



Brussels, 17.5.2018  
SWD(2018) 175 final

PART 1/2

**COMMISSION STAFF WORKING DOCUMENT**

**IMPACT ASSESSMENT**

*Accompanying the document*

**Proposal for a Directive of the European Parliament and of the Council amending  
Directive 2008/96/EC on road infrastructure safety management**

{COM(2018) 274 final} - {SEC(2018) 226 final} - {SWD(2018) 176 final}

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## Glossary

<i>Term or acronym</i>	<i>Meaning or definition</i>
Active safety	Vehicle safety systems that help avoid automobile accidents and minimise the effects of a crash. These include braking systems, like brake assist, traction control systems and electronic stability control systems
Advanced driver assistant systems (ADAS)	Vehicle systems that help the driver in the driving process
The Abbreviated Injury Scale (AIS)	The scale used in the medical world to express the severity of injuries. See also MAIS 3+
Black spot management	The identification and elimination of road sections with a historically high number of fatalities and serious injuries
CCAM	Cooperative, connected and automated mobility
Forgiving roads	This approach aims not only to prevent accidents, but also to lay out the road in an intelligent way such that unintentional driving errors do not result in serious injuries or fatalities.
MAIS 3+	Includes all road traffic victims with a MAIS score of at least three (i.e. a MAIS score of three, four, five or six).
Passive safety	Refers to features that help reduce the effects of an accident, such as seat belts, airbags and strong body structures
Portal area	Tunnel entrances and exits where open road sections connect to road tunnels
RISM	Road infrastructure safety management
Road assessment programme	A systematic network wide assessment of the built-in safety of the road
Road safety audit	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
Road safety impact assessment	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
Road safety inspection	A periodical verification of the characteristics and defects that require maintenance work for reasons of safety
Safe System	A holistic view of the road transport system and the interactions among roads, vehicles and road users
Self-explaining road	A road where the driver is encouraged to naturally adopt a behaviour consistent with the design and the function of the road
Serious injury	Traditionally for the purposes of the CARE database, "serious injury" has been defined as an injury that requires 24 hours or more of hospital care. As this definition has led to imprecisions in reporting, Member States have agreed to start collecting injury data based on a new definition in line with the "Maximum Abbreviated Injury Score" (see MAIS3+)
Star-rating of roads	Star ratings are based on road inspection data and provide a simple and objective measure of the level of safety which is 'built-in' to the road for vehicle occupants, motorcyclists, bicyclists and pedestrians. The
Vision zero	Vision Zero is a road safety approach that aims to achieve no fatalities or serious injuries involving road traffic
Vulnerable road users	Vulnerable road users include users of powered two-wheelers (motorcycles) and non-motorised road users (cyclists and pedestrians).

## 1. INTRODUCTION

The EU regulatory framework for road infrastructure safety management is composed of two Directives: Directive 2008/96/EC on road infrastructure safety management<sup>1</sup> (the RISM Directive) and Directive 2004/54/EC on minimum safety requirements for tunnels in the trans-European road network<sup>2</sup> (the Tunnel Directive).

The current legislation covers roads and tunnels within the Trans-European Transport Network (TEN-T), a network of major European roads (primarily motorways and national/main roads) that is defined in the TEN-T Guidelines<sup>3</sup>. The TEN-T road network makes up about 4% of the EU road network (excluding urban roads).

The RISM Directive and the Tunnel Directive have, according to evaluations carried out in 2015<sup>4,5</sup>, delivered on their objective to improve the design, maintenance and safety management of roads and tunnels across Europe, and have contributed substantially to the reduction of road fatalities in Europe over the last decade. However, the evaluations also highlighted some factors that prevented the legislation, in particular the RISM Directive, from exploiting its full potential and some areas in which the legislation may need to be updated in view of new technological developments.

This report builds on the outcome of the ex-post evaluations of the two Directives as well as on an impact assessment support study<sup>6</sup>. It verifies the existence of a problem which could be solved by a revision of these Directives and assesses the options for their revision. Reflections on whether and how the two Directives should be amended should be seen as part of the preparation of an EU road safety policy framework for the period 2020-2030 (to be proposed as part of the Third Mobility Package in May 2018).

Progress in the reduction of road fatalities and serious injuries on EU roads has stalled in recent years, and a revised framework better adapted to this challenge and to the changes in mobility resulting from societal trends (e.g. more cyclists and pedestrians, an aging society) and technological developments is necessary. The complex situation calls for a dynamic policy adjustment that addresses the major challenges in a consistent and effective way across the entire spectrum of road safety policies. The framework will follow the Safe System approach. This approach is based on the principles that human beings can and will continue to make mistakes and that it is a shared responsibility for actors at all levels to ensure that road crashes do not lead to serious or fatal injuries. In a Safe System approach, the safety of all parts of the system must be improved – roads and roadsides, speeds, vehicles and road use so that if one part of the system fails, other parts will still protect the people involved.

It is estimated that road infrastructure and road surroundings are a contributing factor in more than 30% of crashes.<sup>7</sup> On the other hand, well-designed and properly maintained roads can reduce the probability of road traffic accidents, while "forgiving" roads (roads laid out in an intelligent way that ensures that driving errors do not immediately have serious consequences) can reduce the severity of accidents that do happen. This is why infrastructure safety will play an important part in the policy framework for the next decade.

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<sup>1</sup> Directive 2008/96/EC of the European Parliament and of the Council of 19 November 2008 on road infrastructure safety management, OJ L 319, 29.11.2008, p. 59–67

<sup>2</sup> Directive 2004/54/EC of the European Parliament and of the Council of 29 April 2004 on minimum safety requirements for tunnels in the Trans-European Road Network, OJ L 167, 30.4.2004, p. 39–91

<sup>3</sup> Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU, OJ L 348, 20.12.2013, p. 1–128

<sup>4</sup> <http://ec.europa.eu/transport/facts-fundings/evaluations/doc/2014-12-ex-post-evaluation-study-road-infra-safety-mgmt.pdf>

<sup>5</sup> [http://ec.europa.eu/transport/facts-fundings/evaluations/doc/tunnel\\_final\\_report.pdf](http://ec.europa.eu/transport/facts-fundings/evaluations/doc/tunnel_final_report.pdf)

<sup>6</sup> COWI/SWOV (2017), "Impact assessment support study for the revision of Directive 2008/96/EC on road infrastructure safety management and Directive 2004/54/EC on minimum safety requirements for road tunnels in the trans-European network"

<sup>7</sup> Danish Road Traffic Accident Investigation Board (2014), "Why do road traffic accidents happen?"; Elvik, Hove et al (2012), "The Handbook of Road Safety Measures"

Infrastructure safety management procedures have to be ready for new technological developments. The review of the two directives, as well as the overall framework, needs to take into account developments in connected and automated driving, which are advancing at high speed. Therefore, the present exercise is closely linked to initiatives that are part of the Commission's Strategy on Cooperative Intelligent Transport Systems (C-ITS)<sup>8</sup>, in particular the upcoming proposal for a strategy for Connected and Automated Mobility Systems.

The initiative is also closely linked to the proposal for the revision of the General Safety Regulation<sup>9</sup> and the Pedestrian Safety Regulation<sup>10</sup>, aiming to raise the bar in the rules on vehicle safety through additional safety features, including accident avoidance technologies and features to protect vulnerable road users. The two initiatives do not only share a common baseline, but they also interlink where vehicle technology relies on infrastructure (e.g. visible road markings to support lane keeping assistance technologies). They are part of a broad set of measures addressing road safety from the Safe System perspective.

According to the Safe System approach<sup>11</sup>, death and serious injury in road collisions are not an inevitable price to be paid for mobility. While collisions will continue to occur, death and serious injury are largely preventable. The Safe System seeks to better accommodate human errors, which are often simple errors of perception or judgment by otherwise compliant users, whilst also dealing with misbehaviour. It is a shared responsibility of actors at all levels and from all relevant sectors to ensure that road crashes do not lead to serious or fatal injuries. Better vehicle construction, improved road infrastructure, lower speeds for example all have the capacity to reduce the impact of accidents, and addressing one factor alone will not be enough. The aim is to create several layers of protection so that when one element fails, others will compensate for it. For example, if a drowsy driver veers from his lane, vehicle technology can alert him or gently correct the vehicle's trajectory. Rumble strips provide another warning. Should the vehicle nevertheless leave the road, a "forgiving roadside" without dangerous obstacles or with an energy absorbing roadside barrier can prevent serious consequences. Finally, crash absorbing vehicle design, along with seatbelts and airbags, protect vehicle occupants. The Safe System approach is being adopted increasingly in EU Member States, regions and cities. It is recommended globally by the World Health Organisation<sup>12</sup>.

## **1.1. Policy and legal context**

### *1.1.1. EU policy context*

Road safety in the EU has greatly improved over the past decades, thanks to action at EU, national, regional and local level. Between 2001 and 2010, the number of road deaths in the EU decreased by 43%, and between 2010 and 2016 by another 19%. In 2016, 25,620 people lost their lives on EU roads, 510 fewer than in 2015 and almost 5,900 fewer than in 2010 (see Figure 1). This is a substantial reduction, but it appears unlikely at this stage that we will meet the first part of the EU's strategic objective, which is to halve the number of road deaths by 2020 compared to 2010. In order to move close to zero deaths and serious injuries by 2050 (as

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<sup>8</sup> Communication from the Commission "A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility" (COM/2016/0766 final)

<sup>9</sup> Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor, OJ L 200, 31.7.2009

<sup>10</sup> Regulation (EC) No 78/2009 of the European Parliament and of the Council of 14 January 2009 on the type-approval of motor vehicles with regard to the protection of pedestrians and other vulnerable road users; OJ L 35, 4.2.2009

<sup>11</sup> OECD/International Transport Forum (2016): "Zero Road Deaths and Serious Injuries: Leading a paradigm shift to a Safe System", OECD Publishing, Paris; and <http://www.visionzeroinitiative.com/>

<sup>12</sup> [http://www.who.int/roadsafety/decade\\_of\\_action/plan/plan\\_en.pdf](http://www.who.int/roadsafety/decade_of_action/plan/plan_en.pdf)

set out in the "Vision Zero" approach)<sup>13</sup>, a major paradigm shift will clearly be needed which is beyond the scope of this impact assessment report.

Although some Member States are still making considerable progress every year, EU-wide road fatality rates have stagnated in recent years, with some Member States even reporting slight increases. The causes are diverse, including structural factors (urbanisation; a growing number of cyclists and pedestrians; an ageing population; fewer resources for enforcement, road maintenance and vehicles following the economic crisis) and behavioural factors (distraction by electronic devices; speeding; alcohol). The lack of detailed data makes a precise analysis difficult. It is however clear that much of the low hanging fruit for policy making at national and EU level have been picked and that it is unlikely that the EU objective of a 50% reduction in road fatalities between 2010 and 2020 will be reached. A paradigm shift is needed towards a framework based on results that addresses the major challenges in an effective and flexible way across the entire spectrum of road safety policies. Such a framework will be proposed for the period 2020-2030 as part of the third Mobility Package and will follow the Safe System approach.

This situation is common to many developed countries, where the positive trend in reducing road fatalities of the past years did not continue in 2015 and 2016 (see next section on international context).

Road safety actors in the EU have reacted to the slowdown with renewed commitment to the cause, as expressed by EU transport ministers in the Valletta Declaration on road safety<sup>14</sup> of March 2017. In the Declaration, ministers confirmed that road safety "*requires concrete and joint action by the institutions of the European Union, the Member States, regional and local authorities, industry and civil society*". They undertook to "*continue and reinforce measures necessary to halve the number of road deaths in the EU by 2020 from the 2010 baseline*" and to set a target of halving the number of serious injuries in the EU by 2030 from the 2020 baseline. They committed, among other things, to improving "*the safety of road users by developing safer infrastructure, bearing in mind the possibility of extending the application of infrastructure safety management principles beyond the Trans-European Transport Network (TEN-T) roads*".

Working towards the EU's strategic objectives to halve the number of road deaths by 2020 compared to 2010 and to move close to zero deaths by 2050 ("Vision Zero" approach) requires a wide range of measures. Experts agree<sup>15</sup> that contributions towards these targets will have to come from all areas of road safety policy. Measures addressing speed, drink-driving and vehicle safety, and – to a slightly lesser extent – measures addressing road infrastructure, protective equipment (seatbelts, child restraints) and post-crash care, are generally regarded as having the highest potential impact. Vehicle and infrastructure safety are being addressed in the present proposals. Further complementary actions will be assessed in the future, subject to separate impact assessments.

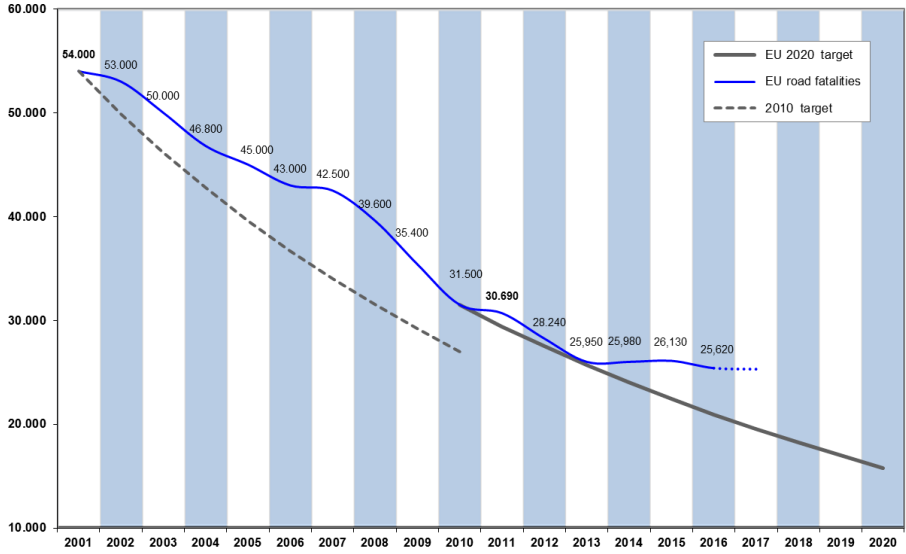
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<sup>13</sup> Communication from the Commission "Towards a European road safety area: policy orientations on road safety 2011-2020" (COM(2010) 389 final)

<sup>14</sup> <http://data.consilium.europa.eu/doc/document/ST-9994-2017-INIT/en/pdf>

<sup>15</sup> The SafetyCube (Safety CaUsation, Benefits and Efficiency) review project, financed under Horizon2020, synthesises relevant research: <https://www.safetycube-project.eu/>

Figure 1: Evolution of EU road fatalities and targets for 2001-2020



Source: CARE database<sup>16</sup>

1.1.2. International context

At global level, the EU is the region with the safest roads. Its fatality rate of 50 deaths per million inhabitants in 2016 compares to 93 deaths per million for the entire European region and 174 deaths per million globally. The total number of road traffic deaths in the world is around 1.25 million per year.

In many developed countries, the positive trend in reducing road fatalities of the past years did not continue in 2015 and 2016, with fatality figures even increasing in some countries (e.g. United States, Australia).<sup>17</sup> This illustrates that the trend of stagnating road safety figures in the EU is not an isolated phenomenon, but the expression of a trend that has led to increased fatality rates in other developed parts of the world.

1.1.3. EU legal context

Infrastructure safety management has been a strong focus of EU road safety policy since the adoption of the White Paper on Transport policy<sup>18</sup> in 2001 and the European Road Safety Action Programme 2003-2010<sup>19</sup>.

The RISM Directive was adopted with the purpose to ensure that road safety considerations are part of all phases of the planning, design and operation of road infrastructure, to work towards a consistently high level of safety of roads across Member States and to use the limited funds for more efficient construction and maintenance of roads. The RISM Directive defines guidelines and best practices without imposing specific technical standards or measures on Member States. The main management instruments are road safety impact assessments (strategic analysis at the planning stage), road safety audits (from design to early

<sup>16</sup> Community Road Accident Database, the European centralised database on road accidents which result in death or injury across the EU  
<sup>17</sup> In the United States, the year 2015 ended a five-decade trend of declining fatalities (albeit at a much higher level of fatalities than in the EU with 109 deaths per million inhabitants) with a 7.2% increase in deaths over 2014. Provisional data for the first 9 months of 2016 indicates an additional 8% increase in fatalities over the same period in 2015. In Australia, where road deaths have decreased by 34% since 2000 (to 49 deaths per million inhabitants), the trend has also been reversed since 2014. Road deaths increased by 4.8% in 2015, with provisional data from 2016 indicating a further increase of 7.2%. Canada, which reduced its fatality rate by 36% since 2000, has seen stagnating figures in 2015 (at 52 deaths per million inhabitants). Source: OECD "Road Safety Annual Report 2017"  
<sup>18</sup> White Paper "European transport policy for 2010: time to decide" (COM(2001) 370 final)  
<sup>19</sup> Communication from the Commission "European road safety action programme – Halving the number of road accident victims in the European Union by 2010: a shared responsibility" (COM(2003) 311 final)

operation), road network safety management (regular safety ranking and follow-up at accident prone locations) and safety inspections (periodic checks).

As regards tunnel safety, major accidents in the tunnels of Mont Blanc and Tauern in 1999 and St. Gotthard in 2001 prompted work at Member State, EU and international levels. The EU became involved following a request by its Heads of State. The Tunnel Directive aims to prevent the occurrence of fires and accidents in tunnels and to provide improved protection of road tunnel users in the event of an accident. It defines organisational and technical requirements that need to be fulfilled in order to provide a minimum level of safety in road tunnels longer than 500 metres that are part of the trans-European road network. The Directive requires Member State authorities to take safety measures in existing TEN-T tunnels, to clearly allocate responsibilities amongst entities involved, to improve tunnel safety management procedures (e.g. periodic inspections), and to design and manage new tunnels to at least a common minimum standard.

Since the adoption of the two directives, the EU legislative framework for road safety has evolved, notably as regards the education and training of road users (Directive 2006/123/EC on driving licences<sup>20</sup>, introducing a European format for licences, Directive 2003/59/EC on the initial qualification and periodic training of bus and lorry drivers<sup>21</sup> - currently being revised), enforcement (Directive 2015/413/EC on cross-border exchange of information for enforcement<sup>22</sup>) and vehicle safety, in the form of the "Roadworthiness Package"<sup>23</sup> (Directive 2014/45/EC, Directive 2014/46/EC and Directive 2014/47/EC, helping to eliminate unsafe vehicles from the roads) and type-approval requirements for new vehicles in the form of the Vehicle General Safety Regulation (EC) 661/2009<sup>24</sup>.

As regards the Vehicle General Safety Regulation, new safety features (seatbelt reminders for drivers, ISOFIX child seat anchorages) became mandatory in November 2014 for every new car, van, truck and bus sold in the EU. As of November 2015, all new trucks and buses have to be equipped with advanced emergency braking systems and lane departure warning systems. The General Safety Regulation is currently being reviewed with a view to making additional safety features mandatory.

The Construction Products Regulation (EU) No 305/2011<sup>25</sup> led to the elaboration of harmonised product standards for a number of construction products relevant for road infrastructure safety (e.g. road marking materials, vertical road traffic signs, road restraint systems etc.) and obliged the manufacturers of these products to CE mark their products and issue a Declaration of Performance regarding their performance<sup>26</sup>. This helps road infrastructure managers to procure construction products that fulfil their own performance requirements. The Regulation, however, does not impose performance requirements (i.e.

