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CORRIGENDUM
This document replaces SWD(2025) 98 final of 24.4.2025
Insertion of the cross-reference to the COM(2025) 180 final and correction of the title

The text shall read as follows:

COMMISSION STAFF WORKING DOCUMENT

EVALUATION

acompanying the documents

Proposal for a Directive of the European Parliament and of the Council amending Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers, and amending Directive 2014/47/EU on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union

Proposal for a Directive of the European Parliament and of the Council on the registration documents for vehicles and vehicle registration data recorded in national vehicle registers, and repealing Council Directive 1999/37/EC

{COM(2025) 179 final} - {SEC(2025) 119 final} - {SWD(2025) 96 final} -
{SWD(2025) 97 final} - {SWD(2025) 99 final} - {COM(2025) 180 final}

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Glossary*Term or acronym*	***Meaning or definition***
ABS	Anti-lock Braking System. This is an electronic system used which operates by preventing the wheels from locking up during braking, thereby maintaining contact with the road surface and allowing the driver to maintain more control over the vehicle.
ACEA	Association des Constructeurs Européens d'Automobiles (European Automobile Manufacturers' Association)
ADAS	Advanced Driver Assistance Systems refer to systems that support the driver in their primary driving task. These systems can inform or warn the driver, but also take over (part of) vehicle control.
BC	Black carbon: a component of fine particulate air pollution ($PM_{2.5}$). It is formed by the incomplete combustion of wood and fossil fuels, a process which also creates carbon dioxide (CO_2), carbon monoxide (CO), and volatile organic compounds. It lasts only days to weeks in the atmosphere but has significant direct and indirect impacts on the climate and human health.
CARE	CARE is an EU database on road crashes resulting in death or injury. Council Decision 93/704/EC (on the creation of a Community Database on road accidents) obliges Member States to provide annual data on road accidents but does not specify the content. The CARE expert group composed of national representatives meets 1-2 times per year to discuss issues related to the database and the variables, as well as the collection, processing and dissemination of data.
CITA	International Motor Vehicle Inspection Committee - an international non-profit association of authorities and companies involved in vehicle compliance.
CNG	Compressed Natural Gas
CO	CO (carbon monoxide): colourless odourless very toxic gas that is formed as a product of the incomplete combustion of carbon or a carbon compound. The greatest sources of CO to outdoor air are vehicles or machinery that burn fossil fuels.
COC	A Certificate of Conformity is a statement by a vehicle manufacturer that the vehicle conforms to EU type-approval requirements.
DPF	Diesel Particulate Filter is a device designed to remove diesel particulate matter or soot from the exhaust gas of a diesel engine.
EEA	European Environmental Agency
EGR	Exhaust Gas Recirculation (EGR) is a system for reducing automotive nitrogen oxide (NOx) emissions in petrol, diesel and some hydrogen engines. The high-pressure EGR loop collects part of the exhaust gases at the cylinder head outlet and re-injects them into the engine air intake.
EPRS	European Parliamentary Research Service
ESC	Electronic Stability Control is an extension of anti-lock braking technology, which has speed sensors and independent braking for each wheel. It addresses the problem of skidding and crashes due to loss of control of vehicles, especially on wet or icy roads or in rollovers.
EUCARIS	European car and driving licence information system. This is an initiative of several European countries, formalised in a multilateral treaty, and focused on the data-exchange regarding vehicle registration, driving licences etc.

GHG	Greenhouse gases
HMI	Human Machine Interface is a user interface or dashboard that connects a person to a machine, system, or device**.** It includes the hardware and software that is used to translate user input into commands, and to present results to the user.
ISO	International Organization for Standardization
NOx	Nitrogen Oxides
OBD	On-board Diagnostics is a computer system in a vehicle that monitors its performance. It collects information from the network of sensors inside the vehicle, which the system can use to regulate car systems or alert the user to problems. A technician can read relevant data through the OBD port to diagnose problems.
OBFCM	An on-board Fuel Consumption Monitoring Device uses vehicle, engine, fuel and/or electric energy parameters to determine and make available information (such as fuel consumption, distance travelled, and speed) and stores the lifetime values on board the vehicle.
OBM	On-Board Monitoring means a system on board a vehicle that is capable of detecting and communicating either emission exceedances or when a vehicle is in zero emission mode.
OPC	Open Public Consultation
PN and PM	Particle Number measurement, a measure of air pollution, is a method of measuring particulate emissions, typically expressed as the number of particles per cm^3. Particulates (or particulate matter – often abbreviated to PM) are microscopic particles of solid or liquid matter suspended in the air.
PTI	Periodical technical inspection
RDE	The Real-Driving Emissions test is part of the type-approval procedure for all new passenger cars and vans. The RDE test is an on-road emissions test meant to complement laboratory tests to ensure vehicle emissions are similar during normal, real-world operating conditions as they are during laboratory testing.
RSI	Roadside Inspection
RWP	Roadworthiness Package
SCR	Selective Catalytic Reduction is a technology that reduces nitrogen oxides (NOx) from exhaust gases of diesel engines. It converts NOx into nitrogen and water vapour, and also improves fuel economy and performance of diesel engines.
TWC	Three-Way Catalytic converter is a device used in the exhaust system to convert harmful gases in the engine exhaust to relatively harmless gases. It is called a three- way catalytic converter because it can convert three types of pollutants simultaneously.
UNECE	United Nations Economic Commission for Europe. One of 5 regional Commissions of the United Nations, its remit includes transport (including road safety) and vehicle regulations.
VRD	Vehicle Registration Document

1 INTRODUCTION

This report presents the findings of the evaluation of the three Directives that together comprise the Roadworthiness Package (hereinafter the "RWP"). These Directives are: (i) Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers, (ii) Directive 2014/47 EU on roadside inspections of commercial vehicles, and (iii) Directive 2014/46 EU on registration documents for vehicles.

The evaluation is performed "back-to-back" with an Impact Assessment for the possible review of the RWP. This exercise is in line with the Commission's Sustainable and Smart Mobility Strategy[1] adopted in 2020 which reconfirmed the Union's commitment to pursue improving road safety and the objective of zero road fatalities by 2050. In this context, the Strategy stated that "Our roadworthiness legislative framework should be adjusted to ensure the lifetime compliance of vehicles with emission and safety standards."

Improving road safety is a prime objective of the EU's transport policy. The EU is pursuing a policy to improve road safety with the objective of reducing fatalities, injuries and material damage. The EU's regulatory framework for road safety addresses the core elements of the Safe System Approach (road use, infrastructure, vehicles and post-crash care) and combines binding legal acts and recommendations to Member States. The EU road safety policy also builds on national initiatives, setting targets and addressing the key factors that play a role in road crashes, supporting public awareness and education campaigns, helping Member States and other road safety actors share relevant experience.

Over the last 20 years, EU roads have become significantly safer. The number of road fatalities has gone down by 60% from around 51,400 in 2001 to around 20,600 in 2022. The 2022 figure represents 2,100 fewer fatalities (-9%) compared with the pre-COVID-19 pandemic year 2019. Nevertheless, the improvement in road safety has not been strong enough to meet the EU's political ambition to decrease the number of road deaths by 50% between 2001 and 2010, and by additional 50% between 2011 and 2020 (i.e. by 75% between 2001 and 2020). This political ambition stems from a number of strategic documents issued by the Commission over the last two decades, such as the White Paper on European Transport Policy for 2010[2], the 2011 White Paper on a Single European Transport Area[3] or the Communication from the Commission on Towards a European road safety area: policy orientations on road safety 2011-2020[4]. In its Sustainable and Smart Mobility Strategy of 2020, the Commission committed to target zero fatalities in all modes of transport by 2050.

In the years before 2020, there was hardly any drop in the number of road fatalities. This slowdown, that already appeared around 2014, prompted the Transport Ministers to issue a ministerial declaration on road safety at the informal transport Council in Valletta in March 2017[5], whereby the Member States called upon the Commission to explore the strengthening of the Union's road safety legal framework to reverse that stagnating trend. Against this background, and in the context of the Safe System Approach that focuses on safe infrastructure, safe vehicles, safe road use and better post-crash care, an important

[1] COM(2020) 789 final, 9.12.2020
[2] COM(2001) 370 final, 12.9.2001
3 EUR-Lex - 52011DC0144 - EN - EUR-Lex (europa.eu)
[4] COM/2010/0389 final, 20.7.2010
5 Valletta Declaration on Road Safety (europa.eu)

element of the Union's efforts to improve road safety is to improve the safety of the vehicle fleet.

1.1 Context

Various measures have been introduced at EU level since 1977, as Member States had begun developing their own national regulations regarding vehicle roadworthiness testing, leading to a lack of harmonisation.

Directive 77/143/EEC on the approximation of the laws of the Member States relating to roadworthiness tests for motor vehicles and their trailers introduced the requirement that motor vehicles should undergo periodic roadworthiness tests, identifying the categories of vehicles to be tested, frequencies, and the items to be tested. This Directive was replaced by **Directive 96/96/EC** which established common requirements for periodic technical inspections (PTIs), including testing frequencies, inspection methods, and standards for various vehicle categories. **Directive 2009/40/EC** on roadworthiness tests for motor vehicles and their trailers was a recast of the 1996 Directive and it allowed Member States to apply higher requirements for PTI concerning, notably, the frequency of testing, the items to be inspected, the vehicles covered or the minimum standards for braking efficiency.

Directive 2000/30/EC on the technical roadside inspection of the roadworthiness of commercial vehicles complemented Directive 96/96/EC by providing the requirement to control the technical state of commercial vehicles in between periodic inspections (roadside inspections).

Finally, **Directive 1999/37/EC** on the registration documents for vehicles aimed to harmonise the form and content of the registration certificates issued by Member States and included provisions concerning the information to be provided in the registration certificates, the process of re-registration of a vehicle previously registered in another Member State and for exchange of information and cooperation.

The 2014 Roadworthiness Package

The Roadworthiness Package was presented by the Commission in 2012 as a set of three legislative proposals. Given their strong thematic interdependence and the alignment of their specific objectives in the field of road safety, the package approach was considered to be more effective than dealing and updating each legislation separately.

- **Directive 2014/45/EU[6] on periodic roadworthiness tests** (hereinafter the "Periodic Technical Inspection or PTI Directive") requires that road transport vehicles are periodically tested to ensure compliance with a set of minimum requirements and it applies to all cars, vans, trucks and buses, heavy trailers, faster tractors as well as, since January 2022, to larger two- and three-wheel vehicles and quadricycles.
- **Directive 2014/47/EU[7] on technical roadside inspections** (hereinafter the "Technical Roadside Inspection or RSI Directive) has a similar aim to PTI Directive, although in relation to roadside inspections of heavy passenger and freight vehicles and their trailers.
- **Directive 2014/46/EU[8] on the registration documents for vehicles** (hereinafter the "Vehicle Registration Documents or VRD Directive") provides for the

[6] It repeals Directive 2009/40/EC; EUR-Lex - 32014L0045 - EN - EUR-Lex (europa.eu)
[7] It repeals Directive 2000/30/EC; EUR-Lex - 32014L0047 - EN - EUR-Lex (europa.eu)
[8] It amends Directive 1999/37/EC; EUR-Lex - 32014L0046 - EN - EUR-Lex (europa.eu)

electronic recording of data on all vehicles registered on a Member State's territory, and harmonised procedures in relation to the suspension of a vehicle's registration.

A more detailed explanation of the provisions of the RWP Directives is provided in Annex VI.

The Roadworthiness Package was intended to act complementarily to the safety and environmental requirements that vehicles must meet to be able to circulate on the EU roads i.e., the respective EU type approval Regulations[9] for motor vehicles. These Regulations also set out the market surveillance requirements for motor vehicles. The focus of the RWP is, however, different. EU market surveillance rules for motor vehicles establish procedures to test vehicles against type-approval requirements with the aim to identify vehicles (and vehicles components) systematic deficiencies through random checks, creating in this way a feed-back loop for improving type-approval legislation. The RWP legislation in force rely instead on regular vehicles checks that focus on ensuring that minimum standards are maintained by owners throughout the lifetime of the vehicle.

The Commission Implementing Regulation (EU) 2019/621[10], adopted as part of the roadworthiness acquis, concerns the technical information necessary for roadworthiness testing of the items to be tested, on the use of the recommended test methods, and establishing detailed rules concerning the data format and the procedures for accessing the relevant technical information. Its main objective is to facilitate roadworthiness testing by requiring manufacturers to make the relevant technical information available to testing centres and competent authorities. Although this Implementing Regulation applies since May 2020, it appears to have only been used to a limited extent. In fact, Member States and vehicle inspection bodies have reported difficulties in collecting the necessary information from each manufacturer due to cumbersome registration processes as well as costs. As a result, some checks have not been performed as legally required.

While this Implementing Regulation does not contain any reporting obligations for Member States, the latter have repeatedly indicated difficulties to the Commission in effectively enforcing road safety measures in EU cross-border traffic and vehicle trade. These mostly have their origin in difficulties for competent authorities in accessing vehicle register data and other safety-relevant information of vehicles, notably if these are registered in another Member State. These difficulties also, for instance, may negatively impact upon attempts to combat odometer tampering which negatively affects road safety and consumer welfare in the EU.

The introduction of advanced vehicle safety features (mandated by the General Safety Regulation[11], from July 2022 onwards) and of significantly strengthened emission legislation is challenging the methods of inspecting vehicles Therefore, changes to current practices will be needed in future to cope with vehicles becoming technically ever more

[9] https://eur-lex.europa.eu/EN/legal-content/summary/eu-approval-and-market-surveillance-measures-for-motor-vehicles-and-their-trailers.html

[10] EUR-Lex - 32019R0621 - EN - EUR-Lex (europa.eu)

[11] Regulation (EU) 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users; EUR-Lex - 32019R2144 - EN - EUR-Lex (europa.eu)

complex and emissions standards requiring lifelong monitoring. In that context, accessing vehicle data will become even more critical to perform roadworthiness checks.

Laboratory tests indicated that even vehicles with defective or tampered diesel particulate filters ('DPF') can pass the opacity test, without the malfunctioning being noticed. An alternative to the opacity test would be to count the particles that are emitted using optical methods. Such an approach would be able to reliably detect a defective or tampered DPF, but a harmonised EU measurement method was lacking. A first step towards harmonised particle number (PN) measurement during roadworthiness testing within the EU was made with the adoption of a specific Commission Recommendation[12]. These guidelines were adopted in March 2023 following the introduction of PN measurement by three Member States and to achieve a minimum degree of harmonisation in PN measurement methods in the EU. Member States can therefore integrate the requirements set in the Recommendation into their PTI regimes. The test methods required by the PTI Directive as regards exhaust emissions of motor vehicles, notably the opacity testing applicable to compression ignition engines, were found not anymore adapted to more recent vehicles equipped with particle filters.

1.2 Purpose and scope of the evaluation

The evaluation of the Roadworthiness Package aims to assess the performance of the substantive provisions of the three Directives, to analyse if the framework is consistent with relevant safety, environmental and internal market objectives and to determine if it is still fit for purpose.

Both the PTI and the RSI Directives contain a reporting requirement for the Commission on the implementation and effects of the Directives. Member States reporting obligations are only foreseen in the RSI Directive. However, these Directives have only applied since 2018, and in order to generate data to draw meaningful conclusions, in particular their effect in terms of improvement of road safety, it was considered that a reasonable period of time should have elapsed. The Commission has therefore prepared reports providing an overview of the implementation actions of the Member States based on the preliminary findings of the transposition control[13]

This evaluation covers all EU Member States and is based on evidence available for the period between 2018 and 2021[14]. The evaluation addresses the five evaluation criteria: effectiveness, efficiency, coherence, relevance, and EU added value, for each of which dedicated evaluation questions were defined. The evaluation systematically reviews and analyses all available evidence, from a variety of sources. The evaluation was developed with the support of an external support study[15] and in line with the Better Regulation Guidelines and Toolbox. The methodology is detailed in Annex II, while Annex III presents the evaluation matrix which was elaborated to answer the evaluation questions.

[12] Commission Recommendation (EU) 2023/688 of 20 March 2023 on particle number measurement for the periodic technical inspection of vehicles equipped with compression ignition engines
[13] COM (2020) 699 final and COM (2020) 107 final
[14] Data on implementation for 2022 are not complete yet.
[15] The evaluation support study was prepared in 2022-2023 by a consortium led by VVA and including TML, TNO, VUFO and the University of Leeds. The study will be published alongside this evaluation.

1.3 Evaluation methodology

Against this background, the Commission has carried out the evaluation of the three Directives. In line with the Better Regulation Guidelines, this evaluation analyses:

- **Effectiveness:** assesses the extent to which the three Directives triggered the actual changes, in particular in view of original objectives of improving road safety, contributing to the reduction of the emissions of GHG and air pollutants from road transport, and facilitating free movement for EU citizens and the smooth functioning of the Internal Market.
- **Efficiency:** assesses the actual costs relative to the actual benefits of the implementation of the three Directives, whether there is potential for simplification and increasing cost-efficiency.
- **Coherence** of the regulatory framework of the three Directives, regarding both the internal coherence and the external coherence with other relevant EU legislation and policies.
- **Relevance:** assesses whether the overall problem analysis and related objectives are still adequate and how the policy context has evolved. It also analyses the relevance of the Directives for current and future needs, in light of the technological, environmental, and scientific advances.
- **EU added value:** assesses the value of the three Directives, for citizens and businesses, compared to what could have been achieved by Member States at national and/or regional and international level without these Directives.

The following sources of information were used for this evaluation:

- Information from stakeholder consultation activities which included an online public consultation, targeted surveys, and interviews;
- A review of existing literature on the effects of technical inspections and their correlation with the evolution of the number of road crashes, as well as on emission control technologies and tampering practices; and
- European Commission's CARE Database, Member States' reports from roadside inspections.

2 WHAT WAS THE EXPECTED OUTCOME OF THE INTERVENTION?

2.1 Description of the intervention and its objectives

In 2010 the European Commission adopted policy orientations on road safety[16], where it proposed amongst other things a two-pronged strategy for safer vehicles: harmonisation/strengthening of EU legislation on roadworthiness tests and on technical roadside inspections to help reaching the announced road safety target (i.e. reducing the number of road fatalities by 50% between 2010 and 2020). The 2012 Commission proposal built on requirements included in the previous Directives related to the roadworthiness

[16] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, *Towards a European road safety area: policy orientations on road safety* 2011-2020, COM(2010) 389 final.

tests, roadside inspections, and rules on the registration documents of vehicles (briefly introduced in section 1.1).

The EU regime in place before the adoption in 2014 of the RWP set minimum standards for roadworthiness testing across the EU. Before a vehicle was allowed to be put on the market, it had to fulfil all the relevant type or individual approval requirements guaranteeing an optimal level of safety and environmental standards. Every Member State had the obligation to register for the first time any vehicle that had EU type-approval on the basis of a "Certificate of Conformity" issued by the vehicle manufacturer. Registration of a vehicle provided administrative authorisation for a vehicle's' entry into road traffic. Registered vehicles had to be regularly submitted to periodic roadworthiness tests, aiming to ensure that they remain roadworthy.

According to the impact assessment[17], the Commission's 2012 legislative proposals aimed to tackle the problem of too many vehicles with technical defects still present on EU roads, despite the existing legal framework. The immediate consequences of this problem were accidents, injuries, fatalities, as well as environmental damage, in particular air pollution. Two main underlying problem drivers were identified: (i) the scope of EU legislation was too narrow and the level of requirements it sets were too low; and (ii) the relevant information and data were not exchanged between the concerned actors.

In this context, the RWP aimed to contribute: (1) to increased road safety (halving fatalities by 2030 and moving to zero fatalities by 2050) by increasing the quality and better coordinating national PTI and roadside inspection systems and (2) to the reduction of greenhouse gas and air pollutant emissions from road transport by detecting more effectively and removing from circulation vehicles which are over-polluting because of technical defects.

The impact assessment identified the following two specific objectives:

(1) Increase the scope and the level of requirements for roadworthiness testing and roadside controls across the European Union;
(2) Create the appropriate framework for a seamless flow of information between actors and Member States involved in the enforcement of PTI results.

While not specifically stated in the impact assessment, the revision also had the objective of facilitating the free movement of EU citizens and the smooth functioning of the internal market, by including explicit references to free movement in recitals 1, 3, and 8 of VRD Directive, and in recital 24 and Article 10 of PTI Directive. With the increase in cross-border vehicle movements within the EU, there was a need for more harmonised and rigorous roadworthiness standards to ensure that vehicles moving across borders met the same safety criteria. The RWP intended to create a common and harmonised framework for roadworthiness control, including common requirements for technical checks, equipment, knowledge and training of inspectors and cooperation between Member States. It also aimed at reducing the administrative burden through general data exchange (based on collaboration among national contact points (NCP) and mutual recognition of roadworthiness certificates (RWCs).

To meet the objective to enhance the safety of vehicles on the road, the minimum EU standards for periodic roadworthiness tests (PTI) were strengthened and mandatory standards were introduced, together with the introduction of random roadside inspections

[17] Register of Commission Documents - SWD(2012)206 (europa.eu)

(RSI). This was seen as essential to avoid reducing the effectiveness of roadworthiness enforcement. To meet the objective of making the necessary data for and from roadworthiness testing available, the PTI Directive also encourages cooperation and information exchange among Member States including records of roadworthiness tests.

In several Member states a high number of private authorised test centres were carrying out roadworthiness tests (and still do). To ensure a coherent approach, certain common procedures such as frequency of testing were specified in the legislation.

In contrast to the PTI and RSI Directives, there was a limited number of changes made to the 1999 Vehicle Registration Documents Directive in Directive 2014/46/EU, perhaps reflecting the fact that this Directive has a relatively limited scope, given that vehicle registration itself is a responsibility of Member States. The main changes introduced in Directive 2014/46/EU were (i) providing for electronic recording of data on all vehicles registered on a Member State's territory, and (ii) harmonised procedures in relation to the suspension of a vehicle's registration.

The expected result from the revision of the three Directives was more detection of defects and reduction of the number of "gross emitting" vehicles and vehicles with dangerous defects in circulation. Also, overall consistency, objectivity, and quality of the testing throughout the EU was expected to be improved, as well as the framework for exchange of information between actors and Member States involved in the enforcement of testing results.

A figure representing the intervention logic of the RWP is presented in Annex VI. It summarises the links and causal relationships between the problems and needs. It takes into consideration the general and specific operational objectives that the legislative framework was designed to address and presents the expected outputs, results, and impacts.

Directive 2014/45/EU on the periodic roadworthiness tests compared to its predecessor, Directive 2009/40/EC:

- Addressed the quality of vehicle tests by setting common minimum standards for equipment, training of inspectors and assessment of deficiencies.
- Made electronic safety components (such as anti-lock braking system (ABS), electronic stability control (ESC) and airbag) subject to mandatory testing.
- Introduced measures to combat odometer fraud.
- Made compulsory EU wide testing for heavy motorbikes, with a possibility for Member States to introduce effective alternative road safety measures instead.
- Foresaw compulsory EU wide testing of high-speed tractors used for commercial road haulage purposes;
- Provided for mutual recognition of the roadworthiness certificate during the re-registration procedure, where the frequency of testing is the same in the Member State of origin and in the Member State of destination.

Directive 2014/47/EU on the technical roadside inspection of commercial vehicles compared to its predecessor, Directive 2000/30/EC:

- Addressed the quality of vehicle tests by setting common minimum standards for equipment, training of inspectors carrying out more detailed inspections, the assessment and follow-up of deficiencies;
- Extended the risk rating system of road transport undertakings, with information based on the technical roadside inspection;

- Relied on a two-step approach for the roadside inspections by introducing the initial and more detailed inspection;
- Introduced measures for the inspection of cargo securing;
- Added compulsory EU wide testing of high-speed tractors used for commercial road haulage purposes.

Directive 2014/46/EU on vehicle registration documents introduced the following new requirements compared to its predecessor, Council Directive 1999/37/EC:

- An obligation for Member States to record electronically data on all vehicles registered on their territory;
- An obligation for Member States to record electronically the suspension of a vehicle's authorisation after a failed PTI, and to notify it to the vehicle registration authority. This suspension is effective until the vehicle has passed a new roadworthiness test. Upon successful completion of the roadworthiness test, the competent authority has to re-authorise the use of the vehicle in road traffic without delay, and with no need of new registration;
- An obligation for Member States to assist each other in the implementation of the Directive, in particular to check, before any re-registration of a vehicle, the vehicle's legal status in the Member State in which it was previously registered. Such checking may involve the use of data from national databases to facilitate the exchange of information.

There are some significant differences between what the Commission originally proposed in 2012, and the measures included in the legal text of 2014 Directives. Some of the measures originally proposed in the Commission's 2012 proposals were not included in the final legal texts (see Tables 1 to 3 below). It should also be noted that the Commission originally proposed Regulations for PTI and RSI, whereas the final legal texts took the form of Directives. In addition, the Commission's proposals would have applied from 2015, whereas the final agreed texts applied from 2018.

