ECOSOC). It was established in 1947 with the mandate to help rebuild post-war Europe, develop economic activity and strengthen economic relations among European countries, and between Europe and the rest of the world.

During the Cold War, UNECE served as a unique forum for economic dialogue and cooperation between East and West. Despite the complexity of this period, significant achievements were made, with consensus reached on numerous harmonization and standardization agreements.

In the post-Cold War era, the Commission acquired not only many new Member States, but also new functions. Since the early 1990s, it has focused on analyses of the transition process, using its harmonization experience to facilitate the integration of Central and Eastern European countries into the global markets.

Today UNECE is the forum where countries of Europe, Central Asia and North America – 56 in all – come together to forge the tools of their economic cooperation. That cooperation encompasses economics, statistics, environment, transport, trade, sustainable energy, timber and habitat. The Commission offers a regional framework for the elaboration and harmonization of conventions, norms and standards. In particular, UNECE experts provide technical assistance to the countries of South-East Europe and the Commonwealth of Independent States. This assistance takes the form of advisory services, training seminars and workshops where countries can share their experiences and best practices.

# Transport in UNECE

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The UNECE Sustainable Transport Division acts as the secretariat of the Inland Transport Committee and the ECOSOC Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals.

The Inland Transport Committee and its 20 working parties, as well as the ECOSOC Committee and its sub-committees, are intergovernmental decision-making bodies that work to improve the daily lives of people and businesses around the world in measurable ways and with concrete action to enhance traffic safety, environmental performance, energy efficiency and the competitiveness of the transport sector.

The Inland Transport Committee is a unique intergovernmental forum that was set up in 1947 to support the reconstruction of transport connections in post-war Europe. Over the years, it has specialized in facilitating the harmonized and sustainable development of inland modes of transport. The main and most well-known results of its ongoing work are reflected in the following outcomes:

- Fifty-eight United Nations conventions and many more technical regulations, which are updated on a regular basis and provide an international legal framework for the sustainable development of national and international road, rail, inland water and intermodal transport, including the transport of dangerous goods, as well as the construction and inspection of road motor vehicles.
- The Trans-European North-South Motorway, Trans-European Railway and the Euro-Asia Transport Links projects, which facilitate multi-country coordination of transport infrastructure investment programmes.
- The TIR system, which is a global customs transit facilitation solution.
- The tool called For Future Inland Transport Systems (ForFITS), which can assist national and local governments in monitoring carbon dioxide (CO<sub>2</sub>) emissions coming from inland transport modes and in selecting and designing climate change mitigation policies, based on their impact and adapted to local conditions.
- Transport statistics – methods and data – that are internationally agreed on.
- Studies and reports that help transport policy development by addressing timely issues, based on cutting-edge research and analysis.
- Special attention to Intelligent Transport Services, sustainable urban mobility and city logistics, as well as to increasing the resilience of transport networks and services in response to climate change adaptation and security challenges.

# List of abbreviations

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<b>EC</b>	European Commission
<b>E - road network</b>	European Road Network
<b>ITS</b>	Intelligent Transport Systems
<b>NSR</b>	Network Safety Ranking
<b>PIARC</b>	World Road Association
<b>RIA</b>	Road Safety Impact Assessment
<b>RISM</b>	Road Infrastructure Safety Management
<b>RSA</b>	Road Safety Audit
<b>RSI</b>	Road Safety Inspection
<b>TEM</b>	Trans-European North-South Motorway
<b>UNECE</b>	United Nations Economic Commission for Europe

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# 1. The Strategic Framework

## 1.1 United Nations Decade of Action for Road Safety

More than 1.2 million people are killed and tens of millions injured worldwide in road crashes every year. So as to reduce road accidents and fatalities, the United Nations General Assembly proclaimed the period 2011 to 2020 as the Decade of Action for Road Safety, “with a goal to stabilize and then reduce the forecast level of road traffic fatalities around the world by increasing activities conducted at the national, regional and global levels” (United Nations General Assembly, 2010).

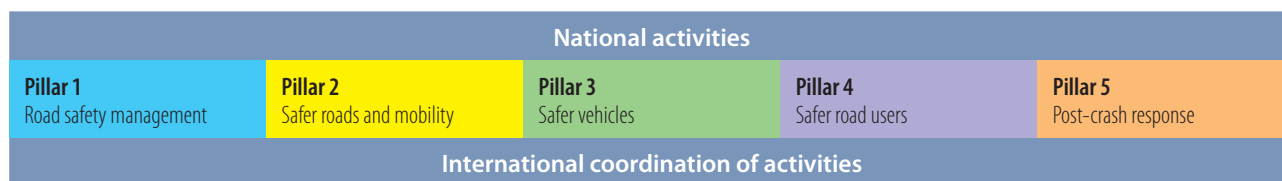
The United Nations appealed to Member States, civil society, organizations, private and public sector to ensure that the Decade of Action for Road Safety leads to a real improvement.

A Global Plan for the Decade of Action for Road Safety 2011-2020 was developed to assist the work. The Global Plan is based on the five pillars of the “Safe System Approach”.

The safe system approach is a comprehensive view on road safety. It acknowledges that human beings make mistakes, and thus, a greater allowance for human error is needed. Therefore, the institutional structures, the maintenance and operation of roads, the planning and design of transport systems and of safer vehicles are part of the safe system approach, as are the road users themselves, who need to take part and responsibility in reducing the risks in the road system.

The RSA and RSI are mainly part of Road Safety Management (on an organisational level) and of Safer Roads and Mobility pillars, but procedures have to take into account all parts of the safe system approach.

**Figure 1.1**  
**The Five Pillars of the Safe System Approach**



Source: World Health Organization, 2010

## 1.2 Sustainable Transport Division

The UNECE Sustainable Transport Division works on all relevant topics of inland mobility, transport and connectivity. The main goals are the sustainability, competitiveness, environmental aspects and safety of inland transport systems: “We work to promote sustainable transport which is safe, clean and competitive, through the development of freight and personal mobility by inland transport modes, by improving traffic safety, environmental performance, energy efficiency, inland transport security and efficient service provision in the transport sector.”<sup>1</sup>

The work of the Division is guided – among other things – by the mandates and by the programmes of work of the ECE Inland Transport Committee (ITC) and its subsidiary bodies. ITC is an ECE Sectoral Committee for cooperation in the field of inland transport and a unique United Nations Regional Commission dedicated to inland transport, with the overarching goal of developing inland transport in a safe, efficient and environmentally friendly way.

To deal with inland transport issues, the ITC is assisted by a number of subsidiary bodies:

- Twenty Working Parties specialized in different topics of inland transport and vehicle regulations;<sup>2</sup>
- Expert Groups;
- Informal Working Groups.

The Sustainable Transport Division provides the secretariat to:

- The ITC and its subsidiary bodies;
- The Administrative Committees to a number of United Nations transport legal instruments;
- Two ECOSOC Sub-Committees of Experts on the Transport of Dangerous Goods, and of Experts on the Globally Harmonized System of Classification and Labelling of Chemicals.

The activities of ECE and ITC in the field of transport have actively represented the principles and objectives of sustainable development for many years. Sustainable transport is essential to achieving most, if not all, of the Sustainable Development

<sup>1</sup> [www.unece.org/trans/welcome.html](http://www.unece.org/trans/welcome.html), 14 June 2016

<sup>2</sup> A full list is available from [www.unece.org/trans/welcome.html](http://www.unece.org/trans/welcome.html)

Goals and of the 2030 Agenda for Sustainable Development. In view of the entire spectrum of themes covered by ITC and its subsidiary bodies (from transport facilitation and security, intelligent transport systems, climate change and sustainable transport, transport infrastructure development, road traffic safety and security), the work of ITC is of the utmost relevance for achieving the Sustainable Development Goals.<sup>3</sup>

The core activity of the Division is development of the international legal instruments (agreements, conventions, regulations, etc.), which provide a legal framework for mobility and infrastructure development. Along with administering the United Nations legal instruments, (i) the analytical work conducted by the Working Parties and the secretariat, (ii) technical assistance and capacity-building activities represent two other pillars of ECE Sustainable Transport Division activities.

The ECE technical assistance projects support accession to and implementation of the United Nations legal instruments and lead to an internationally harmonized development of transport infrastructure. The Trans-European North-South Motorway Project (TEM, see section 2.3 below), Trans-European Railway (TER) and the Euro-Asian Transport Links (EATL) are emblematic projects that spearheaded international cooperation in this field.

### 1.3 Trans-European North-South Motorway Project

The TEM Project was established in 1977 as a subregional cooperation between Central, Eastern and South-Eastern European countries. ECE is the executing agency. The Project Central Office is located in Warsaw. The member States are Armenia, Austria (associate member), Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Lithuania, Poland, Romania, Slovenia

and Turkey. Georgia, Italy and Slovakia are member countries, which are currently not actively participating in the project. Azerbaijan is in the accession process, four more countries have observer status: Montenegro, Serbia, Sweden and Ukraine.

The main objectives of the TEM project are to facilitate road traffic in Europe, to improve the quality and efficiency of transport, to reduce gaps and disparities between motorway networks in the different parts of Europe and to assist the integration process of European transport infrastructure systems.

According to the latest census, the TEM network is comprised of more than 25,000 km of roads of which more than 65 per cent has been completed as full motorway.

A TEM and TER Projects Master Plan was first published in 2006 and revised in 2011 (ECE, 2011). The first Master Plan provided a reliable and pragmatic short- to long-term investment strategy for developing a backbone of road, rail and combined transport networks in the participating countries. It is important to note that the Master Plan promoted the common planning and integration of European transport infrastructure and supported the implementation of the pan-European transport corridors and intermodal transport operations. In the revised plan: (a) the infrastructure development of 25 participating countries was analysed, and (b) a development programme for the road and the rail networks until the year 2020 was prepared, including infrastructure development financing.

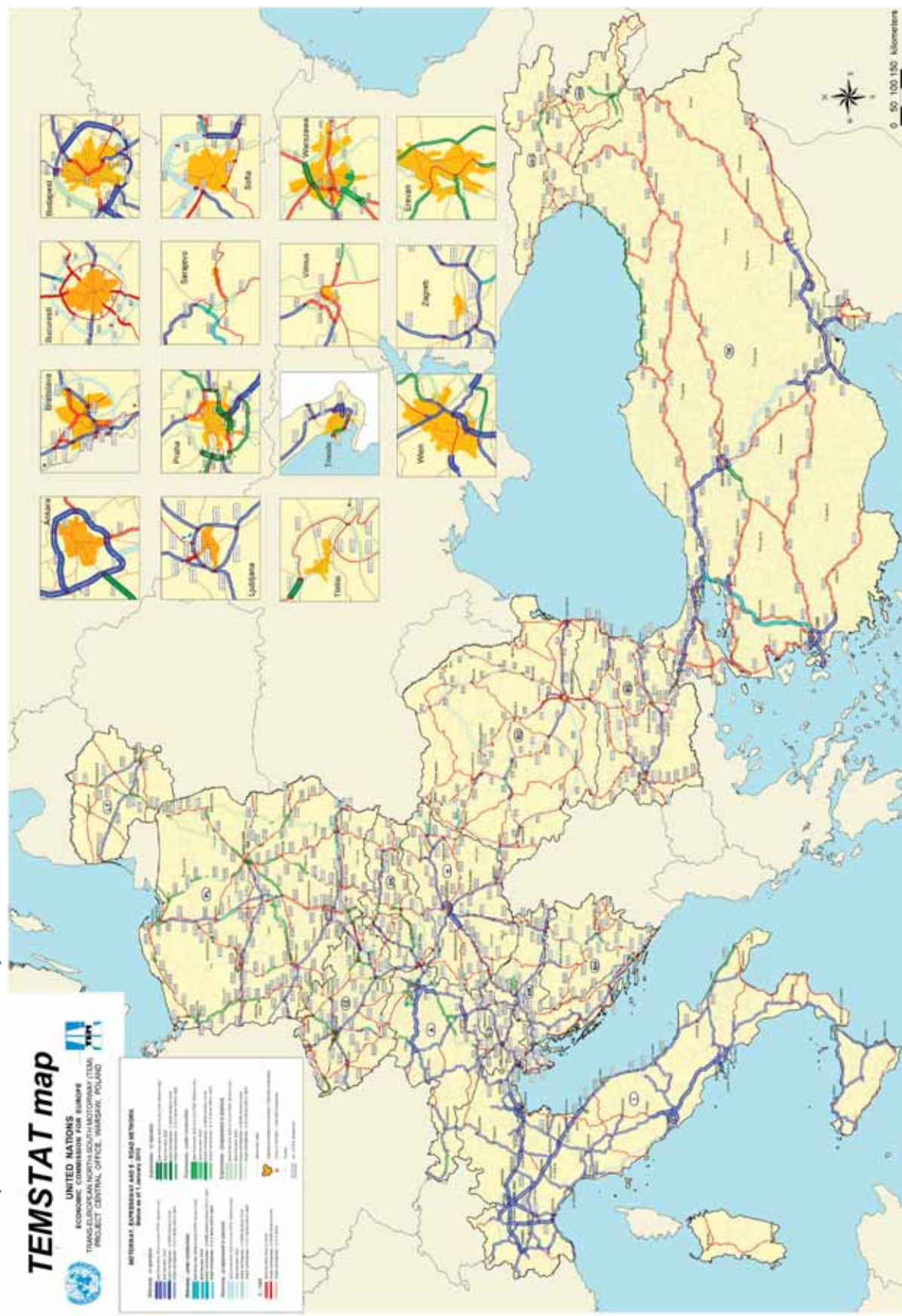
Road safety and transport security issues found their place for the first time in the revised Master Plan. The overall road safety trends and the social costs of road accidents in TEM member States were presented, with information on ECE activities in road safety.

Finally, the revised Master Plan underlined the benefits of a wider deployment of Intelligent Transport Systems (ITS) solutions and stressed the importance of minimizing transport impacts on the environment.