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<sup>20</sup> Directive 2006/123/EC of the European Parliament and of the Council of 12 December 2006 on services in the internal market, OJ L 376, 27.12.2006, p. 36-68

<sup>21</sup> Directive 2003/59/EC of the European Parliament and of the Council of 15 July 2003 on the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers, amending Council Regulation (EEC) No 3820/85 and Council Directive 91/439/EEC and repealing Council Directive 76/914/EEC, OJ L 226, 10.9.2003, p. 4-17

<sup>22</sup> Directive (EU) 2015/413 of the European Parliament and of the Council of 11 March 2015 facilitating cross-border exchange of information on road-safety-related traffic offences, OJ L 68, 13.3.2015, p. 9-25

<sup>23</sup> European Commission press release: "Road safety: Tougher vehicle testing rules to save lives" of 13 July 2012, [http://europa.eu/rapid/press-release\\_IP-12-780\\_en.htm?locale=en](http://europa.eu/rapid/press-release_IP-12-780_en.htm?locale=en)

<sup>24</sup> Regulation (EC) No 661/2009 of the European Parliament and of the Council of 13 July 2009 concerning type-approval requirements for the general safety of motor vehicles, their trailers and systems, components and separate technical units intended therefor, OJ L 200, 31.7.2009, p. 1-24

<sup>25</sup> Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC

<sup>26</sup> Several harmonised European standards are now available and must be used by the manufacturers in order to place their products in the EU market by affixing the CE Marking and issuing a Declaration of Performance for the following products (e.g. EN 1317-5: Road restraint systems - Product requirements and evaluation of conformity for vehicle restraint systems; EN 1423: Road marking materials - Drop on materials; EN 1463-1: Road marking materials - Retro-reflecting road studs - Performance requirements, etc.). In absence of a harmonised standard, the European Assessment Documents recently elaborated by the European Organisation for Technical Assessment (EOTA) under the Regulation (EU) No 305/2011 allow the CE marking and the Declaration of Performance for: EAD 230011-00-0106 on road paints, and EAD 120001-01-0106 on microprismatic reflective sheets used in traffic signs.



thresholds of performance for road barriers) on manufacturers so it is up to road infrastructure managers to decide what performance requirements they aim to fulfil with the products and procure them from manufacturers accordingly.

## 1.2. Assessment and monitoring

The Commission has assessed the implementation and effectiveness of both the RISM Directive and the Tunnel Directive. The findings from the ex-post evaluations have been described in two separate Evaluation Reports<sup>27,28</sup> and can be summarised as follows:

- The RISM Directive has triggered a different way of thinking about and dealing with road safety management. Firstly, it has encouraged a generalised use of the road infrastructure safety management procedures which are now established in all Member States and which are based on a minimum set of compulsory EU rules in the management of TEN-T roads. Secondly, the Directive provides a “common language” for carrying out road infrastructure safety measures. At national level, the Directive has prompted a normative and operational process that would not have taken place in such a widespread manner without EU intervention. On the other hand, the Directive does not seem to have provided an incentive to extend the exchange of good practices across Member States and has not led to increased mobility of road safety professionals across Member States. Furthermore, the scope of the Directive is limited to TEN-T roads which are mostly motorways and account for only about 8% of the total road fatalities in the EU. However, the majority of Member States apply one or more of the road safety management procedures of the Directive to parts of their road networks beyond the TEN-T on a voluntary basis.
- The Tunnel Directive has had a positive influence on road tunnel safety management, even though the task of making all TEN-T road tunnels in the scope of the Directive compliant with the Directive's requirements was far from complete at the time of the ex-post evaluation and thus the minimum safety standard prescribed by the Directive not yet in place throughout the EU. The Directive set a deadline of 2014 for tunnel refurbishments, with a possibility of an extension until 2019 for Member States with a higher than average density of tunnels. The evaluation noted that in the Member States with the 2014 tunnel refurbishment deadline, 82% of the tunnels in scope (as measured by total tube length) were compliant with the provisions of the Directive while in the Member States with a deadline extension to 2019<sup>29</sup> only 17% of the tunnels were compliant. Considering the EU as a whole, the overall compliance rate was 30% when assessed on total tube length and 26% when measured on the basis of the number of tunnels. The evaluators concluded that some of the Member States with a large number of tunnels will face significant challenges in meeting their 2019 deadline. However, the Directive has had a positive effect regarding the awareness of the problem of tunnel safety, has prompted investment that successfully complements other road safety measures, has improved the capacity of tunnel managers and emergency services to manage dangerous events and to prevent and mitigate the effects of accidents and fires, and it has triggered research into new technological solutions.

Since the publication of the ex-post evaluation Denmark, Germany, Luxembourg and the United Kingdom have completed the refurbishment of their existing tunnels and are now fully compliant with the Directive. As for the Member States with the 2014 deadline, three of them (Belgium, Bulgaria and France) still have tunnels that are not fully compliant with the Directive. As for the Member States with the 2019 deadline, only Luxembourg has

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<sup>27</sup> <http://ec.europa.eu/transport/facts-fundings/evaluations/doc/2014-12-ex-post-evaluation-study-road-infra-safety-mgmt.pdf>

<sup>28</sup> [http://ec.europa.eu/transport/facts-fundings/evaluations/doc/tunnel\\_final\\_report.pdf](http://ec.europa.eu/transport/facts-fundings/evaluations/doc/tunnel_final_report.pdf)

<sup>29</sup> Austria, Greece, Italy, Luxembourg, Slovenia, Spain and Croatia

successfully completed the refurbishments and Italy has by far the most infrastructure related upgrades to perform as about two thirds of all the tunnels to be upgraded in the EU are located in Italy. Except for the compliance issue, the evaluation of the Tunnel Directive did not identify any major issue and concluded that the existing legislation was fit for purpose.

Neither of the two evaluations provided any evidence that the integration of the RISM Directive with the Tunnel Directive would further improve the safety of the road tunnels on the TEN-T, but both evaluations noted that further investigation would be necessary to determine whether there was any positive impact to be achieved by merging the Directives.

## **2. PROBLEM DEFINITION**

Figure 2 presents the intervention logic of the initiative, identifying the general problem, the main problems and problem drivers and the general and specific objectives.

### **2.1. General problem: High number of fatalities and injuries on EU roads with road infrastructure being an important crash cause and severity factor**

The general problem that the initiative intends to tackle is the high number of fatalities and injuries on EU roads, for which road infrastructure remains an important crash cause and severity factor.

In 2016, 25,620 people were killed on EU roads and about 246,000 were seriously injured<sup>30</sup>. While most Member States have improved their road safety records since 2010, there is still a significant gap in performance across the EU. In 2016, countries with the lowest fatality rate per million inhabitants were Sweden (27 per million inhabitants), the UK (28 per million inhabitants), the Netherlands (33 per million inhabitants), Spain (37 per million inhabitants), Denmark (37 per million inhabitants), Germany (39 per million inhabitants) and Ireland (40 per million inhabitants). Those with the weakest road safety records and around three times higher fatality rates were Bulgaria (99 per million inhabitants), Romania (97 per million inhabitants), Latvia (80 per million inhabitants) and Poland (79 per million inhabitants). Despite the wide gap between the fatality rates of the best performing and the worst performing Member States, a general trend can be observed over the past 10 years whereby the performance of all Member States is converging towards the performance of the best performing Member States (see Figure 3).

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<sup>30</sup> For the purposes of the CARE database, "serious injury" has been defined as an injury that requires 24 hours or more of hospital care. CARE data is based on police reports. As this definition has led to imprecisions in reporting, Member States have agreed to start collecting injury data based on a new definition in line with the "Maximum Abbreviated Injury Score" (MAIS3+). Based on data from a majority of Member States, the number of serious injuries per year in the EU is now estimated to be around 135,000. However, as the data set is still incomplete and historical data is missing, calculations in this document are based on CARE data.

Figure 2: Intervention logic

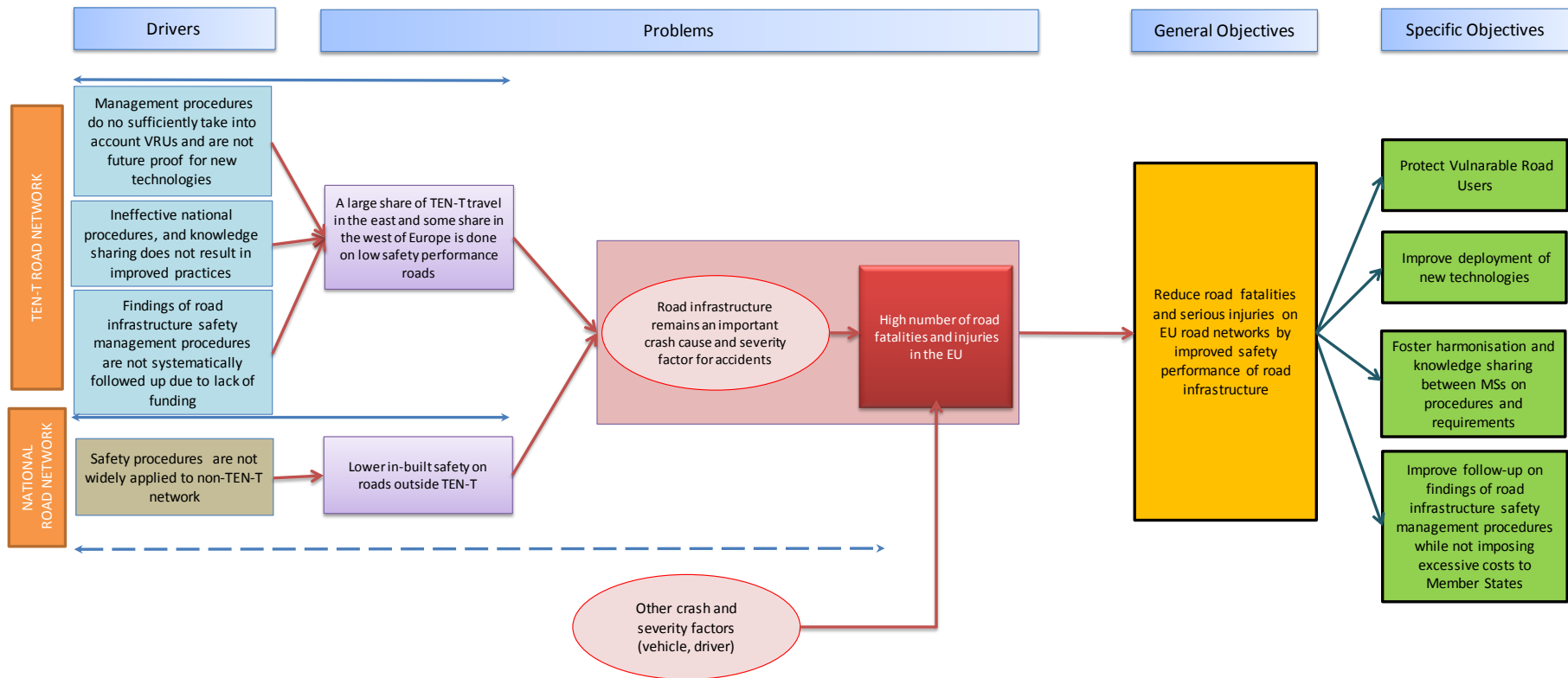
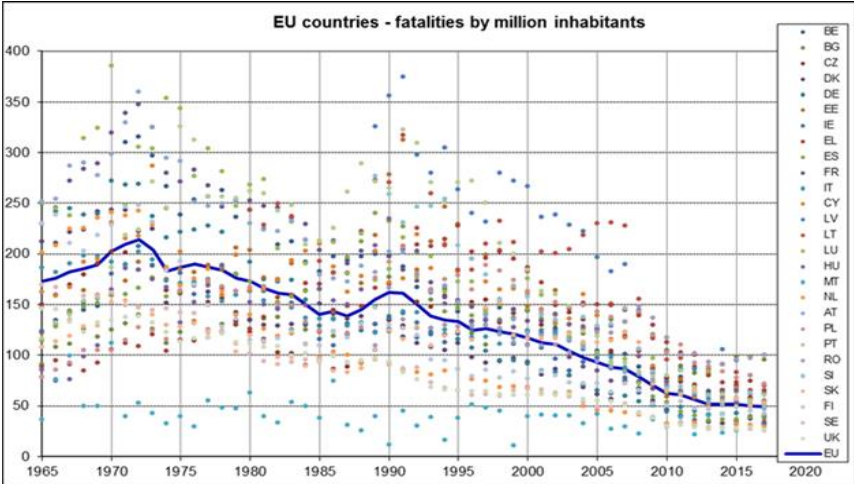


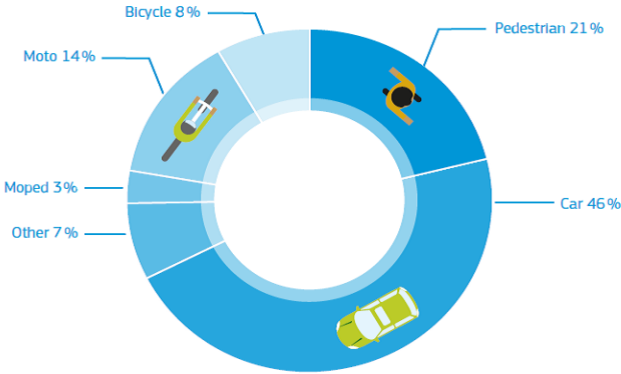
Figure 3: Evolution of road fatalities per million inhabitants in the EU



Source: CARE database

Car occupants accounted for the largest share of victims in 2016 (46%), while 21% of all people killed on roads were pedestrians. Cyclists accounted for 8% and motorcyclists, who are less protected during a crash, accounted for 14% of road fatalities. In general, fatalities among vulnerable road users have over the years decreased much more slowly than fatalities among all road users. Pedestrians and two wheeler deaths combined are 46% of the total – the same as the total for all deaths of car occupants – and are particularly exposed in urban areas. For the period 2000-2010, fatalities for all road users decreased by 45%, whereas it decreased by 38% for vulnerable road users. For the period 2010-2015, fatalities for all road users decreased by 16%, whereas fatalities of vulnerable road users decreased by 13%. The number of vulnerable users is likely to increase, in particular in urban areas, as a result of the promotion of more sustainable modes of transport, and therefore the exposure to risk.

Figure 4: Road fatalities by transport mode in 2016



Source: CARE database

On average only about 8% of road fatalities occurred on motorways. 37% of fatalities happened in urban areas while most fatalities (55%) happened outside urban areas on non-motorways. *Motorways are the safest type of road by definition and by design.* Segregated unidirectional traffic flows, the absence of horizontal crossings and the absence of pedestrians mean that despite the higher travel speeds it is much safer to travel on a motorway than to travel on any other type of road.

From an economic point of view, the yearly cost of road fatalities and serious injuries is estimated to be about EUR 121 billion<sup>31</sup>. These costs comprise individual costs and suffering

<sup>31</sup> COWI/SWOV (2017), "Impact assessment support study for the revision of Directive 2008/96/EC on road infrastructure safety management and Directive 2004/54/EC on minimum safety requirements for road tunnels in the trans-European network"

and costs to the society in the form of output loss, material expenses and combined police and medical expenses.

### **Measuring accident costs**

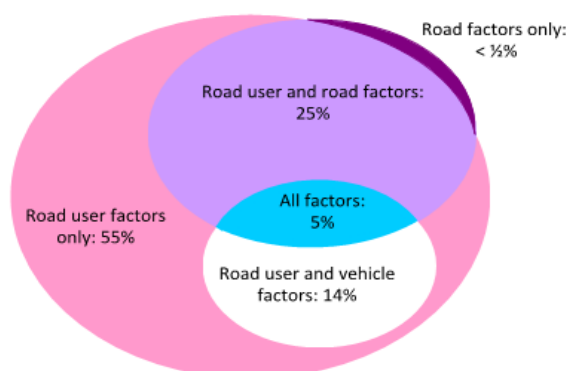
*According to the Handbook on external costs of transport (2014), the basis for the measurement of accident costs - the main element being the cost of fatality - is the estimates of the value of statistical life (VSL). VSLs mostly come from valuation studies where participants are asked to assess their own willingness to pay for accident risk reduction. A VSL is therefore by no means the intrinsic value of life, but rather the price that individuals implicitly attribute to their lives when they make economic decisions: it can be derived, for example, from the price that consumers are willing to pay for a feature reducing the risk of fatal accident by a certain percentage. As they are based on economic decisions, estimates of the VSL differ across age groups, income levels, types of risks under assessment, etc., and evolve over time. In particular, VSL estimates vary across EU countries, reflecting differences in population income and risk characteristics. With this in mind, it is important to ensure consistency in the methods and assumptions used for calculating country-level and EU-level VSLs. The Handbook on external costs of transport (2014) has based its calculations on the UNITE study (2002), updated to represent the average income level in the EU in 2010 prices, which amounts to an EU-wide VSL of €1.8 million. Following HEATCO (2006) recommendations, the value of a severe injury is assumed to be 13% of the fatality value, while a light injury is valued at 1% of the fatality value. These estimates are a tool to support decision making, despite their limitations and their inability to capture all the effects of the loss of human life.*

The role played by users, vehicles and infrastructure in the high number of road fatalities and injuries is analysed in terms of:

- their contribution to the occurrence of a crash (= "crash factor") and
- their contribution to the severity of a crash, when it does happen (= "severity factor").

The traditional understanding of road crash causation was based on the perception that driver or road user error was the predominant cause of road accidents but the emergence of the Safe System approach has put this perception in a different context. While road user factors are still the leading crash factor, there is converging scientific evidence<sup>32</sup> indicating that road infrastructure and road surroundings are an important crash factor in about 30% of accidents leading to fatalities. Road conditions can be the single most lethal factor in serious crashes, ahead of speeding, alcohol and non-use of seatbelts<sup>33</sup>. Addressing the human factor alone cannot address a significant proportion of accidents as there are indications that even if all road users complied with all road rules, 40% of fatalities would still happen<sup>34, 35</sup>.

Figure 5: Shares of crashes caused by road user, vehicle and road factors



Source: Danish Road Traffic Accident Investigation Board (2014)

<sup>32</sup> See for example Danish Road Traffic Accident Investigation Board (2014)

<sup>33</sup> Road infrastructure Safety Management Research Report, ITF (2015)

<sup>34</sup> Elvik and Vaa (2004)

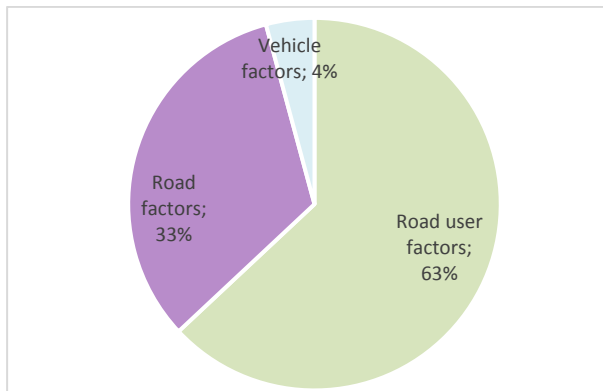
<sup>35</sup> PIARC Road Safety Manual

Similar figures can be found in the literature for other European countries, which suggests that a figure around 30% can be regarded as a mean estimate.<sup>36</sup> For example, a study for Romania shows that the main risk factors are similar to those in other countries.<sup>37</sup> Figures from the US and from Australia show similar tendencies.<sup>38</sup> Only data from UK accident records suggests a lower influence: in one recent study, the road environment was found to be a factor in 18.8% of accidents in the UK.<sup>39</sup>

In addition, road infrastructure plays an important role in the severity of about a third of road accidents.<sup>40</sup> If a complicated road layout or difficult driving conditions (slippery road surface, bad visibility of road markings) place high demands on human performance, errors are more likely to have more severe consequences than in more straightforward circumstances.