Table 1. PTI: Comparison between COM's proposal in 2012 and adopted directive of 2014

Topic	Vehicle Category	Commission Proposal of 2012 for a Regulation	Adopted Directive of 2014
Test intervals	M1 (passenger car) and N1 (light truck)	Initial test after 4 years, next after a further 2 years, then annually	Initial test after 4 years, then every 2 years
	O2 (trailer 0.75 to 3.5 tonnes)	Initial test after 4 years, next after a further 2 years, then annually	Omitted
	L1e, L2e, L3e, L4e, L5e (two- and three-wheeled vehicles, i.e. motorcycles), L6e and L7e (quadricycles)	Initial test after 4 years, next after a further 2 years, then annually	L1e and L2e omitted L6e (light quadricycles) omitted L3e, L4e, L5e and L7e (motorcycles above 125cc and heavy quadricycles) to be included from 1 Jan 2022 with the Member States deciding the test frequency and with the possibility of exemption for Member States adopting effective alternative measures
	M2 (minibus), M3 (bus), N2 (medium truck), N3 (heavy truck), T5 (agricultural vehicle with a maximum design speed of more than 40 km/h), O2 and O3 (trailers over 3.5 tonnes)	Initial test after 1 year, then annually	As proposed, except that first test for T5 category to be after 4 years with subsequent tests every 2 years
Major deficiencies		Retest within no more than 6 weeks	Retest within no more than 2 months
Dangerous deficiencies		Requirement of withdrawal of vehicle registration until rectification	The Member State or the competent authority may decide that the vehicle in question is not to be used on public roads and that the authorisation for its use in road traffic is to be suspended for a limited period of time, without requiring a new process of registration

Table 2. RSI: Comparison between proposal of 2012 and adopted directive of 2014

Topic	Commission Proposal of 2012 for a Regulation	Adopted Directive of 2014
Vehicle categories included	Light commercial vehicles (category N1) and their trailers (categories O1 and O2) to be included	No requirement to include light vehicles and their trailers. Only buses and coaches (categories M2 and M3), trucks (N2 and N3) and trailers of over 3.5 tonnes (O3 and O4), as well as tractors used for commercial road haulage and capable of over 40 km/h (T5) are included.
High-risk profile	Inspectors shall select as a priority vehicles operated by undertakings with a high-risk profile	optional

Table 3. VRD: Differences between proposal of 2012 and adopted directive of 2014

Topic	Commission Proposal of 2012 for a Regulation	Adopted Directive of 2014
Registration withdrawal in case of dangereous deficiencies	The original proposal stated that: "In cases where dangerous deficiencies have been found during a roadworthiness test, the registration should be withdrawn by the competent authorities until the vehicle has passed a new roadworthiness test."	"In cases where dangerous deficiencies have been found during a roadworthiness test and the authorisation of a vehicle for use on public roads has been suspended, that suspension should be recorded until the vehicle has passed a new roadworthiness test." Therefore according to the final version, full re-registration would not be required

It is reasonable to assume that if all of the Commission's proposals had been included in the final texts, then this would have led to fewer dangerous/defective vehicles in circulation, and hence fewer accidents and fatalities. This can be assumed particularly in relation to the Commission's proposals for (i) the earlier proposed date of application of the measures, (ii) the wider scope of vehicles to be tested at PTI and RSI, (iii) more frequent PTI testing of older vehicles, and (iv) the greater repercussions for a vehicle failing at PTI or RSI.

2.2 Points of comparison

Before the adoption of the Roadworthiness Package in 2014, the requirements of EU legislation in this area were set below what was perceived as an adequate scope; moreover, most Member States have had set national requirements for several elements of the roadworthiness system at a level, which was higher than required by EU legislation. This led to a heterogenous transposition of the PTI Directive 2009/40/EC (predecessor of Directive 2014/45/EU) into national legislations. For example, because of this situation Member States often refused to recognise the certificates for roadworthiness tests issued by other Member States for re-registration purposes and required a new test to be performed according to national rules.

Also, information and data vital for the effectiveness of testing and enforcement of test results was not exchanged between concerned actors even if, during PTI and roadside inspections, an important amount of data on the vehicle and its performance was collected. This data could be used by the different authorities to ensure the follow up of the detection of defects, to organise targeted checks, but also to improve the policy measures in this domain. For PTI and roadside inspections, enforcement authorities did not have access to information on the history of the vehicle and its technical characteristics, even if data was available in the national registers. Lack of provisions in EU legislation about the exchange of PTI-relevant data did not allow the effective flow of data to and from PTI centres and enforcement authorities.

Without further intervention at EU level, the implementation of the policy measures in Member States would have continued to diverge with a possible negative impact on roadworthiness, and consequently road safety and environment. Overall, it was expected that the downwards trend in fatalities would be maintained, while the share of accidents caused by technical defects would likely rise. On the environment side, GHG emissions were expected to reduce due to the gradual withdrawal of older vehicles. But this has been

more than compensated by increasing transport activity (and an increase in the average mass of vehicles). However, the impact on air pollution would have become proportionally higher. It was also expected that the number of cross-border re-registrations of vehicles in the EU would increase up to 2050, which would increase the magnitude of the problems related to the absence of exchange of data between the authorities and the testing centres in different Member States.

2.2.1 Road safety points of comparison

In 2011, at the beginning of the period over which the EU aimed to halve road deaths, there were 28,750 fatalities on the roads of the EU27. By 2022, that number was 20,640, equivalent of a 28.2% reduction on the 2011 figure (and a 14.8% reduction on the 2013 figure of 24,230). The 2014 Roadworthiness Package was one of a series of actions at EU level intended to help deliver the targeted reduction. The Impact Assessment for the RWP estimated that it would lead to a yearly reduction of 38,447 in the number of accidents and allow avoiding 1,282 fatalities per year. The measure with the greatest expected effect was more frequent testing of older vehicles (not included in the final agreed text of the Directive). Performance testing of electronic safety systems was expected to have the potential to save an important number of additional lives. The monetised social benefit arising from the reduction in accidents, saving of lives and avoided injuries was estimated at EUR 5,122 million per year. The reduction in congestion resulting from the reduced number of accidents translated into an additional saving of EUR 192.5 million per year.

Additional road safety benefits but which could not be quantified were identified, such as the requirement to make targeted roadside inspections for commercial vehicles, with the obviously badly maintained vehicles being inspected in priority. This was expected to have a positive impact on the effectiveness of RSI in taking off the roads vehicles with defects. Furthermore, positive impact on road safety was also expected by extending RSI to other categories of vehicles than commercial vehicles and setting a minimum target of 10% commercial vehicles undergoing RSI in any given year. Higher training requirements for the inspectors involved in roadworthiness testing and additional requirements on the supervision of PTI centres were also expected to bring positive and significant impacts in terms of an increased rate of detection of defects during tests.

The establishment of a data exchange system was expected to bring better enforcement of roadworthiness test results by the national authorities. For example, police forces and roadside inspectors would have easier access to roadworthiness related data which are needed to detect and fine non-compliant drivers. Finally, the availability of data from the Certificate of Conformity and the PTI should have improved the functioning of the re-registration process for vehicles originating from another Member State.

There is ample literature to support the argument that roadworthiness measures have a positive safety impact. For example, the cost-benefit analysis conducted in the AUTOFORE project[18] calculated that defects in passenger cars would be responsible for 43,536 injury crashes across 10 Member States in 2010 and that older vehicles would be over-represented in this problem. A recent US study[19] concluded that states that have periodic safety inspection regimes had 5.5% fewer traffic fatalities per 100,000 registered passenger vehicles over the period from 1980 to 2015 than the US States that did not have

[18] Study part-funded by the European Commission, conducted by a CITA-led consortium, to examine options for roadworthiness enforcement, 2007, available at: https://citainsp.org/studies/autofore-2007/
[19] https://ascelibrary.org/doi/10.1061/JTEPBS.TEENG-7320

such regimes. The study also concluded that the relationship was causal – i.e. inspection was responsible for those reduced fatalities. It can be observed that this estimated reduction of 5.5% is similar in size to the 4.4% reduction expected in the 2012 Impact Assessment, even though the former is an estimation for a change from no PTI at all to PTI, whereas the latter is a prediction for the outcome of an improvement in the operation of PTI and RSI.

The Impact Assessment observed that those Member States with a poorer performance on road safety also tended to be the ones with a lower level of stringency in PTI, while Member States with a better performance in road safety tended to exceed the then minimum standards for PTI. Thus, it concluded that a higher minimum standard would improve overall performance in EU road safety.

Since periodic technical inspections have been in place in the EU for decades for the most important vehicle categories, the number of recent studies comparing the before and after (or with PTI and without PTI) situation within the EU is limited. What is available relates: (a) to the vehicle categories that are only inspected by some of the Member States or for which PTI has only been introduced recently (such as mopeds and trailers) ([20]), or (b) to non-EU countries, e.g. differences between US States ([21]) and the evolution of the situation in Costa Rica or Turkey ([22]).

2.2.2 Emissions and air pollutant points of comparison

The positive environmental impact of the 2014 RWP was primarily expected from more frequent testing of vehicles and extended scope of tested vehicles, which should have allowed a higher detection level of big polluters. It was estimated that this would lead to a decrease in the overall yearly CO_2 and NO_x equivalent emissions of road vehicles in the EU by 2%. In absolute terms, this would correspond to approximately 18.2 million tons CO_2 and 6,979 tons of NO_x equivalent per year. These were translated into annual monetary savings of EUR 545 million and EUR 30.7 million respectively. However, these estimated emission reductions did not materialise because the measures upon which these estimates were based, principally more frequent testing of passenger cars (annually after 6 years) were not included in the final agreed text of the Directives.

In addition, the testing of emissions using on-board diagnostics (OBD) should ease the process and therefore reduce the costs of testing for PTI centres and for the drivers, but available evidence did not suggest that it would increase the rate of detection of defects. There was also positive environmental impact expected in terms of reduced noise, thanks to removing vehicles with technical defects from circulation, however this was not quantified in the 2012 Impact Assessment.

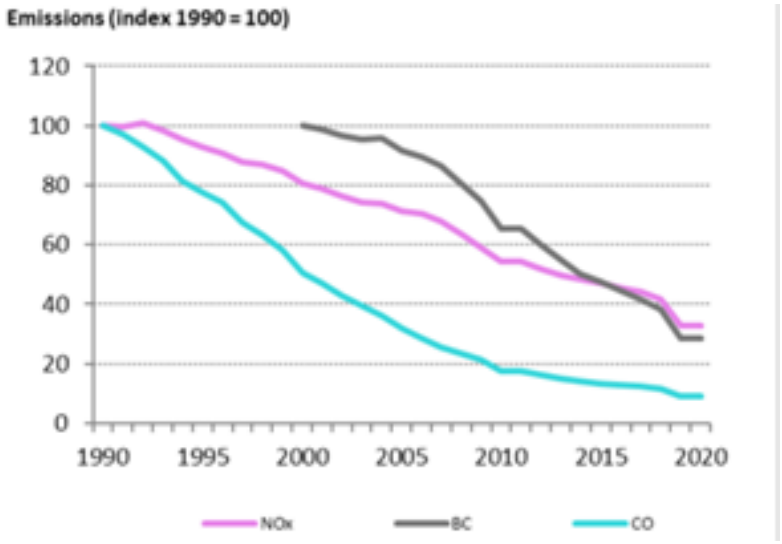
([20]) Study on the inclusion of light trailers and two- or three-wheel vehicles in the scope of the periodic roadworthiness testing, https://citainsp.org/wp-content/uploads/2019/02/LO.pdf

([21]) https://ascelibrary.org/doi/10.1061/JTEPBS.TEENG-7320

([22]) Schulz W.H. and Scheler S. (2019), Reducing the Death Toll of Road Accidents in Costa Rica through the Introduction of Roadworthiness Inspections by the Government, available at SSRN: https://ssrn.com/abstract=3420341; Schulz W.H. and Scheler S. (2020), Getting Ready for Europe: An Empirical Assessment for the Introduction of Periodical Technical Inspections of Road Vehicles in Turkey, available at SSRN: https://ssrn.com/abstract=3523602

Despite the increase in car transport by 18% and freight transport by 22% from 2000 to 2019 the emissions of road transport have decreased substantially[23]. Emission control technology and type-approval have been effective in reducing the overall emissions. Hence, ensuring that emission control systems remain in a proper state has become increasingly important. Road transport was, and is, a major contributor of nitrogen oxides (NOx) in the air, but the continuing decrease is the result of successive and effective European vehicle emission legislation (see Figure 1 below).

Figure 1. The continuing reduction of emissions from road transport.



**Legend: NOx =Nitrogen Oxides ; BC=Black Carbon : CO=Carbon Monoxide*

Source: EEA

Therefore, as noted in the Commission's 2012 Impact Assessment, the effect of defects will increase in the overall context of decreasing carbon dioxide (CO_2) emissions and air pollution. However, the 1.2% to 5.7% increases in emissions estimated by the impact assessment in the absence of the RWP, due to lower detection of technical defects, are conservative estimates. The common understanding of acceptable deterioration of emission control technologies, as estimated in type-approval legislation, is much larger. Typical increases are 10% to 30% in emissions due to gradual deterioration, notably of catalysts, over the useful life. This is the order of magnitude expected as well for the effect of roadworthiness testing on emissions.

At the time, in 2012, it was highlighted that an unnoticed defect could lead to a twentyfold increase in emissions on vehicles. However, the impact on the overall emissions – i.e. 1% vehicles with a defect would increase emissions by 20% – could not be factored in properly, as older, less clean vehicles still dominated the total emissions (although not the fleet composition).

The new emission control technologies in vehicles developed since 2010 all have their own strengths and weaknesses. In 2008, the first SCR (selective catalytic reduction) systems were used on heavy-duty vehicles, and on light-duty diesel vehicles a string of after-treatment technologies was introduced, with Euro-6 from 2014 onwards. The technical

[23] https://www.eea.europa.eu/ims/emissions-of-air-pollutants-from

requirements for inspection, specifically relating to the functioning of the after-treatment technologies, did not anticipate the technological advancements. Therefore, the defects of these advanced technologies likely remained undetected during periodical technical inspections and roadside inspection, as neither the technology, nor the possible testing was addressed beyond the most generic formulation. In that respect, the RWP relied on the fact that appropriate servicing of a vehicle would find defects and enforce their repair. In practice, without incentives, vehicle owners would not consider repairs, which will not affect the normal vehicle usage and are not legally required. The increasingly stringent type-approval emission requirements on vehicles, both in terms of emission limits and test protocols, had not been integrated into the roadworthiness requirements. Without addressing the specific problems with modern technologies in the roadworthiness legislation, there is no basis to check its functioning. The undetected defects can lead to substantial increases in emissions, with a possibly significant impact, even with a small fraction of undetected defects.

The 2014 RWP did not take into account the rapidly changing target, with each next generation of vehicles achieving lower emissions. This has led to a situation where emission tests became outdated, and the effectiveness of onboard diagnostics (OBD) is not currently tested in PTI. The moving target has become more apparent with the scrappage of most polluting pre-Euro-1 vehicles, for which the PTI was suitable, which have almost completely been removed from the road since 2020, as even the most robust pre-Euro vehicles do not last more than 30 years in normal use. Hence, although the 2012 Impact Assessment noted the changing landscape with more complex and effective emission control technologies, it did not identify the risk of undetected defects specific for these technologies, and the consequent gap between type approval and roadworthiness emission levels.

2.2.3 Other expected impacts

In addition to positive impacts on road safety and environment, the revised RWP also introduced the requirement for PTI centres to report the odometer readings of tested vehicles. These readings should be collected at Member State level, thereby helping to combat more effectively the mileage fraud, which was distorting the second-hand car market. The effects were expected to be positive and significant, but not assessed in quantitative terms. Furthermore, the establishment of a system for data exchange was expected to reduce the administrative costs of complying with the PTI requirement for vehicle owners and reduce the administrative procedures for authorities and PTI test stations. This was expected to be achieved through a replacement of manual procedures with electronic data input and exchange.

3 HOW HAS THE SITUATION EVOLVED OVER THE EVALUATION PERIOD?

This section explains the state of play in implementing the Directive and presents what has happened over the evaluation period in relation to the objectives of the 2014 RWP.

3.1 State of play – transposition and implementation of the Roadworthiness Package

All three RWP Directives stipulated that Member States must transpose the measures by 20 May 2017, and that the Directives apply from 20 May 2018, though some provisions envisaged phased application.

The Commission has concluded its compliance assessment of the three Directives, based on information submitted by Member States. This compliance check indicates that no Member State has correctly and completely transposed and communicated every provision of all three Directives. Given that Member States had until 2017 to notify their transpositions, it is likely that in some instances, Member States have modified their legislation since 2017 to comply more fully with the Directives. Therefore, the Commission is currently liaising with the Member States to seek clarification on every item that does not appear to have been correctly transposed or communicated.

However, it should be noted that the Commission has not been made aware of any systemic failure of any Member State to transpose the provisions of the RWP.

In relation to the **PTI Directive**, the information gathered during the evaluation indicated that most Member States have adopted at least the minimum requirements for vehicle testing frequency, with some even introducing more frequent checks, particularly for passenger cars and light commercial vehicles. For example, the PTI Directive requires that passenger cars are subject to a PTI test at the latest 4 years after the first year of registration, and thereafter at least every two years (i.e., a regime of 4-2-2-2- etc.). About half the Member States apply such a regime, while the other half have a stricter regime. For example, Croatia and Latvia require that a PTI be conducted for passenger cars after two years and annually thereafter; Germany and Lithuania require a PTI to be conducted 3 years after first registration and every two years thereafter, while Austria, Bulgaria and Poland require the first PTI to be conducted after 3 years after, then after a further two years, and annually thereafter. Table 4 presents an overview of the frequency of PTI in EU Member States.

Table 4. Frequency of PTIs by Member State, for passenger cars (unless otherwise indicated)

Country	Frequency	Conducted by	Country	Frequency	Conducted by
Austria	3-2-1-1-	A	**Ireland**	4-2-2-2-1-1	B
Belgium	4-1-1-1-	B	**Italy**	4-2-2-2-	D
Bulgaria	3-2-1-1-		**Lithuania**	3-2-2-2	B
Cyprus	4-2-2-2-	B	**Luxembourg**	4-2-1-1-	B
Czechia	4-2-2-2-		**Latvia**	2-2-1-1- or motorcycles: 2-2-2-2-	B & C & D
Germany	3-2-2-2-	B	**Malta**	4-2-2-2-	B
Denmark	4-2-2-2-	B	**The Netherlands**	Petrol/electric 4-2-2-1-1 diesel/other 3-1-1-1	A
Estonia	4-2-2-2-1	B	**Poland**	3-2-1-1-	B
Greece	4-2-2-2-	B & D	**Portugal**	4-2-2-1-	B
Spain	4-2-2-2-1-	B & D	**Romania**	3-2-2-2-2-1-	B & D
Finland	4-2-2-2-1-	B	**Sweden**	3 years – 2 years – 14 months – 14	B

				months – 14 months	
France	4-2-2-2-	B	**Slovenia**	4-2-2-1-	B
Croatia	2-1-1-1-	B	**Slovakia**	4-2-2-2-	B
Hungary	4-2-2-2-	B & D			

A: Commercial garages: commercial garages that are also allowed to carry out repairs
B: Private inspection centres: privately owned vehicle inspection centres
C: Central Licencing Authority: the central licencing authority in the country
D: Public inspection centres: governmental owned vehicle inspection centres

The content and method of these tests are generally harmonised across Member States, adhering to a minimum list of required items. In cases where major deficiencies are found during roadworthiness tests, most Member States stipulate a one to two-month period for a follow-up test. All Member States have instituted minimum competence requirements for PTI inspectors, including routine training and sometimes requalification exams with a given frequency.

Regarding the extension of the scope by the 2014 revision, the inclusion of high-speed tractors (with design speed over 40 km/h) and two- and three-wheel vehicles appear to have posed a problem for some Member States. I In relation to the vehicle categories already covered by the PTI Directive, only minor discrepancies have been found.

It seems that agricultural vehicles are in general not registered in some Member States[24], which made the introduction of periodic testing for these vehicles challenging. The periodic testing of two- and three- wheeled vehicles was due from 1 January 2022, though many Member States were late with the adoption and notification of the transposing national measures. The broad and imprecise definition of "alternative measures" in Article 2(2) of the PTI Directive, which is open to interpretation by Member States[25], was also an issue.

Concerning the measures related to the mutual recognition of roadworthiness certificates in the case of re-registration of a vehicle already registered in another Member State, in the majority of the Member States the transposition has been satisfactory. Most Member States made use of the optional measure to verify, in cases of doubt, the validity of the roadworthiness certificate.

Regarding odometer fraud, the 2020 report on the implementation of the PTI Directive[26] showed that the measures requiring Member States to ensure that the odometer data recorded at the previous roadworthiness test was made available during the next inspection, have been transposed without major problems. However as regards the obligation to introduce effective and dissuasive penalties when an odometer is found to have been manipulated, it seems that the national measures are in many cases rather generic, not specifically aimed at odometer fraud.

[24] Note: In the absence of EU legislation, it is a national competence to decide which vehicles are registered and consequently issued a vehicle registration document and licence plate(s).
[25] Some Member States take it to mean improved road infrastructure, others take it to mean roadside inspections for motorcycles.
[26] COM (2020) 699 final

In relation to the **VRD Directive**, the evaluation found that national legislation in most Member States mandates the electronic record-keeping of all registered vehicles, including the results of periodic roadworthiness tests and their validity periods. In all Member States, a vehicle's suspension is automatically lifted once the identified deficiencies have been rectified and the vehicle successfully passes a new test.

In relation to the **RSI Directive**, the information gathered indicates that roadside inspections for commercial vehicles are carried out in varying numbers by Member States, . The selection of vehicles for initial roadside inspections can be based on the risk profile of the transport undertaking, although random selection is implemented in several countries. The method of selection i.e., random versus targeted, naturally has a very significant effect on RSI failure rates. In all Member States, if a vehicle is found with major or dangerous deficiencies during an inspection, its use is restricted. In the case of dangerous deficiencies, which require immediate rectification, the vehicle may only be driven to the nearest workshop for repair, provided that immediate risks to the vehicle's occupants or other road users have been mitigated. According to the 2020 report on the implementation of the RSI Directive[27], the inclusion of high-speed tractors was challenging for some Member States. The report also indicated possible problems in several Member States concerning the extension of the risk rating system with the information stemming from the technical roadside inspections. On the other hand, the majority of the Member States have introduced the optional measures of the Directive concerning the selection of vehicles. The two-stage approach to inspecting, i.e., the introduction of the separate initial and more detailed technical roadside inspections proved challenging in practice. It seems that the clear separation of the two stages has not been introduced in some Member States, which may raise further questions such as regarding the data collection, the reports of the more detailed roadside inspections, or the training of inspectors. Also, the new obligation on the collection of different sets of information after initial and more detailed inspections seems to have been challenging for some Member States. Only a few Member States appear to have introduced the optional measures to require the payment of a fee linked to carrying out the inspection where defects have been found during the more detailed inspection.

During this evaluation, the Commission contacted Member States to assess the extent to which Member States had exceeded the minimum requirements in the Directives. The responses indicated that some Member States have exceeded the minimum requirements set out in the Directives, including, but not limited to, the scope of vehicles to be subject to PTI and RSI, and the frequency of PTIs (please see Annex VIII for more details).

In addition, Commission Delegated Directive 2021/1716[28] amended the RSI Directive as regards modifications to the vehicle category designations stemming from amendments to the type-approval legislation. Commission Delegated Directive 2021/1717[29] amended PTI Directive as regards the updating of certain vehicle category designations and the addition of eCall to the list of test items. For both Delegated Directives, the most common transposition issues have been the non-communication of the transposition measures, and the absence of a reference to the Directives in the national measures.

[27] COM (2020) 676 final
[28] EUR-Lex - 32021L1716 - EN - EUR-Lex (europa.eu)
[29] EUR-Lex - 32021L1717 - EN - EUR-Lex (europa.eu)

The European implementation assessment of the European Parliamentary Research Service (EPRS), from 2020[30] indicated that the transposition of the RWP at national level has led to improved harmonisation of procedures, such as the frequency and content of vehicle testing, and the provisions of the RWP Directives have enhanced the quality of periodical technical inspections and roadside inspections, as well as road safety standards. The report indicates that it is too early to analyse the effectiveness, the efficiency, the relevance, and the EU added value of the package, but the coherence has been analysed. The report found that the RWP measures are coherent with the general objective of contributing to the achievement of the road safety targets in the 2011 White Paper. The report points to a number of measures in this is regard, in particular the introduction of common standards for testing centres, training of inspectors, as well as the provisions on scope, frequency and the methods for vehicle testing. The report also notes that some Member States have gone beyond the minimum requirements in relation to scope and frequency of testing, and that this helps to reduce the number of unsafe vehicles in circulation.

On the information exchange between Member States, the EPRS report found that 7 of the 21 Member States consulted, had issues in contacting National Contact Points to verify the roadworthiness certificate, and 6 Member States on the time required to obtain the document. 12 authorities reported that there is no fixed time limit to keep information in the database. Furthermore, all the Member States notify the competent authority of the data collected during vehicle testing, including the odometer readings.

On coherence, the Parliament report only pointed at one potential issue between Directive 2014/45 and Directive 2014/46, referring to the notification and registration of the roadworthiness certificate. Directive 2014/45 requires the competent authority to notify the content of the roadworthiness certificate, but Directive 2014/46 only refers to the outcome of the test, and the validity of the roadworthiness certificate. The report also pointed that no stakeholders interviewed have raised any internal coherence issue.

3.2 Market developments

Regarding the objective of improving road safety, one of the measures which was expected to have the greatest effect was more frequent testing of older vehicles, which tend to have more defects. A study from Spain[31] showed that both passenger cars and light commercial vehicles have increasing failure rates in PTI as they age, with vehicles over 10 years old experiencing particularly high rates. This was reflected in the crash data, where older vehicles were more prevalent, often due to issues such as defective tyres, steering, and brakes. Consequently, addressing this group of vehicles with targeted measures under the RWP was expected to bring greater benefits in terms of lives saved and injuries avoided. This is relevant since the vehicle fleet in the EU has been progressively aging. The proportion of passenger cars aged over ten years increased by 13% from 2016 to 2021[32].