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<sup>3</sup> <https://sustainabledevelopment.un.org/?menu=1300>, 1 September 2016

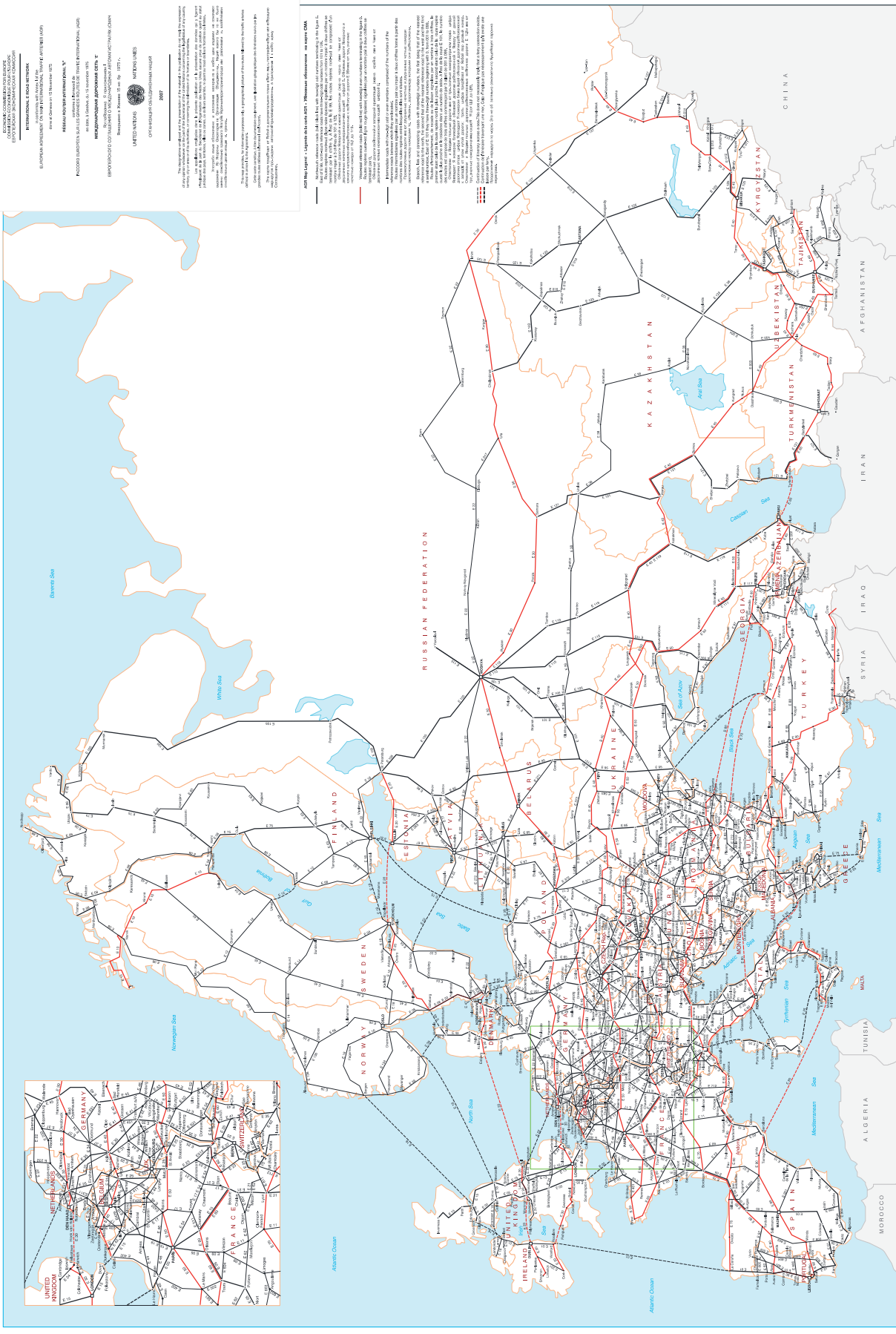
Figure 1.2  
The Trans-European North-South Motorway Network



Source: ECE, 2012



Figure 1.3  
The International European Road Network, 2007



Source: [www.unece.org/fileadmin/DAM/trans/conventn/MapAGR2007.pdf](http://www.unece.org/fileadmin/DAM/trans/conventn/MapAGR2007.pdf)

### 1.4 European Agreement on Main International Traffic Arteries

The Declaration on the Construction of Main International Traffic Arteries was signed in Geneva on 16 September 1950 (United Nations) to improve road transport infrastructure and to strengthen relations between European countries. The Declaration envisaged the first E-road network as a motorway system like the Interstate Highway System of the United States of America.

A few decades later, a coordinated plan for the construction and development of roads of international importance in the ECE region – the European Agreement on Main International Traffic Arteries (AGR) was agreed on in Geneva (15 November 1975). The AGR entered into force on 15 March 1983, in accordance with article 6(1) of the Agreement (United Nations Economic and Social Council / Economic Commission for Europe, Working Party on Road Transport, 1975-2008). The Agreement defines and numbers the European road network and defines the conditions E-roads should conform to. The E-road network consists of a grid system of reference roads of a general north-south and west-east orientation; intermediate roads form the branches, links and connections in between the reference roads. Minimum geometric characteristics (e.g. parameters of horizontal and vertical alignment, cross sections, and deceleration and acceleration lanes) are also part of the Agreement:

- equipment such as road signs, road markings and guardrails;
- aspects of traffic control, lighting and service facilities;
- management and safety equipment for tunnels;
- environmental consideration; and
- maintenance of the roads.

The conditions of the Agreement do not apply to built-up areas. All the conditions and recommendations of the Agreement consider road safety issues very seriously, for the construction of new roads and for the modernization of existing ones.

Setting up and implementing appropriate Road Infrastructure Safety Management (RISM) procedures is seen as essential for improving the safety of road infrastructure on the international E-road network. Thus, the Working Party on Road Transport (SC.1) decided, in 2009, to start an amendment process of the AGR to include RISM in the Agreement.

The SC.1 report (ECE/TRANS/SC.1/396, 2011) stated, “SC.1 was reminded that at its 105th session, the Working Party considered and approved amendments to the AGR on procedures relating to road safety impact assessments, road safety audits, the management of road network safety as well as safety inspections (based on European Commission Directive 2008/96/EC on road infrastructure safety management). The secretariat informed SC.1 about article 7 of the AGR concerning procedures for amending the main text of the AGR agreement and the need for a contracting party to propose amendments. SC.1 invited contracting parties to submit a formal amendment proposal. The secretariat – upon receiving amendment proposals to include in the AGR procedures relating to road safety impact assessments, road safety audits, the management of road network safety as well as safety inspections – will forward them to the Secretary-General.”

Until today, none of the contracting parties has proposed amendments and the AGR amendments on RISM have yet to be adopted.

### 1.5 European Union

In November 2008, Directive 2008/96/EC of the European Parliament and of the Council on Road Infrastructure Safety Management (European Parliament and Council, 2008) was published. The Directive includes definitions and principles on several road infrastructure safety procedures. The Directive applies to roads of the Trans-European Transport Network (TEN-T) in the member States of the European Union. Member States were obliged to bring into force the necessary laws, regulations and administrative provisions to comply with the Directive by December 2010.

Directive 2008/96/EC initialised the development and introduction of road safety management procedures in many European Union countries. The definitions of some procedures according to the Directive are given in section 3 of this report.

The annex of the Directive provides the main elements of different road safety management procedures and states the elements to be taken into consideration.

The Directive states necessary accident information that should be included in accident reports and deals with criteria for appointing and training auditors: auditors should obtain an initial training, hold a certificate of competence and participate in further periodic training courses; the auditor should not be involved in the conception or operation of relevant infrastructure project being or to be audited.

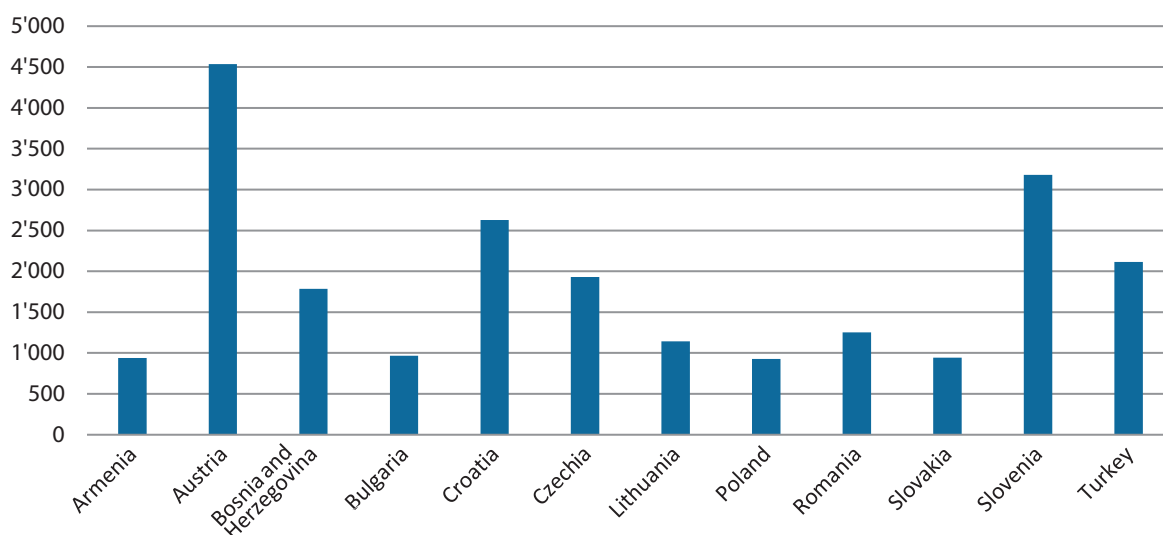
## 2. The Road Safety Situation in TEM member States

ECE in its report “Statistics of Road Traffic Accidents in Europe and North America” provides accident numbers for TEM member States (ECE, 2016). The number of road traffic

accidents, fatalities and injuries due to road traffic accidents per million inhabitants in TEM member States can be seen in following figures.

**Figure 2.1**

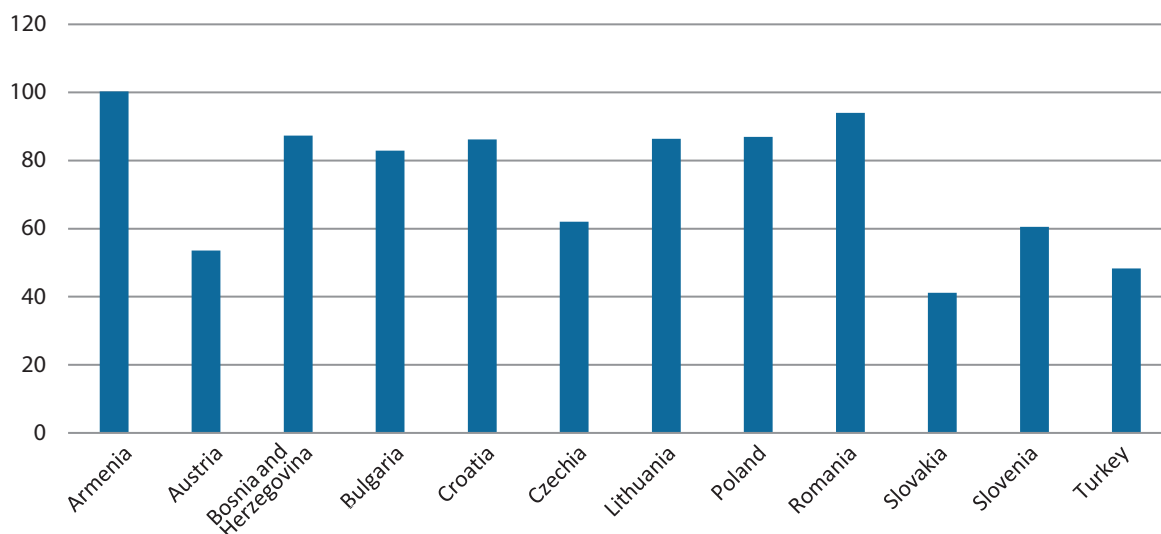
**Road traffic accidents per million inhabitants in TEM member States, 2013**



Source: (ECE, 2016)

**Figure 2.2**

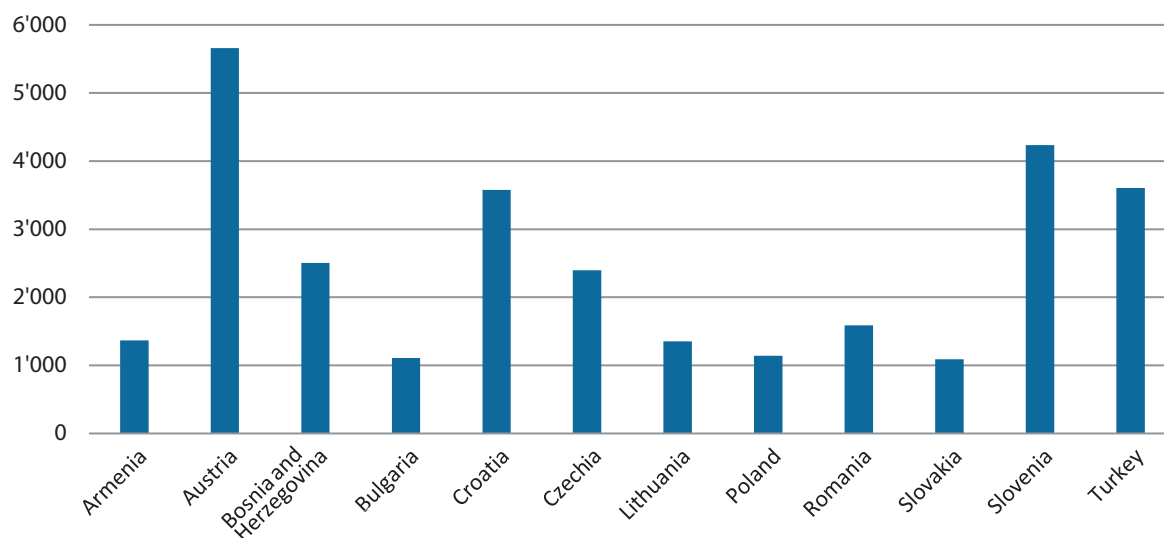
**Road traffic fatalities per million inhabitants in TEM member States, 2013**



Source: (ECE, 2016)

## 2. The Road Safety Situation in TEM member States

**Figure 2.3**  
Road traffic injuries per million inhabitants in TEM member States, 2013

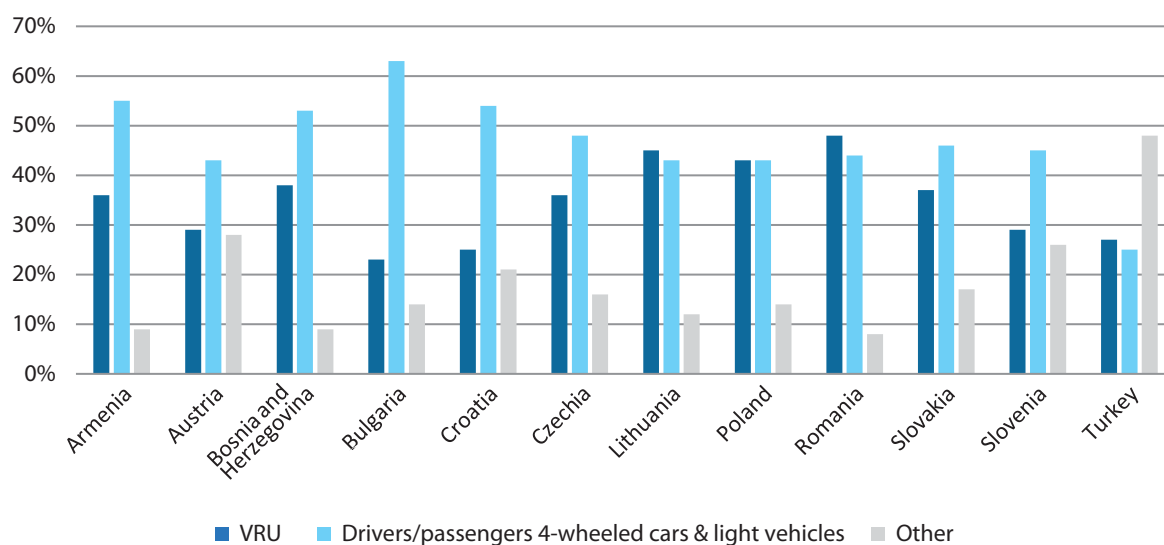


Source: (ECE, 2016)

Naturally, the number of injuries in road traffic accidents mostly correlates with the number of accidents. Statistics show that between 1.15 persons (Bulgaria, Slovakia) and 1.70 persons (Turkey) were injured in accidents in TEM member States in 2013. The differences are greater for the

number of fatalities in road traffic accidents: in Armenia and Poland, statistically one fatality occurs in about 10 per cent of the road traffic accidents, in Slovenia and Turkey, one in about 2 per cent, and in Austria one in about 1 per cent.