Therefore, better enforcement of traffic rules, while crucial, cannot in itself successfully prevent all road traffic accidents. Conversely, positive infrastructure measures can often more effectively influence human behaviour than other measures, such as driver training or police enforcement. Although the overall effects of road infrastructure as a crash cause and as a severity factor taken together have not been studied, for analytical purposes it is reasonable to assume from the above that infrastructure plays a role both in causing accidents and in determining their outcome at a magnitude of around 30%.

Figure 6: Shares of severity factors in road accidents



Source: Based on figures from the Danish Road Directorate (2016)

Lack of consistent data about the location of road traffic accidents in the EU, a lack of common classification of road types and lack of information about the input and output of road infrastructure safety management procedures create difficulties for the impact assessment, making it necessary to extrapolate limited available data in some places. The need for a more harmonised road classification across Europe has already been identified by EuroGeographics, the association representing European National Mapping, Cadastre and Land Registry Authorities<sup>41</sup> that has developed EuroRegionalMap (ERM), a pan-European map and dataset containing topographic information in GIS format.

A similar classification of roads together with harmonised requirements as regards the identification of road traffic accidents might be helpful to determine the optimal scope of EU-wide road infrastructure safety management measures and to monitor their impact.

<sup>36</sup> Elvik, Hove et al (2012)

<sup>37</sup> Petre Liviu Munteanu et al (2014)

<sup>38</sup> Lum and Regan (2015), found in Roshandel, Saman, Zheng, Zuduo, Washington, Simon

<sup>39</sup> Jenkins (2015)

<sup>40</sup> Danish Road directorate (2016)

<sup>41</sup> <http://www.eurogeographics.org>

## 2.2. Main problems

### 2.2.1. Main problem 1: A large share of TEN-T travel in the East and some share in the West of Europe is on roads with low safety performance

There are considerable regional differences at the level of infrastructure safety of TEN-T roads but current EU legislation does not provide for a common methodology to measure the crash risk of road infrastructure. Some relevant and comparable data is, however, available from the European Road Assessment Programme (EuroRAP), an international non-profit organisation of automobile clubs, road authorities and researchers. EuroRAP has carried out road assessment programmes across many EU Member States with a view to providing evidence based safety ratings of the assessed roads to benchmark crash and infrastructure risk, inform investment priorities and track performance over time. These programmes result in infrastructure safety ratings of between 1 and 5 stars (the higher the number of stars, the higher the safety of the road). Star ratings are awarded for roads overall and differentiated for pedestrians, cyclists, motorcyclists and vehicle occupants. The roads assessed belong predominantly to TEN-T. In Western Europe, EuroRAP found that only an estimated 15% of the network length was below the 3-star benchmark (the minimum safety rating target advocated globally by the International Road Assessment Programme<sup>42</sup>, whereas in Eastern Europe the corresponding figure was 58%.<sup>43</sup>

Table 1: Safety levels of national roads in selected European Member States using iRAP/EuroRAP methodology<sup>44</sup>

Country	Average	Fatalities per mio. vkm	<1 star	2 star	3 star	4 star	5 star
UK	3.8	1.4	2%	6%	20%	51%	21%
Netherlands*	>3	1.7	0%	0%	100%	0%	0%
Spain	4.1	1.8	2%	4%	11%	44%	39%
France	3.1	2.7	8%	27%	17%	48%	0%
Slovenia	2.8	4.6	3%	26%	65%	4%	2%
Czech Republic	3.0	5.4	8%	25%	32%	27%	8%
Slovakia	2.3	5.6	26%	26%	38%	8%	2%
Greece	2.2	7.2	35%	16%	45%	4%	0%
Hungary	2.3	8.4	22%	31%	40%	6%	1%
Croatia	2.7	8.5	21%	23%	28%	20%	8%
Poland	2.1	9.9	34%	34%	18%	11%	3%
Bulgaria	1.9	9,6	47%	23%	28%	2%	
Romania	2.1	16.7	30%	23%	46%	0%	0%

Source: EuroRAP Country reports from the SENSOR project. CARE data and Eurostat; Note: not all roads in the specific countries have been analysed; \* All NL TEN-T and national roads are above 3 stars. There are no details indicating distribution between 3, 4 and 5 star rating.

The Netherlands, Sweden and the United Kingdom have already set policy targets on the basis of EuroRAP star rating targets. The variations between the crash risks on roads detected in the EuroRAP surveys are mirrored in the *perceived* quality of road infrastructure across the EU. In a survey among business executives organised by the World Economic Forum<sup>45</sup>, the

<sup>42</sup> <http://irap.org/en/irap-news/3-star-or-better>

<sup>43</sup> Data provided by EuroRAP on 23/8/2017 with analysis based on 2015 data representing a 35% sample of the comprehensive TEN-T network assessed using the iRAP (International Road Assessment Programme) methodology.

<sup>44</sup> The data outlined in the table are based on assessment of a selection of roads in the respective countries. They are carried out on national roads. The calculation of fatalities per mio. vehicle km. is using the total number of fatalities in the country and traffic on all roads.

<sup>45</sup> World Economic Forum: Global Competitiveness Report <https://www.weforum.org/reports/the-global-competitiveness-report-2016-2017-1/>

Netherlands, France, Austria and Portugal score ratings of 6 or above on a scale from 1 to 7, whereas Bulgaria, Romania, Malta and Latvia score below 4.

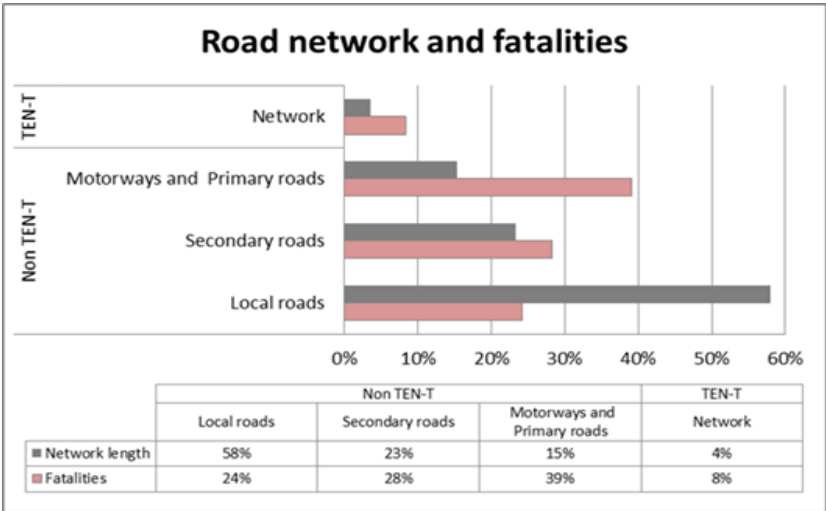
Such perceived differences were also confirmed in the Open Public Consultation carried out as part of this impact assessment, with a large majority of respondents (61 out of 73) having experienced "significant differences" or "some differences" between countries.

2.2.2. Main problem 2: Lower in-built safety on roads outside TEN-T

Among non-TEN-T roads, only a small percentage is of motorway standard. Many main or national roads carry high traffic volumes, but do not possess the road infrastructure safety characteristics of a motorway. The resulting road safety risks are, for example, the presence of bi-directional traffic, bends with limited visibility, slow moving vehicles and the absence of appropriate crash barriers.

Data on fatal accidents compiled by Member States and collected in the European Commission's CARE database permits the classification of accidents by road type (motorways, urban roads, other roads). While the reports do not specify whether an accident took place on a road that is part of the TEN-T network or not, eight Member States (Austria, the Czech Republic, Luxembourg, France, the Netherlands, Portugal, Slovenia and the UK) report the exact location of accidents using GPS coordinates, which means that accidents can be located on TEN-T or non-TEN-T roads, provided that the data quality is sufficient. On that basis, it is possible to estimate the number of fatalities that occur on TEN-T roads versus non-TEN-T roads.<sup>46,47</sup>

Figure 7: Distribution of fatalities by road type on the EU inter-urban road network (TEN-T vs non-TEN-T roads), based on a sample of eight Member States



Source: DG MOVE calculations based on GPS accident data reported by Member States

It is estimated that the TEN-T network comprises 4% of the overall road network (excluding urban roads), on which a disproportionate 8% of fatalities occur. It is important to bear in mind that this is mostly due to high traffic volumes, given that TEN-T roads are mostly motorways, the safest type of road. Motorways and primary roads that are not part of the

<sup>46</sup> Although the sample of Member States for which these figures are established is relatively small, it contains a mixture of large and small countries as well as countries from different regions within the EU. In addition, the distribution of road types within the network (percentage of motorways/primary/secondary roads) is generally very similar across countries of the same region and consequently the distribution in the sample is similar to the overall EU distribution of road types. Therefore, the data permits conclusions that are valid across the EU.

<sup>47</sup> The classification of roads is based on the definitions of EuroRegionalMap (ERM). ERM differentiates between motorways (roads especially sign-posted as a motorway and reserved for specific categories of road motor vehicles), primary roads (defined as roads lacking the characteristics of motorways but having a significant meaning as connection between major cities and regions), secondary roads (defined as regional roads connecting smaller cities within a region where density of the road network is higher than of the primary roads), and local roads (roads not otherwise classified as a motorways, primary roads or secondary roads).



TEN-T network comprise 15% of the overall network. On these roads alone, it is estimated that 39% of fatalities occur. Local roads, which make up 58% of the road length in the overall network, on the other hand, only register 24% of fatalities. This is due to generally lower traffic flows.

### 2.3. Problem drivers

The main problems identified in the previous section are a result of a number of problem drivers.

#### 2.3.1. Problem driver 1: Ineffective national procedures, and knowledge sharing does not result in improved practices

All Member States have transposed the provisions of the RISM Directive into their national legislation. Therefore, procedures for road safety impact assessments, road safety audits, road safety inspections and procedures for the safety ranking and management of the road network in operation are in place in all Member States. However, the ex-post evaluation study concluded that: *“Whilst on the whole, the national laws regulating the procedures stipulated in the Directive have been issued in all EU Member States and specific guidelines have been developed, the level of implementation of the Directive and the level of compliance differ in their details from country to country and the potential road safety effects may vary. In this respect, a range of stakeholders believe that some Member States still appear to have difficulties in implementing the procedures effectively, although the Directive is formally transposed into their national legislation.”*

National procedures can be overly complex, limiting their utility for road authorities as evidenced by the findings concerning road auditors' work in Romania<sup>48</sup>. In this case, infrastructure safety management has been included in the legislation, but in a way that places substantial restrictions on the users of the legislation<sup>49</sup>. For example, the existing training module for road safety auditors is very demanding and leads to few auditors being trained. Recommendations from road safety inspections must be followed by the authorities. Although procedures are outlined, the authorities might not want to use them because they will lead to mandatory implementation of recommendations, for which there may not be sufficient funding.<sup>50</sup>

Conversely, the ex-post evaluation<sup>51</sup> also noted that some national rules and guidelines do not give much guidance for the practical application of the procedures. While overly complex procedures are the likely cause of less effective roads infrastructure safety measures, they also indicate that there is a lack of common practices, and that knowledge sharing between Member States does not result in improved practices.

One of the problems with the current legislative framework is therefore related to the process steps in achieving road infrastructure safety improvements (see Figure 8). There is a lack of clarity of the steps, or of the link between the steps. For example, if the road safety management procedures are complex or if there is a lack of experience among the authorities, it is likely that ineffective road safety measures are identified, and so non-optimal investments are made.

The stakeholder consultation that was part of the ex-post evaluation of the RISM Directive showed that while RISM procedures are considered as clearly defined and effective in many Member States, their clarity and effectiveness could be further improved in a number of

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<sup>48</sup> Jaspers (2016)

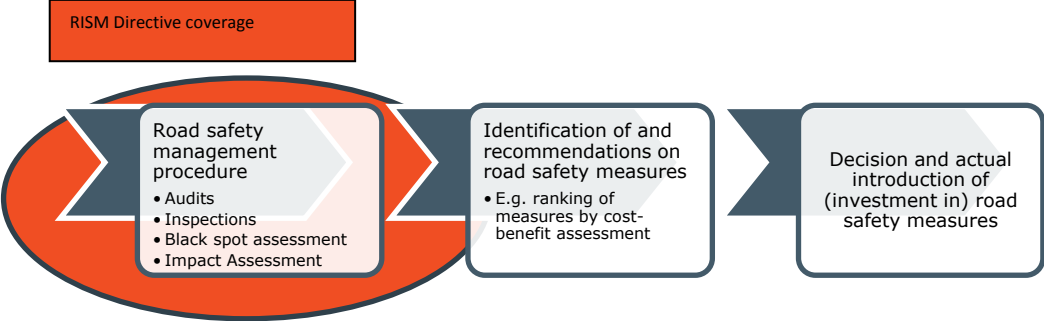
<sup>49</sup> COWI (2017)

<sup>50</sup> Jaspers, 2016

<sup>51</sup> TML (2014a)

Member States. This is backed up by experience of the European Investment Bank<sup>52</sup>. The targeted stakeholder survey confirmed that there appeared to be issues in some countries: 5 out of 27 respondents considered RISM national procedures to be ineffective while four other respondents indicated that the procedures in national legislation are too complex for practical use.

Figure 8: Process steps in achieving road infrastructure safety improvements



2.3.2. Problem driver 2: Management procedures do not sufficiently take into account vulnerable road users and are not future-proof for new technologies

**Vulnerable Road Users**

The RISM Directive does not explicitly address the protection of vulnerable road users (pedestrians, cyclists, motorcyclists), although they account for about 46% of all road fatalities in the EU. The share of cyclist fatalities is particularly high in the Netherlands (24%) and Denmark (17%), while motorcyclist fatalities are particularly frequent in Greece (29%), Italy (21%) and France (20%).

Table 2: Share of vulnerable road user fatalities on all roads (including urban)

Country	Pedestrians	Cyclists	Motorcyclists	Total VRU
AT	15%	10%	13%	38%
BE	14%	10%	14%	38%
BG	23%	5%	5%	33%
CZ	25%	11%	10%	46%
DE	17%	11%	17%	45%
DK	17%	17%	8%	42%
EE	25%	12%	2%	39%
EL	17%	2%	29%	48%
ES	22%	4%	18%	44%
FI	13%	8%	9%	30%
FR	14%	4%	20%	38%
HR	19%	6%	13%	38%
HU	25%	12%	10%	47%
IE	18%	5%	12%	35%
IT	16%	7%	21%	44%
LT	34%	9%	5%	48%

<sup>52</sup> EIB (2016)

Country	Pedestrians	Cyclists	Motorcyclists	Total VRU
<b>LV</b>	39%	7%	6%	52%
<b>NL</b>	11%	24%	6%	41%
<b>PL</b>	34%	9%	8%	51%
<b>PT</b>	23%	5%	12%	40%
<b>RO</b>	39%	9%	3%	51%
<b>SE</b>	16%	5%	15%	36%
<b>SI</b>	15%	9%	14%	38%
<b>SK</b>	18%	10%	7%	35%
<b>UK</b>	23%	6%	19%	47%
<b>Average</b>	<b>22%</b>	<b>8%</b>	<b>15%</b>	<b>45%</b>

Source: CARE database, 2015

Vulnerable road users on the TEN-T are mostly motorcyclists. In 2015 they represented 10% of all fatalities on EU motorways. In addition, in some Member States pedestrians, cyclists and moped riders also use non-motorway TEN-T roads to a limited extent. They may also be affected at intersections and when crossing motorways. According to cycle traffic measurements by members of the European Cyclists' Federation, there are for example several thousand cyclists crossing a certain motorway in Belgium every day and around 1,500 cyclists per day using a stretch of non-motorway TEN-T road in the Netherlands.

The Conference of European Directors of Roads (CEDR)<sup>53</sup> acknowledged that for many years national road administrations had primarily focused on the safety of car occupants. CEDR agrees that ensuring the safety of vulnerable road users will be one of the main challenges of the next 5-10 years.

### **New Technologies**

As regards new technologies, there has been rapid progress since the time of the adoption of the Directive (for example advanced driver assistance systems in vehicles, cooperative Intelligent Transport Systems (C-ITS)), and more developments are unfolding (automated driving). Some vehicle technology improvements, such as lane departure warning systems, lane keeping assistance and intelligent speed adaptation can only work to their full potential if specific elements of the road infrastructure (e.g. road markings and road signs) are available and of appropriate quality. The deployment of connected and automated driving may be hindered unless these issues are directly addressed in road infrastructure safety management procedures.

Automated cars are likely to sustain the shift towards a new mobility scenario where more sustainable transport solutions can replace the traditional car ownership/car usage paradigm. Many major car manufacturers and several technology firms have announced plans to start the commercial production of highly automated vehicles, and many observers expect that a wide range of such models will be on the market by 2030. Some of these may be self-driving<sup>54</sup>. According to the UNECE<sup>55</sup>, fully automated vehicles that can handle all the driving situations they encounter, "are expected to enter the market around 2020 and/or are currently under research".

Some road safety gains are expected to be realised through the uptake of some advanced vehicle safety technologies which are taken into consideration in the baseline scenario.

<sup>53</sup> CEDR (2016) Main road safety challenges for European Road Directors the next 5-10 years – towards vision zero

<sup>54</sup> OECD and ITF (2015)

<sup>55</sup> UNECE (2017)

At the same time the expected deployment of automated vehicles is likely to involve additional requirements for road infrastructure: readability by automated vehicles, placing emphasis on an appropriate vertical signage, road markings and road delineation. Furthermore, the lack of appropriate information about RISM procedures means that there is no information on the safety performance of roads, which will be needed during the transition period towards automated traffic.

### *2.3.3. Problem driver 3: Findings of road infrastructure safety management procedures are not systematically followed up due to lack of funding*

The current EU legislation does not provide any requirements or incentives to follow up the recommendations arising from road infrastructure safety management procedures. Lack of transparency and publicly available information about the recommendations and the actual follow-up measures make it difficult to monitor implementation and the actual effectiveness of countermeasures.

The availability and level of funds allocated to road infrastructure safety is a key root cause for this problem driver. However, there is a lack of data on the current level of investment. Investments in road infrastructure safety are often included in the general budget for road construction and maintenance; the share specifically used for safety measures is not consistently recorded by Member States.

Overall, public spending on road infrastructure maintenance has decreased in the EU by about 30% (or 40% in relation to GDP) between 2006 and 2013<sup>56</sup> and stood at around 0.5% of GDP in 2013<sup>57</sup>. At times of budget cuts, deferring maintenance and investment in the road sector is a relatively quick way to reduce public spending and this has been pursued by a number of EU countries. For example, significant reduction of maintenance activities were reported in Italy, Ireland, Slovenia and Spain in recent years and a likely downward trend also in Slovakia, Finland, Czech Republic, the UK, Portugal and Hungary<sup>58</sup>. Case studies<sup>59</sup> on Italy, Spain and the UK revealed significant falls in maintenance expenditure that were reportedly due to budgetary pressures and the need to reduce government spending overall.