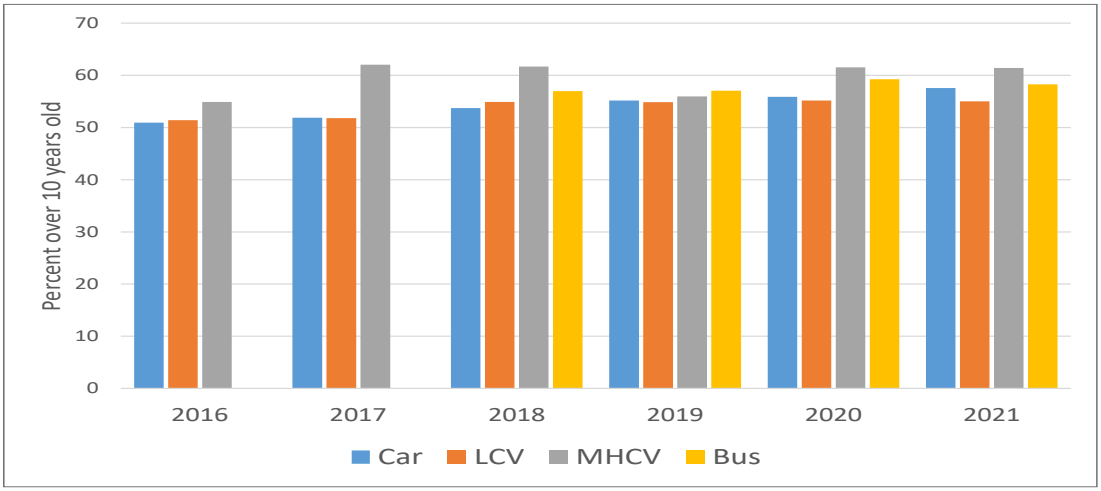
[30] Implementation of the roadworthiness package: European implementation assessment | Think Tank | European Parliament (europa.eu)

[31] Diaz Lopez et al., 2018, https://www.aeca-itv.com/wp-content/contribucion-itv-seguridad-vial-medio-ambiente/eng/files/assets/common/downloads/ROADWORTHINESS%20TESTING%20CONTRIBUTION%20TO%20VEHICLE%20SAFETY%20AND%20ENVIRONMENT.pdf?uni=8643c3a2724634911b854c6080952f96.

[32] ACEA Annual report; Evaluation support study (VVA)

Increases also occurred for light commercial vehicles (7%) and for medium and heavy commercial vehicles (11.8%). See Figure 2.

Figure 2. Proportion of registered vehicles in the EU27 aged over 10 years.



* *Legend: LCV = light commercial vehicles; MHCV = medium and heavy commercial vehicles*
*** Note: buses were nor included as a separate category before 2018*
Source: ACEA, 2023

In parallel, the average age of the vehicle fleet increased: the average age of passenger cars in the EU was 10.7 years in 2016, and by the beginning of 2022 it had risen to 12.0 years.[33] It could be expected that the problem of vehicle defects — minor, major and dangerous — would worsen over time, since it has been established that the incidence of such defects increases with vehicle age.[34]

The introduction of advanced vehicle safety features mandated by the General Safety Regulation, (EU) 2019/2144 from July 2022[35] onwards and of significantly strengthened emission legislation has led to vehicles in the EU becoming technically ever more complex. The Regulation mandates the inclusion of safety features such as intelligent speed assistance, driver drowsiness and attention warning systems, amongst others, in new motor vehicles. Advanced Driver Assistance Systems (ADAS) will gradually become standard in all vehicles and road safety will be increasingly dependent on ensuring the correct functioning of the technologies that assist drivers in performing their driving tasks. These electronic safety and driver assistance systems are not being tested in the current PTI.

To keep pace with this trend, adaptations in the methods of inspecting vehicles throughout their lifetime are necessary. These may require fundamentally new approaches in the field of vehicle testing, taking into account ongoing developments in vehicle automation. Visual and mechanical vehicle inspections, which are still the predominant modes to date, may

[33] Note that the 2016 calculation included the UK, but the 2022 one did not. The ACEA data combines the registration years for vehicles ten years and older, so that it is not possible to calculate average vehicle age for 2016 omitting UK registrations.
[34] Hudec J., et al. (2021), Examination of the results of the vehicles technical inspections in relation to the average age of vehicles in selected EU states, https://www.sciencedirect.com/science/article/pii/S2352146521004695
[35] The General Safety Regulation requires that, from 2022, new vehicle types are equipped with these features, and the features will be mandatory on all new vehicles from July 2024 onwards.

progressively need to be complemented or even replaced by inspection modes that access vehicle status and operational data by other means.

Related to this last issue, improved vehicle technologies offer opportunities to enhance PTI with improved and comprehensive data, but also carry a risk that current testing services are becoming outdated. The introduction of sophisticated electronic safety and advanced driver assistance systems have outpaced the existing standardised inspection methods at PTI. Systems like ADAS require information from manufacturers which is necessary to electronically access and diagnose them. However, the actual availability of data is not the only issue. The costs due to the divergence of format of vehicle data necessary to carry out the inspection is also a problem. The divergence of formats of data and functions across vehicle brands poses a major obstacle to the development of improved PTI methods. The limited access by vehicle inspection authorities and authorised entities to the functions relevant for roadworthiness testing means that the inspection of the safety and driver assistance systems may not be carried out properly. Hence, expected benefits to prevent crashes could be negatively impacted. The same applies to pollutant emissions when, for example, the software integrity of the emission control system cannot be checked in the absence of access to relevant vehicle functions.

Member States have also repeatedly reported difficulties to the Commission in effectively enforcing road safety measures in EU cross-border traffic and vehicle trade. These mostly have their origin in difficulties for competent authorities in accessing vehicle register data and other safety-relevant information of vehicles, notably if these are registered in another Member State. These difficulties may also negatively impact upon attempts to combat the presence on the roads of vehicles with defects or tampered components, which negatively affects road safety, consumer welfare and environment in the EU.

One of the issues regarding the implementation of the RWP is related to the increasing roll-out of vehicles with alternative power train technologies (e.g. hybrid and zero-emission powertrains) which require particular testing methods for their safety- and/or environment-relevant components. The RWP does not currently provide specific guidelines for inspecting such vehicles during PTIs. When the current Roadworthiness Package was adopted in 2014, only around 0.5% of the newly registered vehicles in the EU were electric, including hybrids and range extended vehicles, whereas by 2022 battery electric vehicles accounted for 12% of new car registrations[36]. The issue may exacerbate in view of the ambitious EU's goal of climate neutrality by 2050 which will require having 30 million EVs on the European roads by 2030[37].

While air pollutant emissions from road transport have fallen in the past decade in the EU, in 2022 road transport remained the principal driver of the exceedances of NO_2 emissions, as reported by Member States, with 64% of all reported exceedances linked to dense road traffic in urban centres and to the proximity to major roads[38]. The road transport sector was also the main source of reported NO_x emissions, responsible for 41%, followed by the energy supply sector at 17%. It is also important contributor to black carbon pollution (32%), CO emissions (24%) and PM (particulate matter) emissions (20%)[39]. The impact

[36] Fuel types of new passenger cars in the EU - ACEA - European Automobile Manufacturers' Association
[37] Sustainable and Smart Mobility Strategy, COM(2020) 789 final, 9.12.2020
[38] EEA, Managing Air Quality in Europe, 2023
[39] EEA, Air Pollution in Europe; 2023 reporting status

of road transport emissions of NO_2 and PM on air quality, especially in urban areas, remains high, because they take place close to the ground and the dilution effect is lower.

Since 2015, the development of real-driving emissions (RDE) legislation as a key policy to address high real-world emissions of nitrogen oxides (NOx) from diesel cars led to the application of new and more sophisticated emission control technologies and independent verification. The change has confirmed the need to move away from reliance on the vehicle manufacturer information for checking the actual emissions (such as reading the OBD instead of tailpipe testing). With Euro 6, the selective catalytic reaction (SCR) technology has become standard on light-duty diesel vehicles, passenger cars and vans, and the typical NOx emission levels dropped under the emission limits.

At the same time, the existing EU framework for vehicle inspection (RWP) continue to rely, to some extent, on manufacturer maintenance information, i.e., on on-board diagnostics (OBD)), without any possibility to check independently its functioning. On the other hand, the inspection and surveillance authorities' tasks and responsibilities were extended under the new type-approval and market surveillance legislation in 2018[40]. From 2020 Member States and type-approval authorities have the task of testing independently and have no longer to rely on certification documents and the industry's own quality control systems. The market surveillance authorities received a broader mandate with more means of enforcement. Among these tasks are the checking of the use of defeat devices in vehicles, which can increase the emissions disproportionally in normal use, outside the type-approval tests. The Member States are still adjusting to this new situation.

The need for comprehensive oversight and coordination of activities has been increasingly recognised since 2018. The Member States have developed their own legislation to deal with a variety of vehicle emission problems, with national legislation for PTI tests, anti-tampering, software updates and dealing with car manufacturers. With Euro 4 and (later) Euro 5 vehicles slowly leaving the vehicle fleet and the uptake of zero-emission vehicles, it is expected that the GHG emissions as well as air pollution due to road transport will decrease. However, the issues related to defects and tampering of EGR, particle and NOx filters will persist, and so will the wear emissions of tyres and brakes. These emissions would be addressed in the proposed Euro 7 Regulation[41], which is currently in the legislative process, stimulating new vehicle and brake technologies. Nevertheless, NOx emissions from road transport remain the main source of NOx pollution as long as vehicles with internal combustion engines are on the road. Hence, the environmental performance of vehicles will have to be ensured, notably through adequate roadworthiness testing.

4 EVALUATION FINDINGS (ANALYTICAL PART)

4.1 To what extent was the intervention successful and why?

4.1.1 Effectiveness

This section summarises to what extent the Directives have been successful in (a) contributing to road safety by increasing the quality and better coordination of national PTI and roadside inspection systems and (b) helping to reduce greenhouse gases and air pollutant emissions from road transport through detecting more effectively and removing

[40] https://eur-lex.europa.eu/EN/legal-content/summary/eu-approval-and-market-surveillance-measures-for-motor-vehicles-and-their-trailers.html
[41] COM(2022)586, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_6495

from circulation vehicles which are over-polluting. In addition, the section also provides insight into what extent the Directives were successful in the creation of a harmonised framework for roadworthiness control and vehicle registration, and cooperation between Member States in this field, which helps the free movement of EU citizens and the smooth functioning of the internal market.

4.1.1.1 Factors contributing to the road crashes related to the technical status of a vehicle

While not the most important cause of road crashes, defects of vehicles due to technical malfunctions and/or inadequate maintenance have been found to be the cause for a small share of crashes on EU roads. Deficiencies of those vehicles can compromise vehicle safety and increase the likelihood of occurrence of road crashes and associated injuries. The 2012 Impact Assessment had identified that on average, technical defects are responsible for 6% of all traffic collisions. In view of the expected overall increase in the number of passenger cars in use, it was expected that in principle the risk of crash occurrence would also increase, despite the downwards trend in fatalities. The 2012 Impact Assessment assessed that it was probable that the share of crashes caused by technical defects would even rise from the estimated 6%.

A 2021 study[42] examined the status of temporarily roadworthy[43] vehicles. There was a significant variation observed among Member States in terms of PTI failures, which may be due to the variation in the stringency with which testing is applied in selected countries, and not necessarily that vehicles are less roadworthy in those countries.

Table 5: Average value of temporarily roadworthy and not roadworthy vehicles assessed by PTI in selected European states in 2019

Countries observed in the study	% of temporarily roadworthy and not roadworthy in 2019
Poland	2.00
Czech Republic	8.46
Austria	10.14
Slovakia	13.03
Estonia	15.06
Spain	20.66
Germany	20.77
Finland	27.00
Ireland	35.76

[42] Hudec J., et al. (2021), Examination of the results of the vehicles technical inspections in relation to the average age of vehicles in selected EU states, https://www.sciencedirect.com/science/article/pii/S2352146521004695

[43] A vehicle is considered to be “temporarily roadworthy” if the technical inspection is carried out and at least one major defect is detected, but no dangerous defect is detected. A vehicle is considered "not roadworthy" if at least one major or dangerous defect is detected on the vehicle. In both instances the vehicle has failed the inspection test.

Latvia	39.97

Source: Ricardo, 2023, Impact assessment support study

The age of a vehicle is an important factor that contributes to the risk of roadworthiness faults. Studies have consistently shown significantly higher failure rates among older vehicles, specifically those exceeding 10 years of age. For example, a study from 2018[44], which used data from Spain, found that failure rates in PTI went up with age for passenger cars and light commercial vehicles, and that failure rates were particularly high for vehicles more than 10 years old. A similar pattern was found related to crashes, with older vehicles featuring more frequently due to defective tyres, steering and brakes.

The analysis of the involvement rates of older vehicles in crashes in the period before the RWP was in place supports the argument that older vehicles pose an extra safety risk: the analysis comparing the share of involvements in fatal crashes for passenger cars aged 10 years or more with the share of vehicle registrations concluded that those vehicles have a 13% higher involvement than the average for all vehicles. Given that the literature reports that older passenger cars have considerably lower annual mileage, compared to younger vehicles, that over-involvement is likely to be about 50% higher when calculated on a per km basis as opposed to a per-vehicle basis, i.e. to be around 19.5%, which suggests a substantial extra safety risk for the use of older vehicles[45].

Regarding the role of technical defects in road safety at both EU and national levels there are various estimations. According to the report from the EPRS in 2020[46], technical vehicle defects are deemed responsible for around 5% of accidents involving goods transport vehicles while poor maintenance causes about 4% of accidents for road users. The most comprehensive studies on the subject show that vehicle defects are a contributing factor in 6.5% to 12.6% of traffic crashes; for motorcycles, it is 5% to 12% of accidents[47]. Technical faults were registered as a cause or contributing factor in 3% of traffic collisions in Norway, primarily associated with worn tires and incorrect air pressure[48]. The 2012 Impact Assessment reported varying estimations of technical defects' contribution to traffic collisions, ranging from 3% to 19%.

There is also further evidence based on results of PTI in selected countries, showing the link between improved technical condition of the vehicles and increased road safety. A study[49] on data from Spain attempted to assess the impact of PTI on road safety in terms of numbers of avoided road crashes, injuries and fatalities for each vehicle category. According to the study, thanks to the inspections carried out during 2016, at least 17,632 crashes, about 12,103 injuries and 133 deaths have been prevented, which translated into an economic benefit of at least EUR 330 million. It should be noted that the estimated impacts should be nevertheless treated with caution since the underlying assumptions

[44] Diaz Lopez et al., 2018, https://www.aeca-itv.com/wp-content/contribucion-itv-seguridad-vial-medio-ambiente/eng/files/assets/common/downloads/ROADWORTHINESS%20TESTING%20CONTRIBUTION%20TO%20VEHICLE%20SAFETY%20AND%20ENVIRONMENT.pdf?uni=8643c3a2724634911b854c6080952f96.

[45] VVA et al. (2023), Evaluation support study

[46] European Parliamentary Research Service (2020), Report on the implementation report on the road safety aspects of the Roadworthiness Package

[47] Sarkan et al. (2022), Effect of periodical technical inspections of vehicles on traffic accidents in the Slovak Republic

[48] Norwegian Public Roads Administration (2021), Special Analysis, Fatal Motorcycle Accidents 2005-2009

[49] UC3M (2019), Roadworthiness testing contribution to vehicle safety and environment

concerning the contribution of PTI to the reduction of road accidents are not generally accepted.

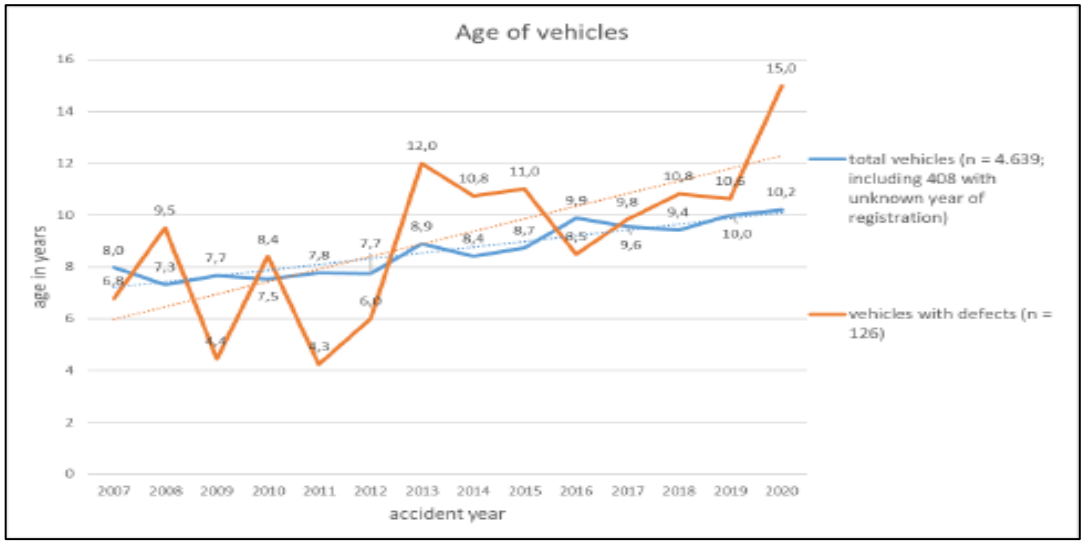
Table 6. Impact of vehicle technical inspections on road safety in Spain

	Avoided Traffic Collisions	Avoided Injuries	Avoided Fatalities
Passenger cars	11,895	7,602	80
Vans	2,127	864	12
Motorbikes and mopeds	3,610	3,637	41
Total	17,632	12,103	133

Source: UC3M, 2019

In relation to vehicle age and deficiencies, the database from in-depth investigations of road crashes IGLAD,[50] containing data for Austria, Czechia, France, Greece, Italy, Sweden, Slovakia and Spain was analysed in the evaluation support study. Figure 3 shows a comparison of the average age of the vehicles in IGLAD selected countries compared with the average age of the vehicles for which a defect was coded as a contributory factor. While there is considerable year-to-year variation for the defect coding, it can still be observed that an overall trend for the age of vehicles with defects rose faster that the age of all the vehicles involved. This indicates a growing problem of defects for older vehicles, perhaps related to some very old vehicles.

Figure 3. Average age of vehicles in IGLAD database compared with average age of vehicles coded with a defect as a contributory factor.



Blue: all vehicles involved in the road crashes, Orange: vehicles with defects
Source: VVA et al. (2023), Evaluation support study

4.1.1.2 Contribution of the RWP to road safety objectives

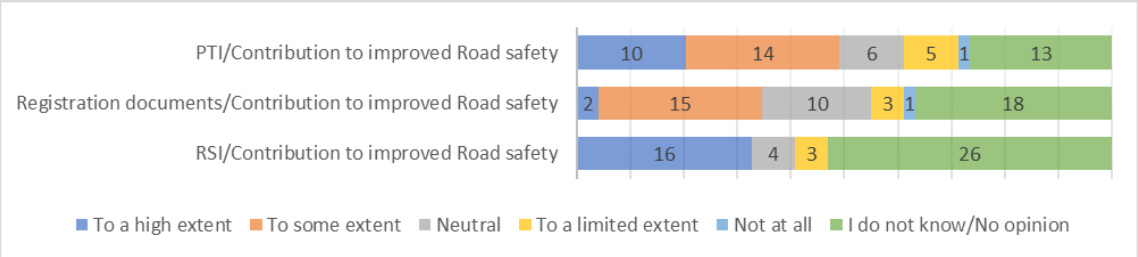
The stakeholders surveyed emphasised that by providing a common framework for PTIs, the RWP plays a central role in maintaining high vehicle standards, improving road safety and reducing emissions. Some stakeholders mentioned how PTI could have an indirect

[50] Initiative for the Global Harmonisation of Accident Data, http://www.iglad.net/

psychological effect on vehicle owners: the awareness of the obligation to undergo a PTI can lead vehicle owners to preventively fix certain defects before the inspection itself, thereby contributing to their safety. If the RWP had not been implemented, then they may not have had the same incentive to do so. While most of the respondents to the survey acknowledge the contribution of PTI and RSI Directives to improved road safety to a large or even to a high extent, the opinions are more divided regarding the contribution of the VRD Directive to improved safety: where vehicle registration authorities maintain a neutral opinion while EU associations and road safety authorities stated that registration documents lead to increased safety on the road and environmental compliance. Availability of accurate vehicle registration data is essential for the proper functioning of the cross-border exchange of information related to road safety offences. While the survey did not indicate specifically the role played by the Directive on facilitating cross-border exchange of information on road-safety-related traffic offences (Directive 2015/413/EU)[51], the inter-institutional negotiations leading to the adoption of this Directive in 2015 confirmed the enabling function of vehicle registration data for the purpose of enforcement and have identified areas for further improvements.

Regarding the success of the RSI Directive to contribute to road safety, stakeholders consulted in the survey - ministries, road safety authorities and PTI bodies - agree to a large extent that RSI has contributed to improved road safety, although just over half of the respondents do not have an opinion on the matter (see Figure 4). Road safety authorities mentioned that figures on crashes in general have decreased since the Directive came into force.

Figure 4. Stakeholder opinions regarding the effectiveness of the RWP in improving road safety and contributing to the reduction of road fatalities and serious injuries in road transport (n=49).



Source: VVA et al. (2023), Evaluation support study, Survey results

Stakeholders reported in the context of RSI, that the identified deficiencies have slightly increased since the entry into force of the Directive, helping reduce the number of vehicles in circulation with dangerous defects.

Table 7 illustrates the total number of RSIs performed in selected EU Member State, including percentages of failed vehicles. The percentage of RSI failed vehicles for the years 2021 and 2022 ranges from 3.8% (reported for Poland) to a maximum of 58.2% (reported for Sweden), with a total average of 9.6% of failed RSI checks.[52]

51 EUR-Lex - 32015L0413 - EN - EUR-Lex (europa.eu)

52 The RSI failure rates in Member States can vary for a number of reasons, including whether the RSI checks are random or are targeted on the basis of a risk assessment, and the nature of the initial check.

Table 7. RSI checks by selected EU countries for the period 2021-2022

Reporting Country	Total		
	Checked	Failed	Percentage failed
BE	17516	3157	18.0%
EE	16566	2593	15.7%
FI	16621	6280	37.8%
HR	16852	2272	13.5%
IT	10082	2367	23.5%
LT	9963	1371	13.8%
LV	16566	2593	15.7%
MT	6193	2638	42.6%
PL	780185	29762	3.8%
PT	335	184	54.9%
SE	67388	39201	58.2%
Total	**958267**	**92418**	**9.6%**

Source: VVA et al. (2023), Evaluation support study

The rules related to the training of inspectors, the detailed listing of deficiencies and the prevention of conflicts of interest have contributed to making roads safer, but there are several gaps that are not explicitly addressed by the RWP. For example, electronic manipulation of engines, diesel particles exhaust emissions, ADAS suspensions and electronic systems cannot be checked based on current PTI standards. Also, desk research suggests that not all deficiencies can effectively be detected by applying the current technical standards for vehicle inspections and that the protocols set in the RWP are not sufficient to detect malfunctions and tampering, possibly leading to high emissions of key air pollutants.

Findings from interviews with stakeholders also indicate that the likelihood of road crashes due to technical defects increases as the PTI validity approaches its end. Some stakeholders therefore thought that shortening the PTI interval for vehicles older than 10 years might be a beneficial measure, as the probability for deficiencies is particularly high in older vehicles.

Finally, the analysis carried out in the evaluation support study for the years the 2016 to 2020 examined whether the changes over the years in the share of fatal involvements by older passenger cars could be explained by changes in the share of older vehicles in the fleet. Data from the countries included in the CARE database analysis of passenger car fatal involvements was used, alongside registration data for those countries. The conclusion was that there was very little difference between the predicted evolution of fatal

involvements (counterfactual situation) and the actual evolution (CARE data). Beyond the crash data analysis, there appears to be a general scarcity of empirical data allowing to establish a clear link between roadworthiness testing and improved road safety. Despite this, the analysis based on an examination of the available literature on safety and the stakeholder input combined, suggests that vehicles on the road have generally been made safer through the introduction of common standards for roadworthiness testing, testing centres and personnel training, as well as by the adoption of standard rules for frequency, scope and methods for testing.