**Figure 2.4**  
Fatalities by category of road user in TEM member States, 2013



Source: World Health Organization, 2015



Figure 2.4 shows that over 40 per cent of fatalities in TEM member States involve drivers or passengers of 4-wheeled vehicles, except Turkey with less than 30 per cents.

In recent years, the number of fatalities decreased in most TEM member States, assuming that many countries have implemented systematic road safety measures (e.g. road safety management, safer vehicles, forgiving roadsides, etc.). In 2013,

the number of fatalities in all TEM member States except Bosnia and Herzegovina, was lower than in the biennium 2007-2008 when some countries had peaks in casualties.

The percentage of accidents on motorways compared to accidents on all other roads types was between 0.8 and 7.4 per cent in TEM member States in 2013, slightly less than the percentage of fatalities and injuries on motorways (see Table 2.1).

**Table 2.1**  
**Percentage of accidents, fatalities and injuries in road traffic accidents on motorways in TEM member States, 2013**

	Accidents on motorways	Fatalities and injuries on motorways	Fatalities on motorways	Injuries on motorways
Austria	5.0	5.5	6.8	5.5
Bulgaria	2.3	-	3.3	-
Croatia	2.4	3.4	10.3	3.2
Czechia	1.8	2.1	3.8	2.0
Lithuania	1.2	-	3.5	-
Poland	0.8	1.0	1.2	0.9
Romania	0.5	0.7	1.3	0.7
Slovakia (2010)	1.8	2.1	3.8	2.0
Slovenia	7.4	8.2	12.8	7.9
Turkey	2.0	2.3	4.9	2.3

Source: ECE, 2016

Motorways usually show the lowest accident rates (injury accidents per million vehicle kilometres travelled) on the road network, thus the relative risk to be involved in an injury accident is lowest on this type of road. Elvik, et.al. gave accident rates from various countries and types of road: the average accident rate on motorways was about 25 per cent of the average for all public roads (Elvik, Høye, Vaa, and Sørensen, 2009).

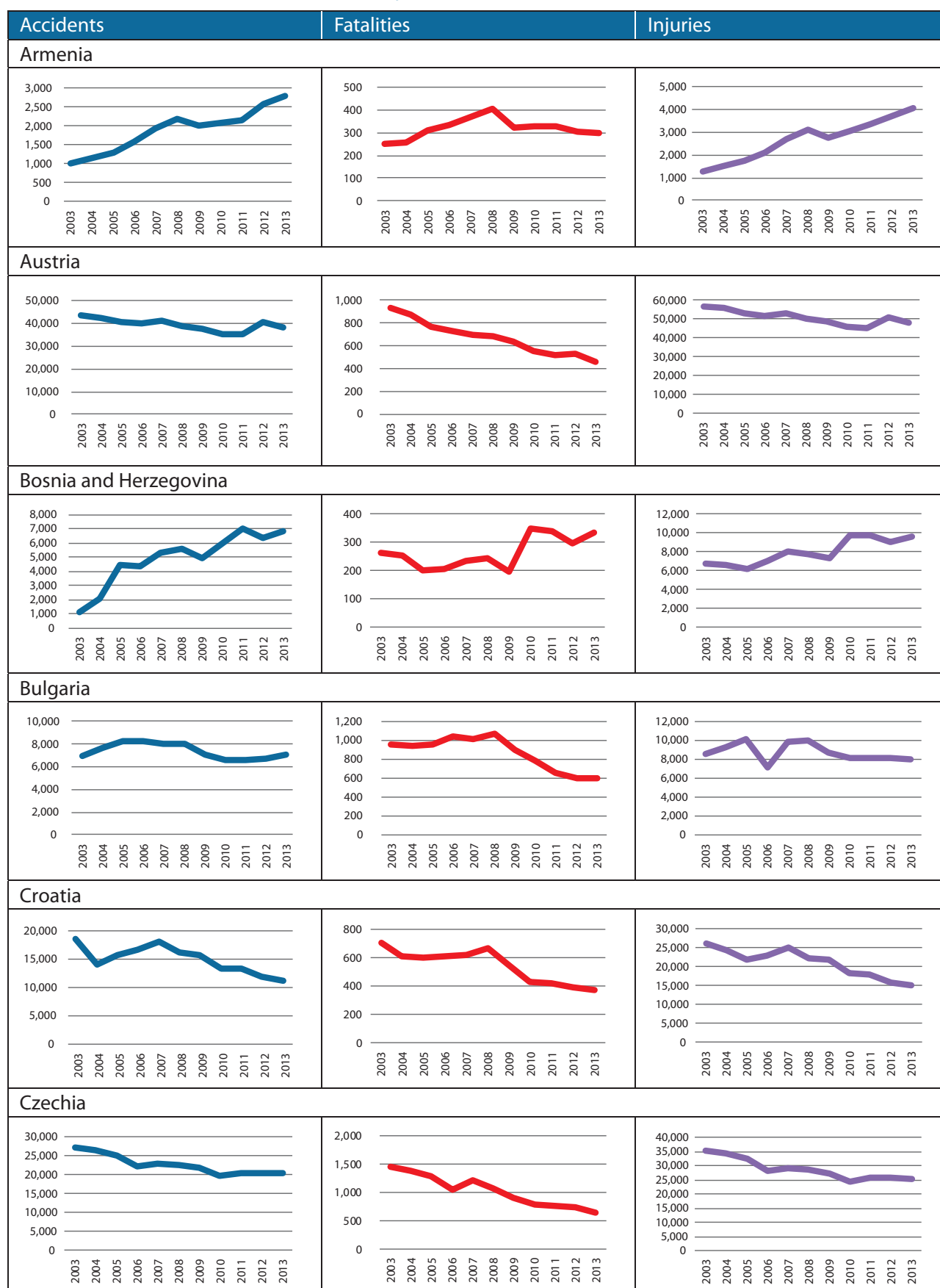
In most TEM member States, the number of road accidents and the number of injured in road traffic accidents

show a comparable improvement. The trend in fatalities sometimes differs from the trend in accidents and injured, respectively (e.g. Figure 2.5, Austria and Turkey). The number of fatalities in the year 2013 was lower than in the biennium 2007-2008 in all countries except in Bosnia and Herzegovina. In most TEM member States, the number of road traffic accidents and injured people decreased, except in Armenia, Bosnia and Herzegovina, Romania and Turkey where the number of accidents and injuries rose in the last decade.

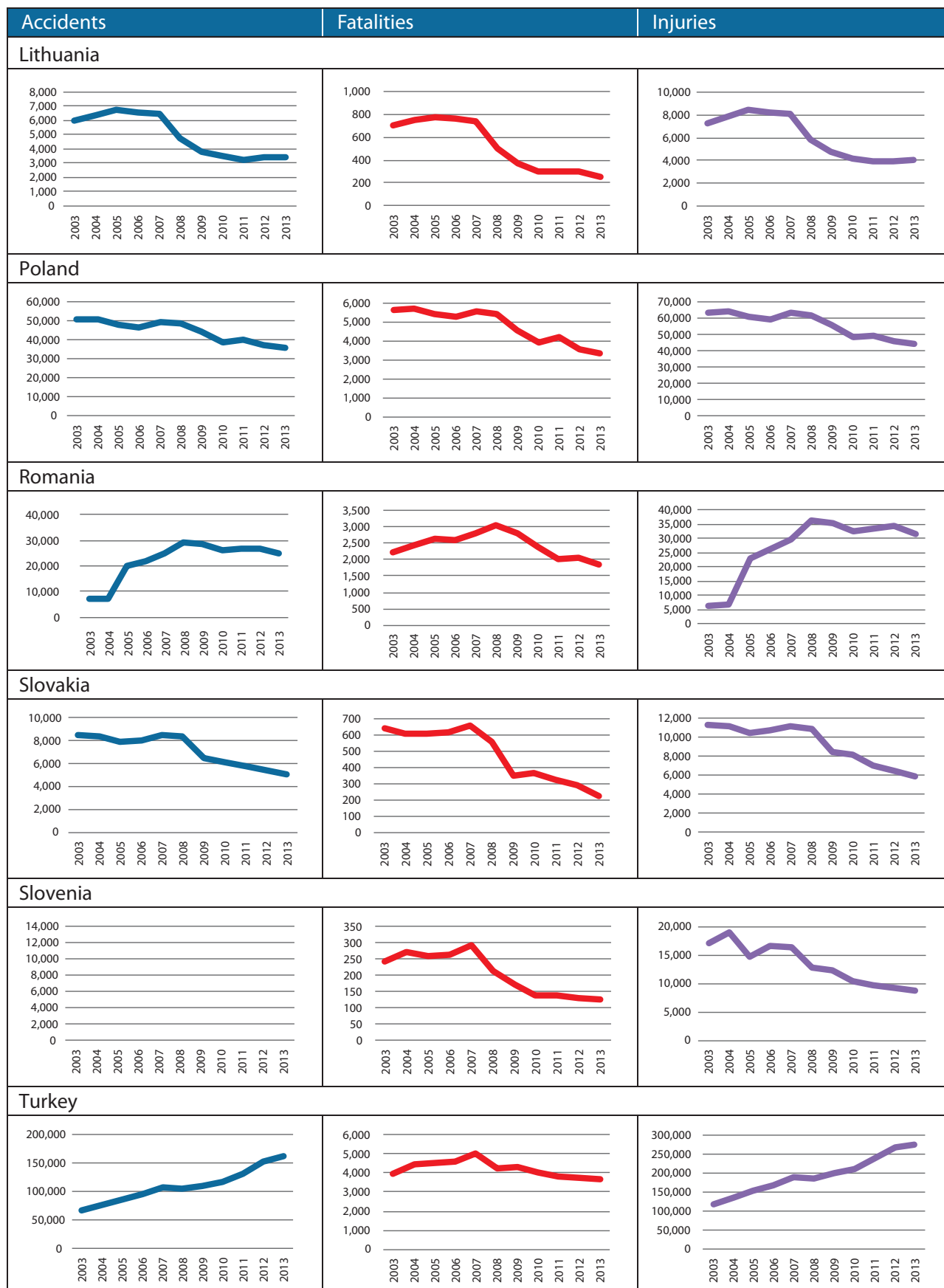
## 2. The Road Safety Situation in TEM member States

Figure 2.5

Number of road traffic accidents, fatalities and injuries in TEM member States, 2003–2013



Source: ECE, 2016



# 3. Road Infrastructure Safety Management Procedures

Some RISM procedures, such as the treatment of high-risk sites, have been applied in many countries for a long time; other procedures have been proposed and introduced in the last 10 to 20 years. Elvik (in Elvik, Assessment and applicability of road safety management evaluation tools: Current practice and state-of-the-art in Europe, 2010) provided an overview of different procedures and cost effectiveness. On the basis of Elvik's report, International Traffic Safety Data and Analysis Group (IRTAD) determined the most important RISM procedures (see Figure 3.1 below).

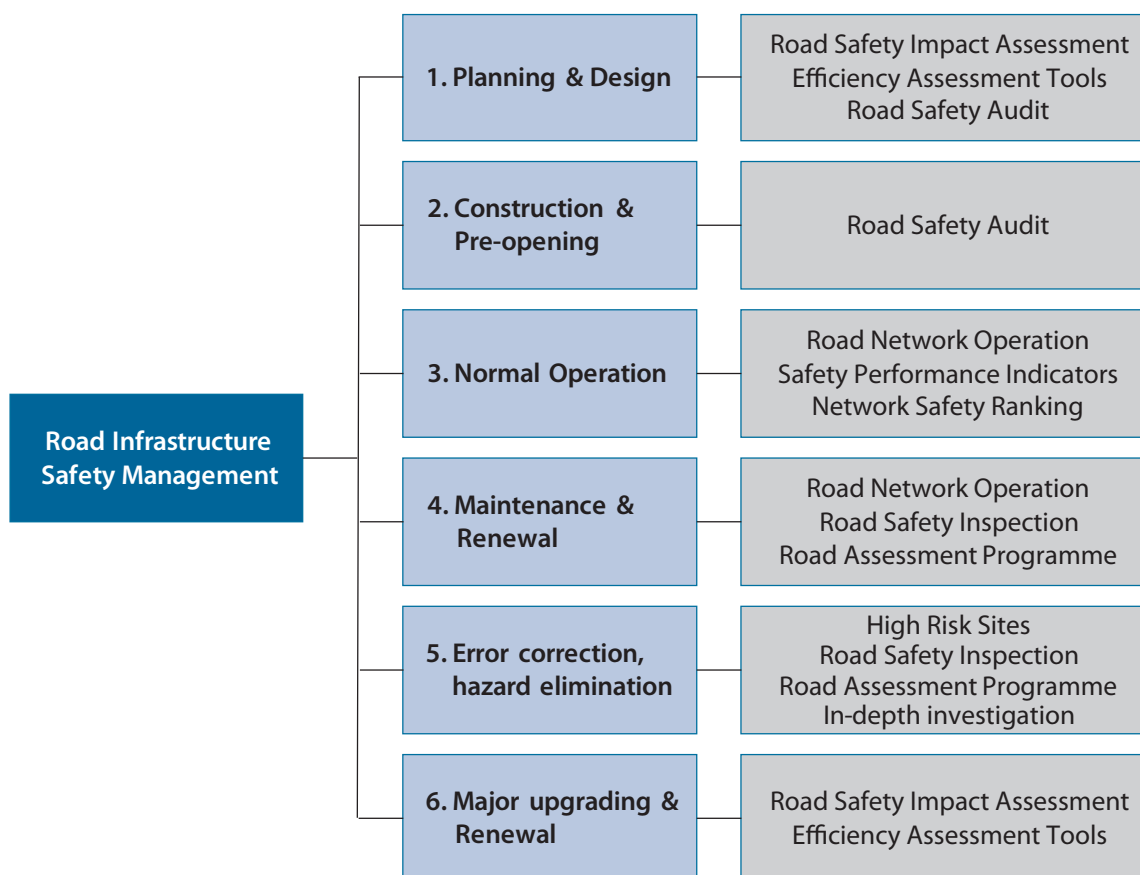
After the publication of Directive 2008/96/EC, many European countries developed, if they had not already, procedures for:

- Road Safety Impact Assessment (RIA);
- Road Safety Audit (RSA);
- Road Safety Inspection (RSI);
- Network Safety Management (NSM);
- Treatment of high accident concentration sections (Black spot management).