Road safety audits deal with road designs for new road sections or for the reconstruction of road sections while road safety inspections deal with existing roads. In both cases, the resulting recommendations can be accepted or not by the road authority. As the specific reports or a summary of the number of recommendation that are followed up are not published by Member States, there is a lack of transparency about the extent to which recommendations are followed up. If all recommendations are rejected, the safety effects of the road safety audit or road safety inspection will not be realised.<sup>60</sup>

While road safety audits only concern new or renewed infrastructure, the biggest road safety challenges concern existing road infrastructure. It is the objective of road safety inspections to identify safety issues with existing roads but follow-up is just as crucial as with road safety audits.

An authority may well have legitimate reasons to reject recommendations, such as budgetary constraints, practical considerations or a disagreement with the auditor/inspector. However, at

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<sup>56</sup> Data extracted on 22 Jan 2017 from OECD.Stat, [https://stats.oecd.org/Index.aspx?DataSetCode=ITF\\_INV-MTN\\_DATA#](https://stats.oecd.org/Index.aspx?DataSetCode=ITF_INV-MTN_DATA#)

<sup>57</sup> <http://www.cedelft.eu/publicatie/road-taxation-and-spending-in-the-eu/1899>

<sup>58</sup> European Parliament. (2014). *EU Road Surfaces: Economic and Safety Impact of the Lack of Regular Road Maintenance*. [http://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL\\_STU\(2014\)529059](http://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_STU(2014)529059)

<sup>59</sup> The Italian operator of national roads, ANAS, reported a reduction in the expenditure on road maintenance both in routine and structural budgets, respectively of 16% and 43% in the 2008 to 2012 period. In the UK, funding reduced by 30% between 2011 and 2015 for the Highways Agency. In Spain, national government allocation for maintenance and operational expenditures reduced from €1,257m in 2009 to €926m in 2012.

<sup>60</sup> SWOV (2012)

present, the authority's decision may seem arbitrary, as there are no official guidelines for what constitutes a valid ground for dismissal.

There are large variations in how national procedures are used and to what extent they are being followed up between Member States. According to the results of the targeted stakeholder consultations in some Member States only few inspections are carried out<sup>61</sup> and there are indications that recommendations are not followed, while only the cheapest solutions are implemented during black spot treatments<sup>62</sup>. Member States are not required to report regularly on the road infrastructure safety management activities carried out in accordance with the RISM Directive, and the data collected as part of the targeted stakeholder consultation does not allow easy comparison due to the fact that procedures are typically carried out in multiannual cycles. The number of road safety inspections carried out in 2016 varied between 0 and 517 depending on Member State and it is unknown what percentage of the road network covered by the Directive has been subject to the procedures. Bulgaria also referred to a lack of financing.

#### *2.3.4. Problem driver 4: Safety management procedures are not widely applied on non-TEN-T network*

Whereas the current EU road infrastructure safety management legislation only applies to the TEN-T roads and tunnels, consisting mainly of motorways, the safest type of road, 54% of road fatalities happen on other inter-urban roads and 38% occur in urban areas. These high numbers are partly due to lower safety standards compared to the TEN-T network. In addition, the non-TEN-T network accounts for the largest road length of the network, and thus also the largest number of crashes, fatalities and injuries.

Many Member States<sup>63</sup> have decided on a voluntary basis to extend the application of some of the road infrastructure safety management procedures to selected non-TEN-T roads. There is variation in the extent to which individual Member States have made the extensions, but typically the additional roads that are covered are other motorways and/or other main roads.

Therefore, there is a lack of consistency in the way RISM procedures are applied outside the TEN-T. In addition, the potential of safety management procedures in decreasing the number of fatalities and injuries is also limited in particular in countries that need to make most progress in improving road safety.

## **2.4. The Tunnel Safety Directive**

The Tunnel Directive was included in the European Commission's Regulatory Fitness and Performance Programme (REFIT) to explore the possibility of administrative simplification, in particular by merging it with the RISM Directive. The ex-post evaluation studies of both the RISM and the Tunnel Directive did not identify any safety improvements to be realised through the integration of the two Directives, but recommended further study. The impact assessment and stakeholder consultation have not found any evidence of an excessive administrative burden. In particular, the assessment did not identify any road safety gains to be achieved by merging the Directives. As the current RISM Directive is a very simple piece of legislation with no reporting obligation for Member States, it does not lend itself to further simplification. Artificially merging the two Directives without actually reducing the administrative burden was not considered beneficial and desirable.

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<sup>61</sup> However, the questionnaire referred to a single year (2016). Data for a longer periods would be necessary to draw more reliable conclusions.

<sup>62</sup> Jaspers (2016)

<sup>63</sup> Belgium (in the region of Wallonia), Cyprus, the Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Romania, Sweden and the United Kingdom.

The results of the on-line public consultation confirmed that the current legislative framework for road tunnel safety is appropriate and that the level of safety in road tunnels is high compared to road infrastructure in general.

The ex-post evaluation of the Tunnel Directive<sup>64</sup> also highlighted that, in view of the very specific infrastructure requirements of the Tunnel Directive, that were specifically designed for the long tunnels of the TEN-T network, extending the application of specific tunnel infrastructure requirements to tunnels beyond the current scope would require significant financial resources which could potentially be better spent on other road safety improvements on other parts of the road network identified as a result of a more systematic assessment of costs and benefits of infrastructure measures.

Respondents to the open public consultation also indicated a preference for keeping the current scope of the Tunnel Directive.

The Ecoroads project<sup>65</sup> focused on the interface between road tunnels and open road sections (the so-called portal areas) and has identified joint safety inspections by tunnel and road safety experts as a best practice measure to improve the safety of portal areas and tunnels. On this basis, this initiative will aim to improve the interface between the two Directives with a view to reducing risks in the portal areas of road tunnels.

The draft problem definition, the draft retained policy measures and the design of the draft policy options were discussed in the Tunnel Safety Committee during the meeting of the Committee on 8 November 2017. The members of the Committee generally agreed with the proposed approach of maintaining a separate Tunnel Directive, with only one Member State (Cyprus) indicating a preference for further analysis of a possible merging of the two directives. The Committee supported the suggested focus on portal areas which are generally considered the most dangerous sections of road tunnels.

Therefore, the conclusion as regards REFIT considerations in view of the evaluations as well as extensive stakeholder consultations was to keep the two Directives separate, propose the revision of the RISM Directive and address the specific issue of tunnel portal areas (where open road and tunnels meet) in the framework of the revision of the RISM Directive.

The issue of future compliance pointed out in the evaluation of the Tunnel Directive (concerning some Member States with a high number of tunnels to be upgraded by the 2019 deadline, and in particular Italy which has almost half of all the tunnels falling under the scope of the Directive), does not require a revision of the Directive. The current Directive already provides Member States with flexibility to derogate from certain infrastructure requirements provided that they can demonstrate that, through the application of alternative operational measures, they can guarantee the same or a better level of safety to tunnel users. Authorisation for the use of such alternative measures are foreseen in the Tunnel Directive to allow the implementation of possible future measures that are the result of technological developments, but they can also be particularly relevant in cases where no alternative route to the tunnel exists and where the partial or full closure of the tunnel that would be necessary to implement the infrastructure measures defined in the Directive would create significant adverse impacts on roads safety. There is sufficient international experience with the successful use of operational measures as demonstrated by the presentations at an international conference organised on the subject in Rome on 16 February 2017<sup>66</sup> where

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<sup>64</sup> [http://ec.europa.eu/transport/facts-fundings/evaluations/doc/tunnel\\_final\\_report.pdf](http://ec.europa.eu/transport/facts-fundings/evaluations/doc/tunnel_final_report.pdf)

<sup>65</sup> [www.ecoroadsproject.eu](http://www.ecoroadsproject.eu)

<sup>66</sup> <http://www.fastigi.com/2017/02/17/conferenza-misure-gestionali/>

speakers from several European countries presented successful examples of the identification, assessment and implementation of alternative measures.<sup>67</sup>

## 2.5. Most affected stakeholders

Existing EU legislation puts responsibilities on national road authorities and infrastructure managers who need to carry out the road infrastructure safety management procedures prescribed by the RISM Directive and ensure that long TEN-T road tunnels meet the minimum safety requirements as stipulated by the Tunnel Safety Directive.

However, any shortcomings in the safety of road infrastructure directly affect all road users. Road fatalities and serious injuries create suffering for those involved in the accidents and their families. In addition, they create costs that are ultimately borne by society as a whole, including the costs of emergency services, health care costs and production losses.

## 2.6. How will the problem evolve?

The Directives will continue to exercise a limited impact on the safety performance of the TEN-T roads while the roads outside TEN-T will continue to pose significant challenges.

Despite the completion of the core TEN-T network by 2030 and of the comprehensive TEN-T network by 2050, that would lead to some improvements in the road infrastructure especially in the Eastern European countries, **a large share of TEN-T travel will continue to take place on roads with low safety performance.** As explained, motorways are the safest type of road by definition and by design. However, the density of motorways in EU13 countries (7.8 km per thousand km<sup>2</sup> of territory) is substantially lower relative to EU15 countries (20.1 km per thousand km<sup>2</sup> of territory); reaching similar densities may take several decades and goes beyond the scope of TEN-T core and comprehensive network completion. Therefore, the share of the network length below the 3-star benchmark (the minimum safety rating target advocated globally by the International Road Assessment Programme) is not expected to improve significantly under current trends and adopted policies.

In addition, **lower in-built safety on roads outside TEN-T will continue to pose significant challenges.** No further extension of the application of RISM procedures is foreseen by Member States on voluntary basis. Growing traffic volumes on the roads concerned will result in higher exposure of road users to the risks represented by inadequate road infrastructure.

In the baseline scenario<sup>68</sup>, measures addressing infrastructure safety and driver behaviour would compensate for the increase in traffic over time while the uptake of the mandatory and voluntary vehicle technology safety measures would result in some limited decrease in the number of fatalities and serious injuries. The number of fatalities is projected to go down by 9% between 2016 and 2030 and 14% during 2016-2050, while the reduction in the serious injuries is expected to be lower at 6% by 2030 and 10% by 2050.

The evolution of fatalities and serious injuries by EU region is projected to continue recent trends observed in the historical data, with the Eastern and Southern EU countries showing the highest decrease in the number of casualties. A description of the Baseline scenario assumptions and results is provided in Annex 4 "*Analytical methods*" and further in the Impact Assessment Support Study.

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<sup>67</sup> Alternative measures can be either preventive measures or damage limiting measures. Illustrative examples of preventive measures may include traffic restrictions or reduced speed limits with measures that ensure that these speed limits are observed or improved lighting in tunnels. Illustrative examples of damage limiting measures may include additional capabilities for emergency response or increased fire protection measures.

<sup>68</sup> The common baseline scenario used for this impact assessment and the impact assessment accompanying the revision of the General Safety Regulation draws on an update of the EU Reference scenario 2016 and has been jointly developed with the PRIMES-TREMOVE model by the ICCS-E3MLab and the TRL model.

The projected developments under current trends and adopted policies would not allow achieving the EU's strategic objective, which is to halve the number of road deaths by 2020 compared to 2010 and to move close to zero deaths and serious injuries by 2050 ("Vision Zero" approach).

Considering the high uncertainty surrounding the evolution of fatalities and injuries, sensitivity analysis has been performed on the baseline scenario reflecting on the impacts of infrastructure safety performance and vehicle technologies. An alternative optimistic and a pessimistic baseline scenario have been considered. In cumulative terms, between 2016 and 2030 the number of fatalities is projected to go down by 18% in the optimistic baseline scenario and 6% in the pessimistic scenario. Serious injuries would decrease by 15% in the optimistic baseline and 4% in the pessimistic baseline. A description of the sensitivity analysis is provided in Annex 4 "*Analytical methods*" and the Impact Assessment Support Study.

Vehicle automation is likely to sustain the shift towards a new mobility approach (see section 2.3.1). As described above, the uptake of certain existing vehicle safety technologies is projected to have a significant influence on the baseline. As to the deployment of fully automated vehicles however, there is a high degree of uncertainty, for example about the technologies to be used, timescale and prices. Only once fully automated vehicles are deployed at a large scale will they be able to deliver a potentially significant contribution to road safety. For the foreseeable future, it is more likely that mixed traffic of vehicles with a high level of automation and of traditional vehicles will lead to increased road safety risks.

Generally, road infrastructure and vehicle safety measures can be regarded as complementary (e.g. for measures like alcohol interlock installation facilitation, autonomous emergency braking for pedestrians and cyclists, distraction recognition, better follow-up of road safety management procedures etc.) although there are also some measures which are mutually reinforcing (e.g. visible road markings to support lane keeping assistance technologies). The baseline scenario assumes the application of the existing General Safety Regulation in line with the current legislation, as required by the Better Regulation principles. No further policy action is considered at the EU level in the baseline. Including additional vehicle safety measures in the baseline would result in lower numbers of fatalities and serious injuries. Consequently, the impact of road infrastructure safety policy options in terms of lives saved and serious injuries avoided may be slightly reduced when compared to such an alternative baseline. This is due to the overlapping effects between the impacts of the policies, in the same way as there is nearly always more than one factor in accident causation. The individual influence of each factor is virtually impossible to determine. In other words the combined effect of road infrastructure and vehicles safety measures deployed together, is going to be somewhat lower than the sum of their individual effects.

### **3. WHY SHOULD THE EU ACT?**

#### **3.1. Legal basis**

The Union has shared competence in the field of transport safety as set out in Article 4 of the TFEU. The RISM Directive and the Tunnel Directive are based on Article 91 (c) of the Treaty on the Functioning of the European Union (former Article 71(1)(c) of the Treaty establishing the European Community), according to which the Council "shall, acting in accordance with the ordinary legislative procedure and after consulting the Economic and Social Committee and the Committee of the Regions, lay down (...) (c) measures to improve transport safety" in the framework of a Common Transport Policy. As competence is shared, subsidiarity considerations apply.



### 3.2. Subsidiarity: Necessity of EU action

The necessity test assesses if the objectives of the proposed action can be sufficiently achieved by Member States. The legitimate rights of Member States to take actions which reflect their local, regional or national specificities must not unduly jeopardise the achievement of road safety targets.

Negative externalities of road accidents, including road fatalities and congestion, are trans-boundary problems that cannot be solved by national or local action alone. The EU has worked on reducing negative externalities of the transport sector for more than a quarter of a century as one of the objectives of the Common Transport Policy. Co-ordinated EU action is necessary to achieve the EU's strategic objective and the goals set in the Transport White Paper 2011, which include halving the number of road fatalities by 2020 on a 2010 baseline and moving close to zero fatalities by 2050.

The scope of the existing EU legislation is the trans-European road network. To achieve and maintain a high minimum level of road safety across the TEN-T network requires the use of harmonised road safety management procedures, which are designed in such a way that the highest levels of safety can be guaranteed in combination with an appropriate and proportionate regulatory framework.

Arguments for an EU intervention that were put forward when the two Directives were proposed included the following:

- Experience had shown that there was not a sufficiently high common level of safety on roads across EU Member States. The sharing of best practice on its own had not delivered sufficient improvement although there is consensus among stakeholders that this has a clear role to play in improving road safety.
- The necessary level of safe mobility on the crucial TEN-T network would not be achieved without intervention at EU level as voluntary action is not supported by all Member States.

These considerations remain valid, and the ex-post evaluations as well as the consultations carried out in the framework of the impact assessment have confirmed that the chosen approach has delivered results and is widely accepted among Member States and stakeholders. Updating the RISM framework to new developments as well as increasing its efficiency and effectiveness is therefore a logical response to the above considerations.

In addition, the deployment of some new safety technologies and the safe roll-out of connected and automated mobility across the EU is likely to require a more harmonised approach at EU level. For example, some new in-vehicle safety solutions will rely on the deployment or upgrade of adequate infrastructure. Road infrastructure must be readable for such applications and therefore infrastructure performance - in particular as regards the visibility and state of repair of traffic signs and road markings - has a role to play in supporting higher levels of safe and reliable automated driving. This is confirmed in a recent report of the TM 2.0 Task Force on Road Automation (composed of representatives of public authorities, service providers, suppliers, manufacturers and researchers), which concludes:

*"It is expected that, at least for mixed fleets of vehicles, spatial or temporal restrictions may be enforced on the circulation of automated vehicles. All traffic signs and road delineation relevant to such restrictions should be harmonised among countries, to allow interoperability of automated functions, as they may be based on the recognition of such markings and signs. (...) Good lane markings condition can support the accurate positioning of automated vehicles.*

*Stricter criteria and maintenance processes as regards the condition of lane markings should be studied.*<sup>69</sup>

Compatibility between infrastructure and vehicle technical solutions will need to be assured across the EU in order to fully benefit from those technologies. This shows again how important a holistic approach remains. Thus, as part of the planned Third Mobility Package, the Commission will propose both a revision of the General Safety Regulation and the Pedestrian Safety Regulation with a view to increasing the safety of vehicles and a revision of the RISM Directive with a view to improving the safety of road infrastructure and supporting deployment of some new vehicle safety technologies.

The issue of subsidiarity is important when considering the possible extension of the scope of the legislation to other roads beyond the TEN-T. TEN-T roads represent only about 4% of the inter-urban EU road network. However, many roads that are not part of the TEN-T network are important for the overall functioning of road transport within the EU and carry significant volumes of national and international traffic. For example, many national roads connect urban and industrial centres to the TEN-T network. And road safety standards on these roads can be considerably lower than on TEN-T roads themselves. Calculations presented in section 2.2.2 indicate that due to the high traffic volumes, the primary road network of the EU represents a high percentage of fatalities compared to the share of these roads in the total road network. Therefore co-ordinated EU action on the primary road network (including the non-TEN-T part) will help achieve both the medium-term EU target of halving fatalities by 2020 and the long-term target of moving towards zero fatalities in road transport by 2050.

### **3.3. Subsidiarity: EU added value**

The EU added value test assesses whether there are clear benefits from EU level action and whether the objectives can be met more efficiently at EU level.

The main benefits of EU action lie in the convergence towards higher standards of infrastructure safety across the EU which the initiative aims to achieve. Travel throughout the EU should become safer, whereby less well performing countries will be able to benefit from the experience of more advanced countries. This should in turn improve the functioning of the internal market, through a smoother and more coherent travel experience for passenger and freight transport, and support the EU's objective of economic, social and territorial cohesion.

In addition, the EU-wide setting of standards, e.g. for road markings and road signs, should improve visibility and subsequently driving conditions. It should also facilitate and accelerate the deployment of new technological safety elements that rely on features of the road infrastructure, such as lane keeping assistance and intelligent speed adaptation.

As for vulnerable road users, action at EU level could ensure that road assessment programmes assess separately the safety of vulnerable road users with a view to improving their safety on the road network concerned.

## **4. OBJECTIVES: WHAT IS TO BE ACHIEVED?**

### **4.1. General objectives**

The revision of EU road infrastructure safety management legislation aims to address the high number of road fatalities and serious injuries on EU roads by improving the safety performance of road infrastructure, including but possibly not limited to the roads that belong to the TEN-T.