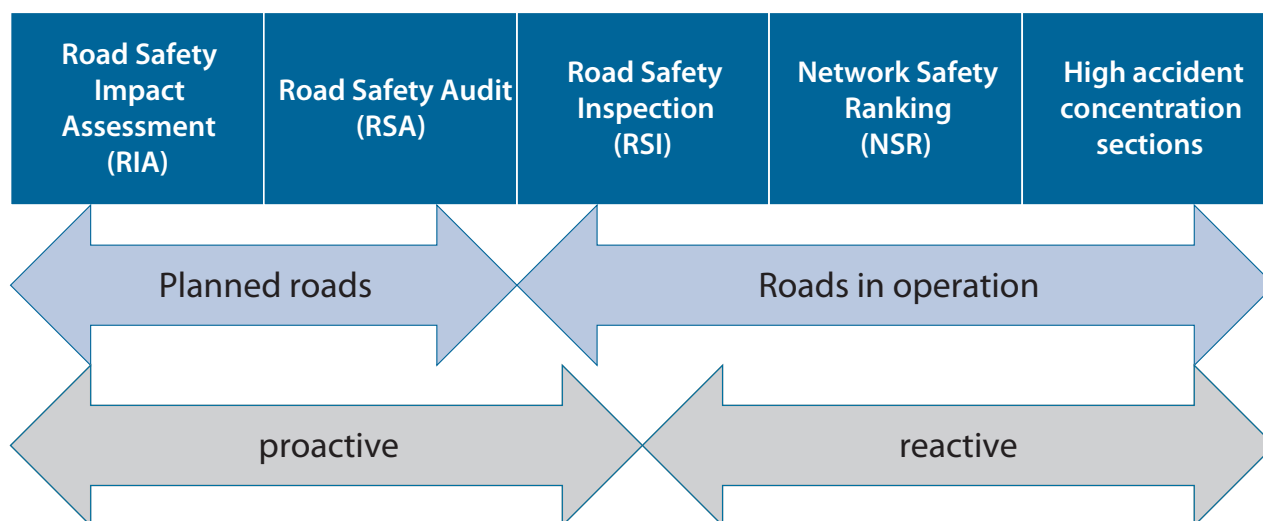
The procedures should be applied in this order to planned roads and existing roads. The procedures could have a proactive approach or a reactive approach to problems. RSI, in many cases, include both approaches, e.g. in the selection of roads that (primarily) should be inspected or in the case of ad hoc inspections due to accident reasons (see Figure 3.2).

**Figure 3.1**

**The road safety procedures in different stages of road development, adapted from Elvik, 2010**



**Figure 3.2**  
**Overview – The methods of safety management of roads**



### 3.1 Road Safety Impact Assessment

RIA according to Directive 2008/96/EC (European Parliament and Council, 2008) and draft amendments to the AGR (ECE, Inland Transport Committee, 2010):

“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”.

RIA should begin the initial stage of the planning process and should aim to include aspects of road safety in the decision-making process, before detailed planning begins. It is used when modifying the road network configuration or operation, when different scenarios are under consideration. One of the scenarios to be considered with RIA is “do-nothing”, i.e. the current situation with an estimation of the safety level of the existing network.

### 3.2 Road Safety Audit

RSA according to Directive 2008/96/EC (European Parliament and Council, 2008) and draft amendments to the AGR (ECE, Inland Transport Committee, 2010):

“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”.

RSA are formal, detailed and systematic checks of road infrastructure projects in different planning stages (e.g. feasibility stage, draft design, detailed design, pre-opening and early operation). Auditors should be trained and must be independent from the designer and from the contractor. Checklists are often used as a working tool for the auditors during RSA.

The results of RSA are restricted to the potential safety deficiencies that are determined during an audit. Usually a list of deficiencies and recommendations for improvement are included in the audit report.

At each stage of the audit, the contractor is required to respond by stating whether the listed enhancements will be done, or if not, explain the reasons for non-implementation.

### 3.3 Road Safety Inspection

RSI according to Directive 2008/96/EC (European Parliament and Council, 2008) and draft amendments to the AGR (ECE, Inland Transport Committee, 2010):

“Safety Inspection’ means an ordinary periodical verification of the characteristics and defects that require maintenance work for reasons of safety”.

RSI are formal, detailed safety checks of existing roads. RSI should be carried out periodically by independent, trained experts. RSI is largely a preventive safety procedure. It may be useful to prioritise the roads to be inspected from data on accidents, and in many cases accident statistics/data are a step in preparing the RSI.

RSI usually consists of three steps:

- in-office preparations: collecting information on the road (traffic data, design drawings, speed level, etc.);
- on-site visiting as the core activity of the inspection (numerous safety features can be important during the visit: design elements, road construction, road signs and marking, speed, user behaviour, etc.). Usually, checklists are provided as a working tool for the experts during the RSI;

### 3. Road Infrastructure Safety Management Procedures

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- drafting a report with a description of the inspected road section, a list of deficiencies detected during the first two steps, and recommendations.

Remedial action is not a part of RSI itself. However, implementation of measures is an important issue to ensure the effectiveness of the procedure. As in RSA, the client is required to make a statement on the recommendations as to whether remedial action will be done or not.

#### 3.4 Network Safety Ranking

The definition according to Directive 2008/96/EC (European Parliament and Council, 2008) and draft amendments to the AGR (ECE, Inland Transport Committee, 2010):

“Network Safety Ranking’ means a method for identifying, analysing and classifying parts of the existing road network according to their potential for safety development and accident cost savings”.

NSR looks at an existing road network to identify potential safety problems, and is, thus a possibility for safety development. NSR is based on accident data and draws extensively on a calculation of different parameters, like accidents per km, number of accidents per vehicle km or accident cost rates. Depending on the parameters used, additional data, like traffic or infrastructure data might be necessary. Different sections of a road network can be ranked and prioritized according to the criteria “investments in road safety will have the greatest impact”. It can also lead to further steps like conducting a RSI, before costlier (e.g. infrastructural) measures are applied.

A general definition or procedure of how to segment a road network does not exist. Usually one section should have homogenous characteristics, e.g. in terms of geometric design, density of traffic, road users or adjacent environment. Junctions may have to be considered separately.

Which type of indicator is chosen for ranking has to be decided in each case and may also depend on the data available.

#### 3.5 High Accident Concentration Sections

The definition according to Directive 2008/96/EC (European Parliament and Council, 2008) and draft amendments to the AGR (ECE, Inland Transport Committee, 2010):

“Ranking of high accident concentration sections’ means 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”.

The first step of road safety work in many TEM member States was to improve high accident concentration

sections (formerly often called “black spots”). It is a reactive approach and has proven very effective in many cases because measures are taken on spots where many accidents occur. Furthermore, treatment of high accident concentration sections often is cost-effective in terms of reducing accident costs (with fatalities and injury costs) in comparison with implementation costs.

#### 3.6 International Guidelines

The procedure of RSA was developed and implemented in Great Britain at the end of the 1980s. Other countries followed, and other guidelines were developed: to mention a few, the Danish Road Directorate had a Safety Audit handbook in 1993 (Danish Road Directorate, 1993), Austroads published guidelines in 1994 (Austroads, 1994), Canada in 1999 (University of New Brunswick; Transportation Group, Department of Civil Engineering, 1999) and Germany in 2002 (FGSV - Forschungsgesellschaft für Straßen- und Verkehrswesen e.V., 2002).

Most guidelines or manuals define the different stages where RSA can or should be undertaken, describe the audit process and the responsibilities of clients, auditors and designers. Additionally, guidelines in most cases contain checklists as a working tool for the auditors.

Though many RSA guidelines are available – and a common understanding exists of what RSA is and does, things are different when it comes to RSI. Many countries developed procedures for checking the existing roads before the term “Road Safety Inspection” was introduced. Thus, different views of what RSI is or what should be considered in a RSI exist.

Guidelines for RSI are often part of RSA guidelines, especially in the English-speaking world where RSA developed first. In these RSA guidelines, a “post-opening stage” is often included, which is a safety check of an existing road with a similar procedure to RSI. An example is HD 19/15 of the Design Manual for Roads and Bridges (Great Britain, Scotland, Wales and Northern Ireland) where the RSA of stage 4 is a monitoring report after the opening a road section.

Other countries developed guidelines and manuals for RSI alone, i.e. not as the last part of a RSA.

Among the countries that developed separate guidelines for RSI are Norway (1999 and 2001) (see latest manual (NPRA Directorate of Public Roads, 2014)), Canada (2004) (Transportation Association of Canada, 2004), and Austria (2007) (FSV - Österreichische Forschungsgesellschaft Straße-Schiene-Verkehr, 2007).

PIARC developed the Guideline for Road Safety Audit, the latest version being published in 2011 (PIARC, 2011). It contains checklists for motorways, checklists for interurban main roads

crossing built-up areas of towns and villages and checklists for urban main roads. For each road category, five stages were considered:

- Feasibility study;
- Preliminary design;
- Detailed design;
- Pre-opening;
- Post-opening / Road Safety Inspection.

In each stage, the checklists include possible safety issues that should be checked, with the main topics being:

- Function of the road, design and operating elements;
- Cross section;
- Alignment;
- Intersections / interchanges;
- Service and rest areas;
- Vulnerable road users;
- Signing, marking, lighting;
- Road side features and passive safety installations.

As can be seen, RSA and RSI are considered together in the guideline. The main topics that are stated in the PIARC guideline are the most important safety issues on motorways and main roads and it can be assumed that all available guidelines include these issues in one way or another.

### 3.7 Training and Certification

Definition according to (European Parliament and Council, 2008) and draft amendments to the AGR (ECE, Inland Transport Committee, 2010):

“Training and certification of safety personnel by means of training curricula and tools for qualification validated by the competent entities should ensure that practitioners get the necessary up-to-date knowledge”

The outcome of any procedure largely depends on the people doing it. Thus, the need of training curricula for auditors, initial training for safety personnel, certification and refresher courses are part of Directive 2008/96/EC to ensure a level of quality of auditors.

Requirements for working as an auditor are relevant experience in road design, road safety engineering and accident analysis and independence, so that the auditor at the time of the audit shall not be involved in the conception or operation of the relevant infrastructure project.

Comment: In Directive 2008/96/EC, training issues concern only auditors. This may be because RSA was initially developed in the United Kingdom of Great Britain and Northern Ireland where Road Safety Inspections are quite similar to post-opening-audits. Some countries distinguish between the auditor and the road safety inspector. However, it is reasonable that road safety inspectors should undergo a training as well and be certified.

# 4. Implementation of Road Safety Audit and Road Safety Inspection Procedures

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The implementation of RSA and RSI procedures often is complex and time-consuming. Directive 2008/96/EC led to the development of procedures in many member States of the European Union, and required that RSA and RSI be incorporated into national law. Furthermore, the Directive led to discussions in SC.1 on adopting amendments to the AGR. But even if there are formal principles available, time will still be needed to activate the procedures and to include them in the regular processes already in use.

Most promising – and experience has shown that in most cases the most successful and cost-effective way to promote these procedures in a country – is the top-down approach. Commitment to the safety processes of the relevant authorities is a big step towards implementation. Thus, it is very useful if the implementation of the procedures is stated in the national road safety strategy as a starting point for all the necessary steps that have to follow. Even better would be the incorporation into national law to define an adequate legal framework. Raising awareness and convincing people of the benefits of road safety procedures is a task that has to be done at all levels, but most of all for decision makers and the authorities that are responsible for road safety.

Funding has to be kept in mind for the new procedures. A lack of resources often may be one of the major obstacles for implementing road safety processes, especially in times of limited resources. The recent economic crisis generally impacted and impacts investments in infrastructure and it may be hard to argue for implementing additional procedures which lead to higher costs. Cost-benefit analyses showed positive benefits from RSA and RSI, and as road investments and maintenance are, in general publicly financed, this may be put in favour of the procedures. Again, work on raising awareness will be necessary on that part.

The procedure has to be determined for each country in consideration of the national or even regional specifications. The existing procedures can be adapted: the new procedures should be included in the existing programmes with as little disruption as possible. Anyway, responsibilities have to be defined and guidelines have to be developed or, since international guidelines are available already, these can be

adapted to the national needs. Still, the awareness raising process and the convincing of people that the procedures make sense will need more time than preparing a manual.

Finally, the efficiency of the procedures depends to a great extent on those conducting RSA and RSI: the auditors and inspectors. These have to be qualified and should have background experience like academic qualifications and work experience. Thus, the criteria for auditors and inspectors should be defined and in fact, an accreditation system has often been established in countries where these procedures have already been implemented for a long time.

## 4.1 Obstacles to implementing Road Safety Audits

The implementation of new procedures into existing processes will always face resistance. Some of the main obstacles to implementing RSA are:

### ■ Denying the necessity of RSA

The necessity or even usefulness of RSA are often denied for several reasons:

- New road sections are (ideally) planned according to the standards – so they will be safe and new roads improve road safety anyway;
- Review processes are already in place, therefore there is no need for a separate Road Safety Audit;
- The designers are very experienced and will plan the road in full regard of road safety;
- Positive effects are doubted.

Most new roads will improve road safety – but maybe not to the maximum extent possible. Even if the standards are fulfilled, other solutions might be better from a safety point of view. Designers are usually confronted with many issues like the environmental protection, cost, noise protection, road standards. Planning new road sections is often finding a compromise within the existing conditions, and safety might only be a minor aspect. RSA is sometimes the only opportunity to assess the project in terms of safety issues.



People that are involved in the planning process often review the processes already in place. One key precondition of RSA is that the procedure is conducted by independent auditors who focus solely on safety. Furthermore, auditors have to evaluate the road section from the view of all road users whereas planning often focuses on motorized vehicles.

### ■ **RSA may delay the planning process**

If RSA is considered right from the start, there will not be a delay. Nevertheless, experience has shown that even after several years of implementation, RSA might not be an “integrated” part of the planning process. This can lead to time pressure for auditors and to problems: once the audit results are available, changes might not be easy anymore. If RSA is part of the process from the beginning, the project will not be held up.

### ■ **Additional funds and resources**

Of course, every new procedure needs time, funding and trained staff. Compared to the general project costs (and potential rehabilitation works that are necessary in case of “unsafe” planning after opening) RSA is a low-cost measure.

### ■ **Increase of legal liability**

Some road authorities fear that they might be held liable in case of an accident due to a hazard that has been detected, but not eliminated in the planning process. If, and to what extent, that can be the case depends on national laws. However, even if that is the case, RSA can be a valuable procedure, proving that the responsible authority had a safety approach.

## **4.2 Obstacles to implementing Road Safety Inspections**

RSI are safety checks of existing roads, so all the obstacles of section 5.1 do not apply. The existing processes are not delayed and hardly anyone doubts the usefulness of the procedure. The two main obstacles to implementing RSI are legal liability and financial issues.

### ■ **Legal liability**

The project RIPCORDER-iSEREST WP5 (RIPCORDER-iSEREST, 2007) mention different legal aspects during the implementation of RSI:

- What are the consequences of not having attempted to detect a hazard (no RSI is performed)?
- What are the consequences of not having detected a hazard (in a performed RSI)?
- Which consequences result from not having acted upon a detected hazard (RSI)?