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<sup>69</sup> [http://2r1c5r3mxgzc49mg1ey897em.wengine.netdna-cdn.com/wp-content/uploads/sites/8/2018/01/TM2.0\\_TF\\_RoadAutomation\\_report3\\_FINAL.pdf](http://2r1c5r3mxgzc49mg1ey897em.wengine.netdna-cdn.com/wp-content/uploads/sites/8/2018/01/TM2.0_TF_RoadAutomation_report3_FINAL.pdf)

The general objective of the proposed revision is defined as the reduction of road fatalities and serious injuries on EU road networks. It is in line with the goals of the 2011 White Paper and with the Council conclusions based on the Valletta Declaration. This initiative has strong links to the other planned elements of the Third Mobility Package that are relevant for road safety, namely the new framework for effective road safety policy, the legislative proposal for the revision of the General Vehicle Safety Regulation which aims to improve the safety of vehicles through the mandatory fitting of important safety features to new vehicles, and the envisaged strategy for Connected and Automated Mobility Systems.

The new framework for effective road safety policy is intended to establish the Safe System approach to road safety at EU level<sup>70</sup>. Concretely, this implies setting up a system of closer cooperation between authorities and stakeholders and a system of monitoring of results through Key Performance Indicators. The objective of improving the safety performance of road infrastructure is key to the Safe System approach. Roads that are well designed, built and maintained and which are "forgiving" towards the inevitable errors human drivers make, improve road safety on two levels: they reduce the likelihood of accidents happening and they also reduce the severity of accidents that still happen.

Digitalisation and automation will be central topics in the new road safety framework, with connectivity and automation being dealt with concretely in the strategy for Connected and Automated Mobility Systems. In order to become future-proof, infrastructure safety management procedures have to be ready for these new technological developments, which is why reflections in the present context have been influenced strongly by the thinking behind the specific initiative.

Lastly, this initiative does not only share a common baseline with the planned proposal for a revision of the General Vehicle Safety Regulation, but the two initiatives also interlink where vehicle technology relies on infrastructure (e.g. visible road markings to support lane keeping assistance technologies).

#### **4.2. Specific objectives**

To achieve this general objective, four specific objectives have been defined:

SO-1: To foster harmonisation and better use of knowledge sharing between Member States on road infrastructure safety management procedures;

This specific objective takes into account the existence of proven best practice procedures and approach which have been already applied for some time in the best performing Member States and aims to facilitate the transfer of this knowledge to those Member States which still need to catch up and improve the safety of their road infrastructure. SO-1 aims to tackle Problem Driver 1 (Ineffective national procedures and lack of knowledge sharing).

SO-2: To protect vulnerable road users;

This specific objective aims to counter the recent trend whereby vulnerable road users are increasingly involved in road accidents. This trend is going to persist over the years to come because due to environmental and congestion considerations it is projected that more people will walk, cycle and ride motorcycles.

SO-3: To improve the deployment of new technologies on EU road networks;

This specific objective aims to future-proof the legislation and aims to facilitate in particular the roll-out of connected and automated mobility systems.

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<sup>70</sup> This is based on the principle that human beings can and will continue to make mistakes and that it is a shared responsibility for actors at all levels to ensure that road crashes do not lead to serious or fatal injuries.

SO-2 and SO-3 together aim to tackle Problem Driver 2 (Management procedures do not sufficiently take into account vulnerable road users and are not future proof for new technologies).

SO-4: To improve the follow-up on findings of road infrastructure safety management procedures while not imposing excessive costs to Member States.

This specific objective aims to increase transparency and data availability with a view to maximising the positive impact of RISM procedures that are being carried out through better implementation of the most relevant findings. At times of budget cuts, deferring maintenance and investment in the road sector is a relatively quick way to reduce public spending and this has been pursued by a number of EU countries. Therefore, SO-4 aims at improving the follow-up on findings of road infrastructure safety management procedures while not imposing excessive costs to Member States. SO-4 aims to tackle Problem Driver 3 (Findings of road infrastructure safety management procedures are not systematically followed up due to lack of funding).

All four specific objectives aim to address also Problem Driver 4 (Safety procedures not widely applied to non-TEN-T roads). Problem Driver 4 will be addressed by separate options covering the non-TEN-T network

## 5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

Based on the ex-post evaluations of the two EU directives, on the impact assessment support study and on contacts with stakeholders (through targeted consultations, the open public consultation, and meetings), the Commission has identified a number of policy measures to address the main problem drivers as listed above and which are in line with the specific objectives of the initiative. These policy measures have been combined into policy packages (options). In the development of the policy options, the principles of proportionality, efficiency and effectiveness have been the guiding principles.

EU funded road safety projects such as the European SafetyCube project<sup>71</sup>, and relevant international scientific research such as Elvik et al. (2012) and OECD/ITF (2015) were used in order to identify initial policy measures, which were then subjected to a preliminary assessment leading to the choice of retained measures described below.

### 5.1. Description of the retained policy measures

After a preliminary assessment of different policy measures, 14 policy measures were retained. The retained policy measures are presented below organised according to the main problem driver that they aim to address.

#### Problem Driver 1 – Ineffective national procedures and lack of knowledge sharing

No.	Policy measure and policy measure description
1	<p><b>Promote knowledge sharing by publishing national best practices in central EU repository</b></p> <p>All relevant documents would be published on EC's road safety website. These documents may include documentation of national road safety programmes, including guidelines, findings related to applying specific procedures, equipment etc.<sup>72</sup> An important element in this knowledge sharing concerns best practices as regards the implementation of new technological developments (e.g. C-ITS) with a view to maximising their potential contribution to road safety.</p>
2	<p><b>Create a European Forum of Road Safety Auditors</b></p>

<sup>71</sup> <https://www.roadsafety-dss.eu/#/>

<sup>72</sup> An example of such a report is the Danish *Road Safety Audit Handbook* ([www.vejdirektoratet.dk](http://www.vejdirektoratet.dk))

	<p>This measure is based on the already existing European Forum for Tunnel Safety Officers.</p> <p>The Commission could facilitate and support a forum, where experts working with audits and inspections can meet and exchange experiences and ideas. This can lead to the establishment of guidelines that can substantiate the high-level requirements in the legislation (e.g. common methodology for CBA to identify the most relevant safety measures to implement). This will complement the exchange of best practices already undertaken by organisations such as the Conference of European Directors of Roads (CEDR) and the World Road Association (PIARC). Participation in this forum will not be limited to the members of the organisations and it will have a wider outreach.</p>
3	<p><b>Create interface between the Road and Tunnel Directives</b></p> <p>This measure includes the definition of tunnel portal areas and periodic joint inspections of portal areas and road tunnels.</p> <p>Current legislation leaves uncertainties with respect to the portal areas of tunnels, i.e. whether they are inspected as part of the tunnel inspections or as part of the RISM Directive inspections. Joint inspection of tunnels will ensure a stronger focus on unsafe elements in road tunnels, because a road safety specialist will participate in the inspections and will have road safety as their primary focus during the inspections.<sup>73</sup></p> <p>This measure will include a reference in the RISM Directive to establish joint inspections to be carried out periodically in the portal areas of all tunnels over 500 meters on the TEN-T road network.</p> <p>This measure addresses Driver 1 by increasing the knowledge sharing between road and tunnel safety experts and also supports addressing Driver 3 by improving the detection of road safety defects.</p>

### Problem Driver 2 – Gaps in the legislation regarding vulnerable road users and new technologies

No.	Policy measure and policy measure description
4	<p><b>Include clear reference to assessing the safety of vulnerable road users in all road infrastructure safety management procedures</b></p> <p>For road sections that carry significant traffic of motorcycles, cyclists or pedestrians, the safety of each user group should be assessed separately.</p>
5	<p><b>Include clear reference to supporting deployment of C-ITS and automation<sup>74</sup> on the TEN-T in all road infrastructure safety management procedures</b></p> <p>General requirement to be followed up with specific requirements once relevant standards are available.</p> <p>New technologies in vehicles enable them to 'read' the infrastructure and communicate with the infrastructure and other vehicles. This development is happening fast. This measure will require Member States to focus on possibilities to adapt their infrastructure to future technologies. This concerns all procedures: RSA (Road Safety Audits) would ensure that new infrastructure is built such that it accommodates the recent technology developments within C-ITS; RSIA (Road Safety Impact Assessment) procedures would include specific reference to analysis of impacts of the required equipment; RSI (Road Safety Inspections) would generally focus on edge and centrelines markings as well as address possible ways of upgrading existing infrastructure to support the most recent developments.</p> <p>Due to the fast pace of technological developments as regards connected and automated mobility, the measure will not include specific references to technologies nor will it restrict the requirement to certain issues. The formulation is general such that Member States in their procedures must include reference to the most recent information.</p> <p>In addition to addressing Driver 2, this measure supports addressing Driver 1 as well.</p>
6	<p><b>Establish general performance requirements for road markings and road signs on TEN-T</b></p> <p>Road markings are an important part of delineation. They help drivers position themselves on the road laterally and (also in periods of poor light) show the alignment of the road ahead. The type, shape and colour of markings play a role in conveying specific messages to the road user (e.g. overtaking/ barrier</p>

<sup>73</sup> The ECORoads project has demonstrated that the exchange of experience and views between road safety and tunnel safety experts is beneficial and relevant safety factors can be identified during joint inspections.

<sup>74</sup> The terms C-ITS and automation are technology neutral. They comprise all relevant communication technologies and infrastructure.

	<p>lines, yellow lines in work zones etc.).</p> <p>A common minimum standard of how TEN-T roads must be marked will be outlined in the RISM Directive.</p> <p>There are European standards (IS EN 1436, <a href="http://www.nen.nl">http://www.nen.nl</a>) governing the quality of road markings, essentially applying only to new road markings. These European standards, however, do not represent general performance requirements and an evaluation of the standards could lead to a commonly agreed performance level that could be applicable to the TEN-T.</p> <p>The Construction Products Regulation (EU) No 305/2011 foresees the elaboration of harmonised product standards for a number of construction products relevant for road infrastructure safety (e.g. road marking materials and vertical road traffic signs) and obliged the manufacturers of these products to CE mark their products and issue a Declaration of Performance regarding their performance. The Regulation, however, does not impose performance requirements (i.e. thresholds of performance for road barriers) on manufacturers<sup>75</sup>.</p> <p>Article 3(3) of Regulation (EU) 305/2011 allows the Commission if appropriate to determine by means of delegated acts the threshold levels (the minimum or maximum performance levels of an essential characteristic) of a construction product. Such minimum thresholds would, however, apply to all the products manufactured so this would not be the appropriate tool to define general performance levels for road markings (or other construction products) on the TEN-T.</p> <p>Moreover, as road markings may wear and lose their primary function<sup>76</sup>, regular monitoring of road marking performance and preventive maintenance will be outlined in the Directive to ensure that markings always comply with the standards.</p> <p>At the present time there is no EU legislation imposing specifications for harmonised road signs and road markings on Member States. This issue is addressed by the Vienna Convention on Road Signs and Signals of 1968<sup>77</sup>.</p> <p>While today there is no agreement on common requirements concerning signs, the deployment of automated vehicles could lead to a need for a much more harmonised approach, to be aligned with the approach of the United Nations Economic Commission for Europe (UNECE).</p> <p>This particular requirement is aiming at supporting the deployment of new technologies. Clear and consistent road signs and road markings of good quality will be beneficial to automated systems. This potential further need can be addressed through a delegated act that would have to be subject to a separate impact assessment.</p>
7	<p><b>Establish general performance requirements for road furniture on TEN-T (e.g. motorcycle friendly guardrails)</b></p> <p>This measure is about defining minimum standards for the design of roadside elements such as: motorcycle friendly guardrails and frangible road side posts (giving in when hit by a car). A minimum standard is defined for each of such types of furniture using the above-mentioned CEN standards. For some Member States this will require reinstallation of road equipment. A deadline for this reinstallation will be set. Minimum standard requirements for roadside elements along the TEN-T network will serve to improve the safety performance of these elements over time and ensure that these meet the safety specifications, not only when new but also during the lifecycle of the road.</p> <p>Individual Member States have developed national road design standards and guidelines. In the majority of cases these standards and guidelines are unique to the Member States themselves although certain aspects related to guardrails and other furniture are subject to the European Committee for Standardisation (CEN) standards (and include standards such as EN 12767: 2013; EN 1317) and maybe</p>

<sup>75</sup> Article 3(3) of Regulation (EU) 305/2011 allows the Commission if appropriate to determine by means of delegated acts the threshold levels (the minimum or maximum performance levels of an essential characteristic) of a construction product. Such minimum thresholds would, however, apply to all the products manufactured so this would not be the appropriate tool to define general performance levels for road markings (or other construction products) on the TEN-T.

<sup>76</sup> This has been named as a safety problem by a number of organisations (<http://www.irfnet.eu/index.php/publications/position-papers/18-publications/position-papers/173-road-marking-requirements-in-europe>) (EuroRAP; and EuroNcap 2013)

<sup>77</sup> The Vienna Convention is a multilateral treaty designed to increase road safety and aid international road traffic by standardising the signing system for road traffic (road signs, traffic lights and road markings) in use internationally. The Convention was adopted under the auspices of the United Nations Economic Commission for Europe (UNECE). The convention has 69 state parties and most but not all EU Member States are contracting parties. The implementation of the Convention is currently under review by the UNECE. The current multilateral approach has advantages as it is not limited to EU Member States. The Convention, however, does not prevent the EU to agree on further harmonisation and also a more active role of the EU in UNECE meetings could have a positive impact. Given the huge number of road signs across the EU any proposal for further harmonisation would have to be preceded by an appropriate cost-benefit analysis which was beyond the scope of the present impact assessment.

	<p>other standards (such as the international ASTM A741-11:2016). Many of the road elements are renewed at regular intervals. So the requirement is aimed at setting common standards when renewals are made.</p> <p>This measure is in particular addressing the low safety level of vulnerable road users such as motorcyclists.</p>
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### Problem Driver 3 – Findings of RISM procedures are not systematically followed up

No.	Policy measure and policy measure description
8	<p><b>Make information about procedures publicly available</b></p> <p>To increase transparency and increase pressure for eliminating deficiencies.</p> <p>Information can be published at different level of detail. Many Member States are already publishing annual reports about the general safety levels on national roads<sup>78</sup>. Detailed reports of individual inspections or audits are generally not published though, according to the responses received from national authorities in the stakeholder consultation.</p> <p>This measure would require Member States to publish information as regards the number of different RISM procedures carried out and about the number of recommendations resulting from these procedures (without publishing the actual recommendations and the number of recommendations actually implemented). This measure is expected to alleviate the lack of data as regards the actual safety management of roads.</p> <p>In addition to addressing problem driver 3, this measure supports mitigating Driver 1, by promoting exchange of experiences and knowledge as well as increasing the awareness of road users.</p>
9	<p><b>Obligation to compile a risk-based prioritised action plan</b></p> <p>Follow-up actions and their timings are to be determined using a risk-based approach.</p> <p>The current provisions of the Directive do not make the implementation of recommendations following a RSA or RSI compulsory. This is appropriate since it is not the task of the auditor or inspector to take over the design role, but rather to highlight potential safety defects and to give the road authority/designer the opportunity to devise improvements. In certain instances, a road authority may have sufficient arguments not to adopt recommendations. Under this policy option, it may continue to do so provided that this is motivated and documented.</p> <p>This measure intends to ensure that a larger proportion of RSA and RSI recommendations are implemented in new road design and in upgrading or improvement projects.</p> <p>In addition, this measure also addresses Driver 1 through publications, increased knowledge sharing and stronger focus on solving the detected safety defects.</p>
10	<p><b>Carry out network-wide safety inspections/road assessment programmes</b></p> <p>This measure requires Member States to set up a road assessment programme and carry out network-wide safety inspections and star rate the roads.</p> <p>Network-wide safety inspections (which are also known as road assessment programmes or RAP) do not only focus on already known dangerous road sections ("black spots" or "high risk sites"), but provide a framework to improve the general safety performance of the road network. The purpose of road assessment programmes is to rank elements of a road network based on road safety and identify infrastructure or traffic related factors increasing accident or injury risk<sup>79</sup>.</p> <p>A road assessment programme will systematically map the risk levels of the roads, identify safety defects and provide the basis for safety rating of roads. The assessment programs will lead to the preparation of risk-based safer roads investment plans identifying cost-effective countermeasures for detected deficiencies. This will in turn lead to an increased follow-up of findings and will help address the impact of Driver 3.</p> <p>Road assessment programmes are a proactive tool to implement the Safe System approach across the entire road network concerned as opposed to concentrating reactively on isolated accident black spots or</p>

<sup>78</sup> 13 out of 22 responses to the stakeholder questionnaire referred to publication of results on safety levels annually. Some mainly consist in an overview of safety levels, some contain maps showing where accidents and/or safety issues are identified. In Switzerland the specific reports (RSI and RSA, RSIA) can be obtained upon demand. No other country has indicated a similar possibility.

<sup>79</sup> OECD/ITF 2015

	<p>localised road safety inspections.</p> <p>There are a number of different methodologies to assess the safety performance of roads. These fall into the reactive and proactive categories, with the former being based on approaches using crash data as a primary source of analysis to develop outputs such as risk maps, black spot (high crash) locations and crash types. The proactive tools aim to assess the state of a road more from the Safe Systems perspective, which is based on extensive historical research, making use of evidence that certain conditions lead to higher risk for crashes. These proactive tools make use of visual inspections to assess a number of road design related variables and to use these to develop an overall safety rating of the road.</p> <p>Safety rating of roads adds transparency for road users, but also helps designers and operators of the system to improve it.</p> <p>Member States will have to describe the methodology they intend to use. This can be an existing international methodology such as the iRAP/EuroRAP programme<sup>80</sup>, existing national programmes or methodologies that will be developed specifically for this purpose. Consistent star rating of roads across the EU would, however, require a common methodology to be agreed at EU level. This is not excluded under this option as a possible second step.</p> <p>As part of the measure, the RISM Directive will clarify that carrying out a road assessment programme may replace some of the RSIs that should have been performed.</p>
11	<p><b>Implement corrective actions to meet minimum safety levels across the TEN-T</b></p> <p>This measure requires Member States to achieve a minimum safety level on TEN-T roads. This includes the obligation to carry out road assessment programmes (measure 10).</p> <p>To ensure a common reference for the minimum rating, the measure requires a common rating approach. It is proposed that this approach should be based on EuroRAP star ratings.<sup>81</sup></p> <p>The EuroRAP star rating has five levels. For this measure the minimum standard is set at three stars as a commonly used reference point.</p> <p>An example of the target could be to aim to ensure that at least 80% of the network concerned will reach a minimum of 3 stars or above by an agreed date.</p> <p>This measure ensures that Member States follow up on the findings in the procedures and invest in higher road safety levels of the infrastructure.</p>

#### Problem Driver 4 – RISM procedures not widely applied to non-TEN-T network

No.	Policy measure and policy measure description
12	<p><b>Conditionality of EU funds</b></p> <p>This measure turns what is a recommendation in the current Directive into an obligation.</p> <p>The conditionality of EU funds would require that the provisions of the RISM Directive have to be applied to any part of the national road transport infrastructure if it is built using EU funding in whole or in part.</p>
13	<p><b>Apply the provisions of the <u>current</u> RISM Directive to main national roads</b></p> <p>Member States must apply the RISM procedures also for their main national roads. This implies that all new or refurbished national roads will be subject to RSA, national roads will be included in the network safety management procedures for identification of high risk locations, and national roads will be included in the inspection programme.</p>
14	<p><b>Application of policy measures 8-10 to main roads outside TEN-T</b></p> <p>The extension of these policy measures to main/national roads that are not part of TEN-T address problem driver 4.</p> <p><i>As part of this measure, some, but not all of the additional policy measures to be applied to TEN-T roads would also be applied to main/national roads.</i><sup>82</sup></p>

<sup>80</sup> <http://www.eurorap.org/protocols/>

<sup>81</sup> Another common assessment methodology can obviously be proposed as well. However, currently no other such generally accepted procedures are established.

<sup>82</sup> The notable exception is the establishment of minimum safety standards for TEN-T road (policy measure number 11) which would only be applicable to TEN-T roads even under this scenario.



## 5.2. Options discarded at an early stage

The policy measures that were included in the preliminary analysis but were later discarded are presented below providing also the reasons for discarding them.

No.	Discarded policy measure	Reason for discarding
1	Prescribe specific approaches and standards for how to undertake RISM procedures	Revisions that include the requirement to carry out RISM procedures using specific standards and approaches would not respect the proportionality and subsidiarity principles. It would not be possible to accommodate the geographical, organisational and administrative specificities of the different Member States, and no specific approach could guarantee high effectiveness and efficiency across all Member States. This measure would have addressed problem driver 1.
2	Require mutual recognition of road safety auditor certificates	Most Member States accept the certificates issued in other Member States, some, however, require national training to be undertaken to understand and learn about local legislation, procedures and conditions. The impact assessment has not found evidence that the requirement from some Member States for national training hinders the effective implementation of RISM procedures. This measure would have addressed problem driver 1.
3	Extending the scope of the RISM Directive to include all roads	There are about 5 million kilometres of roads in the EU, about half of them in urban areas. Beyond the main national roads managed by national road authorities, the responsibility for regional and local rural roads and urban roads is scattered across many thousands of authorities (regional authorities, local councils etc.). Because of reasons of subsidiarity, proportionality and efficiency it is considered that EU road infrastructure safety management legislation should not be extended beyond the high traffic national road networks managed by national road authorities. This measure would have addressed problem driver 4.

## 5.3. Description of the policy options

The retained policy measures were combined into six policy options (in addition to the baseline scenario), addressing policy objectives and tackling problem drivers, but with different levels of ambition. The precise measures and level of ambition of each policy option are described below.

All policy options are compared to the baseline scenario (Policy option 0). Policy options limiting the policy intervention to the TEN-T (Policy options 1-3) and those that extend the scope beyond the TEN-T (Policy options A-C) are assessed separately. Due to the complementary nature of road infrastructure safety management measures, Options 1 to 3 are alternatives, but build on one another in an incremental way. Similarly, the policy options extending the policy interventions beyond the TEN-T are alternatives, but build on one another: Option A can be implemented on its own. Option B includes Option A. Option C builds on and includes Option B.

All legislative measures in all policy options are limited to the revision of provisions of the RISM Directive. None of the policy options involve the revision of the Tunnel Directive (see section 2.4 above).

### 5.3.1. Policy option 0: Baseline scenario

Policy option 0 reflects developments under current trends and adopted policies (i.e. the baseline scenario) as described in section 2.5. This option assumes that Member States continue to apply current EU road infrastructure safety management legislation as they do today. No further action at EU level is assumed in policy option 0.

### *5.3.2. Policy option 1: Light intervention within current scope – on TEN-T*

Policy option 1 covers minimum change at minimum cost, taking into account forthcoming technological changes and proposing limited legislative changes which are relatively easy and quick to implement. It builds on the baseline scenario firstly by adding non-legislative, "soft" measures such as the promotion of knowledge sharing and exchange of best practices with a view to supporting the effectiveness of the management procedures already included in the RISM Directive. Secondly this policy option also introduces legislative measures to improve the transparency of road infrastructure safety management procedures; introduces a clear requirement to focus on assessing the safety of vulnerable road users in RISM procedures; and includes a requirement that RISM procedures review how the road infrastructure can support new technologies such as the deployment of C-ITS and automation. Finally, an improved interface between the RISM and Tunnel Directives is created through the revision of the RISM Directive with a particular focus on portal areas (the areas where open road and tunnel connect) and on joint inspections of tunnels and portal areas involving both road and tunnel personnel.

The scope of the legislation in this policy option remains limited to the TEN-T.

In the Open Public Consultation, there was broad support for the measures proposed in this option, but respondents in general only expected a limited effect on road safety.

### *5.3.3. Policy option 2: Moderate intervention within current scope – on TEN-T*

This policy option goes further to include elements of the Safe System approach such as network-wide safety inspections but also general performance requirements for certain road infrastructure components to facilitate the smooth roll-out of cooperative, connected and automated mobility. It also aims to address the lack of consistent and comparable data as regards the safety level of the road network. This policy option also includes the introduction of an additional RISM procedure, the road assessment programme, in the EU legislation. The guiding principle behind Policy option 2 is that EU legislation would require Member States to conduct and properly follow-up proactive RISM procedures to identify a wide range of potential road infrastructure risks, but Member States would retain flexibility to set the desired level of road infrastructure safety. The choice of appropriate technical solutions would also remain with Member States with EU legislation only setting general performance requirements where required by the smooth roll-out of CCAM.

Policy option 2 builds on Policy option 1 and focuses on ensuring that the safety deficiencies identified by RISM procedures are actually addressed by appropriate actions. It therefore includes further legislative measures such as the compulsory follow-up of RISM procedures using a plan based on risk-based prioritisation of actions, introduces a requirement for network-wide safety inspections (also known as road assessment programmes) which provide an objective and comparable measurement of the actual built-in safety level of roads and aims to establish general performance requirements for road markings and potentially road signs on TEN-T roads. Policy option 2 represents a more proactive approach to road infrastructure safety in line with the proposed framework for road safety 2020-2030 focusing on the implementation of the necessary road safety countermeasures to address identified road infrastructure deficiencies. This option also foresees the possibility of the harmonisation of road signs which might be necessary due to technological developments.

The scope of the legislation remains limited to the TEN-T.

In the Open Public Consultation, 47% of respondents fully agreed that the safety of road infrastructure should be measured across the EU using comparable methodologies while 41% rather agreed with this proposition. The Open Public Consultation also showed wide support

for performance requirements concerning the visibility of road markings (47% fully agree, 41% rather agree) and concerning the visibility of road signs (45% fully agree, 43% rather agree).

NGOs and private entities strongly support road assessment programmes. While many Member States' authorities are reluctant to a mandatory approach, they also in general agree with the positive effect of network-wide road assessment programmes. In the 8 November 2017 meeting of the RISM Committee, disagreements were mostly limited to the question of which particular methodology to use<sup>83</sup>.

#### 5.3.4. Policy option 3: Ambitious intervention within current scope – on TEN-T

This is an ambitious policy option setting a minimum safety level to be achieved on TEN-T roads and defining additional general performance requirements for road furniture. This represents a results-oriented approach which can be used to achieve a uniform level of minimum safety across the whole TEN-T network. The minimum level of safety to be achieved would be set at EU level. Member States would retain flexibility on the choice of road infrastructure safety countermeasures.

Policy option 3 builds on Policy option 2 and includes a further legislative measure to ensure that roads fulfil certain minimum safety rating requirements. It also aims to establish general performance requirements for certain road furniture (motorcycle-friendly guardrails on road sections with significant relevant traffic).

The scope of the legislation remains limited to the TEN-T.

In the Open Public Consultation, 45% of respondents fully agreed that minimum road infrastructure safety requirements should be established for roads that are part of the TEN-T network while 25% rather agreed. However, there were also 24% of respondents who strongly disagreed with the latter proposition. Individual responses included the following: *"Due to the travelling between countries within Europe, the drivers shouldn't face different 'environment' (...). Thus, comparable methodologies are needed."* and: *"Setting any requirements on Member States of the EU, it puts financial strain on countries where there is insufficient funding for the road network."*<sup>84</sup> While NGOs typically support compulsory minimum road infrastructure safety requirements for the TEN-T, many national road authorities disagree with the idea and doubt the feasibility of implementation.

Table 3: Linking policy measures to policy options within the current scope - Measures only apply to the TEN-T road network

No.	Measures	PO 0	PO 1	PO 2	PO 3	Problem driver addressed	Specific objective addressed
1	Promote knowledge sharing by publishing national best practices in central EU repository*		x	x	x	Driver 1	SO1
2	Create a European Forum of Road Safety Auditors*		x	x	x	Driver 1	SO1
3	Create interface between the RISM and Tunnel Directives		x	x	x	Driver 1 and 2	SO1
4	Include clear reference to assessing safety of vulnerable road users in all road infrastructure safety mgmt. procedures		x	x	x	Driver 3	SO2

<sup>83</sup> Many Member States are using the EuroRAP methodology for road assessment programmes but some Member States have developed their own methodologies which they would prefer to continue to use.

<sup>84</sup> Overview report on the Open Public Consultation, COWI 2017, pp. 41-43.

No.	Measures	PO 0	PO 1	PO 2	PO 3	Problem driver addressed	Specific objective addressed
5	Include clear reference to supporting deployment of C-ITS and automation on the TEN-T in all road infrastructure safety management procedures		x	x	x	Driver 3	SO3
6	Establish general performance requirements for road markings on TEN-T			x	x	Driver 2 and 3	SO3
7	Establish general performance requirements for road furniture on TEN-T (e.g. motorcycle friendly guard rails)				x	Driver 2	SO2
8	Make information about procedures publicly available		x	x	x	Driver 1 and 2	SO4
9	Obligation to compile a risk-based prioritised action plan			x	x	Driver 2	SO4
10	Carry out network-wide safety inspections/road assessment programmes			x	x	Driver 2 and 3	SO4
11	Implement corrective actions to meet minimum safety standards				x	Driver 2 and 3	SO4

\* These measures are soft (=non-legislative) measures

Contrary to Policy options 1-3, Policy options A, B and C all involve some extension of the procedures of the RISM Directive beyond the TEN-T. Of the policy options that involve an extension of scope, only Option A and Option B can be applied on their own. Options C can only be applied in combination with Option 2 or 3. This is because Option C includes policy measures which are not applied under the current Directive<sup>85</sup>.

The extensions are restricted to main or national roads which are typically represented by the primary road networks of the Member States. As an EU-wide harmonised common definition of this road category does not exist, a prerequisite for their implementation is the identification of roads that can be categorised as main/national roads.

The possible extension of the field of application beyond the TEN-T network proved to be the most controversial point in the Open Public Consultation. 37% of respondents stated that the scope of the legislation should remain limited to TEN-T. The remainder of respondents were roughly equally divided between the options of extending the application to "all roads", to "all main or national roads" and to "road infrastructure of European importance". Looking at the results by type of respondent, private enterprises and NGOs mainly consider that all roads or all main/national roads should be in the scope of EU legislation, whereas regional and local authorities prefer to see the scope limited to TEN-T.<sup>86</sup>

Motorway operators were supportive of an extension, arguing that legislation only on TEN-T roads would lead to over-legislation on the safest roads, whereas the most dangerous roads were not addressed. The ETSC even favoured an extension to all main rural and main urban roads. This was required in view of the new objective to focus on reducing serious injuries as well as deaths (because a larger proportion of injuries occur in urban areas) and because citizens should be entitled to equal levels of safety on all roads.

<sup>85</sup> The guiding principle in the design of options being that only those policy measures can be extended to main roads beyond the TEN-T which are applied on TEN-T roads.

<sup>86</sup> Overview report on the Open Public Consultation, COWI (2017), pp. 36-37.

### *5.3.5. Policy option A: Conditionality of EU Funds on main/national roads*

This policy option has a very specific focus as it aims to ensure that RISM procedures are fully applied when national road infrastructure is upgraded, using EU funds. Policy option A would transform a recommendation in the current Directive into a legal obligation for Member States. Option A includes one single legislative measure stipulating that any road project on the national road network financed fully or partly with EU funds would have to be subject to the procedures prescribed in the RISM Directive. This policy option would only have an impact on Member States that have not yet extended the application of the RISM procedures to cover their national road networks on a voluntary basis. It is assumed that those Member States that have extended the application of the RISM procedures to their national road network already fulfil the recommendation to apply the procedures to EU-funded road transport projects on their national road transport infrastructure.

Policy option A can be applied on its own without being combined with any of the options 1-3. It conditionally extends the scope of the current RISM Directive beyond the TEN-T.

### *5.3.6. Policy option B: Extension of current RISM provisions to main/national roads*

Policy option B aims to ensure that the already established RISM procedures are applied on a wider road network specifically including the busy roads of Member States' primary road network. This policy option represents a moderately ambitious mandatory extension of the scope of the procedures of the current RISM Directive. The application of new additional RISM procedures is not foreseen. This policy option would only have an impact on Member States that have not yet extended the application of these procedures on a voluntary basis.

Policy option B consists in making the procedures of the current RISM Directive, namely Road Safety Impact Assessments, Road Safety Audits, Road Safety Inspections and Network Safety Management, mandatory for the national/main roads outside the TEN-T network. This policy option includes Policy option A which would only cover projects that are funded by the EU. Option B applies RISM procedures on all roads of the primary network irrespective of whether they were constructed using EU funds or not.

Option B can be applied on its own without being combined with any of the options 1-3. While theoretically this policy option could also be applied in combination with Policy options 2 or 3, in practice such combinations would involve the application of different RISM procedures on different interconnecting parts of the road network. This may result in unnecessary complexity and potential confusion for the road authorities.

### *5.3.7. Policy option C: Extension of Option 2 measures to main/national roads*

Policy Option C aims to apply the philosophy of proactive network-wide road safety management also to Member states' primary road networks. This policy option represents a more ambitious extension of the application of the revised RISM procedures to a larger network of roads beyond the TEN-T.

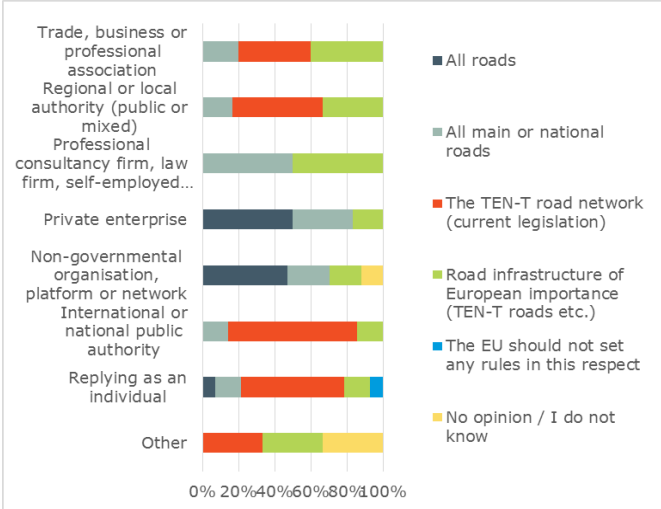
Policy option C builds on Policy option B and extends the measures outlined under Option 2 (moderate intervention) above to main/national roads. This includes in particular making information about procedures publicly available, the obligation to compile a risk based prioritised action plan and the obligation to carry out network-wide safety inspections. It does, however, not foresee a uniform minimum level of safety to be set at EU level and achieved by Member States for the primary road network.

This policy option can be used in combination with either Policy option 2 or 3. If used in combination with Policy option 2, the same requirements would apply to all roads in the scope of the RISM Directive. If used in combination with Policy option 3, the measures providing for minimum safety rating requirements for roads would not apply to non-TEN-T roads.

The results of the public consultation indicate differing views as regards the ideal geographical scope of EU road infrastructure safety management legislation where preferences are very much determined by the type of respondent. While private enterprises and NGOs advocate an extension to all main or national roads or even to all roads in the EU, Member State authorities and road administrations in particular tend to favour the current scope and do not favour a mandatory extension of RISM procedures beyond the TEN-T.

Bearing these mixed reactions in mind, it is clear that road infrastructure safety management procedures at EU level should also be proportionate, they should provide Member States with the necessary flexibility to implement specific procedures that are best suited for local circumstances and they should not add unnecessary administrative burden on national authorities.

Figure 9: Responses by type of organisation to OPC question "In your opinion, what should be the scope of EU legislation in the area of road infrastructure safety management?"



The table below shows an overview of the policy options that aim to address the problems of unsafe road infrastructure outside the TEN-T. The baseline option for these policy options is the preferred option selected for TEN-T with the baseline for non-TEN-T. Policy measures 12 and 13 are additional policy measures which specifically apply to non-TEN roads whereas policy measures 8-10 are the same policy measures that are applied to TEN-T roads in Policy option B.

Table 4: Linking policy measures to policy options going beyond the current scope - Measures apply to main/national roads outside the TEN-T

No.	Measures	PO 0	PO A	PO B	PO C	Problem driver addressed	Specific objective addressed
12	Conditionality of EU Funds (CEF and Cohesion Funds)		x	x	x	Driver 1 and 4	SO 1,2,3
13	Apply the provision of <u>current</u> RISM Directive to national roads			x	x	Driver 1 and 4	SO 1,2,3
8	Make information about procedures publicly available				x	Driver 1, 2 and 4	SO4
9	Obligation to compile a risk-based prioritised action plan				x	Driver 2 and 4	SO4

No.	Measures	PO 0	PO A	PO B	PO C	Problem driver addressed	Specific objective addressed
10	Carry out road assessment programmes				x	Driver 2, 3 and 4	SO4

## 6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

The main impacts of the initiative are expected to be social and economic, whereby most benefits will materialise in the form of a reduced number of fatalities and serious injuries resulting from improved road safety management measures. Costs will be incurred through the application of road infrastructure safety management procedures (road safety inspections, road assessment programmes etc.) and the costs associated with the resulting implementation of findings by means of upgrading the road infrastructure concerned.

Because of the significant difference in the geographical scope of the road networks concerned, the social impacts of options which assume a continued focus on TEN-T only (Options 1-3) and the options which involve an extension beyond the TEN-T (Options A, B and C) are analysed separately.

The general assumption across all countries and types of measures is that the impacts on reductions in fatalities and injuries (the benefits) will gradually be obtained over a 10 year period although many of the most cost-effective low cost interventions can be implemented in a shorter period. The same assumption is applied to the investments related to the measures. This is because the identification of safety defects does not imply that immediate action is taken to correct these defects. Often, due to operational and financial limitations, some time passes before a project can be started. Road authorities have to plan their interventions in advance and Member States have a budget for road safety – typically as part of an overall budget for road renewals and maintenance. It means that it is reasonable to assume that not all identified and confirmed defects are dealt with immediately, they will be prioritised and will be addressed gradually over time, and the effects equally will flow over time.

A model suite has been used for assessing the impacts. The PRIMES-TREMOVE transport model and a specific model developed by TRL in the programming language Python have been used to develop the Baseline scenario. In addition, an excel-based tool was developed by COWI to assess the impacts of the policy options. The tool covers each EU Member State individually and distinguishes between the TEN-T and non-TEN-T network, drawing on the CARE database<sup>87</sup> and the TENtec information system<sup>88</sup>. The main sources used for the estimation of impacts on the number of fatalities and serious injuries in the COWI tool are: the Safety Cube project<sup>89</sup> and the Handbook of Road Safety Measures<sup>90</sup>. Further explanations on the methodology used are provided in Annex 4 on Analytical methods.

### 6.1. Impacts of policy options targeting TEN-T (Policy options 1 to 3)

#### 6.1.1. Social impacts

The main effect of the policy options is the reduction in the number of fatalities and serious injuries from road crashes. This effect is achieved either through a reduction in the number of road crashes or through a reduction in the impact on the persons involved in the crashes. These further have impacts on public or private health costs, production loss etc. They are included in the monetisation of fatalities and of serious injuries.