The first question may only be relevant if a legal obligation exists. In most countries, this is not the case (except for the

TEN-T network in member States of the European Union). The second question is for the inspectors and is their responsibility.

Most crucial is the third question. In most cases, the road authority is responsible for launching RSI and is responsible for the maintenance and safety of its road network. In other cases, there is a close link between the road authority and the road operator.

RSI usually results in lists of deficiencies of the inspected road sections and provides recommendations for improvement. Once these deficiencies appear “officially” in a report, road authorities often fear that a legal liability might occur if they do not rectify the safety issue. This might even be more so, if an accident happens after a detected hazard.

### ■ **Finance**

The costs of the RSI itself are usually not the great concern although there is a need for funding as well. The follow-up activities like monitoring the reports and responses and assessing the results also need time and resources. The biggest issue, however, is the cost of remedial action after a hazard has been detected and has been documented in a report. Particularly in the lower categories of networks, many safety concerns may be detected, and every deficiency puts pressure on the responsible authority to react.

So, it is reasonable that road authorities might not be motivated to implement RSI on their network.

Dealing with these obstacles is not an easy task. It makes sense to consider RSI as part of a bigger system, as part of a road safety infrastructure management, and not as a single procedure. In times of restricted budget, it is essential to set up actions in areas where the greatest improvements can be achieved. This was an intention of Directive 2008/96/EC: remedial treatment should target the road sections which show a higher priority according to the results of ranking the high accident concentration sections, and from NSR. These sections should be inspected by qualified personnel, and overall measures should pay attention to those with the highest benefit-cost ratio.

In that sense, safety deficiencies detected during a RSI are safety concerns in areas that promise the most improvements. Even within the stated deficiencies, a ranking can or should be done in terms of safety relevance and priority. Altogether, RSI can be seen as part of a system to detect deficiencies in a network where the always limited funding would be invested in the most reasonable way.

## **4.3 Administrative and Institutional Requirements**

For the implementation of new procedures, PIARC issued a Road Safety Manual, in which the part Target and Strategic Plans (PIARC, 2015), states: “Implementation also requires

### 3. Road Infrastructure Safety Management Procedures

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identifying what changes to current operating practices within agencies will be required, what impacts of actions on other policy areas will need to be addressed and the level of capacity needed to achieve successful implementation progress.”

This may be one of the most important issues during the implementation. Every new step in an existing process requires change and amendment of sometimes long-established routines. The procedures of RSA and RSI are quite flexible and usually can be adapted to the structures of road authorities and governmental bodies. Anyway, as pointed out before, a political will to implement the procedures is a core point in introducing RSA and RSI.

A definition of the roles and responsibilities for the new procedures is necessary. In most cases, road authorities or road operators will be responsible for launching an RSA or an RSI. Adequate funding is a precondition and most likely will be part of the same institutional bodies which are responsible for launching the process. There will also be a certain requirement of management capacities of responsible bodies, as the implementation takes time, and awareness has to be raised in many directions. Even after the implementation phase, RSA and RSI need time in the daily work and capacity will have to be provided.

#### 4.4 Auditors and Inspectors: Skills, Training, Certification

The best procedure is of little use if the personnel doing the work are unable to fulfil the requirements. Necessary skills maybe even more crucial for road safety auditors as they have to be able to interpret the drawings and imagine the effects of a planned road section on its users once in place. Hence, most countries define preconditions for auditors and inspectors.

These are usually:

- Prior (mostly technical) education, in many cases i.e. academic qualification;
- Relevant work experience (e.g. road design, road safety engineering), at least two years.

For certification, the successful completion of a training course is another requirement in almost all countries with an accreditation system for auditors and inspectors.

For these reasons, the implementation of RSA and RSI require defined preconditions for auditors and inspectors, the development of a training course and a certification system. In most countries, government institutions/organizations or the road authority issues certificates.

The duration and the contents of training courses vary significantly worldwide. According to RIPCORDER-ISEREST (RIPCORDER-ISEREST, 2007) there are two approaches: either short courses for people with experience in road safety work, or more detailed courses for people without extensive experience. In the TEM member States listed in this report, the courses range from 36 hours to 120 hours (see section 7.1 below). Every country has to define the contents and duration of its training courses. A distinction may be made between courses for RSA and for RSI, though in many countries courses are for both procedures. In any case, training courses or curricula should be government approved or certified to ensure an appropriate level of quality of the courses provided.

Usually refresher courses are necessary to maintain the certificate of competence.

It is recommended that the courses include a theoretical and a practical part. For recommendations and proposed course programmes, see e.g. RIPCORDER-ISEREST (RIPCORDER-ISEREST, 2007) and Euro-Audits (Falco, Proctor, and de la Peña González, 2007).

# 5. Road Safety Audits and Road Safety Inspections in TEM member States

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To collect information on the implementation of RSA, RSI and the training of auditors and inspectors, a questionnaire was sent to the representatives of TEM member States. The questionnaire included the following topics:

- Legal framework/guidelines;
- Experiences in the implementation of RSA / RSI;
- Administrative and institutional set-up;
- Training and certification of the auditors / road safety inspectors.

Slovakia is a TEM member State, currently not actively participating in the project and did not answer the questionnaire. However, basic information on the Slovakian situation is extracted from available literature.

According to the Global Status Report on Road Safety 2015 (World Health Organization, 2015) all TEM member States conduct audits of new road sections and audits of existing roads. The answers given in the questionnaire confirm this view.

## 5.1 Overview

According to the definition given in Chapter 4.2 'RSA' 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.

Thus, RSA are formal, detailed and systematic checks of road infrastructure projects in different planning stages (e.g. feasibility stage, preliminary design, detailed design).

'Safety Inspection' as defined in Chapter 4.3 is "an ordinary periodical verification of the characteristics and defects that require maintenance work for reasons of safety".

RSI are formal and detailed safety checks of existing roads. Independent and trained safety personnel should carry out RSIs periodically.

### Armenia

Armenia has not yet incorporated RSA and RSI into national legislation.

A guideline for RSA was issued in 2011.

The TEM network projects are audited by external experts or contractors in all stages, except the study phase. A RSA is necessary for the approval of a project on TEM network.

So far, there is no guideline for RSI in Armenia; however, RSI are conducted on TEM network. RSI are done by internal personnel, and according to the given information, are conducted every 6 months: 150 km of roads are inspected per day (it is assumed by the author that those inspections deal a lot with issues of routine maintenance). It was stated that the applications or devices to support RSI exist, however, the types of devices were not specified.

The Ministry of Transport and Communication of Armenia is responsible for launching RSA on the TEM network and financing them as well. Responsible for launching and conducting RSI are Police and Armenian Roads Directorate, respectively, and funding comes from the Government.

### Bosnia and Herzegovina

Due to different practices in the two main entities in Bosnia and Herzegovina (Republic of Srpska and Federation of Bosnia and Herzegovina), the situation is different in these parts of the country.

According to the comments given, the status is as follows.

Federation of Bosnia and Herzegovina (FBH):

- Basically there is a national Law on Road Safety, but no Law on road safety in FBH;
- The national law does not contain detailed regulations or by-laws regarding RSA or RSI;
- There are no guidelines for RSA and RSI in FBH.

Guidelines in use in FBH:

- Guidelines for road design, construction, maintenance and supervision, 2005;
- Bylaw on basic conditions that roads and engineering structure must comply in terms of traffic safety;
- Bosnia and Herzegovina standards (BAS);
- TEM Standards and Recommended Practices.

## 5. Road Safety Audits and Road Safety Inspections in TEM member States

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Republic of Srpska:

- There is a Law on Road Safety in the Republic of Srpska;
- There is a Traffic Safety Agency of the Republic of Srpska;
- There is a Traffic Safety / Transport Safety Council;
- There is a Road Safety Strategy and an Action Plan;
- There are guidelines for RSA and RSI; RSA and RSI are in the final stage of implementation into the legal framework. After this phase, more activities by road administration on contracting an RSI project on their network is expected.

Guidelines in use in the Republic of Srpska:

- Guideline of the terms and conditions of audits and inspection of road safety, terms and conditions licensing in the Republic of Srpska;
- Guideline on the identification of dangerous spots, the method and criteria for setting priorities to eliminate dangerous spots and method of removing dangerous spots in the Republic of Srpska;
- Guideline on the manner of connecting to a public road in the Republic of Srpska;
- Regulations on maintenance, rehabilitation and protection of public roads and road facilities;
- Guidelines for road design, construction, maintenance and supervision, University of Ljubljana Faculty of civil engineering and geodesy, and DDC Consulting and engineering Ltd, for Road directorate FBH and Public company "Republic of Srpska roads", 2005;
- TEM Standards and Recommended Practices.

Although not an EU Member State, Bosnia and Herzegovina has incorporated RSA and RSI into its national legislation. It was stated though, that the national law does not contain detailed regulations or by-laws on RSA or RSI (see the above details about the two main entities of Bosnia and Herzegovina).

At the time being there are guidelines for RSA and RSI in the Republic of Srpska. Neither RSA nor RSI are implemented in the FBH.

In the Republic of Srpska, projects are audited, among them motorways and expressways. It was not stated that projects on the TEM network are audited, but with motorways being subject to an audit, it may be assumed that TEM network projects are audited as well – and information was given that a RSA is necessary for the approval of projects on TEM.

RSIs are conducted on the TEM network in the Republic of Srpska with a time interval of three years. Both RSA and RSI in the Republic of Srpska are done by external experts.

Responsible for launching, financing and conducting RSA and RSI is the road administration in the Republic of Srpska.

### Bulgaria

RSA and RSI procedures were incorporated into Bulgarian law in 2011, guidelines for both procedures were issued in the same year.

RSA is conducted in all stages and also in the time after opening ("after opening stage"). Projects on the TEM network are audited by external experts, a RSA is necessary for the approval of a project on the TEM. It was stated that the procedure for awarding a RSA to external experts or contractors is slow and difficult: facilitating this procedure would have been better during implementation of the procedure.

The whole TEM network is inspected every year by internal personnel that do not have to be independent. Applications or devices to support RSI are supposedly available but were not specified.

The Road Infrastructure Agency is responsible for launching and conducting RSA and RSI on the TEM network. Funding is provided from the national budget.

### Croatia

Croatia incorporated RSA and RSI into its national legislation in 2011. Guidelines for RSA are available since 2016. The guidelines do not include checklists nor a report template. Guidelines for RSI are not available.

All stages are audited, including the initial stage of use: audits are conducted by external experts. Projects on the TEM network are subject to an audit, a RSA is necessary for the approval of a project on the TEM network.

According to the response to the questionnaire, TEM roads are inspected by external personnel in Croatia but no further information was provided.

Different Croatian Road Managing Companies are responsible for launching and financing RSA and RSI on the TEM network.

### Czechia

In Czechia, RSA and RSI procedures were put into national legislation in 2011, guidelines followed in 2012 for RSA and in 2013 for RSI.

Audits are compulsory for TEN-T roads and for all TEM network in Czechia. RSA are in all stages and also in the "before testing operation". Auditors are external experts; a RSA is necessary for approval of projects on the TEM network.

The whole TEM network is inspected once every 5 years by external personnel. A web application with a description of deficiencies, photos, comments, responsibilities for taking measures, status of deficiency (solved/unsolved) and further information has been developed.

The Road and Motorway Directorate of Czechia is responsible for launching, financing and conducting RSA and RSI.

### Lithuania

Lithuania incorporated RSA (2008) and RSI (2012) into its national legislation; guidelines for both procedures are available since 2008.

RSA is limited to the stage of detailed design; audits are conducted by external experts. Projects on the TEM network are subject to an audit, a RSA is necessary for the approval of a project on the TEM network.

Every year 1,500 km of TEM network roads are inspected with an average length of inspected sections of 50 km. The time interval in which TEM network roads should be inspected is 3 years. RSI are conducted by external experts or contractors, though information was given that inspectors do not have to be independent. An on-site data collection device and interactive database were developed as a device to support RSI. It was stated that although there is a procedure about data collection there is no procedure yet what should be done with collected data.

The Lithuanian Road Administration is responsible for launching RSA and RSI on the TEM network; funding is provided from the national budget. The PE Road and Transport Research Institute, an institute under the Ministry of Transport, is responsible for conducting RSI on TEM network.

### Poland

Poland incorporated RSA and RSI into its national legislation in April of 2012. National guidelines are available for both procedures since 2014. The guidelines were developed and approved only for motorways and national roads and were not approved by the government for official use.

RSA and RSI are done by internal personnel, though auditors and inspectors have to be independent. RSA is necessary for the approval of projects on all national roads, including the TEM network.

Every year 5,300 km of TEM network roads are inspected in Poland, with an average length of 100 km per inspection (it is assumed by author that the inspector deals a lot with issues of routine maintenance).

The General Director for National Roads and Motorways is responsible for launching RSA and RSI on the TEM network; funding is provided by the state treasury. The Regional Office Director is responsible for conducting a RSI on the TEM network.

### Romania

RSA and RSI became part of the national Romanian legislation as early as 2008. Guidelines for both procedures are available, and the issue dates were not specified.

RSA is conducted in all stages and are done by external experts. A RSA is necessary for the approval of a project on the TEM network.

RSI are done on the TEM network by external personnel, but no detailed information was given about the length of inspected roads or the time interval.

The Romanian Road Transport Authority is responsible for launching RSA and RSI on the TEM network; the Romanian National Company of Motorways and National Roads finances the procedures.

### Slovakia

Slovakia is currently not actively participating in the TEM project, and did not reply to the questionnaire. However, some initial information on RSA/RSI implementation is presented.

RSA and RSI were implemented into national law in 2011; a guideline is available for both procedures since 2015.

Audits are conducted in the detailed design stage. TEM network roads are subject to RSI and by external experts. The road authorities are responsible for launching and financing RSA and RSI.

### Slovenia

Slovenia incorporated RSA and RSI into its national legislation in 2010. National guidelines are available for both procedures since 2012.

TEM network roads are audited in the stages of "detailed design" and "before opening" by external experts; RSA is necessary for the approval of a project on the TEM network.

Every year about 50 km of TEM network roads are inspected by external personnel, with a time interval of 5 years.

The road operator is responsible for launching, financing and conducting RSA and RSI.

### Turkey

RSA and RSI have not been incorporated into the Turkish legislation. It was stated that there is a need for the procedures in the national legislation, for harmonizing the procedures with Directive 2008/96/EC, and for training and certification of independent auditors and inspectors.

Guidelines for RSA and RSI were issued in 2006.

Audits are conducted during the stages of "preliminary design" and "detailed design" but not on motorways (TEM network roads), solely on interurban/rural roads. Auditors are internal personnel but have to be independent. A RSA is not necessary for the approval of a project on the TEM network.

So far, RSI have not been implemented in Turkey.

The General Directorate of Turkish Highways is responsible for launching RSA and RSI on the TEM network, and also responsible for conducting RSA.



### Austria

In Austria, RSA and RSI procedures were put into national legislation in 2011. The first RSA and RSI guidelines were published in 2006 and 2007, respectively.

Audits are compulsory for TEN-T network including all TEM network roads in Austria and a RSA is necessary for approval of projects on the TEM network. RSA are conducted in all stages by external auditors.

The time interval in which TEM roads have to be inspected is 10 years. External personnel are inspecting the roads. Every year, road safety inspections cover about 220 km of the network, with an average length of 10-15 km of one RSI. Asfinag, the Austrian motorway operator, has a database that includes detected deficiencies on its network.

The road operator, Asfinag is responsible for launching, financing and conducting RSA and RSI on TEM roads.

## 5.2 Road Safety Audits and Road Safety Inspections in TEM member States

### 5.2.1 Road Safety Audits

According to the replies received, RSA are conducted during the planning of all projects on the TEM network: motorways/expressways are subject to RSA in all countries with the exception of Turkey. An RSA is necessary for the approval of a project on the TEM network in all countries except Turkey.

All the European Union member States have incorporated RSA into their national law; Bosnia and Herzegovina included RSA in the two major entities in 2010 and 2011. Only Armenia and Turkey did not incorporate the procedure into national law.

Guidelines for RSA are available in all countries, with the exception of Bosnia and Herzegovina (guidelines available from 2016 in the Republic of Srpska). All guidelines, except in Croatia, contain checklists for the auditors and most guidelines include report templates.

All countries except Lithuania audit in at least two stages. Lithuania does so only in the detailed design stage, making this stage the only one where all countries conduct RSA. The study phase is absent in six out of ten countries, whereas audits in the preliminary design or before opening stage are omitted in two of ten countries. Bulgaria stated RSA “after opening” as additional phase, Croatia “in the initial use stage” and Czechia stated an additional “before testing operation” phase.

In most cases, external personnel or contractors conduct the RSA, except in Poland and Turkey. All countries agree that auditors have to be independent. Certification of auditors is necessary in all countries except Armenia, Lithuania and Turkey.

Audit teams are necessary in Bulgaria, Czechia and Poland. In all other countries, where stated, audit teams are recommended. The audit team leader usually has to be specified, with the exception of Lithuania.

Those responsible for launching and financing are, as expected, ministries, road administrations or road operators, depending on the national structures.

In some phases, there seems to be a common approach in almost all TEM member States: all TEM network projects (except in Turkey) are audited — at least in the detailed design stage — by independent auditors who have guidelines at hand.

#### ■ Structures of Road Safety Audit reports

To share the best practices in preparing RSA reports, several example reports are given below. Examples of audit reports are available from Austria, Bosnia and Herzegovina, Czechia and the United Kingdom that follows the British report guidelines.

Bosnia and Herzegovina, Czechia and the United Kingdom summarize the detected deficiencies in chapters or by characteristics after giving the general information. The deficiencies are summarised according to different topics under one header. Bosnia and Herzegovina follow the PIARC guidelines; Czechia has a different structure.

#### Report structure: Bosnia and Herzegovina (PIARC approach)

- 1) General documents  
Team leader, team members
- 2) General Project Details  
Short design description, section, designer, project phase, audited documents
- 3) Specific Project Details  
Length, Cross Section, Traffic volume, speed limit, relevant guidelines
- 4) Audit results, divided in different characteristics
  - Function, operating elements and surroundings
  - Cross section
  - Alignment
  - Intersections
  - Traffic Signals and ITS measures
  - Service and Rest areas
  - Public transport
  - Needs of vulnerable road users
  - Traffic Signing, Marking, Lighting
  - Road side features and passive safety installations

The deficiencies regarding the different characteristics are stated in a rather general way
- 5) General remarks (recommendations)
- 6) Auditors statement, team members
- 7) Attachment  
Further remarks and pictures of recommendations

### Report structure: Czechia

- 1) General information, identification data  
Audited scheme, stage, client, auditor
- 2) Introduction  
e.g. description of the structure of the report, stating of relevant documents, available drawings
- 3) Description of audited scheme, locality
  - General description of current situation
  - Accident statistics
  - Risk analysis of current situation
  - Description of planned scheme
- 4) Audit results, divided in different characteristics
  - Parameters of the design elements, including grading and drainage
  - Accuracy, logical continuity and consistency of the vertical and horizontal road markings, including the assessment of the possibilities of overtaking
  - Clear sight conditions
  - Surroundings and fixed obstacles
  - Lighting
  - Greenery, landscaping
  - Safety of all road users
  - Parking and parking areas
  - Application of passive safety devices
  - Potential local and temporary adjustments due to the scheme
  - Results of safety audit in the previous stage

Every deficiency within a characteristic is numbered and described:

  - Hazard No. 1: localization
  - Description of hazard
  - Recommendation
  - Risk level
  - Hazard No. 2: localization
  - Description of hazard
  - Recommendation
  - Risk level
- 5) Conclusion, summary, signature of auditor
- 6) Guidelines and documents used
- 7) Attachment
  - Evaluation sheet: short summary of hazard, recommendation and risk level
  - Statement of client if hazard will be treated
    - => accepted / partly accepted / not accepted
  - with space for explanatory statement
  - Space for further statement of ordering party

## 5. Road Safety Audits and Road Safety Inspections in TEM member States

### Report structure: Austria

In the Austrian, approach deficiencies are not summarised in the predefined characteristics, but stated in a list without any further grouping.

- 1) General information  
Name of road scheme, client, designer, audit stage, length of scheme, cross section, traffic volume, street category, speed limit
- 2) Available drawings, documents used
- 3) Further information, if appropriate  
Site visits, current accident situation, meetings, description of project
- 4) Auditors
- 5) Audit results, stated in a list  
Number of deficiency; localization; deficiency; safety problem; recommendation; statement of client (if hazard is accepted / not accepted / treated, etc., including a reason if a deficiency is not going to be treated)  
The list can be amended if appropriate, e.g. an additional column for the number of the drawing where the deficiency was detected

#### **Audit results: road XXX, km 60,00 – km 70,00, detailed design 2016**

No.:	Location	Deficiency	Safety problem	Recommendation	Comment of Client
1					
2					

- 6) If needed or reasonable, a stated deficiency or the safety problem can be described in more detail after the list of deficiencies. Plans, photographs and sketches can be part of the deficiency list or of the detailed description
- 7) If needed or reasonable, further comments (e.g. stating of not safety-related recommendations)

The audit report is sent to the client as a draft report. The client and / or the design team state their comments in the table, the finished report includes all deficiencies, recommendations and responses in one document.

### Report structure: The United Kingdom

The British guideline HD 19/15, RSA (The Highways Agency / Transport Scotland / Llywodraeth Cymru, Welsh Government / The Department for Regional Development Northern Ireland, 2015), contains an illustrative report of a RSA, Stage 2. The structure is as follows:

- 1) Introduction  
Client, audit team members, time and place of audit, terms of reference, reference of audit brief, description of road scheme, exceptions of scope of RSA
- 2) Items raised at previous stage RSA
- 3) Items raised at current stage RSA, divided in different characteristics
  - General
  - The Alignment
  - The Junctions
  - Non-motorised users
  - Signs and LightingEvery deficiency within a characteristic is numbered and described:
  - Number
  - Location
  - Summary (short description of risk)
  - Detailed description of deficiency
  - Recommendation
  - Number
  - Location
  - Summary (short description of risk)
  - Detailed description of deficiency
  - Recommendation
- 4) Audit Team Statement



Another illustrative form included in HD 19/15 is a RSA brief, which defines the scope of the RSA and is seen as essential for an effective and efficient RSA. An illustrative response report is also part of the guideline.

### ■ Other forms of reporting

Some countries which are advanced in RSA implementation, e.g. Ireland and Norway, do not have RSA report templates but forms for specific audit topics. Ireland has an “RSA Feedback form” and an “RSA Exception Report Decision Form” (see (National Roads Authority, 2012) or [www.unece.org/fileadmin/DAM/trans/doc/2015/TEM/12.\\_IRELAND.pdf](http://www.unece.org/fileadmin/DAM/trans/doc/2015/TEM/12._IRELAND.pdf)). Norway has an “Agreement form” at the very beginning of the audit process, which is similar to the British RSA Brief, and an “Audit form” at the end of an RSA (NPRA Directorate of Public Roads, 2014).

### ■ Conclusion Road Safety Audit reports

Many RSA guidelines include a report template. Even if a template is not specified in the national guidelines, the necessary or useful information are listed (i.e. description of the scheme, name of auditors, documents used and a list of deficiencies) is included in most guidelines. Furthermore, some basic principles are often found in many guidelines, like stating hazards as clearly as possible, sticking to safety-related problems only and that a numbering of deficiencies is useful for reference.

In any case, an audit report is necessary in the procedure and part of the outcome of the formal RSA process.

## 5.2.2 Road Safety Inspection

Formally, the situation with RSI seems to be quite similar to RSA: motorways/expressways are subject to RSI in all countries with the exception of Turkey, where RSI has not yet been implemented.

As with RSA, all European Union member States have incorporated RSI into national law; Bosnia and Herzegovina included RSI in the two major entities in 2010 and 2011, respectively. Only Armenia and Turkey did not incorporate the procedure into national law.

Guidelines for RSI are available in all countries, with the exception of Bosnia and Herzegovina (guidelines are available in 2016 in the Republic of Srpska), Croatia and Armenia. All existing RSI guidelines in TEM member States contain

checklists for the inspectors and most guidelines include report templates.

Inspection teams are mandatory in Bulgaria, Czechia, Lithuania, Poland and Romania. In all other countries, inspection teams are recommended.

Some aspects differ from RSA: independence of inspectors is not a precondition in Armenia, Bulgaria and Lithuania, whereas auditors in all TEM member States have to be independent. As for auditors, the certification of inspectors is not needed in Armenia, Bulgaria, Lithuania or Turkey.

In Armenia and Bulgaria, RSI is – or can be – conducted by internal personnel that do not have to be independent. In Poland, RSI is done by internal personnel as well, but on the condition of independence.

There are big differences in the time interval between RSIs and the extent of RSI done within a year or even within one RSI. Armenia stated a 6-month period between two inspections and 150 km of inspected roads per day. Poland is similar with 5,300 km of RSI every year, and 100 km of inspected roads per RSI. On the other end is Austria with a maximum time interval of 10 years and an average 10-15 km inspected per RSI. Most other countries stated a period of 3-5 years between RSIs of the same segment of road.

Clearly, the approach seems to be different among the TEM member States. A length of several thousand km of RSI every year may only cover limited aspects or maybe similar to routine maintenance inspection work. If RSI is limited to a short segment of road, the inspection may cover more aspects and it maybe a rather detailed safety check of the road.

Five out of ten TEM member States stated that applications or devices to support RSI are in use, two did not specify the devices. Czechia has a web application with all deficiencies, photos, comments, responsibilities and status of remedial action; Lithuania has an on-site data collection device and interactive database; the Austrian road operator has a database containing all deficiencies and status of treatment.

### ■ Structure of Road Safety Inspection reports

Examples of RSI reports from Austria and Bosnia and Herzegovina, and others from Bulgaria, Czechia and Ireland according to their national guidelines are given.

## 5. Road Safety Audits and Road Safety Inspections in TEM member States

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### Report structure: Bosnia and Herzegovina (PIARC approach)

The submitted report of Bosnia and Herzegovina follows the PIARC approach.

- 1) Basic information about the project
- 2) Participants in the RSI  
Team leader, team members
- 3) Detailed information about the project  
Municipality, location, cross section, speed limit
- 4) RSI results, divided in different characteristics
  - Function, operating elements and surroundings
  - Cross section
  - Alignment
  - Intersections
  - Traffic Signals and ITS measures
  - Service and Rest areas
  - Public transport
  - Needs of vulnerable road users
  - Traffic Signing, Marking, Lighting
  - Road side features and passive safety installations

Results are listed in a table and grouped in the characteristics as mentioned. Pictures illustrate deficiencies.

- 5) Assessment of deficiencies
- 6) Proposed measures
  - short-term measures
  - medium-term measures
  - long-term measures



### Report structure: Bulgaria

In the Bulgarian guidelines <sup>4</sup>, a RSI report consists of two parts.

<b>1) General information</b>						
Road number						
Description of the inspected area						
Date of inspection						
Description of climatic conditions during the inspection						
Inspection team						
<b>2) List of identified defects</b>						
No.	km	Description of the hazard	Comment	Category	Prescription restraint	Picture

The categories:

- Category 1: Problems which require urgent action within 24 hours.
- Category 2: Defects that require special attention because they represent an immediate danger or a risk of short-term deterioration of the structure.
- Category 3: All other defects.

A risk level for different characteristics is defined in the guideline (Table 5.5).

### Report structure: Czechia

There is no detailed structure of a RSI report given in the Czech manual of Road Safety Inspection (CDV - Centrum dopravního výzkumu, v. v. i. / The Transport Research Centre, 2013). There have to be two parts in the report which cover the following:

Part A: General information, such as reason for the inspection, scope of RSI, name and function of road, main design elements, documents used.

Part B: results of the RSI – list of deficiencies with recommendations. If possible, costs of the proposed measures and the expected effects of the proposed action can be included.

The risk severity of the deficiencies (low, medium, high) must be stated for every detected hazard.

Further information can be given in an attachment, e.g. maps, diagrams, photos, minutes, etc.

<sup>4</sup> (Bulgarian Ministry of Regional Development and Public Works (МИНИСТЕРСТВО НА РЕГИОНАЛНОТО РАЗВИТИЕ И БЛАГОУСТРОЙСТВОТО), 2011)

## 5. Road Safety Audits and Road Safety Inspections in TEM member States

### Report structure: Austria

The Austrian manual for RSI states following report structure (BMVIT - Federal Ministry for Transport, Innovation and Technology, 2014):

- 1) General information  
Client, road type, cross section, length of section, traffic volumes, traffic restrictions, evaluation period (accidents), junctions/intersections, tunnels (if present), service facilities, driving directions; Overview map, documents used, meetings and site visits  
Inspection team members
- 2) Checklist and Accident Evaluation

Checklist for Motorways and Expressways			
<b>Inspected section:</b> [designation, length, from–to]			
Date/time:			
<b>Ambient conditions:</b> [weather, road conditions, etc.]			
Inspectors:			
Maximum permissible speed: [any other available speed data can also be entered here]			
Traffic statistics: [indication of ADT, share of heavy vehicles, special features]			
1) Structural conditions	Safety relevant?		Comments
	Yes	No	
Site plan		✓	-
Longitudinal section		✓	-
Alignment		✓	-
Cross section		✓	-
Road surface condition	✓		Ruts at km 2.5 lane 1
Visibility conditions		✓	-
Drainage	✓		Risk of hydroplaning at km 2.5 lane 1
Junctions		✓	-
Tunnels		✓	No tunnels in the inspected section
Ancillary facilities (parking spaces, etc.)		✓	-
2) Equipment and roadside environment	Safety relevant?		Comments
	Yes	No	
Traffic signs/guidance	✓		Unclear guidance at km 10.8 lane 2
Road markings	✓		
Guidance systems		✓	
Vehicle restraint systems	✓		Traffic signs not sufficiently shielded at some locations
Lighting		✓	-
Vegetation		✓	-
Wildlife protection systems		✓	-
Signal systems/telematics		✓	-
Roadside environment, non-traffic systems, other		✓	-

The checklist in the report contains main characteristics of road schemes; different checklists for different types of roads are available. The checklists contain various characteristics and shall help the inspectors to regard all relevant aspects during the site visit. Comments in the checklist are rather general, deficiencies are stated in detail later in the report.

- 3) List of deficiencies and recommended measures including assessment of safety relevance  
For the hazards, recommendations and assessment, a form is available in the Austrian manual for conducting RSI. Apart from the risk level, the implementation period has to be estimated as well: short-term (implementation of measure possible within approximately 2 years), medium-term (within approximately 6 years) and long-term measures (implementation only possible within major renewal / reconstruction).

Road Safety Inspection Measures Proposals	Legend:		High safety relevance	No. 1
			Moderate safety relevance	
			Low safety relevance	
Road / section		Direction	Location	
Road A / km 14.50–km 18.85		1	km 16.45	
Problem / deficiency		There is neither an end piece nor an impact absorber at the end of the concrete divider island; a collision with the blunt end of the concrete divider is possible		
Proposed measure / expected improvement		Install an impact absorber; this will reduce the consequences of a collision		
Assessment of the accident risk		moderate	Obstacle in the divider island, two accidents with personal injury in the last three years	
Assessment of possible accident consequences		severe	Inflexible, fixed obstacle	
Assessment of implementation timeframe and safety relevance		Short term	Medium term	Long term
		x		
Place holder for photo				
Place holder for further diagrams and explanations if needed/sensible		Place holder for further diagrams and explanations if needed/sensible		

- 4) Further comments (if appropriate)
- 5) Summary
- 6) Attachment

Monitoring list: a list with a very brief description of problems and recommendations of the RSI; the list is mainly for the client/road operator to have a tool for monitoring of remedial action.

The list includes proposed measures, date of implementation, costs of measure, and the exception statement if a hazard is not treated.

Accident map (if available)

## 5. Road Safety Audits and Road Safety Inspections in TEM member States

### Report structure: Ireland

The Irish Guideline NRA HA17/12, Road Safety Inspection Guidelines (National Roads Authority, 2012), contains a sample report with the structure shown below. This approach notes whether a deficiency was or was detected in the last RSI of the road scheme.

- 1) Introduction
  - 1.1) Number of inspected road, client
  - 1.2) Inspected road
  - 1.3) Period of Inspection, date of video, date of site visit, weather during site visit
  - 1.4) Inspection Team members
  - 1.5) People attending the inspection as observers
  - 1.6) Information used

Item	Source	Description

- 1.7) Inspection carried out in accordance with Guideline
  - 1.8) Map of inspected road

- 2) Road Safety Inspection
  - 2.1) Brief description of the Route Features
  - 2.2) Summary Description of the Implications for Road Safety of the Route Characteristics (alignment, cross section, traffic, speed, collisions, engineering characteristics)
  - 2.3) Road safety problems

No.	Problem	Location	Risk	Sample Photos	Previous RSI item
			Low / medium / high		Yes/No

- 3) Statement of inspection team, signatures

### ■ Risk assessment in Road Safety Inspection reports

In the current PIARC approach, the only distinction is whether the measures are short-, medium- or long-term measures (see the report structure of Bosnia and Herzegovina). An assessment is not made of the level of risk of the hazard.

Some countries include risk assessment, usually as a risk matrix, with an assessment of the probability of an accident at the location and of the severity of an outcome in case of an accident. Norway has used this approach for many years, and other countries have recently followed. The classification of risk levels is mostly low, medium, high or similar. Examples are given in the following tables.

**Table 5.1**  
**Risk matrix in Norway**

Severity			
Consequence Probability	Light	Serious	Very serious/fatal
Small			
Medium			
High			

Source: RIPCORD-iSEREST, 2007

**Table 5.2**  
**Ranking the safety relevance according to the Austrian manual for conducting RSI**

Assessment of the possible accident consequences	low	moderate	high
Assessment of the accident risk			
low			
moderate			
high			

Source: Federal Ministry for Transport, Innovation and Technology, 2014

**Table 5.3**  
**Risk rating in Ireland**

Risk Rating		Likelihood of Occurrence		
		Likely High probability of occurrence	Possible Medium probability of occurrence	Unlikely Probability of collision is close to random
Severity of Outcome	Severe Potential fatality Major injury/illness Long-term disability	High Risk	High Risk	Medium Risk
	Medium Injury/illness Causing short-term disability	Medium Risk	Medium Risk	Low Risk
	Minor Minor injury/illness	Medium Risk	Low Risk	Low Risk

Source: National Roads Authority, 2012

Thus, various countries define risk levels, with differences in the attribution of the different risk levels.

The Bulgarian guidelines use a slightly different approach: colours represent and estimate of the time necessary for remedial action.

## 5. Road Safety Audits and Road Safety Inspections in TEM member States

**Table 5.4**  
Time for necessary remedial action, Bulgaria

Legend	Deadline for necessary remedial action
	No action – review of the hazard after Inspections
	Action within 30 calendar days
	Action within seven calendar days
	Action in the Inspection or within 24 hours

Source: [www.api.bg/files/5313/6838/2610/API-Nasoki-za-upravlenie-na-bezopasnostta.pdf](http://www.api.bg/files/5313/6838/2610/API-Nasoki-za-upravlenie-na-bezopasnostta.pdf)

Depending on the category of the road, the time period for necessary remedial action (or colours) represent different risk levels.


**Table 5.5**  
Risk levels, Bulgaria

Impact	Probability	Very low Third grade roads	Low Second grade roads	Average First grade roads	High Highways
Negligible – Minor defects, not considered a hazard					
Low – There are some defects, unlikely to pose a risk					
High – significant defects which can lead to high risk					
Very high – very significant defects that create a high risk					

Source: [www.api.bg/files/5313/6838/2610/API-Nasoki-za-upravlenie-na-bezopasnostta.pdf](http://www.api.bg/files/5313/6838/2610/API-Nasoki-za-upravlenie-na-bezopasnostta.pdf)

Examples of the risk definition for different issues are given in the guideline. For example, the extent of unevenness defines the risk level on the different road categories, leading to the time needed until remedial action is necessary. If two colours are marked in one cell, the inspector can decide which risk level is appropriate in the current situation.

**Figure 5.1**  
Risk level in Bulgarian RSI – uneven surface

					
Height/Depth	Third grade roads	Second grade roads	First grade roads	Highways	
< 50 mm					
50 – 100 mm (category 3)					
> 100 mm (category 2)					

Source: [www.api.bg/files/5313/6838/2610/API-Nasoki-za-upravlenie-na-bezopasnostta.pdf](http://www.api.bg/files/5313/6838/2610/API-Nasoki-za-upravlenie-na-bezopasnostta.pdf)

In Czechia, inspection teams categorize the detected deficiencies into three levels according to the estimated risk: low, medium or high.



**Table 5.6**  
**Risk levels, Czechia**

Risk severity	Characteristics
Low	Risk factor increasing conflict situations or reduce feeling of safety of traffic participants. Low accident risk, low impact.
Medium	Risk factor increasing accident risk, personal injuries possible. The inspection team considers removal of hazard as important.
High	Risk with a significant probability of accidents with considerable consequences. The inspection team considers removal of hazard as a priority and necessary.

Source: [www.audit-bezpecnosti.cz/file/bezpecnostni-inspekce-pozemnich-komunikaci-metodika-provadeni/](http://www.audit-bezpecnosti.cz/file/bezpecnostni-inspekce-pozemnich-komunikaci-metodika-provadeni/)

### ■ Conclusion: Road Safety Inspection Reports

The different approaches to RSI in the TEM member States lead to several report structures.

All reports cover:

- general information
- deficiencies
- recommendations

Some countries include: the estimated time to solve a hazard, effects of proposed measures, accident data, categories of deficiencies, if hazard was a previous RSI item, etc. Risk assessment is also different between the countries.

Obviously, the scope of an RSI has an influence on the report structure. As long as there are different approaches to what a road safety inspection should contain, report structures will vary. Further discussion and experiences seem to be necessary to develop a harmonized approach.

# 6. Training for Road Safety Auditors and Inspectors in TEM member States

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## 6.1 Overview of Training in TEM member States

To ensure the quality of auditors, countries should define some requirements:

- need of training curricula for auditors;
- initial training for safety personnel;
- qualification;
- certification;
- periodic further training courses;
- independence of auditors.

Two years after the adoption of Directive 2008/96/EC, RSA shall only be undertaken by auditors or teams with auditors that meet the following requirements: initial training, participation in periodic further training courses and holding a certificate of competence.

### Armenia

Currently certification is not necessary in Armenia to conduct RSA or RSI. Guidelines are not available for the education of auditors and inspectors. There are initial training courses but further information was not provided.

### Bosnia and Herzegovina

Guidelines for the education of auditors and inspectors are not available in Bosnia and Herzegovina nor are there regular training courses. Certification is necessary to conduct an audit or an inspection in the Republic of Srpska.

Training for auditors and inspectors is in preparation in the Republic of Srpska. Courses will be held by a government organization or a road authority, which will also issue the certificates. Formal criteria for certification will be academic qualification, 3 years of work experience and the successful completion of the training course. The period of validity of the Certificate of Competence will be 5 years. Refresher courses will be necessary to maintain the certificate in the Republic of Srpska as well as conducting at least 3 audits.

### Bulgaria

Bulgaria is one of two TEM member States with separate courses for auditors and inspectors. Certification is only necessary for auditors; guidelines on education are available for auditors only.

The initial training course for auditors lasts 7 days. Courses are given by one university; this institution also issues the certificates. Formal criteria for certification as an auditor are academic qualifications and the successful completion of the training course. The period of validity of the certificate is 2 years; 3-day refresher courses are necessary to maintain the certificate.

For RSI, two-day courses are provided by a governmental organization/road authority/private organization. RSI is done by internal personnel in Bulgaria, the courses may be for internal personnel only. Certificates are not issued, but it was stated that 2-day refresher courses are necessary.

### Croatia

Certification of auditors is necessary in Croatia, but neither guidelines for education nor training courses are available yet (pending adoption of the national by-law).

### Czechia

In Czechia, certification is necessary to work as an auditor or as an inspector. Education guidelines were issued in 2011. Training courses are for auditors and inspectors.

The initial course last 40 hours. Four institutions provide training courses: one State organization, two universities and one private company. Certifications are issued by the road authority.

Formal criteria for the certification for an auditor or an inspector are: academic qualification, work experience, road safety experience and successful completion of the training course.

The certificate is valid for 3 years and 16 hours of refresher courses necessary to maintain the certificate of competence.

### Lithuania

Training for the auditors and inspectors is not yet implemented in Lithuania. The certification of auditors and inspectors is not yet necessary.

## Poland

Poland is the second TEM member State with separate courses for auditors and inspectors. Certification is necessary for both. A guideline for the training and certification of auditors and inspectors is only available for RSA, issued in 2012.

The duration of the RSA course is 120 hours; this is the longest course in the countries covered.) The courses are provided by four universities, and the certificates are issued by the Ministry of Infrastructure. Formal criteria for certification as an auditor are: academic qualifications (engineer in the fields of road construction, traffic engineering or transport), 5 years of work experience in the fields of road design, traffic engineering, road management or traffic management, and the successful completion of the training course.

The certification is valid for a period of 3 years; 32-hour refresher courses are required to maintain the certificate.

Courses for inspectors last 30 hours. As RSI in Poland is conducted by internal personnel, courses were provided by one university for internal personnel of the road authority. Certificates are issued by the institution that offers the course. Refresher courses with a length of 30 hours are necessary, the period of validity of the certificate for inspectors was not stated.

The formal criteria for certification as an inspector are: at least two years of practice in the fields of road design, traffic engineering, road management or traffic management, and successful completion of the training course.

## Romania

In Romania, certification is necessary for auditors and inspectors. Details are not provided.

Currently, a process for the approval and issuance of an emergency ordinance<sup>5</sup> for amending and supplementing Law No. 265/2008 on the management of traffic safety on roads is ongoing.

## Slovakia

Slovakia does not currently participate in the TEM project and did not fill-in the questionnaire. However, basic information is available: 50-hour courses for RSA and RSI are available and refresher courses are necessary to maintain the certificate.

## Slovenia

Certification is necessary to work as an auditor or as an inspector in Slovenia. The guidelines for education were issued in 2010, and training courses are for auditors and inspectors.

The initial course is 7 days (36 hours). One governmental organization/road authority provides the training courses. Certificates are issued by the Ministry of Infrastructure.

The formal criteria for certification as an auditor or inspector are: academic qualifications (first degree university diploma in the fields of road infrastructure, traffic engineering or road safety), at least 10 years of experience in road design in auditing or in reviewing of road projects or analysis of traffic safety and analysis of road accidents, and successful completion of the training course.

The certificate is valid for 3 years, with a 1-day refresher course necessary to maintain the certificate of competence.

## Turkey

Training for auditors and inspectors is not yet implemented in Turkey. The certification of auditors and inspectors is not yet necessary.

## Austria

In Austria, certification is necessary to work as an auditor or as inspector. The guidelines for education were issued in 2009; training courses are for auditors and inspectors.

The initial course last 5 days. One private organization, the same organization in which framework Austrian guidelines are developed, providing the initial course and refresher courses. The Federal Ministry for Transport, Innovation and Technology issues certifications.

The formal criteria for certification as an auditor or as an inspector are: academic qualifications or graduation from a technical school, work experience (3-5 years, depending on the education), road safety experience and the successful completion of the training course.

The certificate is valid for 5 years. The extension of a certificate requires conducting at least two RSA or RSI, and refresher courses of a duration of 20 hours.

## 6.2 A Comparison of Training in TEM member States

The training of auditors and inspectors varies greatly in the TEM member States under consideration.

Four countries have neither guidelines for education / certification nor training courses: Bosnia and Herzegovina, Croatia, Lithuania and Turkey. In Bosnia and Herzegovina, the Republic of Srpska is preparing an education programme.

Armenia does not have guidelines for the training of auditors or inspectors, but initial courses exist.

Two countries, Bulgaria and Poland, have a standard or guideline for the training and the certification of road safety auditors, but not for inspectors. These countries are

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<sup>5</sup> ORDONANȚE DE URGENȚĂ

## 6. Training for Road Safety Auditors and Inspectors in TEM member States

the only countries that distinguish between the education of auditors and inspectors, and provide separate courses for RSA and RSI, respectively.

Austria, Czechia and Slovenia have guidelines for the education of auditors/ inspectors and courses for both RSA and RSI.

The duration of the courses usually about a week: Slovenia has the shortest course (36 hours), Bulgaria (7 days),

Czechia and Austria in between (40 hours and 5 days, respectively). In Poland, the initial course takes 120 hours, which is about 3 times longer than most of the other countries.

All countries agree on the required qualification for certification of an auditor or inspector: education and work experience are preconditions, plus the successful completion of a training course:

**Table 6.1**  
**Necessary qualifications for Auditors and Inspectors in TEM member States**

Country	Education	Work experience	Road safety experience
Austria	Technical school with emphasis on traffic/road design	5 years	Yes
	Academic qualification	3 years	Yes
Bosnia and Herzegovina	Academic qualification	3 years	-
Bulgaria	Academic qualification	Yes (at least for RSI)	-
Czechia	Academic qualification	Yes	Yes
Poland	Engineer	5 years	-
Slovenia	Education	10 years relevant experience	-

The certification authority is usually a government organization or road authority, except in Bulgaria where a university issues the certificate of competence.

Successful completion of the training course is usually assessed by knowledge tests and practical exercises. Other forms of assessment are individual tests or exams in Slovenia (in addition to knowledge tests and practical exercises) and group work in at least one of the institutions offering courses in Czechia.

Most countries have one organization providing training courses; Czechia and Poland have four organizations each that offer courses.

The certificate of competence is valid for 2 to 5 years. All countries require refresher courses to maintain the certificate: the duration of the courses is from one day to 32 hours. Only Austria requires the auditors and inspectors to conduct a certain number of RSA and/or RSI to maintain their certification. The Republic of Srpska is planning a similar precondition.

As mentioned above, Bulgaria and Poland have separate courses for RSI. In both countries, internal personnel conduct RSI, and Poland did state that the RSI course was solely for internal personnel. This may also be true for Bulgaria.

Courses in Bulgaria take 2 days, in Poland 30 hours. Refresher courses have the same duration as the initial courses in both countries. There are no certificates for inspectors in Bulgaria, and no certificate is necessary to work as an inspector.

### ■ Training Course Curricula/Contents of training courses

As stated above training courses differ among the countries. The training programmes of Austria, Czechia, Ireland and Poland below, provide examples of the set-up of their programmes.

### Austria (RSA course)

Duration of the course: 5 days, consists mostly of lectures

Five thematic blocks:

- Road design
  - Alignment interurban roads, theory and practical issues
  - Road design in urban areas, junctions
  - Non-motorised users
- Accident analysis
  - Trucks
  - Motorised 2-wheelers
  - Road conditions, road grip
  - Accident analysis, accident causes
  - High accident risk sites, treatment
- Human factors
  - Psychological aspects
  - Lighting
  - Aspects of perception
- Traffic engineering
  - Optical guidance
  - Restraint systems
  - Road equipment
  - Traffic lights
- RSA and RSI procedures
  - International context
  - Reports, checklists
  - Practical examples

The course is organized by the Austrian Association for Research on Road – Rail – Transport (FSV). Lectors are from different institutions (road authority, road administration, university, civil engineers, research institute, and road safety institution).

The course ends with a test of knowledge.

### Czechia (RSA course)

Four institutions provide training courses in Czechia. One is CDV (The Transport Research Centre (Centrum dopravního výzkumu, v. v. i)) which provides a course comprised of two parts: theoretical and practical.

#### Theoretical part

- Road safety  
accident causes, accident data, statistics, Czech road safety programme, European context
- Road design  
Safety aspects of different road users, psychological aspects, analysis and treatment of high risk sites, special topics (e.g. level crossings, work zones, vulnerable road users), RSA, RSI
- Guidelines, legislation  
Relevant guidelines and legal issues concerning RSA and RSI, requirements for auditors, duties

#### Practical part

- Site visit  
Site visit, documentation with video/photo, regarding aspects of all road users
- Information and data about road scheme  
RSA: drawings; RSI: useful/needed data
- Analysis  
Data analysis, identification of risks and risk severity, recommendations
- Report  
Writing of RSA and RSI reports, work with checklists
- Discussion  
Presentation of findings of different audit/inspection teams, identified risks, discussion

### Poland (RSA course)

Duration of the course<sup>6</sup>: 120 hours, including 60 hours lectures and 60 hours of practical work

The course includes nine thematic blocks:

- Guidelines, regulations  
basic principles of road safety
- Identification of road safety hazards and methods of analysis for the planning and design of roads
- Identification of road safety hazards and methods of analysis at the stage of preparation for the operation / before opening the road
- Procedures for conducting RSA
- Conduct RSA on roads outside built-up areas
- Conduct RSA on roads in urban areas
- Specific elements of road infrastructure and RSA
- Conduct RSA at the preparation stage for the operation / before opening the road
- RIA
- Network Safety Management
- Practical issues

The course contains basic knowledge and new developments in design issues and analysis of traffic safety. An important element of the course is practical exercises, related hazard identification, safety on existing roads and safety issues during the planning phases.

The course ends with an exam composed of theoretical and practical parts.

### Ireland (Audit course including Post-opening stage Audits)

Source: NRA, Road Safety Management Procedures for National Roads in Ireland, Annex E: Syllabus of Road Safety Audit Course, 2012

According to the guideline, the duration of the course is 10 days with 60 contact hours, additional hours for project work and further study time required for the final exam. The guideline contains a very detailed programme for the course:

#### Week 1

- Day 1: Introduction to RISM in Ireland  
Scale of the collision problem in Ireland, Road Safety in Ireland  
Collision causation, collision data
- Day 2: Collision data recording and initial analysis  
Road Safety Engineering process  
Ranking high risk locations including frequency rates, exposure-based rates, road risk mapping  
Collision location, statistics

#### Week 2

- Day 1: Evaluation of options and Economic Assessment  
The importance of the site visit  
Conflict studies, other data, conflict studies site visit  
Collision savings and Economic Assessment  
Prioritisation of works programmes
- Day 2: Scheme options for design  
Sites and routes - a review of Irish Schemes  
Guidelines (e.g. traffic management, urban roads, rural roads, cycle design)  
Case studies

#### Week 3

- Day 1: Preparation for Project Work  
Introduction to case study location  
Preparation of collision data in groups
- Day 2: Site visit  
Site visit in groups  
Format of report

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<sup>6</sup> Source: [www.audytybrd.pk.edu.pl/index.html](http://www.audytybrd.pk.edu.pl/index.html) (June 2016)

## 6. Training for Road Safety Auditors and Inspectors in TEM member States

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Following this unit, participants will have two weeks to complete a road safety engineering case study report, which should be brought to the start of the next unit.

### Week 6

Day 1: Introduction to Road Safety Audit  
Principles, Irish Standard, Guidelines  
Checklists  
Examples, good and bad practice  
Legal implications  
RSA writing and response

Day 2: Design Stage Audits  
Audit workshops and feedback in the stages  
feasibility stage, stage 1 and stage 2  
Safety issues within junction design

Following this unit, participants will be required to write a design stage 3 RSA report and bring it to the start of the next unit.

### Week 7

Day 1: Post-opening Stage Audits  
Preparation for Stage 3 Audit workshop  
Stage 3 Audit – site visit, report writing, risk  
assessment, feedback

Day 2: The role of Safety Assessments and other audits in  
the design process  
European and Irish Guidelines on RIA and RSI  
Workshops on comparative assessment of scheme  
options risk assessment from site visit (or video footage)  
Exam (multiple choice knowledge test and exam  
paper).

# 7. Recommendations and Implementation

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## 7.1 Recommendations for Road Safety Audits and Road Safety Inspections in TEM member States

Most of the TEM member States have already implemented RSA and RSI to some extent. Guidelines are available except in Bosnia and Herzegovina where guidelines are in preparation. Armenia and Croatia do not have RSI guidelines. Still, the procedures may not be part of everyday business in some countries and there are differences in the approach between countries.

The objectives of the TEM project are to improve the quality of transport and to reduce the gaps and disparities between motorway networks in different parts of Europe. RSA and RSI can help. For both, a mandatory implementation on the high-level network would increase the use of the procedures in a way that RSA and RSI become routine procedures.

From the answers to the questionnaire, some recommendations can be stated.

### ■ Updates and Amendments to the International Legal Instruments

One of the main goals of the TEM project is to balance the existing gaps and disparities between the motorway networks in Western, Eastern, Central and South-Eastern Europe, where the harmonization of legal instruments and standards on the TEM network plays a crucial role. In order to harmonize RISM procedures and to set-up a level playing field in all TEM member States, an important step would be to find modalities to amend the AGR to include RISM procedures. In this sense, importance of already proven RSA and RSI procedures will be recognized and basic procedures for the implementation of RSA/RSI will be harmonized on the TEM network, and in the 37 countries that are contracting parties to the AGR.

### ■ Awareness-raising

Some TEM member States have yet to implement any RISM procedures like RSA or RSI. Training and certification for safety personnel does not exist in some TEM member States. Further awareness-raising on all levels is necessary to convince the relevant decision makers and organizations of the usefulness of the procedures.

### ■ Knowledge transfer and exchange

Usually deficiencies are detected during RSA and RSI. Due to different technical guidelines in the TEM member States, which form an important basis of assessment, a comparison of situations and hazards detected in RSA sometimes may not be easy. Moreover, deficiencies are often a very special topic associated with a certain local situation. Still, an exchange of knowledge and best practice between the TEM member States may help to increase the quality level of RSA, e.g. by raising the awareness of the benefits of road infrastructure safety and putting RSA/RSI topics on the agenda in some countries where this issue might not have been considered thoroughly yet.

Problems in the existing network are often similar throughout European countries. Deficiencies detected in RSIs may well be quite similar as well. An exchange of knowledge on the main hazards detected in RSI within the TEM member States therefore seems useful. Especially knowledge transfers of good remedial measures, in best cases good cost-efficient solutions, would make sense, as setting similar standards on the TEM network is one of the objectives of the TEM project. If similar problems and situations within the TEM roads are treated in a similar way, this certainly would be a big step towards harmonisation of the network.

Knowledge transfer and exchange is essential when new developments and safety issues are in the implementation phase. ITS, for example, can play an important role in safety and security in transport. As these systems (on-board systems and/or roadside ITS, influencing e.g. human factors, running performance of vehicles or giving information on infrastructural or outside conditions) are developing rapidly, experiences with those new devices are of utmost interest for auditors and inspectors to take into account new technologies in RSA and RSI.

### ■ Defining a minimum standard for RSI

For the time being, there is, in general, a wide range of what road safety inspection means and includes throughout the world, and it is the same between TEM member States. A RSI can be a quite detailed examination of a section of 10 km or it may be an inspection of 150 km roads per day, which presumably is concentrating on maintenance issues. All those inspections are useful and help to improve the current situation, of course. Still, it may be reasonable to further define



## 7. Recommendations and Implementation

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the procedure in detail to help compare the results of RSIs. As there is no overall agreement on what RSI should contain on a minimum level, possibly within TEM project, a step towards a harmonized RSI procedure can be made.

### ■ **Introducing a Risk Matrix in Road Safety Inspections**

In many cases, quite a lot of hazards are found during RSI. Some deficiencies might pose a high risk; in other situations, it may be highly unlikely that an accident will lead to severe consequences on the road users. To distinguish between hazards, many countries introduced a risk matrix to assess deficiencies. In most cases, the risk matrix includes an assessment of the probability of an accident at the location, and the probable severity of outcome in case of an accident. A risk matrix helps to set priorities and can be the basis for medium- to long-term planning as some deficiencies can only be solved over years. Furthermore, risk assessment can lead to a better use of funds, as available resources should be invested where the highest improvements can be expected.

### ■ **Database of Deficiencies**

As stated above, many potential hazards are detected during RSIs. TEM road networks in some countries amount to several thousand kilometres. This will presumably lead to a large amount of deficiencies. It seems unlikely to keep an overview on all deficiencies, recommendations, prioritization and status of treatment without a working tool containing all the information. Thus, working tools, e.g. a database for deficiencies, seem to be appropriate to ensure remedial action, which is the most important result of a RSI.

### ■ **Constantly proving cost efficiency of the procedures**

Funding is always limited and, though cost-efficient procedures, RSA and RSI do face a certain resistance due to needed resources. Evaluating the safety benefits of RSA is not an easy task as before/after studies are not possible. Nonetheless, estimations have indicated good cost-efficiency (see e.g. (SWOV - Institute for Road Safety Research, 2012)).

Evaluation studies of RSI are also difficult, since remedial action after a RSI often takes time and different measures may be implemented at different locations with a different schedule. However, evaluating the effects of RSI is possible, Mr. Elvik (Elvik, Assessment and applicability of road safety management evaluation tools: Current practice and state-of-the-art in Europe, 2010) proposes "Empirical Bayes" studies. To prove the cost efficiency of RSI, studies on the benefits of RSI would be useful. If different RSI approaches would be covered in studies, the results could lead towards a harmonized RSI approach.

Proving the cost efficiency of the procedures in different conditions, and RSI approaches could also help implement

RSA and RSI on the lower category network where these procedures are conducted less frequently than on motorways.

### ■ **Feedback for Road Design/Standards**

Results from RSA and RSI should ideally lead to an improvement in technical standards. With a correct exchange of knowledge and databases of deficiencies, feedback could be used regularly for the improvement of road design and standards. Apart from harmonizing the infrastructure of TEM roads, it could help to further develop, for example, the safe system approach or forgiving roadsides.

## 7.2 Implementation

From the responses to the questionnaire, the training of auditors and inspectors is still an issue in Croatia and Lithuania; in Turkey, RSI are not implemented.

### ■ **RSI in Turkey**

Guidelines for conducting RSI are available in Turkey, but RSI is not yet conducted in Turkey.

Pilot projects are a good method to start implementing new procedures. Many countries started RSI with pilot projects: to see how the procedure fits with the existing procedures, to adapt the procedure to local needs and to evaluate the results. The pilot projects in Turkey may be possible with the help and in cooperation with other TEM-countries, proving RSI as a method regularly used on the TEM-network.

### ■ **Training of Auditors and Inspectors**

In Croatia, Lithuania and Turkey, courses for the training of auditors and inspectors are not currently available. The administration, i.e. which offers courses or issues certificates, etc. can only be decided by the country.

The minimum standards for training courses have already been defined (e.g. EURO-AUDITS (Falco, Proctor, and de la Peña González, 2007)), the contents of training courses could be found above in section 7.2. However, it is recommended that courses should contain a theoretical part and a practical part in which the candidates conduct the RSA/RSI procedures themselves. Naturally, training courses should include the latest developments and research findings in traffic safety issues. Hence, new technologies, like ITS, should be a topic within the courses.

Establishing RSA/RSI training courses under the TEM umbrella could be an additional possibility for improving the road safety capacity of TEM participating countries and for knowledge sharing. At a later stage, training could be offered as a technical assistance to East and South-East European and Central Asian countries.

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# Road Safety Audit and Road Safety Inspection on the TEM network

The Trans-European North-South Motorway (TEM) Project was initiated to facilitate road traffic in Central, Eastern and South-Eastern Europe and to assist the process of integrating European transport infrastructure systems.

One of the objectives of the project is to improve the quality and efficiency of transport operations. Road safety is an important part of the quality of transport and is promoted by the TEM project.

Road Safety Audit (RSA) and Road Safety Inspection (RSI) are road infrastructure safety management measures which are considered as important engineering tools for improving infrastructure safety.

Road safety is frequently discussed at the TEM Steering Committee, which commissioned this report. The report focuses mainly on the RSA and RSI procedures and on the administrative and institutional set-up for implementation (i.e. the legal framework of RSA and RSI procedures in TEM participating Governments). Experiences and examples of RSA and RSI procedures and training and licencing of auditors and inspectors are covered as well.

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