<sup>87</sup> Source: [https://ec.europa.eu/transport/road\\_safety/specialist/statistics\\_en](https://ec.europa.eu/transport/road_safety/specialist/statistics_en)

<sup>88</sup> Source : [https://ec.europa.eu/transport/themes/infrastructure-ten-t-connecting-europe/tentec-information-system\\_en](https://ec.europa.eu/transport/themes/infrastructure-ten-t-connecting-europe/tentec-information-system_en)

<sup>89</sup> See e.g. Filtness A. & Papadimitriou E. (Eds) (2016), Identification of Infrastructure Related Risk Factors, Deliverable 5.1 of the H2020 project SafetyCube.

<sup>90</sup> Elvik, R., T. Vaa, A. Hove and M. Sorensen eds. (2012) The Handbook of Road Safety Measures: Forth Edition in Norwegian Second ed. In English, 2009.

The assumptions used in the quantification of each policy option and the detailed results by Member State are provided in the Annex 4 "*Analytical methods*" and further in the Impact Assessment Support Study.

Policy option 1 (PO1), reflecting light intervention – best practice sharing, publication of information about procedures, would result in a reduction by 1% in the number of fatalities on TEN-T roads (0.1% reduction for the whole road network) and 0.9% of serious injuries (0.1% decrease for the whole road network) in 2030 relative to the baseline (representing an absolute reduction of 14 fatalities and 116 serious injuries). The estimated reduction in fatalities and serious injuries is due to the increased focus of RISM procedures on the safety of vulnerable road users, in particular motorcyclists.<sup>91</sup> At Member State level, the impacts on fatalities and serious injuries range between 1.5% reduction in Greece in 2030 relative to the baseline and 0.6% in Luxembourg, the Netherlands and Slovenia. Overall, PO1 delivers an estimated reduction of 0.8 billion euros in the social costs of road traffic accidents by 2050 (expressed as present value), based on the application of social unit costs of fatalities and serious injuries to the above-calculated reduction.

Policy option 2 (PO2), covering moderate intervention – mandatory follow-up and network-wide inspections, is projected to lead to a more significant reduction in the order of 8.8% for fatalities on TEN-T roads (0.6% decrease for the whole road network) and 6.5% of serious injuries (0.4% decrease for the whole road network) in 2030 relative to the baseline (representing an absolute reduction of 129 fatalities and 815 serious injuries). The impacts of PO2 are mainly due to better follow-up of the findings of existing RISM procedures and to the positive effects of running road assessment programmes in addition to the existing procedures. General performance requirements for road markings contribute to these positive results. Policy option 2 has a relatively low effect in some countries (e.g. 3.2% reduction for Sweden, 1.6% reduction for the Netherlands, 2.6% decrease for the UK). This is because these countries already apply road assessment programmes and have high safety levels on their TEN-T roads. When the impacts of PO2 are monetised, the savings amount to approximately 5.4 billion euros by 2050 (expressed as present value). Total savings are highest in countries with large road networks such as Germany and Italy, but Greece would also experience significant social cost savings.

Policy option 3, covering ambitious intervention – minimum star rating, shows a significant reduction in the number of fatalities and serious injuries: 13.8% decrease in fatalities on TEN-T roads (0.9% decrease for the whole road network) and 8.6% of serious injuries (0.5% decrease for the whole road network) in 2030 relative to the baseline (204 fatalities and 1076 serious injuries). The distribution of the impacts is to a large extent similar to that in PO2, where countries with large road networks or a relatively high number of fatalities and injuries in the baseline would experience a higher total impact. The relative impact is highest in countries with a relatively low safety rating of roads in the baseline (e.g. Greece, Hungary and Romania). The higher reduction in the number of fatalities and serious injuries compared to PO2 is mainly due to the compulsory improvements to road infrastructure which would be carried out to meet minimum safety requirements on the road network concerned. This is complemented by general performance requirements for road furniture (guardrails). The estimated social cost saving resulting from the reduction in the number of fatalities and serious injuries is 6.9 billion euros by 2050 (expressed as present value).

While all three policy options deliver a reduction in social costs by 2050 (expressed as present value), the impacts of PO2 (5.4 billion euros) and PO3 (6.9 billion euros) are an order of magnitude larger than the impact of PO1 (0.8 billion euros).

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<sup>91</sup> Due to the level of quantification of the impact of many elements of this option, the overall impact is possibly slightly underestimated.



## 6.1.2. Economic impacts

### (a) Regulatory costs

The main economic impact of the policy options relates to the regulatory costs associated with the policy measures. These regulatory costs include in particular:

- Compliance costs related to the costs of using the road infrastructure safety management procedures (carrying out road safety inspections, road safety audits, road assessment programmes etc.) and to implementation costs related to making the necessary improvements to the road infrastructure (maintenance type and investment type costs)
- Administrative costs borne by businesses, citizens, civil society organisations and public authorities as a result of administrative activities performed to comply with information obligations included in legal rules. In this case the costs are imposed on national public administration to fulfil the reporting obligations of the Directive.
- Enforcement costs representing the resources that authorities need to monitor and enforce the legislation. As the RISM Directive put the responsibilities for compliance directly on national road authorities, no enforcement costs are expected.

While the unit cost of RISM procedures can be quite stable (notwithstanding the differences in labour costs between Member States), the implementation part of compliance costs will always depend on the actual condition of the infrastructure and the specific infrastructure countermeasures required to address the safety shortcoming detected by the procedures carried out. Therefore, significant differences in total compliance costs are expected between Member States.

Using the cost assumptions and the data on the length of TEN-T roads, the compliance costs for Policy options 1 to 3 at EU level (where the scope of the legislation is limited to TEN-T) over the period 2020-2050 are presented in Table 5. The costs represent the present values of one-off and recurring costs where recurring costs also include the cost of reporting. Recurrent costs are estimated at 10,000 euro annually per Member State for Policy option 1, 2 and 3. The detailed assumptions for estimating these costs are presented in the Impact Assessment Support Study while the costs by Member State are presented in the Annex 4 "*Analytical methods*".

Table 5: Compliance costs in million euro (TEN-T roads), over the period 2020-2050

EU level	Policy option 1	Policy option 2	Policy option 3
Compliance costs	103	2,004	5,563

As the scope of the measures increase, so does the cost of compliance. The major part of the compliance costs associated with PO2 and PO3 are the costs of the infrastructure upgrades resulting from the improved follow-up of RISM procedures and in case of PO3 specifically the infrastructure costs required for all the TEN-T roads to meet the agreed minimum safety requirements.

Given the persisting budgetary pressures to reduce government spending overall in many Member States, it is important to assess whether EU and national resources will be able to cover the financing needs to be addressed. It is therefore important to estimate the compliance costs associated with the various policy options as a share of GDP for each Member State.

Differences between costs by Member State are due to the length of the roads concerned and their current level of safety. For example, as a share of GDP costs are higher especially in Eastern and Southern Europe where the safety level is currently lower (i.e. Bulgaria, Cyprus,

Estonia, Greece, Croatia, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia). Table 6 shows the compliance costs in million euro by EU country in 2030 relative to the baseline. Overall, compliance costs in PO3 are almost 3 times higher than those of PO2. However, all policy options for all Member States result in compliance costs below 0.1% of GDP in 2030<sup>92</sup> relative to the baseline.

Table 6: Compliance costs in million euro (TEN-T roads) by EU country in 2030

Member State	Policy option 1	Policy option 2	Policy option 3
AT	0.2	0.3	10
BE	0.2	7.8	12.1
BG	0.1	9.6	35.1
CY	0	2	3.7
CZ	0.1	5	8.9
DE	1.5	1.6	72.1
DK	0.3	6.2	3
EE	0.1	5.2	9.6
EL	0.3	18.7	42.3
ES	1.3	1.3	27.7
FI	0.5	8.5	9
FR	1.9	62	69.7
HR	0.1	2.1	7.7
HU	0.1	3.7	9.3
IE	0.2	0.3	11.9
IT	1.3	27.7	97.9
LT	0.1	2	14.1
LU	0	0.1	0.5
LV	0.1	4.5	12.1
MT	0	0.4	0.9
NL	0.3	0.3	0.3
PL	0.3	17	55.7
PT	0.2	11.5	18.3
RO	0.2	13.3	37.7
SE	0.7	0.7	0.7
SI	0.1	0.8	1.5
SK	0.1	2.9	8
UK	0.8	1	24.4
<b>EU28</b>	<b>11.1</b>	<b>216.5</b>	<b>604.2</b>

(b) Other economic impacts

Proper follow-up of road infrastructure safety management procedures in general and road assessment programmes in particular will result in many relatively small scale interventions aimed to upgrade the safety of the existing road network. Such activities are typically carried out by SMEs, who are therefore likely to benefit from the initiative. Due to the relatively

<sup>92</sup> The share is derived using the projected GDP for 2030 in the baseline scenario.

localised nature of these activities, no impacts are expected on the competitiveness of EU companies.

### 6.1.3. Environmental impacts

The measures might have small positive environmental impacts. Fewer road crashes could marginally improve the overall flow of traffic on TEN-T roads. This might reduce congestion and thus energy consumption and air emissions from road traffic. Measures that reduce speed in order to improve the safety of certain road or tunnel sections might also reduce energy consumption and air emissions. However, these impacts are expected to be very limited and they are thus not quantified.

## 6.2. Impacts of policy options targeting an extended road network (Policy options A to C)

### 6.2.1. Social impacts

Similarly to the Policy options 1 to 3 that limit the application of policy measures to TEN-T, the major effect of the policy options which involve an extension of the scope of the RISM Directive is the reduction in the number of road fatalities and serious injuries. The assumptions used in the quantification of each policy option and the detailed results by Member State are provided in the Annex 4 "*Analytical methods*" and further in the Impact Assessment Support Study.

Policy option A, covering the conditionality of EU funds, would result in very limited reduction in the number of fatalities and serious injuries in 2030 relative to the baseline at EU level.<sup>93</sup> Policy option A provides social benefits in Member States where national road infrastructure outside the TEN-T is being upgraded using EU funding and where the RISM procedures are not currently applied beyond the TEN-T. The size of the overall impact is small (less than 0.5 billion euros by 2050, expressed as present value). This is due to the limited length of the road infrastructure covered.

Policy option B, including the extension of current RISM provisions to main/national roads, is projected to deliver about 1.8% reduction in the number of fatalities on non-TEN-T motorway and main roads (0.4% decrease for the whole network) and 0.8% cut in the serious injuries (0.2% decrease for the whole network) in 2030 relative to the baseline (83 fatalities and 418 serious injuries). By 2050, Policy option B provides significant social benefits in countries where RISM procedures have not been extended to non-TEN-T roads so far. It is assumed that Policy option B will not have any impact on those Member States that already apply RISM procedures on non-TEN-T national roads. Overall, the estimated social cost saving resulting from the reduction in the number of fatalities and serious injuries is 3.3 billion euros by 2050 (expressed as present value).

Policy option C, covering the extension to main/national roads including network-wide inspections, shows the highest impacts: about 9.4% reduction in the number of fatalities on non-TEN-T motorway and main roads (1.9% decrease for the whole network) and 5.6% cut in the serious injuries (1.2% decrease for the whole network) in 2030 relative to the baseline (433 fatalities and 2,860 serious injuries). The estimated social cost saving resulting from the reduction in the number of fatalities and serious injuries is approximately 20 billion euros by 2050 (expressed as present value).

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<sup>93</sup> The length of the roads concerned by the measure has been estimated on the basis of the data presented in the table below assuming that in the baseline period from 2020 to 2050, the same length of roads will be constructed or reconstructed as the length planned for ESIF 2014-2020. This assumption is in the upper range of what may be expected to happen as the absolute level of EU funding dedicated to the construction of new roads is unlikely to increase in the future in the light of other transport priorities (e.g. decarbonisation of transport).

In summary, all policy options are effective in reducing road transport casualties, but to a different extent. While the size of the impact of Policy option A is very limited, Policy option B delivers a significant impact. Policy option C delivers by far the biggest reduction in fatalities and serious injuries among the options concerned and thus the highest impact on social cost savings.

### 6.2.2. Economic impacts

#### (a) Regulatory costs

For the policy options involving a change in the scope of the legislation (to include roads beyond the TEN-T), the compliance costs at EU level for 2020-2050 are presented in Table 7, while the results at Member State level are provided in Annex 4. The costs represent the present values of one-off and recurring costs where recurring costs include the cost of reporting. Recurrent costs are estimated at 30,000 euro annually per Member State for Policy options B and C.

Table 7: Compliance costs in million euros for Policy options A to C, 2020-2050

EU level	Policy option A	Policy option B	Policy option C
Compliance costs	203.3	257	7,440

The compliance costs for all policy options include the compliance costs associated with the necessary upgrade of the road infrastructure concerned. The much higher compliance costs for Policy option C relative to Policy options A and B are largely the result of the implementation of the findings of road assessment programmes.

The distribution of the costs by Member State is influenced by the length of road (some Member States have very large primary road networks) and by the current state and safety level of the existing road infrastructure in the scope. Table 8 shows the compliance costs in million euro by EU country in 2030 relative to the baseline. All policy options for all Member States result in compliance costs below 0.1% of GDP in 2030<sup>94</sup> relative to the baseline.

Table 8: Compliance costs in million euro (TEN-T roads) by EU country in 2030

Member State	POA	POB	POC
<b>AT</b>	0	0	0
<b>BE</b>	0	0	26.4
<b>BG</b>	0	0	3.9
<b>CY</b>	0	0	2.4
<b>CZ</b>	0	0	13.2
<b>DE</b>	0	0	0
<b>DK</b>	0	3.4	18.5
<b>EE</b>	1.2	3.3	13.4
<b>EL</b>	8.8	4	16.1
<b>ES</b>	3.8	0	172.4
<b>FI</b>	0	4.2	54.6
<b>FR</b>	0	0	224
<b>HR</b>	0.5	3	20.8
<b>HU</b>	0	0	2.7

<sup>94</sup> The share is derived using the projected GDP for 2030 in the baseline scenario.

Member State	POA	POB	POC
<b>IE</b>	0	0	17.6
<b>IT</b>	0	0	103.9
<b>LT</b>	0	0	0
<b>LU</b>	0	0	0.8
<b>LV</b>	0	0	0.2
<b>MT</b>	0	0	0
<b>NL</b>	0	0	0
<b>PL</b>	30.9	8.2	41
<b>PT</b>	0	0	35.1
<b>RO</b>	0	0	30.4
<b>SE</b>	0	0	0
<b>SI</b>	0.1	0.4	2.1
<b>SK</b>	4.2	1.4	7
<b>UK</b>	0	0	0
<b>EU28</b>	<b>49.5</b>	<b>27.9</b>	<b>806.5</b>

#### (b) Other economic impacts

Proper follow-up of road infrastructure safety management procedures in general and road assessment programmes in particular will result in many relatively small scale interventions aimed to upgrade the safety of the existing road network. Such activities are typically carried out by SMEs, who are therefore likely to benefit from the initiative. Due to the relatively localised nature of these activities, no impacts are expected on the competitiveness of EU companies.

#### 6.2.3. Environmental impacts

The measures might have small positive environmental impacts. Fewer road crashes could marginally improve the overall flow of traffic on national roads outside the TEN-T. This might reduce congestion and thus energy consumption and air emissions from road traffic. Measures that reduce speed in order to improve the safety of certain road or tunnel sections might also reduce energy consumption and air emissions. However, these impacts are expected to be very limited and they are thus not quantified.

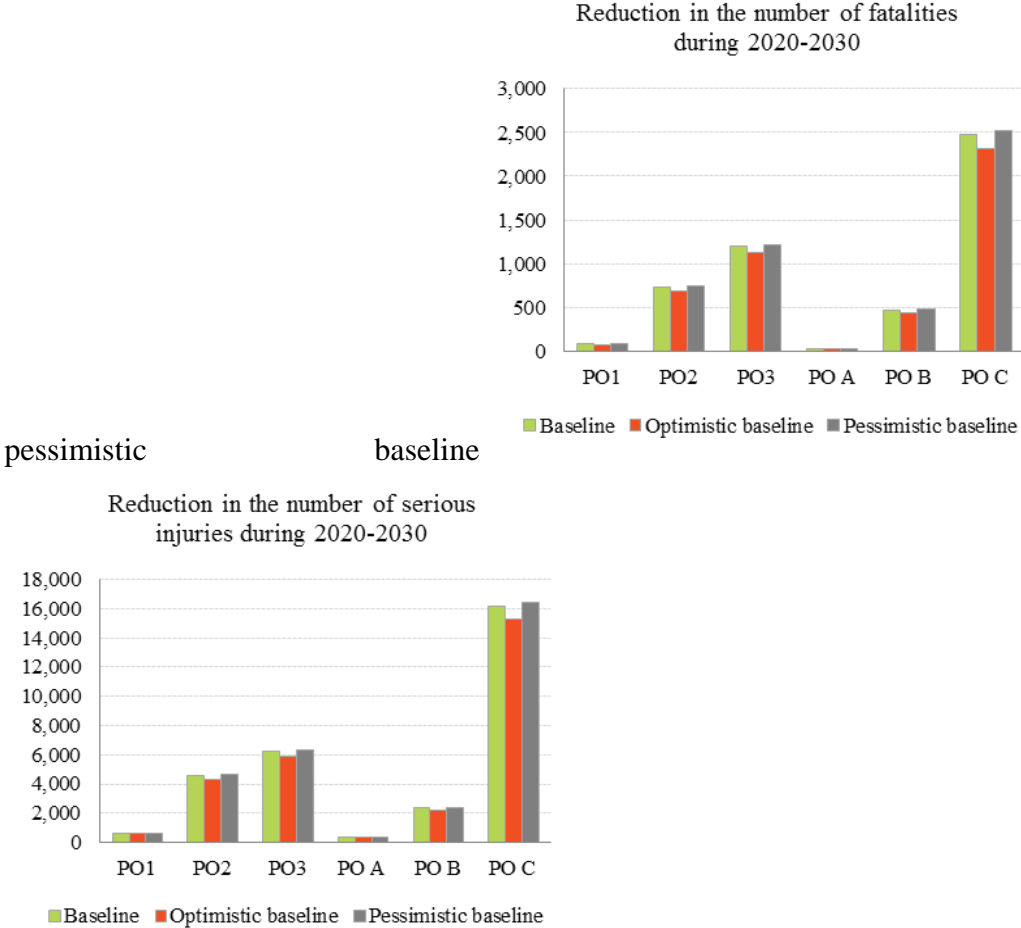
### 6.3. Results of the sensitivity analysis

As explained in section 2.6, sensitivity analysis has been performed on the baseline scenario, reflecting on the impacts of infrastructure safety performance and vehicle technologies. An alternative optimistic and a pessimistic baseline scenario have been developed. The policy options have been then tested against the optimistic and the pessimistic baseline scenario to assess the robustness of their results.

Overall, the number of lives saved and the number of serious injuries avoided is slightly lower when assessing the policy options relative to the optimistic baseline compared to the situation where the policy options are assessed relative to the main baseline scenario. The opposite is true when assessing the policy options relative to the pessimistic baseline (see Figure 10).

The sensitivity analysis shows that the ranking of the policy options is the same when considering both the optimistic and the pessimistic baseline. Among policy options targeting TEN-T, Policy option 2 would result in 691 to 751 lives saved (compared to the central estimate of 738) and 4,342 to 4,674 serious injuries avoided (compared to the central estimate of 4,595) during 2020-2030 relative to the optimistic and pessimistic baseline, respectively, while Policy option 3 would lead to 1,123-1,216 lives saved (1,195 for the central estimate) and 5,917 to 6,347 serious injuries avoided (6,244 for the central estimate). Among the policy options targeting an extended road network, policy option B would result in 444 to 482 lives saved (474 for the central estimate) and policy option C in 2,313 to 2,520 lives saved (2,472 for the central estimate) over 2020-2030 horizon relative to the optimistic and pessimistic baseline, respectively. In addition, policy option B would lead to 2,234 to 2,394 serious injuries avoided (2,358 for the central estimate) and policy option C to 15,271 to 16,436 serious injuries avoided (16,167 for the central estimate) over 2020-2030.

Figure 10: Impacts of the policy options on the number of lives saved and on the number of serious injuries avoided during 2020-2030 relative to the optimistic and



**7. HOW DO THE OPTIONS COMPARE?**

**7.1. Effectiveness**

The effectiveness of the intervention is measured by the total reduction in the number of fatalities and severe injuries achieved by each of the alternative policy options for the entire evaluation period. Table 9 below shows the estimated reductions in the number of fatalities and seriously injured in 2030 (by which all the measures are fully implemented) relative to the Baseline for the policy options concerning the TEN-T (Policy option 1 to Policy option 3)

and for the policy options extending the scope to national roads beyond the TEN-T (Policy options A to C). The reduction in the number of fatalities and seriously injured is also provided relative to the whole road network. In addition, Table 10 provides the cumulative reductions in the number of fatalities and serious injuries over 2020-2030 relative to the Baseline.

Table 9: Reduction in the number of road fatalities and serious injuries by policy option in 2030 compared to the Baseline

Policy option	Reduction in number of fatalities in 2030	% reduction in fatality in 2030 (targeted roads)	% reduction in fatalities in 2030 (all roads)
PO1	14	1.0%	0.1%
PO2	129	8.8%	0.6%
PO3	203	13.8%	0.9%
PO A	1	0.0%	0.0%
PO B	83	1.8%	0.4%
PO C	433	9.4%	1.9%
Policy option	Reduction in number of serious injuries in 2030	% reduction in serious injuries in 2030 (targeted roads)	% reduction in serious injuries in 2030 (all roads)
PO1	116	0.9%	0.0%
PO2	815	6.5%	0.3%
PO3	1,076	8.6%	0.5%
PO A	6	0.0%	0.0%
PO B	418	0.8%	0.2%
PO C	2,860	5.6%	1.2%

From the policy options that concern only TEN-T roads, Policy option 3 is the most effective. It achieves almost 10 times more reduction in the number of fatalities and serious injuries than Policy option 1 and about 50% more than Policy option 2. As regards the options involving an extension of the scope, Policy option C is by far the most effective and achieves 6-7 times higher reduction in the number of road casualties than the next best policy option (Option B). Option A is by far the least effective delivering only a very limited reduction in the number of fatalities. The ranking of the policy options does not change when looking at the cumulative impacts over the 2020-2030 horizon.

Table 10: Reduction in the number of road fatalities and serious injuries by policy option during 2020-2030 (cumulative) compared to the Baseline

Policy option	Reduction in number of fatalities during 2020-2030	% reduction in fatality during 2020-2030 (targeted roads)	% reduction in fatalities during 2020-2030 (all roads)
PO1	82	0.5%	0.0%
PO2	738	4.8%	0.3%
PO3	1,195	7.9%	0.5%
PO A	36	0.1%	0.0%
PO B	474	1.0%	0.2%
PO C	2472	5.2%	1.0%
Policy option	Reduction in number of severe injuries during 2020-2030	% reduction in severe injuries during 2020-2030 (targeted roads)	% reduction in severe injuries during 2020-2030 (all roads)
PO1	645	0.5%	0.1%
PO2	4,595	3.6%	0.2%
PO3	6,244	4.9%	0.3%
PO A	382	0.1%	0.0%
PO B	2,358	0.5%	0.1%
PO C	16,167	3.1%	0.7%

## 7.2. Efficiency

The efficiency is assessed by comparison of the benefits (the reduced social costs of fatalities and serious injuries) and the compliance costs (costs of undertaking procedures and the costs of investments into the road network). Table 11 below shows the aggregated results for the EU as a whole.

Table 11: Costs, benefits and benefit-cost ratios for policy options within the current scope

	Policy option 1 (million euro)	Policy option 2 (million euro)	Policy option 3 (million euro)
<b>Social benefits</b>			
Fatalities costs savings	339	2,788	3,916
Injuries costs savings	443	2,620	3,080
<b>Total social benefits</b>	<b>782</b>	<b>5,408</b>	<b>6,996</b>
<b>Costs</b>			
Compliance costs <sup>95</sup> (Investments and use of procedures)	103	2,004	5,563
Other derived costs	No specific impacts	No specific impacts	No specific impacts
<b>Net benefits (present value)</b>	<b>679</b>	<b>3,404</b>	<b>1,433</b>
<b>Benefit-cost ratio</b>	<b>7.6</b>	<b>2.7</b>	<b>1.3</b>

All three options show net benefits (expressed as present values). Policy option 2 exhibits the highest net benefits while Policy option 1 shows the highest benefit-cost ratio. Policy option 1 is by far the most efficient option. It is, however, the one with the lowest net benefits.

Option 3 is the option that directly mandates Member States to implement improvements in road infrastructure in order to obtain a minimum safety level on TEN-T. Policy option 3 will require some countries to invest in their road networks, especially in Southern and Eastern Europe where the safety level is currently lower.

For the three policy options that include an extension of the scope, efficiency calculations are summarised in Table 12.

Table 12: Costs, benefits and benefit-cost ratios for policy options representing extensions to non-TEN-T roads

	Policy option A (million euro)	Policy option B (million euro)	Policy option C (million euro)
<b>Social benefits</b>			
Fatalities costs savings	203	2,008	10,470
Injuries costs savings	288	1,274	9,398
<b>Total social benefits</b>	<b>491</b>	<b>3,282</b>	<b>19,868</b>
<b>Costs</b>			
<b>Compliance costs<sup>96</sup></b> <b>(Investments and use of procedures)</b>	203	257	7,440
<b>Other derived costs</b>	No specific impacts	No specific impacts	No specific impacts
<b>Net benefits (present value)</b>	<b>289</b>	<b>3,025</b>	<b>12,428</b>
<b>Benefit-cost ratio</b>	<b>2.4</b>	<b>12.8</b>	<b>2.7</b>

All options show net benefits, expressed as present value. The largest impact will be achieved in Member States where the application of RISM procedures is currently limited to TEN-T

<sup>95</sup> Recurrent costs are included in the estimated present value of compliance costs. They are estimated at 10,000 euro annually per Member State for Policy options 1, 2 and 3.

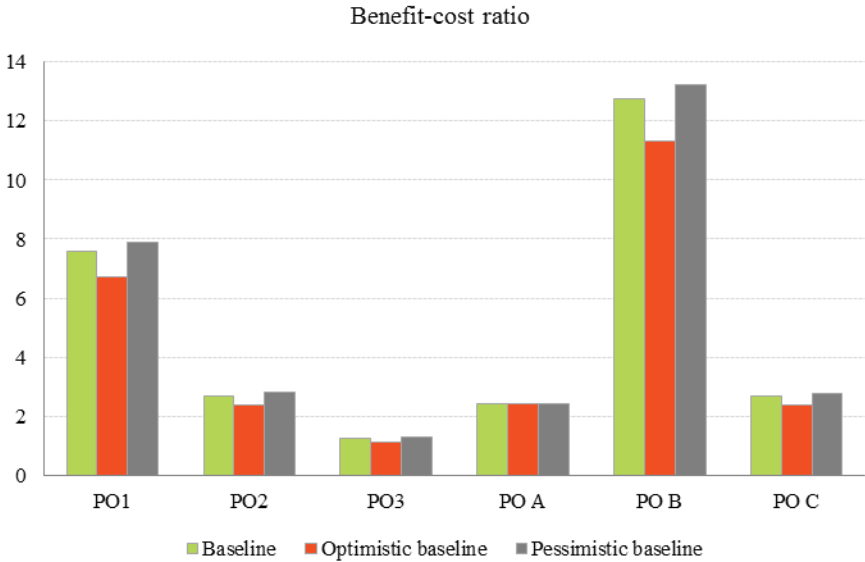
<sup>96</sup> Recurrent costs are included in the estimated present value of compliance costs. They are estimated at 30,000 euro annually per Member State for Policy options B and C.



and where the application of RISM procedures will enable the identification of safety deficiencies on roads where no RISM procedures are carried out at present.

The choice of the baseline scenario does not change the ranking of the options in terms of benefit-cost ratio (see Figure 11).

Figure 11: Benefit-cost ratio for the policy options relative to the baseline, optimistic and pessimistic baseline



### 7.3. Coherence

Coherence describes how each policy option is related to national and EU road safety policies as well as to EU transport policies in a broader perspective.

In terms of coherence with national policies, options that maintain the scope and current form of the RISM procedures are most coherent with national safety policies. Policy option 3, which includes the requirement to achieve a three star rating, means that most Member States would have to adapt their national policies as at the present time only a few Member States have made explicit commitments to achieving a minimum star rating on their networks. Policy options A, B and C, which extend the scope to national non-TEN-T roads, could interfere with national policies at least in some Member States.

The coherence assessment is summarised in the table below with a qualitative scoring of the options. Policy options 1, 2 and A score higher than the other options. All of the options are coherent with EU policies. Option A is very coherent as it only requires the application of RISM procedures that are built using EU funding. Options B and C, which expand the scope of coverage to the main national road network, give Member States flexibility as it will be up to them to designate national roads, which increases coherence with national policies.

Table 13: Assessment of the coherence of the alternative policy options

	National safety policies	EU safety policies	EU transport policies	Overall coherence
<b>Option 1</b>	+	+	+	+++
<b>Option 2</b>	+	+	+	+++
<b>Option 3</b>	0	+	+	++
<b>Option A</b>	+	+	+	+++
<b>Option B</b>	0	+	+	++

<b>Option C</b>	0	+	+	++
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#### 7.4. Proportionality

The assessed policy options represent various degrees of proportionality in achieving the policy objectives. While all policy options are made up of proven measures to tackle effectively the problem of road fatalities and serious injuries, the most ambitious policy option (Policy option 3) is the least proportionate. The extension of the scope of the RISM legislation to the primary road networks of Member States (Policy option B and Policy option C) are proportionate, as these policy options target 15% of the road network by length which is responsible for approximately 39% of road fatalities in the EU. Member States would also be involved in the exact definition of the road network concerned.

### 8. PREFERRED OPTION

The table below provides an overview of the results of the assessment of the effectiveness, efficiency and coherence of all policy options.

Table 14: Comparison of options

	Effectiveness		Efficiency	Coherence
	Cumulative reduction in the number of fatalities over 2020-2050 (compared to Baseline)	Cumulative reduction in the number of serious injuries over 2020-2050 (compared to Baseline)	Cost-benefit ratio	Qualitative scoring
<b>Option 1</b>	374	3,247	7.6	+++
<b>Option 2</b>	3,377	21,778	2.7	+++
<b>Option 3</b>	5,370	29,100	1.3	++
<b>Option A</b>	20	209	2.4	+++
<b>Option B</b>	2,179	11,166	12.8	++
<b>Option C</b>	11,273	75,724	2.7	++

In selecting the preferred options, there are trade-offs to be made. The overall political objective of the initiative has to be clearly born in mind: to reduce the number of deaths and serious injuries in line with current and future EU aspirational targets as a step towards the Vision Zero by 2050 announced in the 2011 White Paper for Transport.

In terms of efficiency, Policy option 1 ranks higher than any other option. It has both limited costs and limited effects. It is the option with the lowest effectiveness as it does not make a significant contribution to the political objective of reducing road deaths and serious injuries.

The most effective option targeting the TEN-T network is Policy option 3, but it is less efficient than Policy option 2. Option 3 implies that the TEN-T network (both core and comprehensive) has to comply with a minimum safety level (e.g. 3 star rating) by a certain point in time. It is clearly the option that brings the biggest benefits in terms of road safety on TEN-T, and to Member States with low safety standards in particular. However, compliance costs in Policy option 3 are almost three times higher than those of Policy option 2. It is also less coherent than Option 2 in the sense that it will require Member States to adapt their national policies to achieve a minimum star rating (while only few MSs have taken such commitments so far).

On the contrary, Policy option 2 preserves the flexibility of Member States to focus their road infrastructure safety efforts where they consider them most effective and efficient. It obliges Member States to screen infrastructure through inspections at network level (Road Assessment Programmes) identifying the parts of network below the 3-star benchmark but leaves them the flexibility to decide on the priorities, the level of investments and the

timetable. The rationale of Option 3 i.e. to ensure a minimum level of safety across the TEN-T network remains valid and coherent with the overall policy objective but it could potentially be achieved through more flexible and softer means. Such instruments include the monitoring of the safety level across TEN-T (a potential Key Performance Indicator in the forthcoming road safety policy framework for the next decade), the inclusion of a performance target in the next revision of TEN-T guidelines, and, most importantly, the possibility to support road safety upgrades through Community funds. Such possibility is currently being explored for the next Multi-annual Financial Framework.

As regards vulnerable road users, Option 3 would prescribe the mandatory implementation of a specific technical solution (motorcycle-friendly guardrails), which may raise questions of acceptability and may not in all cases be the best measure to improve overall safety. Option 2 on the other hand obliges Member States to systematically assess the safety requirements of all types of vulnerable road users in the framework of network-wide inspections, but leaves them the flexibility to implement solutions which best fit the specific local circumstances. This appears to be the most comprehensive and suitable way to take the needs of vulnerable road users into account in this initiative.

Policy option 2 is more proportionate than Policy option 3, as the costs are almost three times lower and as it is more flexible. As a conclusion, Policy option 2 (moderate intervention - mandatory follow-up, network wide inspections) is the preferred option for the current scope.

With respect to extending the scope to target a larger network, Policy option A is coherent with EU policies but only delivers very small benefits by limiting the intervention to a small share of the national road network. Policy option B extends the provisions of the current legislation to the main roads but due to the inherent limitations of the current legislation (such as the lack of obligation on the follow-up of findings), it is much less effective than Policy option C. Option C is applying the same, more ambitious procedures as Option 2 (without the general performance requirements for road markings and signs though). It is the most effective of all options and has the advantage of aligning procedures on TEN-T and on national roads. Option C is less efficient than B but addresses in a coherent manner the substantial road safety problem on the main roads which count for 39 % of the fatalities (in contrast to less than 10% for the TEN-T network). Option C (extension to main/national roads including network-wide inspections) is therefore the proposed option in terms of the extension of scope. The Commission shares the concern of stakeholders related to ensuring that an extension of the scope of the Directive takes the needs of vulnerable road users into account. This is the reason why the Commission proposes to set up of a Forum of Exchange for auditors, in order to facilitate the spreading of best practice in this regard.

Analysis has shown that benefits and costs of the selected options are unequally distributed across the EU, with low benefits and low costs in well performing countries and higher benefits and costs in less well performing countries. If accompanied by appropriate funding assistance, this need not be a weakness of the proposed approach, but could become a strength, helping to spread an advanced road safety culture across the EU in road infrastructure investment and to close the gap between the good and poorer performers. By helping the poorer performers catch up, the initiative will support the EU's objective of economic, social and territorial cohesion.

Therefore, based on the analysis above, it is recommended to proceed with the preparation of the implementation of Policy option 2 combined with Policy option C.

The analysis shows that the combination of Policy option 2 and Policy option C could save over 3,200 lives and avoid more than 20,700 serious injuries during 2020-2030 relative to the baseline (14,650 lives saved and 97,502 serious injuries avoided for 2020-2050). Vehicle safety measures would have higher impact, reducing the number of fatalities by 4,380 to

7,300 and of serious injuries by 19,850 to 38,900 during 2020-2030.<sup>97</sup> For 2030 alone road infrastructure measures would result in 562 lives saved and 3,675 serious injuries avoided, while vehicle safety measures would result in 1,030 to 1,769 fewer fatalities and 4,721 to 9,824 serious injuries avoided. Thus, additional measures going beyond road infrastructure and vehicle safety will be needed to achieve the EU's strategic objectives.

The sensitivity analysis does not change the choice of the preferred options as they remain the preferred option under both the optimistic and the pessimistic scenario (see section 6.3).

The application of Policy option 2 and Policy option C in combination is coherent as they involve the application of the same RISM procedures on the TEN-T and on the primary road networks of Member States representing a consistent approach to road infrastructure safety management on the roads that carry the biggest traffic flows across the EU.

**9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?**

An important element of the Safe System approach, which will be implemented at EU level in the EU framework for effective road safety policy 2020-2030, is the performance monitoring of different aspects of road safety work. As part of the framework, the Commission will propose a set of Key Performance Indicators, one of which should relate to the safety quality of the road network (TEN-T and national roads). The Commission is working with experts to define and operationalise these indicators.

The indicators will be used as a basis for best practice exchange between Member States, with the High Level Group on road safety (bringing together high level representatives of Member States' transport administrations) taking on a strong coordinating role.

More specifically, the Commission services will monitor the implementation and effectiveness of this initiative through a set of core indicators that will measure the progress towards achieving the operational objectives, based on the monitoring obligation that is part of the preferred Option. Some of the indicators are of a qualitative nature and show if the desired deliverables are being achieved and implemented, while others are based on data to be collected that will need to be analysed further. More detailed data concerning traffic volumes and traffic flows, improved availability of exact location data of road traffic accidents resulting in fatalities or serious injuries, more information about the road infrastructure safety management procedures carried out and information about the effectiveness of the deployed infrastructure measures will allow a more targeted application of policies that effectively contribute to the improvement of road infrastructure safety.

The Table below presents possible progress indicators for the policy measures included in the preferred policy options.

**Core progress indicators for monitoring purposes**

Operational objectives	Core progress indicators	Source of data
<b>Foster harmonisation and knowledge sharing between Member States</b>	Number of Member States actively participating in exchange of best practices	Attendance records in relevant events
<b>Improve follow-up on findings of RISM procedures</b>	Number of RISM procedures carried out	Member States' reports
<b>Improve follow-up on findings of RISM procedures</b>	Number of road infrastructure safety interventions carried out in response to RISM findings	Member States' reports

<sup>97</sup> Add reference to IA on GSR

<b>Improve follow-up on findings of RISM procedures</b>	% of road network assessed by network-wide safety inspections	Member States' reports
<b>Improve follow-up on findings of RISM procedures</b> <b>Protect vulnerable road users</b>	Distribution of the assessed road network across the safety categories defined in network-wide safety inspections (1 star, 2 star, 3 star etc.) by category of road users	Member States' reports
<b>Improve deployment of new technologies</b>	% of road network type covered by cooperative-ITS services and applications	Voluntary reporting of Member States in the framework of ITS Directive <sup>98</sup>

It is foreseen that once the new legislative framework has become applicable in its entirety, the Commission services will carry out an evaluation to verify whether the objectives of the initiative have been reached. This is intended to determine whether the new measures in place have resulted in an improvement of the situation. This evaluation shall be carried out based on the above core progress indicators in line with Commission requirements on evaluation.

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<sup>98</sup> Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport