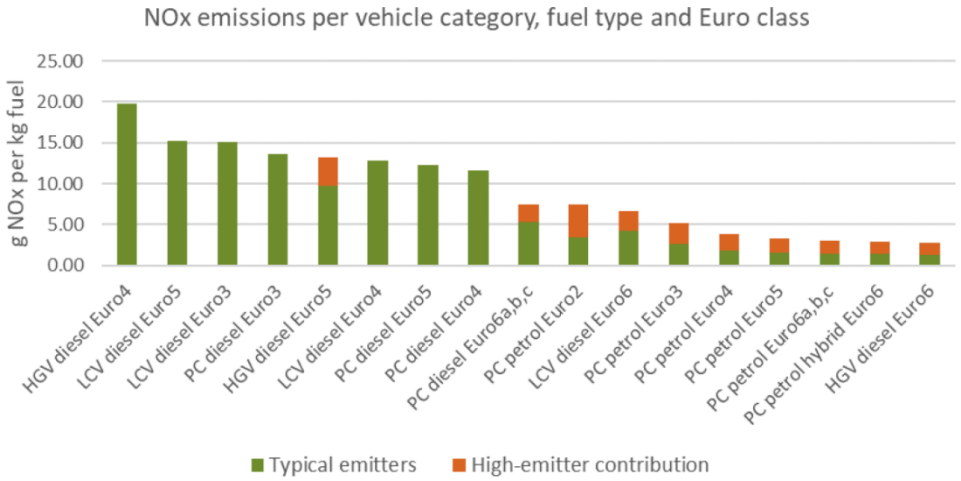
4.1.1.3 Contribution of the RWP to emissions reduction objective

Regarding the objective of the RWP to help reducing GHG emissions and air pollution, roadworthiness emission checks have the potential to identify high-emitting vehicles that are responsible for most of the air pollution from road transport. These high-emitting vehicles include vehicles with technical problems, as well as vehicles with tampered emission systems. Emission reduction technologies reduce emissions significantly. As a consequence, when this technology is not functioning properly, a small fraction of vehicles with malfunctioning emission technology has a major impact on the total emissions. This phenomenon has been reported by study on remote sensing[53] based on on-road emission measurements carried out in 2019. Figure 5 presents the results of the study which demonstrates that the few high emitters[54] reported are responsible for a relative high share of pollution.

[53] Hooftman N., Ligterink N., Bhoraskar, A., (2020), Analysis of the 2019 Flemish remote sensing campaign. Commissioned by the Flemish Government - Flanders Environment Agency - Team Air quality policy

[54] The term "high emitter" is generally considered to refer to a margin over legal limits. In the Flemish remote sensing study, they defined high emitters as emitting at least 1.5 times above the average of their vehicle category emission class, and they looked at real driving emissions

Figure 5. NOx emissions per vehicle category, fuel type and Euro class.



Source: Hooftman et al., 2020

To understand the impact of the 2014 EU rules, using the number of PTI failures on emission and the data from the various studies, the effect of PTI was estimated in the evaluation support study as presented in Table 8.

Table 8. Estimates of the effect of PTI

Engine	Pollutant	High emitter share of vehicles	High emitter share on emission	High emitter share of vehicles (no PTI assumed)	High emitter share on emission (no PTI assumed)	Factor increase emission (no PTI against RWP)
Petrol car, van	**PM**	10.5%	78.5%	11.50%	80.17%	107.24%
Petrol car, van	**NOx**	6.9%	41.1%	7.90%	44.68%	105.32%
Diesel car, van	**PM**	10%	80.4%	10.50%	81.24%	103.91%
Diesel car, van	**NOx**	4.6%	19.4%	5.10%	21.15%	101.69%
HDV Diesel	**NOx**	6.14%	54.7%	6.64%	56.76%	104.21%

Source: VVA et al. (2023), Evaluation support study

Based on these estimations, on average, emissions would increase by 10% to 13% for PM and by 4% to 10% for NOx without the current PTI procedures. However, the number on high emitters on the road despite the current inspection efforts also demonstrates that further reductions in emissions are needed. Literature review has also pointed at the problem that the current procedures are inadequate for detecting tampering, removal or malfunction of EGR, SCR and Three-Way Catalytic converter (TWC) and DPF [55].

[55] Ligterink, N.E., Elstgeest M., Frateur T., de Ruiter J.M., Paschinger P. (2022) Approaches for detecting high NOx emissions of aged petrol cars during the periodic technical inspection TNO report https://publications.tno.nl/publication/34639407/wqLoW7/TNO-2022-R10659.pdf

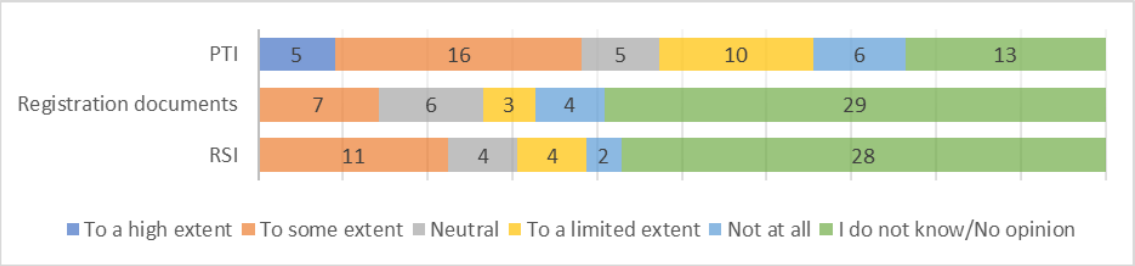
Regarding the impact of the RWP on CO2 emissions, the policy measure that targeted the CO2 reduction was the increased frequency of the testing for "older" cars (i.e. more than 6 years old), which would have lead to better maintanence of vehicles and reduce the presence of high-emitting vehicles on the EU roads. This measure was however not retained in the finally agreed text of the PTI Directive. It should also be noted that emissions depend on fuel consumption and the type of powertrain. No effect from the RWP for CO2 emission reduction could therefore be identified in the evaluation. The only impact could be indirect through the measures targeting the tampered vehicles, but no evidence was found on this in the evaluation. Therefore, the effect of the RWP on CO2 emission can be expected to be very minor.

Stakeholders' views regarding the effectiveness of the RWP in reducing emissions were divided: while representatives from some Member States reported having positive experiences with dealing with stricter air pollutant limits for diesel cars and for hydrocarbons of petrol cars, others claim that current emissions requirements are no longer applicable and therefore need to be updated. Basic tests for diesel engines are not able to accurately take emission measurements for Euro 5 and Euro 6 vehicles, and they do not detect faults in newer diesel cars and older cars with missing catalysts. For example, opacity testing measurement[56] is outdated as it no longer applies to new diesel vehicles in circulation and it does not accurately capture GHG, particle matter and NOx counts. According to some of the stakeholders consulted, particle number (PN) measurement should be used as the control method for newer diesel cars to detect tampering with emission control systems, and remote sensing emission limits should be set for each type of vehicle and Euro standard to standardise remote sensing across the EU.

Survey respondents gave varied responses to the question on the extent to which the provisions of the RWP have contributed to reduced air pollutants from road transport since it came into effect in 2018. The majority did not have specific views or were neutral, whereas slightly more stakeholders who provided a reply considered that the contribution was high or to some extent, than those who thought it was only limited or not even that (see Figure 6).

[56] Exhaust gas opacity is a result of the presence of solid particles, hydrocarbons and water vapour. An increase in exhaust gas opacity is usually accompanied by an increase in the emission of other harmful exhaust gas components (CO_2, CO, HC, NO_x). Exhaust smoke opacity measurement is conducted by using an adsorption opacimeter.

Figure 6. Contribution of rules and provisions of the RWP to reduced air pollutants (n=49)



Source: VVA et.al (2023), Evaluation support study, survey results

According to the EU associations[57] active in this policy area and road safety authorities which responded to the survey [58], the PTI Directive ensures the environmental performance of motor vehicles by regular testing throughout their entire service life, and they considered that the proportion of vehicles failing emission tests at PTI has declined from its start of implementation in 2018. However, according to the EU associations, additional equipment and testing methods, such as PM and NOx requirements for AdBlue systems, and OBD scanning tools for commercial and non-commercial vehicles, would be needed to increase the detection of high emitters. The same stakeholder group also agreed to some extent that the current PTI testing is able to detect malfunctions and tampering leading to high emissions of air pollutants, whereas national ministries and road safety authorities agreed to a limited extent. Feedback from ministries and road safety authorities showed that vehicles with defects that have been tampered, which are not covered by the EOBD system or those specifically related to NOx emissions (e.g. defects in sensors required by ADAS systems) will not necessarily be detected by the current PTI regimes. An OBD check and complementary tailpipe measurement are perceived to be the optimal way to perform an emissions test, and to leverage all potential PN measurements.

4.1.1.4 Contribution of the RWP to improved exchange of information and functioning of the internal market

Regarding the improvement of the exchange of information on testing results between actors and Member States, according to most stakeholders consulted there appears to be significant room for improving the current framework. Although the legislation enables data exchanges between Member States authorities, it does not mandate it (and not all countries use this), nor does it define essential elements for the exchange of information, especially for the compliance with the existing EU data protection standards[59] and cybersecurity aspects. Many Member States use the EUCARIS system on a voluntary basis for import/export of vehicles and registration processes.

Some stakeholders stated that additional EU legislation might be desirable to formalise the use of services to improve information exchange, including cross-border odometer fraud. Several EU associations highlighted that in case more countries were connected to a common platform, this could result in a quick win for facilitating information exchange and making relevant vehicle mileage data available to car buyers and inspection operators across borders. Just over a half of the survey respondents (28 out of 49) expressed no

[57] The group 'EU association' in the survey carried out by the external contractor includes business associations, NGOs and consumer associations.
[58] VVA et al. (2023), Evaluation support study, survey results
[59] Regulation (EU) 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation)

opinion on whether the 2014 RWP made it possible to further digitalise the re-registration process, while only 7 out of 49 considered that it made it easier to further digitalise the re-registration process.

From a legal point of view, the current situation brings therefore uncertainty as regards a key enabling factor of the EU-wide cooperation between relevant authorities. Uncertainties also exist regarding the enforcement of data protection rules applicable in the Union when it comes to exchange of information between national authorities.

Regarding the contribution of the RWP to facilitating free movement for EU citizens and the smooth functioning of the internal market, 20 stakeholders (EU associations, ministries, and road safety authorities) out of 49 considered that the VRD Directive has contributed to the free movement of citizens, while 25 had no opinion on that. EU associations highlighted that the obligation to keep electronic record of data on all vehicles registered in their territory and to exchange information between Member States helps improve free movement of EU citizens, as well as the recognition of PTI certificates in EU countries.

Even if the harmonisation of vehicle registration documents was made easier for citizens to register vehicles from other Member States and EEA, there seems to be room for further advancing the digitalisation process to make it even easier. Moreover, although some countries have entered bilateral agreements (such as between Sweden and Spain), there is no mutual recognition of a PTI across Member States. Currently, PTIs must be performed in the same country where the vehicle has been registered, which in practice limits the effects of the EU harmonisation.

Other factors having driven or hindered the achievement of the objectives

During this evaluation, stakeholder views on the main elements currently hindering the achievements of the objectives defined by the RWP were also collected, such as the lack of harmonisation of PTI standards, equipment and procedures across Member States and the inconsistencies identified between the RWP and the Type Approval Directive. Most stakeholders, especially EU associations and Member States authorities (ministries and road safety authorities) agreed on the importance of ensuring free access to relevant standardised in-vehicle data and functions to authorised service providers, as well as creating an electronic information platform to drive digitalisation and set standards for a common document platform in the EU. Besides, some shortcomings in PTI/RSI testing could be avoided in their views if, already at the stage of type-approval legislation, requirements would ensure easier testable vehicles. Therefore, some of them called for type-approval made by design to testing needs.

Some additional factors hindering the achievement of objectives have been highlighted by stakeholders during consultations, namely:

- The absence of dedicated requirements for electric and hybrid vehicles such as safe, direct measurement sample points at the high voltage system;
- The exclusion from the RWP of safety functions managed by electronics, ADAS systems and new intelligent headlights;
- The ‘hidden’ wear and tear on cars with odometers that have been tampered with, which negatively affects maintenance schedules and therefore road safety;
- No binding cargo securing rules which would ensure this area is regulated and would minimise accidents;

- The lack of PTI information in certification documents; and
- The perceived excessive costs of testing equipment and the time required by inspections.

Regarding odometer fraud, the 2014 RWP introduced measures requiring Member States to ensure that the odometer data recorded at the previous roadworthiness test were made available during the next inspection. Member States have transposed this requirement, but in many cases, there were no effective and dissuasive penalties put in place when an odometer fraud was detected; moreover, the measures in place were in many cases rather generic, not specifically aimed at odometer fraud. Also, the existing measure does nothing to address the issue of odometer tampering between PTIs, or before a vehicle passes the first PTI. Moreover, in the absence of information exchange on odometer fraud between national authorities, cross-border odometer fraud persists. All these shortcomings point at ineffectiveness of the RWP as regards the odometer fraud. On the other hand, the examples of national implementing measures such as introduced by Belgium and Netherlands proved to be effective, as they addressed the issue of regular collection of odometer readings from vehicles, which takes place in-between PTIs (such as vehicle repair workshops, including tyre and windscreen repair services) and well before the first PTI. In addition, these two countries introduced an exchange of the odometer history data between the national databases. These more targeted measures proved to be more effective in tackling the odometer fraud and could also be replicated at the EU level.

4.1.2 Efficiency

The efficiency analysis explores the extent to which the costs associated with the RWP have been proportionate to the overall benefits achieved.

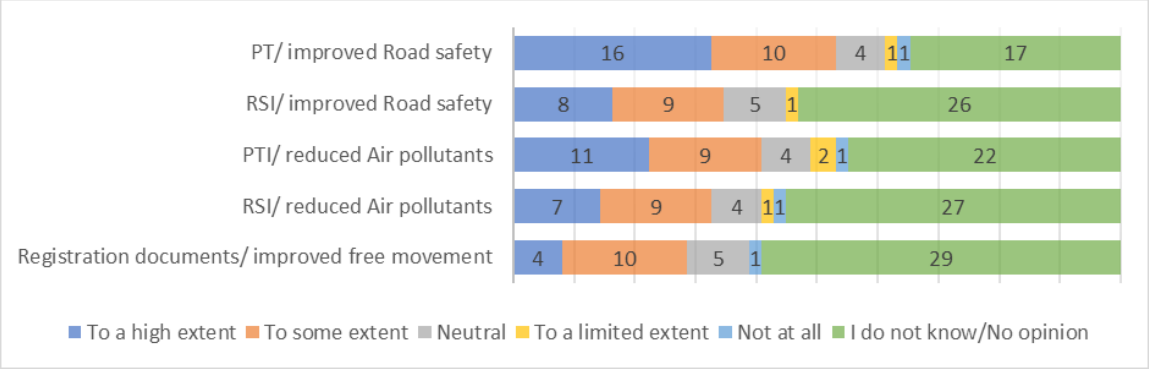
The evaluation support study[60] estimated the administrative costs for vehicle owners (citizens and businesses) at around EUR 10 billion in 2019. They were calculated based on the number of PTI inspections for all vehicle categories and the respective PTI charges. Regarding the possible benefits, the evaluation support study estimated 1,300 lives saved for 2019, and 10,600 serious injuries and 59,600 slight injuries avoided. In monetary terms, using the Handbook on the External Costs of Transport[61], this would translate into benefits of around EUR 12.7 billion. In addition, the reduction in the external costs of air pollutants (NOx and PM) was estimated at EUR 0.7 billion. Thus, the total benefits are estimated at EUR 13.4 billion and the net benefits at EUR 3.4 billion. However, while these estimates can help understand the magnitude of costs and benefits of the PTI regime, they should be interpreted with a significant degree of caution.

Stakeholders assessed rather positively the extent to which the benefits of the RWP in terms of increased road safety, reduced air pollutants and improved free movement are justified compared to the costs and effort invested in implementing the EU rules (Figure 7). Representatives of Member States' authorities (ministries, road safety authorities) and EU associations mostly agreed that the costs/benefits ratio of PTI, RSI and registration documents are justified. Ministries and the road safety authorities of several EU Member States stated that implementation of the RWP has not caused significant administrative and

[60] VVA et al. (2023), Evaluation support study
[61] https://op.europa.eu/fr/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1

adjustment costs as they already had a developed system of PTI and RSI. National representatives noted that there is available evidence that demonstrate the contribution of the RWP Package – and in particular PTI – to the reduction of fatalities, thus justifying the investments. On the other hand, EU associations stated that EU legislation such as PTI can reduce the number of illegally polluting cars on the EU's roads and reduce the human costs of air pollution.

Figure 7. Benefits of the RWP (increased road safety, reduced air pollutants) justification compared to the costs and efforts invested in implementing the RWP rules (n=49)



Source: VVA et al. (2023), Evaluation support study, survey results

Despite the lack of sufficient and reliable empirical data to perform a comprehensive cost-benefit analysis for the RWP, the benefits of its implementation are likely to outweigh the associated costs. For instance, a 2018 study on odometer manipulation in motor vehicles in the EU[62] showed that the total economic costs of odometer fraud in second-hand cars traded cross-border in the EU can be estimated to be at least EUR 1.31 billion, with the most probable fraud rate scenario incurring a loss of around EUR 8.77 billion.

In the stakeholder interviews[63], it was also suggested that a way to simplify the RWP and reduce costs could be to prioritise the adaptation of PTI procedures to keep up with technical advancements and thus strengthen the safety of vehicles. Stakeholders also pointed out that it would be important to establish universal standards for in-vehicle data access to facilitate inspections. To further reduce expenses, some stakeholders considered to be made mandatory for original equipment manufacturers (OEMs) to provide information required for carrying out the inspections to PTI operators free of charge. Along with a unified digital format for registration documents and the definition of universal standards for data extraction, this requirement could greatly simplify the RWP and minimise expenses. Finally, some stakeholders suggested adjusting the scope of the Directives to exclude weights for roller brake testers and heavy vehicle lifting testing methods to simplify the RWP and reduce costs.

Administrative burden for authorities, businesses and citizens

The RWP has placed several administrative responsibilities on **public authorities** in Member States. Interviewed stakeholders generally considered the administrative

[62] EPRS study "Odometer manipulation in motor vehicles in the EU", January 2018, available at: https://www.europarl.europa.eu/RegData/etudes/STUD/2018/615637/EPRS_STU%282018%29615637_EN.pdf

[63] VVA et al. (2023), Evaluation support study, stakeholder interviews

workload generated by the three Directives a necessary condition for its effective implementation. The major administrative challenges and related costs faced by PTI centres included training of highly qualified inspection personnel, investments in necessary equipment and materials, analysing statistical data from technical controls, and monitoring of inspector activities, including the supervision of testing centres and verification of inspectors. To reduce administrative burden on national authorities, some best practices include developing e-PTI (electronic PTI) based ISO standards, which can allow for automatic real-time transmission of diagnostic data through the OBD port and streamline procedures for monitoring the implementation of the RWP. The stakeholders consulted pointed out that important vehicle data is often not accessible to inspectors: therefore, it has been suggested that testing would be improved if information for vehicle inspections was made available to inspection centres free of charge.

Odometer tampering causes to the buyers of tampered cars higher-than-expected maintenance and repair costs because the cars are not inspected based on their real mileage. Some Member States have introduced instruments to minimise odometer manipulation, such as Car-Pass in Belgium and Nationale AutoPas (NAP) in the Netherlands; both Member States use a database collecting odometer readings at every maintenance, service, repair, or periodical inspection of the vehicle, without collecting any personal data, and both have almost eradicated odometer fraud in their domains within a short timeframe[64].

Ministries, road safety authorities and vehicle registration authorities emphasised in their interviews that digital data exchange and harmonisation of vehicle documents is needed for streamlining the vehicle re-registration process since standardising the content and format of vehicle files would facilitate the digital transfer of registration information between national databases and reduce the administrative burden and costs associated with the process. The interviewees stressed the need for a legal framework to support this exchange of data and digital services for efficient re-registration process. The introduction of digital information systems and structured messages exchanges was also seen as possibly helping to improve communication among Member States and to reduce administrative burden.

In terms of the **administrative burden RWP imposed on businesses and citizens**, most stakeholders in the survey (30 out of 49) did not provide any opinion or were neutral of whether the RWP has generated administrative burden for businesses. Similarly, more than half of the survey respondents (32 of 49) did not have an opinion or were neutral on the administrative burden generated by the RWP for citizens. However, it was highlighted that certain requirements were considered burdensome for citizens, such as the requirement for citizens to present their registration certificate when undergoing re-registration. This was perceived as time consuming and add to the overall administrative burden faced by citizens. Also, EU associations stated that digital (mobile) vehicle registration documents could further facilitate the digitalisation of the vehicle registration and data-keeping processes and reduce costs for citizens and businesses. Furthermore, a well-assessed test methodology was also considered important to avoid false negative and false positive outcomes during PTI and to achieve a harmonised approach to test procedures and equipment. This would help improving the efficiency of inspections and could consequently positively impact both citizens and businesses.

[64] European Parliament resolution of 31 May 2018 with recommendations to the Commission on odometer manipulation in motor vehicles: revision of the EU legal framework (2017/2064(INL))

4.1.3 Coherence

The evaluation of coherence covers both the internal coherence dimension which looks how well various elements of the RWP operate together, and the external coherence, meaning if and how the RWP is consistent with other related EU legislation and policies.

The evaluation found no real issues with **internal coherence** of the RWP. Regarding the **external coherence**, the evaluation looked in the coherence with relevant EU legislation and policies in the field of EU road safety, such as the EU Road Safety Policy Framework 2010 to 2020, and its successor, the Road Safety Action Plan 2021-2030, as well as the Sustainable and Smart Mobility Strategy. Stakeholders overall agreed on the consistency between the RWP Directives and the objectives of EU road safety policy. Periodic technical inspections and roadside inspections were considered essential instruments for achieving the European Commission's Vision Zero approach on fatalities and serious injuries on European roads by 2050.

However, some of the interviewed stakeholders highlighted that type-approval requirements should enable lifelong testing by design and called therefore for better coherence between the type-approval regulation and the RWP.

Regarding interventions at international level, EU associations also added that the UNECE whole-lifetime compliance is at a very preliminary stage while RWP is at a more mature stage and can be treated as state of the art legislation in the international context. Survey replies however reflected the opinion that more coherence between the RWP and the UNECE standards would be needed as regards the life-cycle approach.

The evaluation identified the following **specific coherence issues** in relation to relevant EU legislation:

- The lack of coherence between the **PTI Directive and Regulation 2018/858 on type-approval requirements for motor vehicles** makes it difficult to perform thorough inspections, and the issue is likely to grow with deployment of automated devices, electronic sensors and safety features.
- Coherence with **Regulation 2018/858 on type-approval requirements** regarding **tampering**: vehicles should not be allowed to be altered in a way that diminishes the original functioning of the emission and safety controls without further legal checks and it should be possible to monitor any deviations or alterations during PTI or RSI. PTI does not provide an effective tool to counteract the tampering such as removing particulate filters and emulating SCR systems.
- In the **VRT Directive**, **definitions of the vehicle registration data/terminology** in some instances do not correspond to those in the type-approval legislation. This leads to confusion and potential errors in recording and tracking vehicle information.
- Inconsistencies of definitions existing between the **VRD Directive** and the **End-of-Life Vehicles Directive** (Directive 2000/53/EU). Terms such as 'registration', 'de-registration' 'temporary de-registration', 'suspension', 'cancellation of the registration' and 'permanent cancellation of the registration' should be harmonised across these two Directives.
- **General Safety Regulation (EU) 2019/2144** requires that all motor vehicles will have to be equipped with **safety features** such as intelligent speed

assistance, driver drowsiness and attention warning systems; these systems should be also covered by roadworthiness testing.

- Lack of data coherence between the RWP and relevant EU legislations due to **divergence of safety relevant vehicle data**. According to interview respondents, a common problem with the RWP is the limited direct access to in-vehicle data and functions for authorised inspection service providers. For example, even two models of the same manufacturer can require different file formats, which makes the daily use of reference vehicle data very difficult;
- **UNECE regulations on whole-lifetime compliance** set out methods for checking electric vehicles when undergoing a technical inspection while the PTI Directive does not specify such requirements.

4.2 How did the EU intervention make a difference and to whom?

The EU level intervention on roadworthiness testing and vehicle registration documents brought benefits beyond those which would have been possible at national or local level alone. The 2021 European Parliament resolution[65] strongly endorsed action on roadworthiness at EU level, pointing out that there had been improved harmonisation of national procedures in the Member States, increased quality of PTI and better coordination in RSI. The report suggested that these actions had improved road safety standards.

This view was widely acknowledged by relevant stakeholders consulted during this evaluation who perceived the RWP as contributing towards the harmonisation of roadworthiness rules among Member States. By creating a common framework for identifying vehicle defects, the RWP ultimately benefits both EU citizens and business entities. Crucially, according to most consulted stakeholders, the introduction of minimum standards for periodical technical inspections and roadside inspections contributed to preventing road crashes, thus being beneficial to vehicle owners and citizens at large.

The RWP contributed to SDG 11 through making cities and human settlements more inclusive and sustainable, primarily by focusing on improving road safety (Target 11.2) and by reducing the adverse impact of cities, by focusing on air quality (Target 11.6), in particular the reduction of air pollutants such as NOx.

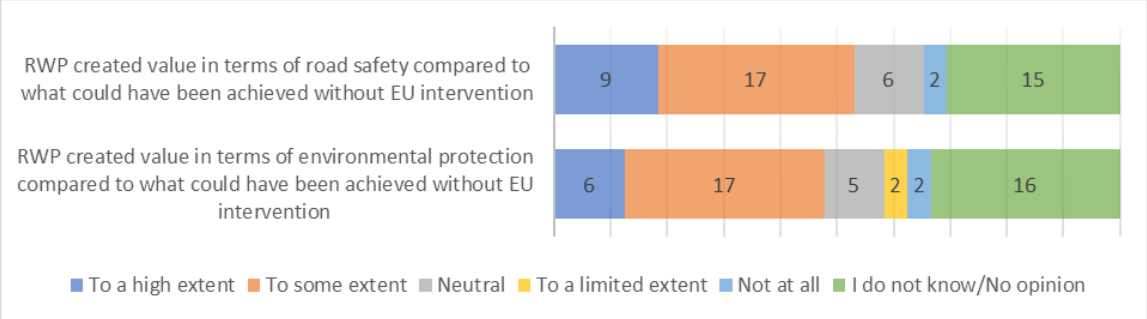
The interviewed stakeholders considered that had the RWP not been in place, the road safety policy in the EU would be more fragmented and with Member States possibly taking very different actions. The RWP set a minimum standard for all Member States and provides a basic framework for detecting and addressing roadworthiness defects, ensuring that all Member States take action to improve road safety.

Similarly, survey respondents agreed that the implementation of the RWP created value in terms of road safety and environmental protection compared to what could have been achieved without EU intervention (Figure 8). According to some of the EU associations, RWP sets a minimum standard across the EU and ensures that all Member States need to act for road safety and environment protection, providing a basic framework and orientation for defects with a wider scope and more detailed description. However, as observed by some ministries and road safety authorities, several Member States had

[65] Procedure File: 2019/2205(INI) | Legislative Observatory | European Parliament (europa.eu) Texts adopted - Implementation report on the road safety aspects of the Roadworthiness Package - Tuesday, 27 April 2021 (europa.eu)

already implemented high-level roadworthiness test regimes before the implementation of the RWP. Across all stakeholder categories the need to improve mutual recognition of PTI inspections was emphasised, since this adds value to the functioning of the EU single market, while it also helps increasing vehicle safety and environmental protection.

Figure 8. Stakeholder views on RWP added value (n=49)



Source: VVA et al. (2023), Evaluation support study, Survey results

The harmonisation of emission standards and practical implementation to test these standards at EU level improves the **level playing field for the commercial transportation of goods and passengers in the EU**, as companies in different Member States must comply with similar technical roadworthiness requirements leading to similar cost-for-vehicle purchases and maintenance in commercial activities. As vehicles and pollution do not stop at the border, it is rational for EU vehicles to meet the same emission standards and that throughout their lifetime operations. Finally, in requiring the mutual recognition of roadworthiness certificates from other Member States for the purpose of re-registration, the RWP provisions also **facilitate free movement** within the EU.

4.3 Is the intervention still relevant?

Relevance in view of road safety objectives

The Commission laid out a Road Safety Policy Framework for the decade 2020 to 2030[66] which sets a 50% reduction target in deaths and serious injuries over the decade on the way to the goal of zero fatalities by 2050. The document recognises the importance of ensuring vehicle roadworthiness: "As safety problems often appear after the placing on the market, regular roadworthiness checks are important to ensure that consumers are protected through the lifetime of the vehicles." Regular roadworthiness checks play a central role in ensuring consumer protection throughout the entire lifetime of the vehicles.

It can also be argued that the requirement as of 6 July 2022, to fit a variety of new Advanced Driver Assistance Systems (ADAS) systems introduced by the revision of the General Safety Regulation of 2019[67] increases the relevance of vehicle roadworthiness testing. These systems are potentially subject to malfunctions, they may require software updates to ensure intended performance and they could be the target of tampering. The projections of road safety benefits from these systems were made on the basis that the systems would be fully functional over the vehicle's lifetime. Thus, the installation of these new ADAS systems requires expanding the scope of roadworthiness testing to verifying the operation of the mandated electronic systems. Similar findings on the importance of

[66] EUR-Lex - 52018DC0293 - EN - EUR-Lex (europa.eu)
[67] EUR-Lex - 32019R2144 - EN - EUR-Lex (europa.eu)

inclusion of the recent safety systems in vehicles come from a study published by the Commission in 2019 on the inclusion of eCall in periodic roadworthiness testing of motor vehicles. The study notes[68] that the eCall equipment on a vehicle is subject to deterioration and that the inclusion of this equipment in PTI would have a high benefit-to-cost return.

The average age of vehicles has been increasing in recent years. According to ACEA data[69], the average age of passenger cars in the EU was 10.7 years in 2016, whereas by the beginning of 2022 it had risen to 12.0 years. The average age of other vehicle categories rose in a similar way. In this context, the International Motor Vehicle Inspection Committee (CITA) points out[70] that the average age of the vehicle fleet has increased and will continue to rise and that serious defects are more likely to emerge as vehicles age.

The RWP is recognised by technical and institutional stakeholders as a significant contribution towards road safety. It is generally acknowledged that the introduction of a common EU framework for conducting PTIs and RSIs has yielded many advantages, allowing for better detection of deficiencies in malfunctioning vehicles throughout their lifecycle.

With regards to the relevance of the RWP for the current needs of roadworthiness, all the objectives set out in the Directives are recognised to be relevant to a high or some extent by a majority of consulted stakeholders. As for the relevance of the RWP to the future needs of roadworthiness, all the objectives are also deemed very relevant by the majority of stakeholders consulted: despite the gradual shift to e-mobility, cars with internal combustion engines will likely still be on EU roads for decades, and the RWP has the potential to continue to play an important role in monitoring emissions and ensuring road safety. However, all stakeholders consulted during the evaluation highlighted the importance of adapting the Directives to the changes in vehicle technology. They take the view that the relevance of the RWP has been diminished by the widening gap between the existing requirements and the new systems installed in modern vehicles. In particular driver assistance interfaces (e.g. ADAS), Intelligent Transportation Systems (ITS), human-machine interface (HMI) and electronic safety features were considered by stakeholders as not sufficiently addressed by the RWP directives. On ADAS, the RWP does not seem to provide a sufficiently comprehensive framework for evaluating the safety performance of ADAS and automated vehicles of SAE Level 3 and higher. Another area that the RWP does not cover is the definition of specific testing protocols to ensure the compliance and maintenance of electric, hybrid and hydrogen vehicles, including how to handle software updates in a safe and efficient manner. In addition, as the number of vehicle classes is growing faster than the testing centres' ability to diagnose their defects, parameters for technical inspections are not sufficiently updated to allow the efficient acquisition of important safety-related data and the monitoring of new sensors and functions.

In terms of keeping up the RWP with the technological and scientific progress, most of the stakeholders interviewed considered that it is essential to update the Directives to include features such as the ADAS interface, the tyre pressure monitoring system (TPMS) and laser or LED lighting, which have been embedded in cars for around a decade but are not tested by standard PTIs. This is consistent with the views from survey respondents, especially ministries, road safety authorities and PTI bodies, which considered that the current RWP and its objectives address the technological advancement in automated

[68] eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=PI_COM:C(2021)4992
[69] ACEA-report-vehicles-in-use-europe-2023.pdf
[70] In its position paper submitted alongside its response to the public consultation on RWP

systems only to a limited extent. The technology used in vehicles has surpassed what the current framework covers and new rules for inspection of new safety systems, such as ADAS, are needed. Furthermore, since current tools like the OBD system do not fit some cars in circulation for diagnostic purposes, the scope of the RWP would also become more relevant should it be broadened to enable the inspection of new software and to improve testing facilities. According to the evidence gathered, the RWP intervention is currently not adapted to teleoperated and autonomously driving vehicles, as well as their sensors, radar systems and cameras that act and function in network. Concrete testing of high-voltage vehicles and their components is also currently missing.

Relevance in view of environmental objectives

The RWP's objective to contribute to reduction of greenhouse gases and air pollutant emissions from road transport is still relevant in the context of the EU climate objectives and the ambitions put forward in the related key strategies, the European Green Deal[71], the EU Zero Pollution Action Plan[72], and at international level, the Sustainable Development Goals.

The objective of identifying gross emitters through periodical technical inspections and roadside inspections and removing them from road traffic contributes to the emission reduction targets established by different EU instruments, such as the newly proposed Euro 7 norms, the national emission reduction commitments for the main air pollutants set in Directive 2016/2284, and the stricter air quality standards recently proposed by the revision of Ambient Air Quality Directive[73] .

In the stakeholder consultations, most stakeholders maintained that the three Directives are still very relevant to the achievement of wider EU environmental policy goals, in addition to the overall improvement of road safety.

With internal combustion engine vehicles becoming cleaner (as per the Euro norms), some of the tests used in PTI are no longer sufficiently sensitive to detect emission failures. Given the undetected problems for vehicles equipped with emission control systems, diesel particulate filters (diesel Euro 5 and 6) and three-way catalysts (petrol from Euro 1), existing evidence supports the claim that the current testing procedures are not fit to meet the EU policy goals. Modern vehicle engines and exhaust gas systems have other critical detection criteria that are not covered by the currently prescribed test methods, and current PTI tools are not functional for measuring PN and NOx. Considering these shortcomings, the current RWP's contribution to reducing the number of vehicles in circulation with high emissions has become less relevant. While some stakeholders suggested that DPF filters might reduce considerably particulate matter emission for Euro 5 categories or later, the measurement of nitrogen oxide emissions or PM/PN values for new cars are still not covered by the current RWP. Additionally, there are currently no EU provisions for testing vehicles for NOx manipulation/defect or manipulation/defect of diesel particulate filter. On this point, many stakeholders expressed interest in evolving the testing of engine management and exhaust emission control systems towards updated, more sensitive measurement procedures. According to some consulted stakeholders, consideration should

[71] COM/2019/640 final
[72] COM/2021/400 final
[73] COM/2022/542 final

also be given to mandating that original equipment manufacturers (OEMs) provide type-approval information for PTIs.

Relevance in view of other technological developments

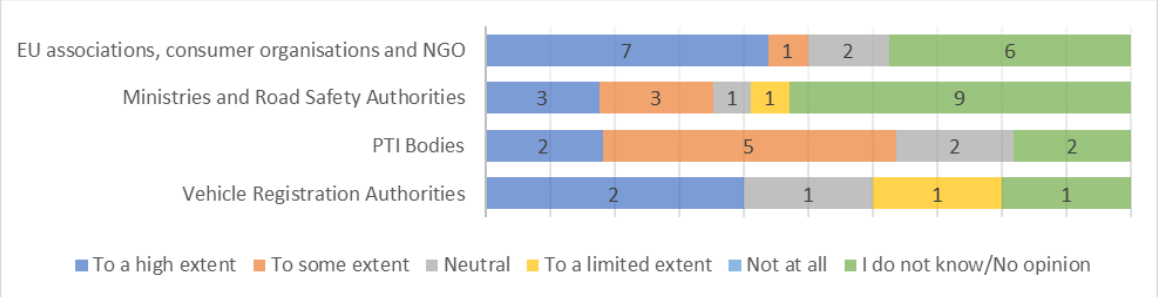
The evidence and stakeholder views gathered suggests that there have been numerous significant changes in vehicle technology since the RWP came into effect, making the current RWP not adapted to new developments and less relevant.

Regarding vehicle software, the stakeholders in the survey (24 out of 49), especially among EU associations, but also ministries, road safety authorities and PTI bodies, pointed out that it is necessary to identify the vehicle software version in the PTI test, to ensure the vehicle updates have been installed. Still, 16 out of 49 respondents did not have an opinion on the matter; EU associations stated that only safety-critical and environmentally critical software updates are relevant to PTI and RSI, whereas ministries and road safety authorities pointed out that vehicle manufacturers should make available a database with the latest software versions for every vehicle.

Furthermore, 26 stakeholders out of 49 in the survey, in particular EU associations and PTI bodies, opined that on-board fuel and energy consumption meter (OBFCM) devices, OBD (on-board diagnostics) and on-board monitoring (OBM) data should be registered centrally during PTI checks. Ministries and road safety authorities highlighted that OBFCM data collection during PTI is already established by the Implementing Regulation EU 2021/392. In relation with OBM, as proposed in Euro 7, the OBM sensors could be checked/compared with real tailpipe measuring during PTI. However, in contrast with the equipment installed in PTI stations, the OBM sensors are not submitted to any metrological control during the life of the vehicle. Moreover, EU associations stated that centrally registered OBFCM and PTI data can help detect tampering with the odometer or with OBFCM/OBM data itself, as it can allow for the easy analysis of the collected data and flagging of suspicious outliers.

Finally, even though stakeholders' opinion on the need for standards and regulations on mobile vehicle registration documents was divided, most EU associations consulted considered that such standards are needed. EU associations and vehicle registration authorities expressed the view that vehicle registration documents must be readable in all Member States, and this is the reason why standards are very important, since documents which are only valid at national level have only limited value (Figure 9).

Figure 9. Need for standards and regulations on mobile vehicle registration documents (n=49)



Source: VVA et al. (2023), Evaluation support study, Survey results

5 WHAT ARE THE CONCLUSIONS AND LESSONS LEARNED?

5.1 Conclusions

The evaluation's findings lead to several conclusions regarding the overall performance of the three Directives of the RWP, which can be grouped by evaluation criterion as follows:

5.1.1 Effectiveness

The evaluation is based on evidence available for the period between 2018 and 2021. At the same time, it should be borne in mind that Member States had to transpose the provisions of the RWP by May 2017. While there are gaps in the requirements for the Member States' reporting on RWP, the evaluation considers the available implementation reports for the PTI and RSI Directive. While there was no sufficient quantified evidence which would allow to establish a clear link between roadworthiness testing and improved road safety, the evaluation analysis based on the examination of the available studies on safety and stakeholders' input combined, suggests that vehicles on EU roads have generally been made safer through the introduction of common standards for roadworthiness testing, testing centres and personnel training, as well as by the adoption of standard rules for frequency, scope and methods for testing.

Regarding the role of technical defects in road safety at both EU and national levels various estimations are available. The most comprehensive studies estimate that vehicle defects are a contributing factor between 6.5% to 12.6% of road crashes. The improved technical condition of the vehicles should hence contribute to increased road safety in terms of numbers of avoided road crashes, injuries and fatalities, which has also been confirmed by the results of periodic technical inspections in selected countries, showing the link between improved technical condition of the vehicles and increased road safety. Moreover, given that the age of a vehicle was found to be an important factor which increases the risk of roadworthiness faults, and in the context where the average age of the EU vehicle fleet has increased in the recent years, the contribution of RWP to road safety objectives appears even more important. Most stakeholders consulted considered that PTIs and RSIs helped to some extent to reduce the number of vehicles in circulation with dangerous defects.

Regarding the objective of the RWP to help reducing emissions, roadworthiness emission checks can identify high-emitting vehicles that are responsible for most of the air pollution from traffic. However, the effectiveness of the RWP was rather limited, especially in a fast-evolving sector: while there were some positive experiences with adopting stricter emission limits for diesel cars and for hydrocarbons of petrol cars, the current emissions requirements under PTI and RSI are no longer applicable and have to be updated. Basic tests for diesel engines are not able to accurately take emission measurements for Euro 5 and Euro 6 vehicles, and they do not detect faults in newer diesel cars and older cars with missing catalysts. The opacity testing measurement is outdated as it no longer applies to new diesel vehicles in circulation and it does not accurately capture GHG, particle matter and NOx counts. Instead, PN measurement should be used as the control method for newer diesel cars to detect tampering with emission control systems, and remote sensing emission limits should be set for each type of vehicle and Euro standard to standardise remote sensing across the EU. To ensure adequate levels of accuracy and efficiency in detecting NOx emissions, it is necessary to have access to the vehicle itself and to reference values during the approval process, which is not the case today.

Regarding the improvement of the exchange of information on testing results between actors and Member States, the current framework for information exchange is not considered as successful. Although the legislation enables data exchanges between Member State authorities, not all countries use this possibility. Even if the harmonisation of vehicle registration documents was made easier for citizens to register vehicles from other Member States and EEA, there seems to be room for further improvement in the process to make it even easier. Moreover, there is no mutual recognition of PTIs across Member States. Currently, PTIs must be performed in the same country where the vehicle has been registered, which in practice limits the positive effects of the RWP on the free movement for EU citizens and the smooth functioning of the internal market.

5.1.2 Efficiency

Despite the lack of sufficient empirical data to perform a more robust cost-benefit analysis for the RWP, it is generally accepted by the stakeholders consulted that the benefits of its implementation outweigh the associated costs. Representatives of Member States' authorities (ministries, road safety authorities) and EU associations mostly agreed that the costs/benefits ratio of PTI, RSI and registration documents are justified. Ministries and the road safety authorities of several EU Member States stated that implementation of the RWP has not caused significant administrative and adjustment costs as they already had a developed system of PTI and RSI. Nevertheless, opinions are divided on the level of costs involved in certain aspects of the RWP and some practical suggestions have been identified to reduce costs associated with its implementation.

The major administrative challenges and related costs faced by Member States included the enforcement procedures, training of highly qualified inspection personnel, investments in necessary equipment and materials, analysing statistical data from technical controls, and monitoring of inspector activities, including the supervision of testing centres and verification of inspectors. To reduce administrative burden on national authorities, some best practices include developing e-PTI (electronic PTI) based ISO standards, which enable automatic real-time transmission of diagnostic data through the OBD connector and streamline procedures for monitoring the implementation of the RWP.

In terms of the administrative burden RWP imposed on businesses and citizens, there were certain requirements which were considered burdensome for citizens, such as the requirement for citizens to present their registration certificate when undergoing re-registration. This can be time consuming and add to the overall administrative burden faced by citizens. Also, digital (mobile) vehicle registration documents could furthermore facilitate the digitalisation of the vehicle registration and data-keeping processes and reduce costs for citizens and businesses.

5.1.3 Coherence

The evaluation finds that there is consistency between the RWP Directives and the objectives of EU road safety policy. Periodic technical inspections and roadside inspections are considered essential instruments in the policy toolbox for achieving the European Commission's Vision Zero approach on fatalities and serious injuries on European roads by 2050.

However, it appears that more consistency should be ensured between the type-approval regulation and the RWP. For example, in the responses to the survey, 92% (46, 25 'no responses' or 'Don't knows') believed that updating the PTI to cover the safety systems

introduced by the General Safety Regulation (GSR) would ensure better consistency, objectivity, and quality of roadworthiness testing. Also, the coherence between the RWP and relevant EU policies could be improved through the standardisation of safety relevant data regarding vehicles. In the response in relation to vehicle registration, one EU representative organisation[74] called for a standardised exchange of data between type approval and licencing authorities, to eliminate the need to carry the registration certificate in the vehicle, and the possibility for relevant authorities and bodies to access vehicle registration data. Another stakeholder organisation[75] also underlined the importance of access to in-vehicle data and diagnostic information in an independent and reliable way, specifically the information made available in the context of EU type approval legislation, along with unrestricted access to the vehicle data and software, covering the whole lifetime of the vehicle.

Regarding interventions at international level, the EU RWP measures should set standards for related legislation at UNECE level, as it is currently in the case of the recommendation on PN measurement. The RWP is also not sufficiently aligned with the General Safety Regulation (GSR) (EU) 2019/2144 regarding responsibilities for manufacturers during the vehicle's lifecycle. Defining responsibilities more clearly and mandating that relevant information is made available for PTIs across Member States for free could better address sovereign tasks and reduce procedural overlaps, thus improving the overall accuracy and efficiency of inspections.

5.1.4 EU added value

The road transport and the automotive industry are international sectors, therefore a certain minimum level of harmonisation in vehicle testing and exchange vehicle data between Member States is more effective than uncoordinated national approaches. While historically, the national practices differ, the EU level intervention on roadworthiness testing and vehicle registration documents brought benefits beyond those which would have been posssible at national or local level alone. The overwhelming majority of interviewed stakeholders agreed that if the RWP had not been implemented, the road safety policy and its implementation in the EU would be far more fragmented, with Member States taking different actions. The RWP sets a minimum standard for all Member States and provides a basic framework for detecting and addressing roadworthiness defects, ensuring that all Member States take action to improve road safety.

The harmonisation of emission standards and practical implementation to test these standards at EU level improves the level playing field for the transport of goods and passengers in the EU, as companies across the EU must comply with similar technical roadworthiness requirements leading to similar cost for vehicle purchases and maintenance. Since vehicles and pollution do not stop at the border, it makes sense for EU vehicles to meet the same emission standards throughout their lifetime operations. Further harmonisation of the minimum level PTI and RSI requirements in the revision of the RWP would be useful to improve consistency of laws, standards and practices within the EU. Common rules applied to testing modern vehicle technologies (EVs, ADAS, and the most recent emission control equipment), would on the one hand help Member States realise economies of scale, and on the other hand the testing equipment manufacturers could operate on a more homogenous market. There is also a scope to improve mutual recognition of PTI inspections

[74] CITA Home - CITA International Motor Vehicle Inspection Committee

[75] FSD German central agency for PTI

by the Member States, which would add value to the EU internal market, benefit the consumers and it would also help increasing vehicle safety and environmental protection.

5.1.5 Relevance

With regards to the relevance of the RWP for the current needs, all the objectives set out in the Directives are still recognised as relevant. With regards to the future needs, the RWP has the potential to continue to play an important role in monitoring emissions and ensuring road safety. However, it will be important that the Directives adapt to the changes in vehicle technology.

The relevance of the RWP has been diminished in recent years by the widening gap between the existing roadworthiness requirements and the new systems installed in modern vehicles. In particular on advanced driver assistance systems (e.g. ADAS), Intelligent Transportation Systems (ITS), human-machine interface (HMI) and electronic safety features the three Directives do not seem to provide a sufficiently comprehensive framework. Another area which is increasing in relevance is the roll-out of low and zero emission vehicles; the RWP currently does not cover specific testing protocols to ensure the compliance and maintenance of electric, hybrid and hydrogen vehicles, including software updates, in a safe and efficient manner. Also, parameters for technical inspections are not sufficiently updated to allow the efficient acquisition of important safety-related data and the monitoring of new sensors and functions. Beyond, according to the evidence gathered, the RWP intervention would not be adapted to teleoperated and autonomously driving vehicles.

The RWP's objective to contribute to emissions reduction from road transport is still relevant in the context of the EU climate and environmental objectives. However, some of the tests used in PTI are no longer sufficiently sensitive to detect emission failures in internal combustion powered vehicles. Modern vehicle engines and exhaust gas systems have critical detection criteria that are not covered by the currently prescribed test methods, and current PTI tools are not functional for measuring PN and NOx. Considering these shortcomings, the current RWP's contribution to reducing the number of vehicles in circulation with high emissions has become less relevant**.** Additionally, there are currently no EU roadworthiness provisions for testing vehicles for NOx manipulation/defect or manipulation/defect of diesel particulate filter. Stakeholders considered that if the Directives are not adapted to modern driving features and safety systems, the gap between vehicle technology and testing techniques will widen excessively.

5.2 Lessons learned

Although EU roads are the safest in the world and road safety has improved significantly over the last decades, casualties of road crashes continue to represent a high cost to society.

Defective vehicles may not always be detected, as some categories of vehicles are not subject to PTI or RSI in some Member States, or the frequency or scope of the testing is not adapted to their higher safety and environmental risk. In addition, current test methods and procedures are not always capable of detecting defective or tampered vehicles and are not designed to test the most recent vehicles, such as electric vehicles or vehicles with advanced driver assistance systems. At the other end of the spectrum, older vehicles (over 10 years) are found to be defective more frequently than newer ones. This is a concern with the gradual ageing of the EU vehicle fleet.

In relation to emissions, there are still many vehicles with defective or tampered emission control systems that go undetected. There are multiple, readily available, and cheap solutions to cheat existing emission control technologies, and the current testing (PTI and RSI) methods are not suited to measuring the emission performance of modern vehicles.

Member States still report difficulties in effectively enforcing road safety measures in EU cross-border traffic and vehicle trade. These difficulties can be caused by Member States recording different sets of vehicle data, or difficulties for competent authorities in accessing vehicle register data and other safety-relevant information of vehicles, particularly when these are registered in another Member. These difficulties can also negatively impact the fight against the widespread malpractice of odometer tampering.

5.3 Robustness of the conclusions

The evaluation is based on evidence available for the period between 2018 and 2021. At the same time, it should be borne in mind that Member States had to transpose the provisions of the RWP by May 2017. While there are gaps in the requirements for the Member States' reporting on RWP, the evaluation considers the available implementation reports for the PTI and RSI Directive. In addition, it also takes into consideration results of the implementation assessment of the European Parliamentary Research Service (EPRS) from 2020, which established that the transposition of the RWP at national level has led to improved harmonisation of procedures, such as the frequency and content of vehicle testing, and the provisions of the RWP Directives have enhanced the quality of periodical technical inspections and roadside inspections, as well as road safety standards.

Regarding the contribution of the RWP to road safety, the evaluation considered all available evidence and in particular corroborated the findings from desk research and various independent studies on the role of technical defects in road safety, the results of PTI in selected EU countries showing the link between improved technical condition of the vehicles and increased road safety, with the evidence and views provided by the stakeholders, which confirmed that the RWP plays a central role in maintaining high vehicle standards and improving road safety, based on their most recent practical experience with all three Directives of the package. It should be kept in mind though that the effectiveness of the RWP regarding road safety has to be considered in the context of an already high level of the roadworthiness testing legal framework and implementation in the EU, and it should also be assessed as a complementary tool to relevant road safety regulations (such as EU type-approval Regulations for motor vehicles) and other road safety policy measures already in place.

ANNEX I: PROCEDURAL INFORMATION

Lead DG, Decide Planning/CWP references

The lead DG is Directorate General for Mobility and Transport (MOVE), Unit C2: Road Safety

DECIDE reference number: PLAN/2021/10932

This initiative was referred to in point 16 of the Sustainable and Smart Mobility Strategy. Action 7 in the Action Plan called for improved emission testing in roadworthiness tests.

This initiative is included in the Commission Work Programme 2023[76], item 3 in Annex II (REFIT initiatives), under headline A – A European Green Deal.

Organisation and timing

The impact assessment and the ex-post evaluation of the Roadworthiness Package were performed in a back-to-back manner (i.e. the evaluation and impact assessment have been launched at the same time) in 2021-2023.

The combined evaluation roadmap/ inception impact assessment was published on Have your say on 4 October 2021[77].

The ex-post evaluation and the impact assessment on a possible review of the Roadworthiness Package were coordinated by an Inter-Service Steering Group (ISG). The Commission Services participating in the ISG were: Secretariat-General, Legal Service, Directorates-General GROW, RTD, CLIMA, ENV, JRC, CNECT, EMPL, JUST. The ISG met 6 times: 22 September 2021, 14 December 2021, 8 July 2022, 24 November 2022, 9 October 2023 and 9 November 2023. It was consulted throughout the different steps of the evaluation and impact assessment process: notably on stakeholder consultation questionnaire and deliverables of the external support study and on the draft Staff Working Documents. When necessary bilateral discussions were organised with the concerned services.

Consultation of the RSB

The draft impact assessment and evaluation reports were submitted to the RSB on 15 November 2023 and were discussed by the Board on 13 December 2023.

Evidence, sources and quality

The impact assessment and evaluation are based on several sources, using both quantitative and qualitative data, collected from Member States, industry, consumer groups, NGOs, European Parliament etc.
• Stakeholder consultation activities (see dedicated annex IV);

[76] 2023 Commission work programme – key documents (europa.eu)

[77] Vehicle safety – revising the EU's roadworthiness package (europa.eu)

• External support studies carried out by two independent consortia (the study supporting the evaluation was led by VVA et al. and the one supporting the impact assessment was led by Ricardo et al.). The external support studies will be published alongside this report.
• Commission experience in monitoring and implementing the Roadworthiness Package.

ANNEX II. METHODOLOGY AND ANALYTICAL MODELS USED

1 Process

The starting point for the evaluation was the 2012 Impact Assessment accompanying the proposal for a revision of the three Directives included in the Roadworthiness Package. The IA has notably been used to define the intervention logic, the points of comparison, and the overview of costs and benefits.

Against that background, this evaluation was based on a methodology consistent with the Better Regulation Guidelines and Toolbox, with the support of an external study. Further to the Call for evidence, the Commission launched the process for contracting the external support study. The terms of reference provided a draft intervention logic and draft evaluation questions to address the five evaluation criteria: relevance, effectiveness, efficiency, and coherence and European added value, which were further refined during the evaluation. The support study was undertaken by a consortium led by VVA Economics & Policy, including Transport and Mobility Leuven (TML), TNO, VUFO and the University of Leeds.

The intervention logic diagram (see Annex V) helps capture the logic of the RWP and the causal chain linking problems, objectives, inputs and expected results. It provides the basis for the development of the evaluation matrix (see Annex VIII) which sets out the following aspects for each evaluation question:

• Operational questions, breaking down the evaluation questions into smaller, measurable aspects.

• Indicators (quantitative or qualitative), providing the measures/metrics that correspond to each operational sub-question,

• Data sources & methods, identifying the sources of data and information used to inform the indicators and outlining the methodology used to answer the evaluation questions and form the conclusions.

The evaluation matrix was reviewed several times during the study, taking into account Commission inputs as well as evidence collection activities (desk research, interview programme, survey responses and data requests), to reflect the identification and review of data sources, as well as updated evidence needs and gaps and the improved understanding of the mechanisms and structures leading to better targeted questions.

2 Methodological framework

2.1 Data collection

The data collection was undertaken in the course of the whole evaluation process with a view to collate existing quantitative and qualitative evidence. A certain degree of flexibility was ensured to deal with unexpected issues arising throughout the data collection phase and in particular during the data analysis phase to cover any data gaps.

Desk research

The methodology used for the gathering of data consisted of collecting information from published sources at EU and Member States level regarding statistical and monitoring data. These included Eurostat and ACEA for vehicle fleet data, the EU CARE database for road crashes, complemented by two other datasets: GIDAS (which is broadly representative of

crashes in Germany) and IGLAD (which is an aggregation of various global databases and was useful to extract information for Austria, Czechia, France, Greece, Italy, Sweden, Slovakia and Spain). The existing evidence provided in published literature played an important role in supporting the evaluation in a number of thematic areas. An updated list of sources is provided in Annex IX of the support study.

Field research – stakeholders consultation

Important part of the data collection phase has been realised through various stakeholder consultation activities, performed by the Commission and the external consortium. The design of the questionnaires and the specific questions addressed to the stakeholders groups were developed on the basis of the evaluation matrix.

The Open Public Consultation (OPC) questionnaire was accessible on "Have Your Say" webpage from 6 July to 28 September 2022. 907 replies including 29 position papers were received; they were carefully reviewed and valuable insights and perspective were extracted and used during the evaluation. The factual summary report is available on the consultation page and further details on the OPC are presented in Annex IV.

The targeted consultation consisted of tailored-made surveys and interviews and complemented the data gathered through desk research and OPC (the latter not being representative).

Two online surveys were launched at the beginning of the evaluation support study and targeted the stakeholder groups impacted by the legislation: on one side the EU associations, consumer organisations, ministries of EU Member States, road safety authorities and vehicle registrations authorities; and on the other side the PTI bodies (centres authorised to conduct PTIs). 49 replies were received in total: 16 from EU associations/consumer organisations/NGOs, 17 from ministries and national road safety authorities, 5 from vehicle registration authorities and 11 from PTI bodies.

A number of 30 in-depth interviews with selected stakeholders allowed to explore specific questions regarding the RWP in a more profound manner thanks to their qualitative nature.

2.2 Data analysis

Safety

To analyse the reduction of road fatalities and serious injuries in road transport during the RWP period the analysis relied on the EU CARE Database. Despite the fact that vehicle registration year was missing for some Member States, inconsistently provided, or incomplete which was a limitation, the complete data available and used for the analysis is a fair representation of the EU in terms of country sizes and geographical coverage. The CARE database does not contain information on contributory factors in crashes, so it was not possible to look directly at the role of vehicle faults in crash involvements. Therefore, the overall research question asked whether the RWP reduced the proportion of involvements by older vehicles, by comparing the relative share of involvements of older vehicles in total involvements in the period before the implementation of the RWP. Data for the period between 2016 and 2021 (the last year with data available) was examined. Two categories were used to define older vehicles: vehicles aged 10 to 19 years at the time of the crash and vehicles aged 20 years or more. Involvement by vehicles in these categories was compared with total vehicle involvements. The results indicate that over the period analysed, vehicles aged 20 years or more are involved in a higher share of fatal crashes.

Emissions

PTI aims to identify high emitters that are then taken out of circulation or repaired, in order to reduce the air pollutants from road transport.

During the evaluation support study, data on exhaust emission in real driving conditions detected by remote sensing technology has been analysed. It has been estimated that the share of vehicles with malfunctioning emission technology ranges from a few percents to 10%. Nevertheless, their contribution to pollution is considerable as PM and NOx emissions are increasing by a factor of 10 to 100 for these vehicles. High emitters can represent up to 80% of the total emission in PM, and up to 25% of the total emissions in NOx, for particular euro classes and vehicle categories.

Detailed data available for 3 Member States show that for the years 2019-2021, an average of 0.7% of vehicles failed the emission test during PTI in Denmark, 0.9% for petrol engines and 0.4% for diesel engines in Finland and 0.62% for petrol engines and 0.36% for diesel engines in The Netherlands.

ANNEX III. OVERVIEW OF BENEFITS AND COSTS

Table 9: Overview of costs and benefits identified in the evaluation

	Citizens/Consumers		Businesses		Administrations	
	Quantitative	Comment	Quantitative	Comment	Quantitative	Comment
COSTS						
Administrative costs (per year relative to the baseline)	EUR 10 billion in 2019.	This covers both citizens and businesses. Only part of these costs was experienced by citizens.	-	Part of the costs EUR 10 billion in 2019 were experienced by businesses.	-	
Enforcement costs: (costs associated with activities linked to the implementation of an initiative such as monitoring, inspections and adjudication/ litigation)	-	-	-	-	-	MS administrations faced costs related to the enforcement procedures, training of highly qualified inspection personnel, investments in necessary equipment and materials, analysing statistical data from technical controls, and monitoring of inspector activities, including the supervision of testing centres and verification of inspectors
BENEFITS						
Direct benefits (such as improved well being: changes in pollution levels, safety, health, employment; market efficiency)	EUR 13.4 billion in 2019, of which EUR 12.7 billion external costs savings	The reduction in external costs savings for accidents and air pollution represent	-	-	-	-

	related to accidents and EUR 0.7 billion external costs savings related to air pollution	benefits for the society at large.				
Indirect benefits (such as wider economic benefits, macroeconomic benefits, social impacts, environmental impacts)	-	-	-	-	-	-

ANNEX IV. STAKEHOLDERS CONSULTATION - SYNOPSIS REPORT

This stakeholder consultation synopsis report provides a summary of the outcomes of the stakeholder consultation activities which were carried out as part of this back-to-back evaluation and impact assessment in view of a possible revision of the Roadworthiness Package (RWP). It provides a basic analysis of the responses of stakeholder groups involved in the consultation process and a summary of the main issues which they raised. The full analysis of the consultation results is presented in the stakeholder consultation reports annexed to the two external support studies. The same report is included in the evaluation SWD and in the impact assessment SWD, as an annex to both reports.

Stakeholder involvement was vital for the evaluation and impact assessment in order to collect facts, data and opinions enabling the Commission to:

- On the one hand, assess the performance of the RWP against the five evaluation criteria, identify possible issues with the existing legal framework and, on this basis, learn lessons for future action;
- On the other hand, (i) substantiate, validate and develop the problems and the underlying drivers, (ii) conceive corresponding policy objectives, (iii) elaborate a list of specific possible policy measures and policy options and (iv) assess their likely impacts on the various categories of stakeholders.

This report also aims at informing stakeholders on how their input has been considered.

This document should be regarded solely as a summary of the contributions made by stakeholders in the various consultation activities on the back-to-back evaluation and impact assessment in view of a possible revision of the Roadworthiness Package (RWP). It cannot in any circumstances be regarded as the official position of the Commission or its services. Responses to the consultation activities cannot be considered as a representative sample of the views of the EU population.

1 OVERVIEW OF CONSULTATION ACTIVITIES

Consultation activities took place from October 2021 to August 2023.

The consultation strategy set different focuses for the consultation activities for the evaluation and the IA to complement each other. The evaluation related survey and targeted interviews gathered stakeholders' views and input on the selected evaluation questions and evaluation criteria. They are complemented with the views expressed at the OPC.

The focus of the survey and interviews for the IA were on defining the different policy measures to meet the objectives set as part of the revision of the Roadworthiness Package, particularly the costs and potential impacts of these policy measures. The underlying problem drivers of the RWP were extensively discussed with stakeholders, e.g. in the Roadworthiness Expert Group and are also a result of the stakeholder consultation activities of the evaluation. Having said that, both the survey and interviews did briefly cover the baseline, problem drivers and objectives, as well as potential impacts of the measures, so on all parts of the IA.

The stakeholder consultation included the following activities:

- **Targeted online survey for the evaluation**: two online surveys were conducted targeting the stakeholders identified at the inception stage of the Evaluation Study and covered the 5 evaluation criteria of relevance, effectiveness, efficiency,

coherence and EU value added. It was launched on 8 December 2022 and ran until 20 January 2023. One survey targeted relevant EU associations, relevant ministries of EU Member States, road safety authorities and OEMs; In total 38 responses were received: 17 from ministries and road safety authorities, 16 from EU associations, consumer organisations and NGOs, 5 from vehicle registration authorities. The other survey was addressed to PTI bodies and 11 responses were received.

- **Targeted semi-structured interviews for the evaluation** sought to explore the respondents' views on the RWP for each evaluation question defined. They took place in the period between November 2022 and April 2023. The interviews were conducted with representatives from 30 selected technical or policy related organisations including national registration authorities, technical inspection bodies, the Roadworthiness Committee, the Roadworthiness Expert Group and road safety and environmental NGOs. They were selected in order to gather additional evidence, to ensure geographical coverage and to increase the sample size in a group of interviewees by stakeholder type.
- **Exploratory interviews for the IA**. The aim of the exploratory interviews was to obtain early engagement with key stakeholders (including authorities, industry and user representatives). Introductory calls were made with key stakeholders, i.e. CITA, EReg, CORTE and EGEA, to discuss the engagement of these organisations and their members with the initiative, including the distribution of the survey and the identification of potential interviewees. In addition, user groups, such as FIA (car drivers), IRU (lorry drivers) and FEMA (motorcyclists), were informed about the initiative and were interviewed as well.
- **Targeted online survey for the IA.** The focus of the survey was on the policy measures under consideration, particularly the details of the measures, their potential costs and savings and potential impacts. The survey was online between 26 June and 14 August 2023. The survey targeted national authorities involved in inspection activities at various levels, including policy development, inspection supervision and enforcement, and industry representatives, including those that undertake inspections and supply garage equipment and vehicles. 75 responses were received to the survey.
- **Targeted stakeholder interviews for the IA.** The majority of interviews were based on the interviewee's survey response, with a focus on identifying information on costs. A minority of interviews were undertaken independent of a survey response, e.g. for those organisations, such as users and research representatives, for which a survey was less relevant. The interviews began at the same time as the survey and continued until the end of August 2023. Overall, 37 interviews were undertaken to refine responses provided in the targeted online survey and to collect evidence from relevant stakeholders not covered in the survey.
- **Evaluation roadmap / Inception impact assessment (IIA).** As part of the initial feedback mechanism, stakeholders had the possibility to provide views on the combined evaluation roadmap / inception impact assessment published on the "Have your say" webpage between 4 October and 1 November 2021. Responses were received from 210 respondents: 171 from EU citizens, 9 from business associations, 6 from companies or business organisations, 6 from NGOs, 3 from consumer organisations, 3 from non-EU citizens, 2 from public authorities, 1 from academia and 9 other. 174 responses were linked to a campaign from predominantly French citizens, while 36 were unique written responses, that were analysed individually.

- **Open public Consultation (OPC**) questionnaire, covering both the IA and the evaluation, was accessible on "Have Your Say" webpage from 6 July to 28 September 2022. 907 replies were received: 758 from EU citizens, 47 from companies or business organisations, 35 from business associations, 18 from non-governmental organisations (NGOs), 10 from non-EU citizens, 10 from public authorities, 5 from trade unions, 3 from consumer organisations, 2 from academic/research institutions, 1 from an environmental organisation and 18 other. **731 of the responses received were part of a campaign from predominantly French citizens.** The factual summary report is available on the consultation page.

2 STAKEHOLDER GROUPS CONSULTED

This section provides a short overview of the main types of stakeholders identified and targeted as part of the consultation strategy. Overall, the consultation attracted interest from various types of stakeholders, which resulted in a good participation level and numerous contributions received. All identified stakeholder groups have been reached. However, the responses received are not representative of the EU population.

Table 10: Identification of key stakeholder groups and mapping against consultation activities.

High-level stakeholder group	Description	Stakeholder engagement activity
Public authorities in charge of road safety	Authorities involved in different activities relating to the RWP, including vehicle registration, inspection, enforcement and policy. Initial engagement was undertaken via their various representative associations, such as CITA, EReg and CORTE.	Exploratory interviews Targeted surveys Targeted interviews OPC Call for Evidence
Industry associations and companies	Associations and companies involved in different aspects of RWP, particularly those involved in inspections and supplying equipment to garages. These were engaged with initially via their representative associations, such as CITA and EGEA. In addition, vehicle manufacturers and vehicle component suppliers were also contacted.	Exploratory interviews Targeted surveys Targeted interviews OPC Call for Evidence
Representations of user groups	Groups representing the drivers of the various vehicles covered by the RWP were engaged with to identify their views on the potential measures.	Targeted interviews OPC Call for Evidence
Road safety and environmental NGOs	The views of specialist NGOs were also sought to ensure that the safety and environmental aspects of the measures were sufficiently considered.	Targeted interviews OPC Call for Evidence
Research / academia	Interviews were undertaken with selected road safety academic experts.	Targeted interviews OPC Call for Evidence
Citizens	Citizens responded to the combined evaluation roadmap/IIA and OPC both individually and as part of a campaign, both from within and outside the EU.	OPC Call for Evidence

3 ANALYSIS OF THE KEY RESULTS OF THE STAKEHOLDER CONSULTATION

This chapter presents key findings from the analysis of stakeholder contributions to the consultation process.

3.1 FEEDBACK RECEIVED ON THE EU ROADWORTHINESS RULES BY EVALUATION CRITERIA

Relevance

- Survey respondents and interviewed stakeholders generally consider that the **scope and objectives of the RWP are relevant** as a well-designed legislative package. Interviewed stakeholders overwhelmingly agree that the three Directives within the RWP are still thematically relevant to the wider EU policy goals.
- However according to the overwhelming majority of survey and interview respondents, there have been **numerous significant changes in vehicle technology since the RWP came into effect, which the current RWP does not account for**. There is a **need to adapt the Directives to environmental and technological developments and digitalisation**. Additionally, according to the respondents, the current measurement methods outlined by the RWP are considered inadequate for obtaining accurate readings of air pollutants emitted by vehicles, and traditional smoke opacity testing methods are deemed outdated and insufficient in detecting various pollutants. Some interviewed stakeholders also emphasise the need to increase the frequency of inspections for all vehicles due to the growing prevalence of shared mobility strategies and suggest clarifying certain aspects of testing to make it more targeted.
- **Relevance of the current EU rules on periodic roadworthiness testing and technical roadside inspections in improving road safety**. Several stakeholder categories, including academic and research institutions, public authorities, and consumer organisations, who have participated in the OPC, consider the rules relevant or very relevant in areas such as minimum standards for testing centres, facilities, and equipment, as well as categorising deficiencies during periodic tests. However, there are varying opinions from some responding NGOs, EU citizens, and environmental organisations, who perceive some aspects of the rules as less or not relevant. In particular, many respondents being part of the campaign consider the periodic testing of high-speed tractors and heavy motorcycles and applying different time intervals between periodic tests according to the age of vehicle and vehicle type as less or not relevant.
- **Relevance of current EU rules on periodic roadworthiness testing and technical roadside inspections in reducing air pollutant emissions**. Business associations, public authorities, and trade unions, who participated in the OPC consider the rules relevant in areas such as establishing minimum standards for testing centres, facilities, equipment, and inspectors' competence, training, and objectivity. However, there are varying opinions from responding EU citizens, environmental organisations, and some public authorities, who perceive certain aspects of the rules as not relevant in reducing air pollutant emissions. In particular, many respondents being part of the campaign consider the rules related to periodic testing of high-speed tractors and heavy motorcycles as not relevant for the purpose of reducing air pollutant emissions.

- **Relevance of current EU rules on registration documents for vehicles in facilitating free movement of goods and people within the EU**. The majority of the respondents, who participated in the OPC, consider the current EU rules to be relevant or very relevant in facilitating free movement, regarding the obligation on Member States to recognise roadworthiness certificates upon change of ownership. Views among those who responded being part of the campaign are more varied.

Effectiveness

- **Effectiveness of the current EU rules on periodic roadworthiness testing and technical roadside inspections in improving road safety** and contributing to the reduction of road fatalities and serious injuries in road transport in the EU. The majority of respondents, who participated in the OPC, view the current EU rules as effective in improving road safety and contributing to the reduction of road fatalities and serious injuries in road transport in the EU in areas such as establishing minimum standards for testing centres, facilities, and equipment, categorising deficiencies during periodic tests, obliging Member States to perform roadside tests on commercial vehicles, and implementing different time intervals based on vehicle age and type, except for periodic testing of high-speed tractors and heavy motorcycles on which views are diverging. The respondents participating in the campaign, perceive the current EU rules on roadworthiness as less or not effective in in certain aspects, such as periodic testing of high-speed tractors and heavy motorcycles, and minimum standards for inspectors' competence, training, and objectivity. The majority of survey respondents and interview stakeholders agree that PTIs and RSIs helped reduce the number of circulating vehicles with dangerous defects.
- The feedback collected from survey respondents and interviewed stakeholders suggests that vehicles on the road are perceived to have generally been made safer through the introduction of common standards for testing centres and personnel training, as well as with the adoption of same rules for frequency, scope and method for vehicle testing. However, interviewed stakeholders acknowledge that reduction in road deaths witnessed over the past 10 years could be due to a combination of factors (e.g. gas prices, driver behaviour, infrastructure) and it is therefore difficult to determine how many accidents are directly caused by mechanical defects and how many of the lives saved and injuries avoided are specifically linked to PTIs/RSIs.
- **Effectiveness of current EU rules on periodic roadworthiness testing and technical roadside inspections in reducing air pollutant emissions**. 80 % of public authorities, who have responded to the OPC, consider as effective the rules regarding minimum standards for inspectors' competence, training, and objectivity. Respondents in the OPC part of the campaign, have differing perspectives, with a majority of those respondents viewing the rules as not effective for the periodic testing of high-speed tractors and heavy motorcycles and for applying different time intervals between periodic tests, according to the age of vehicles and vehicle type
- However, interviewed stakeholders also pointed out that not all deficiencies can effectively be detected by applying the current technical standards for vehicle inspections. Among the survey respondents and interviewed stakeholders, there is no clear-cut opinion on the extent to which the provisions of the RWP Package have contributed to reduced air pollutants from road transport. According to

surveyed ministries and road safety authorities, vehicles that have been tampered with defects which are not covered by the EOBD system or those specifically related to NOx emissions will not necessarily be detected by the current EU PTI regimes.

- **Effectiveness of current EU rules on registration documents for vehicles in facilitating free movement of goods and people within the EU**. The majority of respondents to the OPC from public authorities and business associations find the current EU rules effective in facilitating free movement. On the other side, the participants in the campaign have diverging opinion on the effectiveness of the current EU rules on registration documents for vehicles in facilitating free movement.

Efficiency

- **Cost-effectiveness of the roadworthiness rules.** Respondents in the targeted survey and the interviews deemed the **benefits** associated with its implementation generally **proportionate to the costs**, especially with regards to the improvement of air quality. This is in line with the views expressed by the survey respondents, who consider that the implementation of the RWP has generated limited extra costs for authorities, citizens, and businesses. PTI inspections have not become more expensive, and the use of the EUCARIS system is cost-effective according to survey respondents. However, certain provisions like OBD checks have incurred costs for citizens. Ministries, road safety authorities, and EU associations participating in the survey agree that the benefits of the RWP in terms of road safety and reduced air pollution justify the costs. EU associations also emphasise its potential in combating illegal pollution and the human costs of air pollution.
- However, while some respondents did not consider RWP provisions as extraordinarily expensive, others mentioned that the costs associated with installing and upgrading testing equipment for testing stations is high.
- Interviewed stakeholders consider the administrative burden generated by the three Directives to be smaller for businesses and citizens than for public authorities.
- Ministries and PTI bodies, who have participated in the survey, acknowledge that the RWP and its implementing acts have created to some extents **administrative burden** for public administration. They emphasise the need for digitalisation in vehicle re-registration to reduce costs and administrative workload, particularly through data exchange and document harmonisation. Vehicle registration authorities who have responded to the survey, call for improved legal provisions and digitalisation to streamline the process. Additionally, EU associations responding to the survey propose providing type-approval information to PTI centres without charge.
- Most respondents of the survey did not express an opinion on whether the RWP package and its implementing acts have imposed administrative burdens on businesses. Survey respondents emphasised the importance of mutual recognition to enhance cost effectiveness in inspections. They also recommended implementing systems like Car-Pass in Belgium on an EU-wide scale to address odometer fraud. Furthermore, it was highlighted by them that a well-assessed test methodology is crucial to avoid inaccurate outcomes in PTI and ensure a standardised approach to testing procedures and equipment.
- The majority of survey respondents did not express an opinion on the administrative burden imposed by the RWP Directives on citizens. However, EU

associations suggested that implementing mobile vehicle registration documents could enhance the digitalisation of registration and data management processes, resulting in reduced costs for citizens.

Coherence

- While the Directives comprised in the **RWP are deemed internally coherent by the interviewed stakeholders,** a few **inconsistencies between the RWP and other road safety legislations** have been identified by interviewed stakeholders. As a response to the survey a similar message was passed by responding ministries, road safety authorities, and EU associations, who acknowledged that to some extent there are inconsistencies, overlaps, and gaps between the RWP Directives and other EU and international interventions.
- According to the interviewed stakeholders the **lack of harmonisation between the PTI and the type approval legislations** makes it difficult to perform thorough inspections, as the number of automated devices, sensors and safety features is growing faster than the PTI operators' ability to check them.
- The need for consistency between periodic technical inspection (PTI) requirements and type approval regulation was also emphasised by the respondents of the OPC. PTI should not go beyond what is specified in type approval regulations according to their views. Moreover, according to OPC respondents, Member States have different conditions and contexts for L-category vehicles, and they should have the flexibility to determine effective ways to reduce accidents.
- The **Registration Directive and the Type approval Regulation are not fully consistent** in the view of interviewed stakeholders: the fact that each country has the possibility of allowing a national type approval with more flexibility than EU type approval gives some Member States the chance to be less strict than others, thus raising road safety issues.
- According to the interviewed stakeholders the General Safety Regulation could better align with the RWP: for instance, the GSR identifies more responsibilities for manufacturers during the vehicle's lifecycle than those foreseen by the PTI legislation.
- The feedback received from interviewed stakeholders points to a lack of data coherence, whereby no one has a holistic view regarding the whole life of the vehicle: from vehicle definition to vehicle scrapping.
- According to the OPC respondents, **s**tandardisation of rules among EU countries is considered essential for the effectiveness of the EU technical control package. Disparate rules, particularly concerning the approval of controllers, need to be addressed in their view.

EU added value

- **The EU rules on roadworthiness have added value for citizens and businesses** compared to what could be achieved by Member States at national and/or regional and international level according to the respondents to the OPC. There is disagreement among EU citizen responding to the OPC whether the EU rules on roadworthiness provide added value compared to what could be achieved at the national, regional, and international levels. However, there is a significant agreement among academic and research institutions, who have participated in the OPC that the EU rules do offer added value for citizens and businesses.

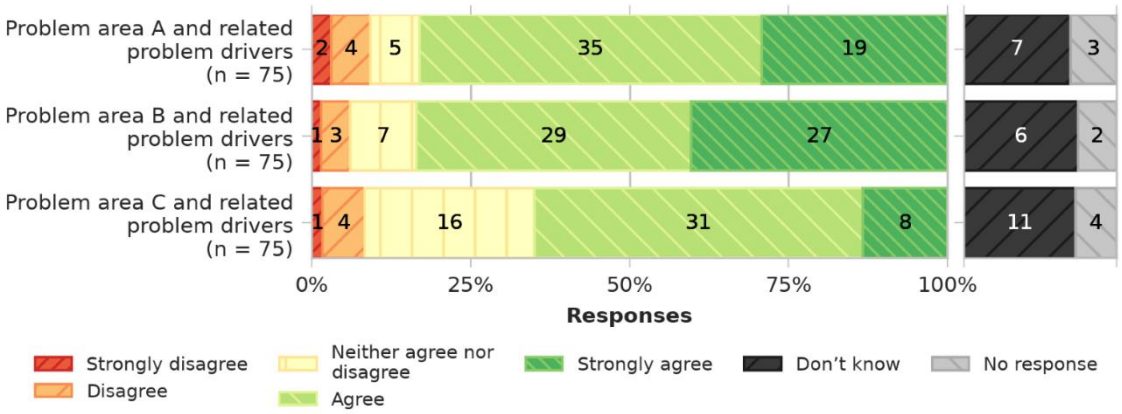
- The interviewed stakeholders widely acknowledged the added value of the three Directives in their contribution towards the harmonisation of roadworthiness rules among Member States. By setting up minimum standards for carrying out periodical technical inspections and roadside inspections, the RWP sets up a common framework to identify vehicle deficiencies, prevent accidents, reduce vehicle emissions and promote fair competition in the field of road transport.
- When expressing views in the survey, ministries, road safety authorities, and PTI bodies considered that additional EU action is necessary to enhance the RWP and achieve the objectives of reducing fatalities, serious injuries, and improving air quality through PTI and RSI inspections in the EU. They emphasised the need for minimum requirements across Member States to ensure effective PTI and RSI contributing to road safety and air quality.
- The overwhelming majority of interviewed stakeholders agree that if the RWP had not been implemented, the road safety scenario in the EU would be far more fragmented, with Member States taking greatly differing actions.

3.2 FEEDBACK RECEIVED ON THE PROBLEM DEFINITION

In the **OPC**, respondents were asked for their views on three problems that the revision of the RWP could address. A majority of respondents – between two-thirds and four-fifths in each case – supported a revision of the EU's roadworthiness rules addressing each of the specified problems. The problem that received most support was the need to address *vehicles circulating on the roads with defects or tampered components* (78%; 123, six 'no responses' or 'Don't knows'), followed by *methods for PTI of vehicles to test electronic safety and driver assistance systems in vehicles* (74%; 116, seven 'no responses' or 'Don't knows'). Two thirds (67%; 100, 14 'no responses' or 'Don't knows') of respondents also believed that a revision to the legislation should address the *availability of relevant vehicle data to enforcement authorities in the EU Member States in cross-border traffic*. Themes raised in response to the open questions included that it was important to update inspections to reflect changes to vehicles and their technology, that it was important to have access to in-vehicle data to support inspections, that more action was needed to address tampering and that it was important to support public authorities in the inspection of foreign vehicles on their roads. Others, while recognising that changes to inspections were needed, underlined that inspections had to remain affordable for consumers.

The **survey** produced similar results of support for the revision of the EU's roadworthiness rules addressing the different identified problem areas, see Figure 10.

Figure 10: Survey results on stakeholders' views on identified problems.



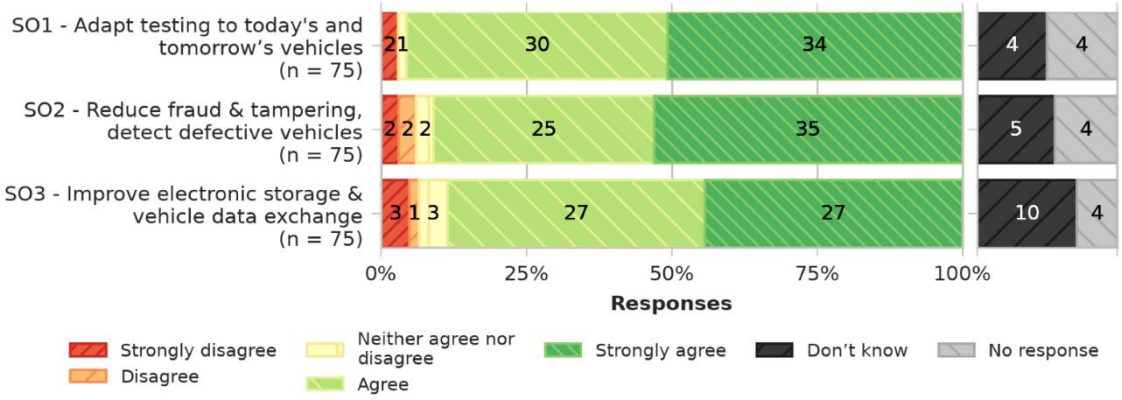
Source: Ricardo et al. (2023), Impact assessment support study, survey results

In the survey, respondents were asked for their views on more detailed problem areas, and their associated drivers and on three Specific Objectives (SOs):

- SO1: Adapt testing to today's and tomorrow's vehicles (improve consistency, objectivity and quality)
- SO2: Significantly reduce fraud and tampering (of safety and emission control systems) and improve the detection of defective vehicles)
- SO3: Improve electronic storage and exchange of relevant vehicle identification and status data.

There was a high level of agreement – around two thirds or more – for each set of problems and problem drivers, and overwhelming support (at least 89%) for each of the specific objectives.

Figure 11. Survey results: Stakeholders' views on identified specific objectives



Source: Ricardo et al. (2023), Impact assessment support study, survey results

Respondents to the **IIA** made a number of general comments about the revision. A common theme that was raised by those responsible for inspections was the importance of more consideration being given to coordinating between type approval and roadworthiness legislation, and the importance of maintaining the independence of inspection organisations and inspectors from other parts of the automotive trade, including repair and maintenance. The importance of a more consistent approach to roadworthiness testing across the EU was also mentioned.

3.3 FEEDBACK RECEIVED ON THE BASELINE/ EXISTING LEGISLATION

In their response to the **survey** and **interview** questions, respondents were often split between those who believed that the different factors listed had had a high impact on various aspects of roadworthiness, and those who believed that the impact had been low. The question to which respondents were mostly having a common view with 75% agreeing (51 of 75; seven 'Don't knows' or no responses) – was in relation to the belief that the *enforcement of roadworthiness legislation* had had a high impact on the *number of unsafe vehicles* on the EU's roads since 2014. The majority (60%; 40 of 75; eight 'Don't knows' or no responses) of respondents also felt that *technological and market developments* had had a high impact on the *number of unsafe vehicles* on the EU's roads since 2014. On the other hand, a majority of respondents believed that *technological and market developments* had had a low impact on reducing the *number of vehicles with tampered or defective noise control systems* (77%; 46 of 75; 15 'Don't knows' or no responses), or *tampered odometers* (64%; 39 of 75; 14 'Don't knows' or no responses), since 2014. The responses relating to the impact on the *number of vehicles with tampered or defective emissions control systems* and the *vehicle re-registration process* were much more split between those who felt that the impact had been high or low.

Respondents were asked to explain their responses. A common reason listed amongst those responsible for inspections, as well as users, was the need to update PTIs (and so the PTI Directive) to take account of the way in which vehicles have developed and will continue to develop. Many of these respondents also underlined the problem of detecting tampering during a PTI, particularly tampered odometers.

3.4 FEEDBACK RECEIVED ON POSSIBLE SOLUTIONS

Policy measures: Scope of PTI Directive

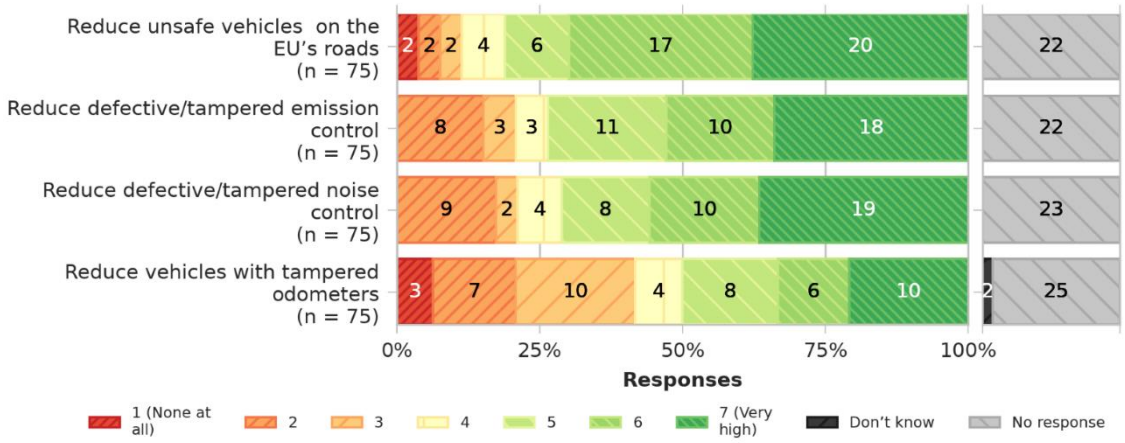
The first group of policy measures related to the potential extension of the ***scope of the PTI Directive***. In their responses to the **IIA**, various industry respondents, including those organisations responsible for inspections, called for the extension of the PTI Directive to cover all vehicles that are able to use roads. For example, In the response for IIA, CITA called for the extension of the scope of PTI to L-category vehicles and light trailers, as it had undertaken a study that concluded that this would have a positive cost-benefit impact; it also specified its proposed frequency for inspecting these vehicles. The French National Council of Automotive Professions (Conseil national des professions de l'automobile; CNPA) and GOCA Vlaanderen also supported extending the scope of PTI to these vehicles. The Portuguese National Association of Automobile Inspection Centres (Associação Nacional de Centros de Inspeção Automóvel; ANCIA) called for testing to be mandatory for all motor vehicles used on public roads. Inspection company Applus also suggested that the general rule should be that all vehicles that can circulate on roads in the EU should be covered by the PTI Directive, although they proposed allowing some exceptions for certain L-category vehicles where alternative measures were in place. The European Garage Equipment Association (EGEA) also underlined the importance of extending roadworthiness testing to all road transport vehicles.

On the other hand, various motorcycle users' groups that submitted contributions to the IIA argued against the mandatory extension of the scope of the PTI to motorcycles, in line also with the responses from the campaign. The Federation of European Motorcyclists'

Associations (FEMA) argued that the evidence was that the technical state of motorcycles only played a marginal role in accidents involving motorcycles.

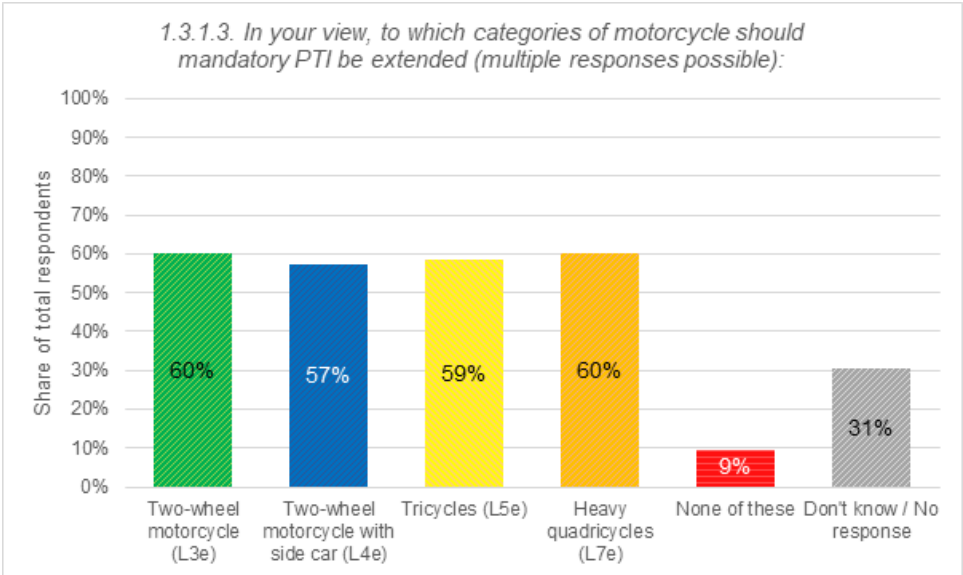
In the **OPC**, among the respondents not linked to the campaign, there was a small majority that supported extending the scope of the PTI Directive to cover L-category vehicles (53%; 73, 25 'no responses' or 'Don't knows'), whereas again the responses that were part of the campaign *were against* such an extension to motorcycles.

Figure 12. Survey responses: In your view what would the contribution of this measure be to:



Source: Ricardo et al. (2023), Impact assessment support study, survey results

Figure 13. Survey responses: In your view, to which categories of motorcycle should mandatory PTI be extended? (multiple responses possible):



Source: Ricardo et al. (2023), Impact assessment support study, survey results

In the **survey**, respondents were asked about different potential measures to extend the scope of the PTI Directive. For each of the potential measures, around two thirds or more of the respondents believed that the respective measure would contribute to a high level to

delivering Specific Objective 2, i.e. extending the scope to motorcycles (80%; 41, 24 'no responses' or 'Don't knows'); agricultural and forestry tractors (78%; 31, 35 'no responses' or 'Don't knows'); and light trailers (66%; 27, 34 'no responses' or 'Don't knows'). In the **survey** and **interviews**, it was noted that many Member States already required a PTI for motorcycles, tractors and/or trailers. Some potential challenges of this measure were mentioned by the respondents, including the distance that would need to be travelled to take motorcycles and tractors for an inspection at an inspection centre, and whether a PTI should be required for tractors that were not used on public roads. In addition, for the lightest trailers (O_1), it was questioned whether a PTI was needed for these, due to the way in which these were used, and also due to the fact that these trailers are not registered in some countries, such as the Netherlands and France.

In the responses to the OPC, ***SMEs*** who had responded were much less supportive extending the scope of the PTI Directive to motorcycles than large enterprises participating in the OPC, with 38% (eight) not supporting it, compared to no ***large enterprise***. In the response to the survey and interviews, the fear was expressed that costs for SME inspection companies could increase, if they had to buy more equipment, or if SME rental companies had to have their vehicles tested more often.

Policy measures: Frequency of PTI tests

The second group of measures considered in the survey and interviews covered measures to increase the ***frequency of testing for certain vehicles***. In the **survey**, more than two thirds of respondents believed that four of the measures would contribute to a high level to delivering Specific Objective 2, i.e. an annual PTI for N_1 vehicles (70%; 30, 32 'no responses' or 'Don't knows'), an annual PTI for vehicles over 10 years olds (78%; 39, 25 'no responses' or 'Don't knows'), a mandatory PTI for crashed vehicles with significant damage (70%; 33, 28 'no responses' or 'Don't knows') and for vehicles with significant modification (67%; 32, 27 'no responses' or 'Don't knows'). On the other hand, a significant majority of respondents (85%; 34, 35 'no responses' or 'Don't knows') believed that the remaining measure, a simplified PTI for vehicles that had recently passed an RSI, would have a low contribution to delivering Specific Objective 2.

In the IIA response, CITA called for an increased frequency of PTI for some vehicles. For example, they supported annual tests for vehicles over 12 years' old, as the number of these was increasing in the EU and they would experience more frequent defects as they aged. GOCA Vlaanderen called for more frequent PTIs for certain vehicles, such as N1 vehicles and vehicles of more than 10 years' old. The EGEA also mentioned possibly increasing the frequency of inspections for high mileage vehicles. The French CNPA and a French inspection company called for the alignment of the frequency of testing of N1 vehicles, with those of N2 and N3 vehicles, arguing that in France, where N1 vehicles are tested at the same frequency as cars, they already often had many deficiencies by the time of their first PTI. The Spanish Association of PTI service providers (AECA-ITV) called for annual PTIs for all cars, light commercial vehicles and L-category vehicles. The Portuguese ANCIA also called for an increased frequency of testing for vehicles used for shared mobility or for public transport services. They also called for a mandatory PTI after a vehicle had been in an accident affecting its main safety components, which should have the active involvement of insurers, and on the transfer of ownership of a vehicle. Inspection company Applus also called for a mandatory PTI after a vehicle had been in an accident (as reported by an insurer), and on the transfer of ownership of a vehicle. Finally, they recommended that a quality standard for inspection entities and supervisory bodies be created to improve vehicle inspection and to make this more consistent across the EU.

A common argument in favour of more frequent testing for N_1 vehicles, which were mentioned in different consultation exercises, wase that such vehicles were used frequently, and often experienced a number of technical issues by the time of their first PTI, although other respondents were not convinced of the added value of this measure. For older vehicles, it was widely suggested that these deteriorate more quickly than newer vehicles, and so should be tested more frequently. The main argument against having a simplified PTI for vehicles that had recently passed an RSI was, that it was not possible to test a vehicle in an RSI in the same way as it was in a PTI -while the potential cost of setting up a system to record and exchange this information was noted-, as was the time that would be needed to amend each PTI to the take account of the recent RSI history of the vehicle. In relation to requiring a mandatory PTI for crashed vehicles with significant damage and for vehicles with significant modification, challenges were identified in relation to who makes the respective judgements and how the information is exchanged. In addition, some respondents considered that a standard PTI was not sufficient to determine the roadworthiness of some crashed or modified vehicles.

Policy measures: Mutual recognition of PTI certificates

The third set of measures included two alternative approaches to enable the ***recognition of PTI certificates in other countries***, i.e. other than the one in which the PTI was undertaken. In the **OPC**, a majority of respondents (63%; 97, 11 'no responses' or 'Don't knows') agreed with the proposal that measures were needed *to enable a vehicle owner to obtain a valid roadworthiness certificate, to be accepted throughout the EU, in a Member State other than the Member State of registration of the vehicle*. In the **survey**, respondents were split on the extent of the contribution of each of the two measures to Specific Objective 3. A marginal majority (51%; 19, 38 'no responses' or 'Don't knows') felt that requiring the mutual recognition of PTI certificates under certain conditions would have a high contribution to Specific Objective 3, whereas a minority (38%; 12, 43 'no responses' or 'Don't knows') felt that way about mutual recognition under bilateral agreements.

In responses to the variation consultation exercises, users and those not directly involved in inspections tended to be more in favour of the mutual recognition of PTI certificates under certain conditions, although some recognised that the mutual recognition under bilateral agreements would be a good first step. However, those more actively involved with inspections were concerned that the extent of the variation between the approach taken to PTIs in different Member States meant that mutual recognition would be difficult and potentially lead to adverse effects on safety, unless mutual recognition was the subject of a bilateral agreement. Linked to this, concerns were also raised that mutual recognition without the increased harmonisation of PTIs would lead to "PTI tourism", where drivers had their vehicles tested in countries where it was easier to pass a PTI.

Policy measures: Electronic roadworthiness certificates

The fourth set of measures consisted of a single measure, i.e. ***require that the roadworthiness certificate is issued in an electronic format***. In their responses to the **survey**, the overwhelming majority of respondents (94%; 49, 23 'no responses' or 'Don't knows') believed that this measure would have a high contribution to addressing Specific Objective 3, with a majority of these (63%; 33) believing that a paper version should still be available on request. In their responses to the **survey** and **interview**, various respondents underlined their support for this measure, and for the increased digitalisation of all aspects of the roadworthiness testing process more generally, due to its potential

benefits for efficiency, the environment (less paper use), enforcement and in potentially opening the door for new services. The importance of retaining the option to have a paper copy of the certificate was underlined, so as not to exclude owners who were less digitally literate. The importance of having a standardised format for the electronic roadworthiness certificate was also a common remark of the respondents. A potential challenge of such digitalisation was identified for ***SMEs*** that undertake PTIs in some countries, if they were not yet digitally connected to the agency that oversaw inspections.

Policy measures: Content of PTI tests

The fifth group covered measures to ***improve the current PTI test requirements and procedures***. In their responses to the OPC, a small majority (60%; 91, 13 'no responses' or 'Don't knows') was in favour of *measures to specifically tackle noise-related tampering / non-compliance problems in vehicles inspected at the roadside*. ***SMEs responding to the OPC*** were *less supportive* of this measure, with 29% (six) not supporting it, compared to no ***large enterprise*** among the responding large enterprises.

In the **survey**, around two thirds or more of respondents believed that the measures would contribute to delivering the respective Specific Objectives to a high level, with one exception. The measure that the vast majority (91%; 50, 20 'no responses' or 'Don't knows') thought would contribute at a high level to achieving Specific Objective 1 was to require the training of PTI inspectors to inspect electric vehicles. Around two thirds thought that advanced noise testing for motorcycles (65%; 28, 32 'no responses' or 'Don't knows') and more advanced testing of braking for HDVs (69%; 27, 36 'no responses' or 'Don't knows') would contribute to Specific Objective 2 at a high level. The response was more ambivalent with respect to the contribution of advanced testing of advanced headlamps, as only a slight majority (52%; 23, 31 'no responses' or 'Don't knows') thought that this would make a contribution to addressing Specific Objective 2, although a majority (79%; 37, 28 'no responses' or 'Don't knows') thought that this measure would address Specific Objective 1 at a high level.

More detailed responses in both the **survey** and **interviews** regarding the advanced noise testing for motorcycles ranged from that this was already done in a number of countries, such as Spain, to a concern that such tests would not be effective, as users could remove any tampered devices before the PTI. The latter responses came from national authorities, inspecting companies and user groups, although some felt that such adaptation prior to the PTI was still an additional burden for users. With respect to the advanced testing of advanced headlamps, some, such as the FIA, were not yet clear of the scale of the problem, whereas others, such as CITA, argued that such testing was not yet possible. On the other hand, in some countries it was considered that such tests were already undertaken, e.g. in Germany and Belgium, using a range of different methods. Some respondents noted that there could be additional costs for ***SMEs*** resulting from these measures, if a measure required new equipment or additional training, particularly in countries with a decentralised testing system, such as the Netherlands.

The ***introduction of new PTI test requirements and procedures*** was the subject of the sixth group of measures. In the responses to the **OPC**, around two thirds of respondents supported similar measures to those covered in the survey and interviews. For example, 70% (106, 13 'no responses' or 'Don't knows') supported *methods to test the functioning of safety-relevant electronic components, advanced driver assistance systems (ADAS) and automated functions* being included in the revision of the PTI Directive, with 66% (100, 12 'no responses' or 'Don't knows') supporting the inclusion of *new methods to test vehicles with alternative powertrain technologies (hybrid, full-electric, hydrogen)* and

64% (96, 13 'no responses' or 'Don't knows') *new methods for measuring exhaust emissions, for example particle number (PN) and nitrogen oxides (NO_x).* Many responses to the **IIA** also called for similar measures.

In the responses to the **survey**, at least 80% of respondents thought that the respective measures would address the specified Specific Objectives, e.g. 92% (46, 25 'no responses' or 'Don't knows') believed that updating the PTI to cover the safety systems introduced by the General Safety Regulation (GSR) would address Specific Objective 1 to a high level and 88% (45, 24 'no responses' or 'Don't knows') felt the same way about adapting the PTI to the particularities of EVs and hybrids. Similar proportions, 81% (43, 22 'no responses' or 'Don't knows') for mandatory PN counting and 82% for requiring NO_x testing according to the JRC methodology, thought that these measures would address both Specific Objective 1 and Specific Objective 2 to a high level. In the open responses to the **survey** and the **interviews**, there was some concern regarding the feasibility of applying NO_x testing according to the JRC methodology in northern Member States, particularly the requirement that testing be undertaken when the vehicle has a warm engine. Again, there were some concerns about the impact of any additional costs from these measures on ***SMEs*** that undertake inspections, particularly where the PTI system was decentralised.

Policy measures: Scope of RSI Directive

The seventh set of measures focused on ***extending the scope of RSIs***. In the responses to the **OPC**, there was a high level of support for *mandatory checks during roadside inspections of commercial vehicles to ensure the safe securing of cargo* (70%; 99, 22 'no responses' or 'Don't knows'). However, there was only a marginal majority in favour of *extending the rules to other vehicles, (e.g., light commercial vehicles, and passenger vehicles, including cars, powered two- and three-wheelers (N_1, M_1 and L-category vehicles)* (51%; 77, 14 'no responses' or 'Don't knows'). In particular, respondents who were ***SMEs*** were much <u>*less supportive*</u> of this measure, with 38% (eight) not supporting it, compared to no ***large enterprise*** participating in the OPC.

In the **survey**, between two-thirds and three-quarters of respondents believed that the respective measures would address the associated Specific Objectives at a high level, although in all cases at least half of the respondents to the survey did not express a view. On one hand, two-thirds of respondents (67%; 20, 45 'no responses' or 'Don't knows') believed that the introduction of mandatory standards in relation to cargo securing inspections would address Specific Objective 1 at a high level. On the other hand, around three quarters of respondents believed that the extension of the scope of the RSI Directive to N_1 and L-category vehicles would address Specific Objective 2 at a high level (76%; 28, 38 'no responses' or 'Don't knows'; and 74%; 23, 44 'no responses' or 'Don't knows', respectively). In their responses to the **survey** and **interview**, various respondents noted that some of these measures were already undertaken in their respective countries, although a minority of respondents were not convinced of the added value of each of these measures. In relation to introducing RSI for N_1 vehicles, it was suggested that this could bring additional costs, in terms of lost time, for ***SMEs*** operating such vehicles.

Policy measures: Content of RSIs

The ***introduction of new RSI test methods and procedures*** was the subject of the eighth group of measures. In the responses to the **OPC**, a small majority supported consideration of relevant measures, as 60% (91, 13 'no responses' or 'Don't knows') supported *measures to specifically tackle noise-related tampering / noncompliance problems in vehicles inspected at the roadside* and 53% (78, 17 'no responses' or 'Don't knows') supported

extended emission testing (e.g., NO_x and PN), including the use of remote sensing equipment. ***SMEs*** participating in the OPC were much *less supportive* of either of these measures (29% (six) and 40% (eight), respectively), compared to no respondent large enterprise in both cases.

In the responses to the **survey**, a majority of respondents, who expressed a view, thought that each of the proposed measures would contribute to addressing both Specific Objective 1 and Specific Objective 2 at a high level, although more than half of respondents did not have a view on any of these measures. For example, 81% (26, 43 'no responses' or 'Don't knows') believed that *PN testing for commercial vehicles* would address Specific Objective 2 at a high level, as did 77% (24, 44 'no responses' or 'Don't knows') for *NO_x and noise testing for all vehicles using remote sensing*. The measure that the fewest respondents believed would address Specific Objective 2 at a high level was *plume chasing for commercial vehicles* (61%; 14, 52 'no responses' or 'Don't knows'). The responses relating to Specific Objective 1 were similar for each measure. In the responses to the open questions in the **survey** and **interviews**, various respondents from national authorities were not convinced of the added value of requiring PN counting during an RSI, if this was also measured in the course of a PTI. It was also suggested that remote sensing would only be able to identify vehicles that exceed the respective emission standards significantly, rather than being able to identify slight exceedances.

In the IIA response in relation to the RSI Directive, CITA called for cargo securing requirements for cargo vehicles to be set in type approval, in order to facilitate the inspection of the security of cargo in RSIs. Ireland's RSA called for some changes to improve the RSI Directive, including more specific wording around failures involving frontal protection systems and tampered emission control systems. They also suggested that consideration could be given to expanding the scope of the RSI Directive. The inspection company Applus suggested that the RSI Directive should be extended to all vehicles that were able to circulate on roads in the EU to check their emission levels, noise levels, overloading and other relevant technical issues. They also suggested that remote sensing could be used to identify the need for additional inspections for high polluting vehicles. The Nordic Logistics Association highlighted the importance of electronic data exchange and the storage of the results of RSIs, and for RSI authorities to have access to this information, in order to prevent drivers being subject to another RSI when they cross a border. They also underlined the importance of digital tools, including those that could support the registration of vehicles, in making it easier to inspect vehicles, and so make this more efficient, thus saving time for inspectors and for those being inspected.

Policy measures: Testing software in PTIs and RSIs

The ninth set of measures included a single measure relating to both the PTI and RSI Directives: ***require the testing of software status/integrity of safety and/or emission relevant systems in the PTI for all vehicles and as part of technical roadside inspections of commercial vehicles***. The **OPC** included a question on a similar measure, but only in relation to PTI, which was supported by two thirds of respondents (65%; 100, nine 'no responses' or 'Don't knows'). The importance of checking a vehicle's software, at least during PTIs, was highlighted by a number of inspection bodies in the **IIA**. In the **survey**, a high proportion of respondents believed that the measure would address both Specific Objective 1 (86%; 42, 26 'no responses' or 'Don't knows') and Specific Objective 2 (81%; 38, 28 'no responses' or 'Don't knows') at a high level. In the open responses to the **survey** and **interviews**, some authorities were concerned about the additional costs of this

measure, particularly on ***SMEs***. On the other hand, those that undertook inspections believed that the test could be relatively straightforward, even automated, as long as those undertaking inspections had easy access to the relevant information within the vehicle and also to relevant manufacturer databases that contained the necessary information on the software used.

Policy measures: Access and exchange of information/data

The tenth set of measures focused on ***access and exchange of information/data*** that was needed to support PTIs and RSIs.

In the response to IIA, CITA called for all those undertaking inspections to have access to vehicle-specific original data in a non-discriminatory, free and independent manner, given that technical inspections are undertaken for the authorities of the Member States, They also underlined the importance of relevant stakeholders being able to verify that the right version of approved software was being used by the vehicle. Germany's Central Agency for PTI, the FSD, also underlined the importance of access to in-vehicle data and diagnostic information in an independent and reliable way, specifically the information made available in the context of EU type approval legislation, along with unrestricted access to the vehicle data and software, covering the whole lifetime of the vehicle. Similarly, the Spanish AECA-ITV underlined the importance of PTI inspection providers having access to the original vehicle data, including up-to-date software, in a non-discriminatory, free and independent manner, so that vehicles could be appropriately tested. The Portuguese ANCIA also underlined the importance of testing services having access to the technical specifications of a vehicle's safety systems to be able to properly test these, and to be able to check that a vehicle's software was approved and up to date. Austrian VFT and BdF, and the German DKZ also underlined that, in order to facilitate the inspection of the functionality of safety systems, testing centres should have easy access to the relevant OBD data, free of charge. They also noted that the implementation of Regulation (EU) 2019/621 regarding ePTI had been more difficult than expected and so more detailed provisions should be included in the revised RWP. GOCA Vlaanderen also emphasised the importance of free access to specific PTI-related data for each individual vehicle in order to be able to properly inspect modern vehicles. Similarly, Ireland's RSA called for manufacturers to be required to provide to Member States with "accessible and standardised" information relating to the test items, at no cost to Member States, and to provide sufficient access to in-vehicle data in PTIs to enable the necessary inspections. They also argued that testing inspection companies should have similar access to these information and data. Inspection company Applus argued that organisations involved in statutory activities, such as vehicle inspections, should have a "clear and unfiltered access" to vehicle data, potentially via a central hub. They also called for the information needed for an inspection to be made available in a standardised format in an easy-to-access, computer-readable format on the European level, to facilitate access to the OBD, for example. Applus also underlined the importance of inspections being able to check that the appropriate, non-modified software was present on the vehicle. The EGEA underlined the importance of direct access to in-vehicle data to facilitate the testing of safety and environmental control systems, and also called for all inspection equipment to have digital network capability to enable the secure transmission of data between inspection sites and the respective authorities. GTÜ, the German association of independent PTI inspectors, also underlined the importance of being able to access vehicle data using standardised interfaces, and of having internet access at all inspection sites. They also noted that they would welcome a system that would allow Member States to issue inspection reports solely in a digital format. The FIA also underlined that the relevant diagnostic data and functions

must be made "conveniently accessible" for inspection bodies free of charge, as these were undertaking a government activity, with the explicit consent of users. They also called for the implementation of an independent, vehicle security certification scheme to allow "efficient and effective" verification during testing to ensure that the most up-to-date security, safety and environmental protection updates have been installed. The ÖAMTC's response made similar points.

In the **OPC**, questions were asked about relevant measures relating to both PTIs and RSIs. Two-thirds of respondents (67%; 102, 11 'no responses' or 'Don't knows') supported *extending (or clarifying) existing rules on access to in-vehicle data…, with data protection safeguards* for PTIs, whereas a slightly smaller proportion (62%; 93, 15 'no responses' or 'Don't knows') supported this for RSIs. In both cases, ***vehicle and equipment manufacturers/suppliers,*** who participated in the OPC, were less supportive of this provision than other respondents, e.g. for PTI (58%; seven, three 'no responses' or 'Don't knows') and for RSI (50%; six, three 'no responses' or 'Don't knows'). In addition, 59% (92, nine 'no responses' or 'Don't knows') supported *new methods for reading out onboard data stored in the vehicles* for PTIs, although again ***vehicle and equipment manufacturers/suppliers,*** who participated in the OPC, were less supportive of this measure (38%; five, two 'no responses' or 'Don't knows') than other respondents. In addition, nearly two thirds of OPC respondents (64%; 96, 14 'no responses' or 'Don't knows') were supportive of *granting roadside inspection authorities access to electronic data,* which again was less supported by ***vehicle and equipment manufacturers/suppliers,*** who participated in the OPC, than other respondents (31%; four, two 'no responses' or 'Don't knows').

In the **survey**, a majority of respondents believed that *further defining data governance procedures and the means of access to vehicle technical information by testing centres free of charge and in standardised format* would address both Specific Objective 1 (87%; 45, 23 'no responses' or 'Don't knows') and Specific Objective 3 (75%; 38, 24 'no responses' or 'Don't knows') to a high level. A similarly high proportion believed that *enabling and use of independent remote access to in-vehicle data in the RSIs of commercial vehicles* would address both Specific Objective 1 (81%; 34, 33 'no responses' or 'Don't knows') and Specific Objective 2 (73%; 30, 34 'no responses' or 'Don't knows') to a high level. Around three-quarters of respondents (75%; 24, 43 'no responses' or 'Don't knows') believed that *requiring the electronic storage of RSI reports in national databases, as well as the access and exchange of RSI-relevant data to RSI authorities in other EU Member States through a common IT system* would address Specific Objective 3 at a high level. In response to the open **survey** and **interview** questions, various respondents underlined that *enabling and use of independent remote access to in-vehicle data* was as important for PTIs as it was for RSIs, and so underlined that this measure should also be considered in the context of PTIs. In this context, EReg underlined that they supported the three measures in this section applying to all three Directives that are part of the RWP. Various respondents, including CITA, EGEA and EReg, underlined the importance of free and easy access to in-vehicle data to enable the proper inspection of vehicles. Many respondents also underlined the importance of storing relevant data in a structured format, rather than storing the full RSI report. A couple of respondents suggested that ***SMEs*** would benefit from having easier access to information.

Policy measures: Measures relating to vehicle registration

The final – eleventh – set of measures focused on ***potential amendments to the Vehicle Registration Documents Directive***.

In the IIA response in relation to vehicle registration, CITA called for a standardised exchange of data between type approval and licencing authorities, to eliminate the need to carry the registration certificate in the vehicle (or even its replacement entirely with an electronic version) and the possibility for relevant authorities and bodies to access vehicle registration data, no matter which Member State the vehicle was registered in. Spanish AECA-ITV called for the establishment of an electronic platform in which Member States were able to access the registration documents and certificates of conformity of all vehicles. The Nordic Logistics Association agreed with the difficulties in enforcing road safety measures in cross-border traffic and trade in the EU, and underlined its belief that sharing vehicle registration data, and other safety-relevant information, of vehicles between Member States was important to address this problem.

In the **OPC**, respondents were asked whether they supported four relevant measures, each of which was supported by around three-quarters of respondents, with the most popular being *adding data on major accidents of a vehicle to the vehicle register* (76%; 115, 13 'no responses' or 'Don't knows'). This was followed by *improved exchange of roadworthiness data between Member States in electronic format* (75%; 116, 10 'no responses' or 'Don't knows'), *full digitalisation of registration documents* (74%; 110, 16 'no responses' or 'Don't knows') and *adding odometer data to the vehicle register* (72%; 111, nine 'no responses' or 'Don't knows'). Responses to the **IIA** also supported the sharing of relevant information between Member States.

In the **survey**, a large majority of respondents that had a view (at least 85% in all cases) believed that the respective measures would have a high impact on the respective Specific Objectives. Over 90% of respondents believed that *providing electronic access to relevant data to the registration authorities of other EU Member States through the use of a common IT system* (95%; 38, 35 'no responses' or 'Don't knows') and *adding a minimum set of new data to the vehicle register* (93%; 42, 30 'no responses' or 'Don't knows') would address Specific Objective 3 to a high level. Slightly fewer respondents believed that *introducing the requirement that any vehicle transformation has to be approved and registered* and *increasing the harmonisation of the technical data in the vehicle registration documents on the basis of a common standard* would address Specific Objective 3 at a high level (91%; 30, 42 'no responses' or 'Don't knows'; and 88%; 28, 43 'no responses' or 'Don't knows', respectively). The proportion believing that *requiring issuing of the registration certificates (Annex I) in digital format* and that *requiring that Member States update vehicle registration data on a regular basis* would address Specific Objective 3 at a high level was marginally lower (85%; 23, 48 'no responses' or 'Don't knows'; and 86%; 25, 46 'no responses' or 'Don't knows', respectively).

In the responses to open questions in the **survey** and **interviews**, many national authority respondents highlighted that 17 Member States already used Eucaris for the purpose of data exchange, and that this system worked well. Many of the same organisations underlined that data on the vehicle register should be harmonised and available to all organisations that were involved in undertaking PTIs and RSIs for national authorities, while EReg and some if its members called for a larger set of data to be included in the vehicle register. EReg also generally supported the digitalisation of the vehicle registration documents and the mutual recognition of these. Various national authorities, and users, underlined the importance of the data in the vehicle register being updated as soon as

relevant changes happen. It was suggested that additional costs could arise for ***SMEs*** that were not currently digitally connected in order to be able to access electronic documentation and information, although it was also suggested that SMEs would have a lot to gain by having better access to relevant standardised information.

3.5 FEEDBACK RECEIVED ON POLICY OPTIONS

Various industry respondents, including PTI operators, called for the extension of the PTI Directive to cover all road vehicles. PO3 and PO1b introduce the obligation to inspect motorcycles at PTI, albeit at a various level of stringency and with PO3 being more ambitious, while PO2 and PO1a allow to substitute PTI with RSI. While stakeholders belonging to motorcyclists' groups at EU or national level did not support such extension in the OPC, in the survey most of the respondents supported mandatory PTI for motorcycles with the objective to reduce tampering and the detection of defected vehicles. Stakeholders also noted that many Member States already required a PTI for motorcycles, as well as for tractors and/or trailers. In the consultations, SMEs were much more likely not to support extending the scope of the PTI Directive to motorcycles than large enterprises, arguing that costs for SME inspection companies could increase, if they had to buy more equipment.

All policy options include mandatory testing after significant modification of a vehicle, which was supported by stakeholders in the survey. Regarding the increased frequency of testing, PO1b and PO2 introduce annual emission testing for vans and a requirement for an annual PTI for vehicles over 10 years old, all these measures being supported by a majority of stakeholders in the survey.

The recognition of PTIs conducted in another Member State was an issue that the majority of stakeholders responding to the OPC considered as necessary to address. PO3 introduces a full recognition, while PO1b and PO2 require the recognition of the PTI from another MS than the MS of registration for a period of up to 6 months. PO1a on the other hand envisages only a recognition based on bilateral agreements. Stakeholder views on this differ to quite some extent: vehicle owners and those not directly involved in PTI inspections tended to be more in favour of the mutual recognition of PTI certificates under certain conditions, although some recognised that the mutual recognition under bilateral agreements would be a good first step. Those more actively involved with inspections were concerned that the difference between the approach taken to PTIs in different Member States meant that mutual recognition would be difficult and potentially lead to adverse effects on safety. Concerns were also raised that mutual recognition without the increased harmonisation of PTIs would lead to "PTI tourism", where drivers had their vehicles tested in countries where it was easier to pass a PTI.

All policy options tackle odometer tampering. New methods for tackling odometer fraud were considered as necessary by 69% (107) respondents in the OPC and adding odometer data to the vehicle register was welcomed by 72% (111) respondents in the OPC. In the consultations, in relation to odometer readings, some stakeholders suggested that it should be mandatory to record odometer data at certain events, such as following accidents and the transfer of ownership, and that potential buyers should have access to all this information. Not all stakeholders were however positive about this measure: some called on odometer system manipulation to be addressed via type-approval legislation, rather than the revision of the PTI Directive (FIA), and others questioned the potential inclusion of

new methods to tackle odometer fraud, arguing that inspection organisations did not have the legal means or ways to detect and sanction such fraud (CITA).

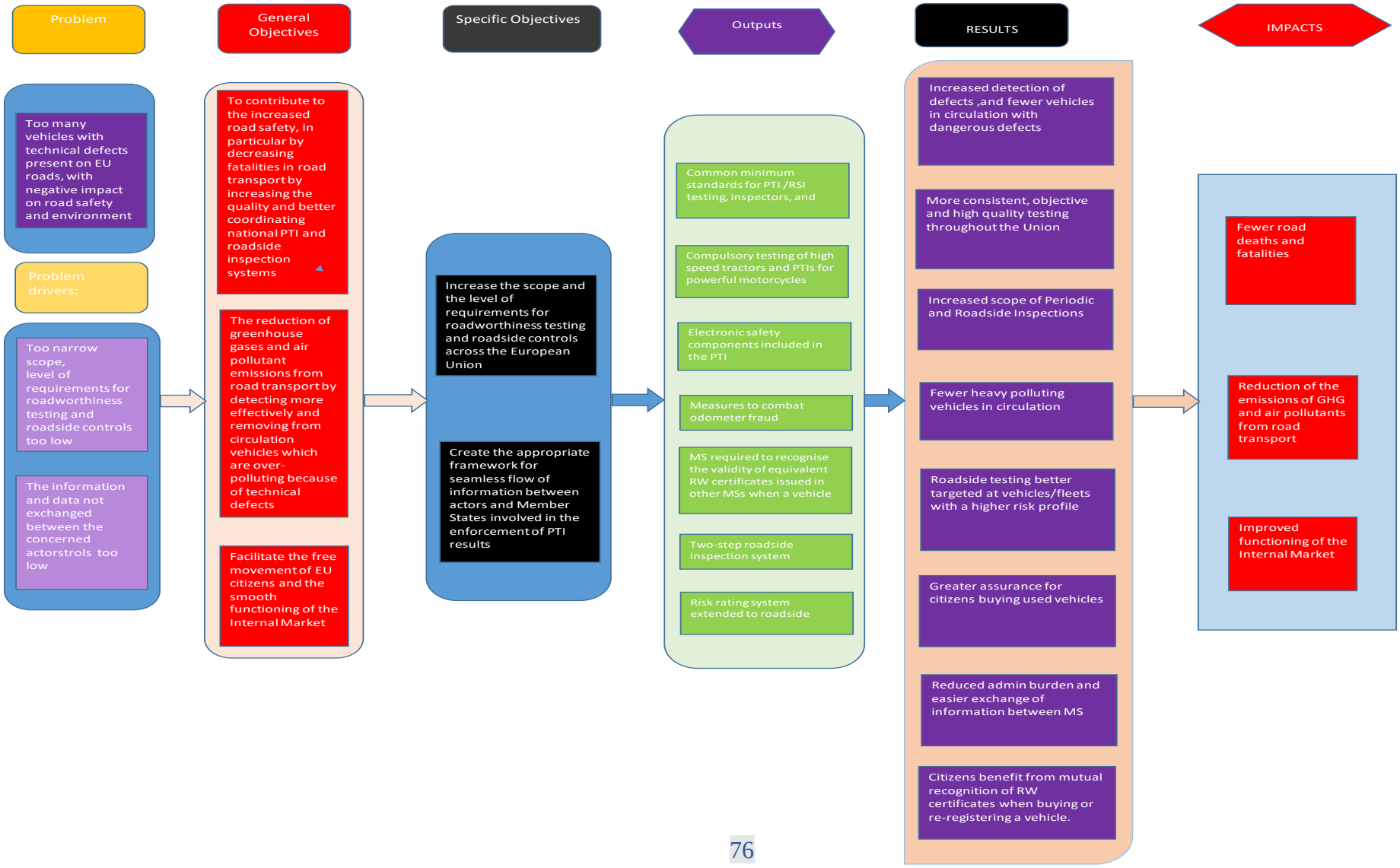
Regarding the content of RSI, PO1b, PO2 and PO3 introduce mandatory NOx and PN measurement and inspection of cargo securing. In the responses to the survey, a majority of respondents (81% and 77% respectively) thought that PN testing for commercial vehicles and NO_x and noise testing for all vehicles using remote sensing would improve the detection of defective vehicles and reduce tampering. In the OPC, a small majority supported extended emission testing (e.g., NO_x and PN), including the use of remote sensing equipment, during RSI. Regarding cargo securing, in the responses to the OPC, there was a high level of support for mandatory checks during roadside inspections of commercial vehicles to ensure the safe securing of cargo (70%; 99). In the survey, two-thirds of respondents (67%; 20) believed that the introduction of mandatory standards in relation to cargo securing inspections would contribute to road safety.

PO2 and PO3 also introduce the extension of scope of RSI to light commercial vehicles. In the OPC, there was only a marginal majority in favour of extending the rules to other vehicles (51%; 77). In the survey, around three quarters of respondents thought that the extension of the scope of the RSI to light commercial vehicles would contribute to better detection of defective and tampered vehicles (76%; 28). In relation to introducing RSI for these vehicles, some stakeholders suggested that this could bring additional costs, in terms of lost time, for SMEs operating such vehicles.

Regarding access and exchange of information/data, PO2 and PO3 both introduce the procedures for access to vehicle technical information by testing centres free of charge. In the OPC, two-thirds of respondents (67%; 102) supported clarifying the existing rules on access to in-vehicle data. Vehicle and equipment manufacturers/suppliers were less supportive of this provision than others. In the survey, a majority of respondents (87%; 45) supported this approach to address the objectives of the initiative. In response to the open survey and interview questions, various respondents (including CITA, EGEA and EReg), underlined the importance of free and easy access to in-vehicle data to enable the proper inspection of vehicles.

Finally, all policy options include measures aimed at facilitating exchange of PTI and registration data. PO1a, PO2 and PO3 furthermore introduce measures on the digitalisation of registration certificates and new data sets to be included. A large majority of stakeholders supported these measures. National authority respondents highlighted that 17 Member States already used Eucaris for the purpose of data exchange, and that this system worked well. They underlined that data on the vehicle register should be harmonised and available to all organisations that were involved in undertaking PTIs and RSIs for national authorities. EReg called for a larger set of data to be included in the vehicle register and generally supported the digitalisation of the vehicle registration documents and the mutual recognition of these. Various national authorities, and users, underlined the importance of the data in the vehicle register being up to date as soon as relevant changes happen.

ANNEX V. INTERVENTION LOGIC


Problem
General Objectives
Specific Objectives
Outputs
RESULTS
IMPACTS
Too many vehicles with technical defects present on EU roads, with negative impact on road safety and environment
Problem drivers:
Too narrow scope, level of requirements for roadworthiness testing and roadside controls too low
The information and data not exchanged between the concerned actorstrols too low
To contribute to the increased road safety, in particular by decreasing fatalities in road transport by increasing the quality and better coordinating national PTI and roadside inspection systems
The reduction of greenhouse gases and air pollutant emissions from road transport by detecting more effectively and removing from circulation vehicles which are over-polluting because of technical defects
Facilitate the free movement of EU citizens and the smooth functioning of the Internal Market
Increase the scope and the level of requirements for roadworthiness testing and roadside controls across the European Union
Create the appropriate framework for seamless flow of information between actors and Member States involved in the enforcement of PTI results
Common minimum standards for PTI /RSI testing, inspectors, and
Compulsory testing of high speed tractors and PTIs for powerful motorcycles
Electronic safety components included in the PTI
Measures to combat odometer fraud
MS required to recognise the validity of equivalent RW certificates issued in other MSs when a vehicle
Two-step roadside inspection system
Risk rating system extended to roadside
Increased detection of defects ,and fewer vehicles in circulation with dangerous defects
More consistent, objective and high quality testing throughout the Union
Increased scope of Periodic and Roadside Inspections
Fewer heavy polluting vehicles in circulation
Roadside testing better targeted at vehicles/fleets with a higher risk profile
Greater assurance for citizens buying used vehicles
Reduced admin burden and easier exchange of information between MS
Citizens benefit from mutual recognition of RW certificates when buying or re-registering a vehicle.
Fewer road deaths and fatalities
Reduction of the emissions of GHG and air pollutants from road transport
Improved functioning of the Internal Market

ANNEX VI. SUMMARY OF CURRENT LEGISLATIVE FRAMEWORK

Directive 2014/45/EU (PTI Directive)

It establishes a comprehensive framework for ensuring the safety and environmental performance of vehicles circulating on European roads and outlines specific activities and responsibilities for various stakeholders, including EU Member States, in order to achieve harmonised standards and practices across the EU.

It entails regular and systematic roadworthiness testing of vehicles to identify potential safety and environmental risks. These periodic tests are conducted at testing centres and aim to assess the overall condition of vehicles, including their components, systems, and emissions.

The requirements laid out in the directive apply to the following types of vehicles capable of speeds of more than 25 km/hour:

- **Passenger cars and light commercial vehicles** (categories M1 and N1). To be tested 4 years after first registration and thereafter every 2 years.
- Vehicles in category M1 used as **taxis or ambulances**, **buses or minibuses** (M2, M3), **heavy goods vehicles** (N2, N3) and **heavy trailers** (O3, O4). To be tested 1 year after first registration and thereafter yearly.
- **Wheeled tractors** with a design speed above 40 km/h (T1b, T2b, T3b, T4.1b, T4.2b and T4.3b) and used mainly public roads . To be tested 4 years after first registration and thereafter every 2 years.
- Two- or three-wheeled vehicles (category L3e, L4e, L5e, and L7e) with a combustion engine larger than 125 cm^3 haves to be tested from 2022, unless Member States notify to the Commission an exemption from testing for such vehicles, and road safety statistics for the previous 5 years show that the same level of road safety could be achieved by alternative measures.

In certain circumstances, member States or inspection authorities may require vehicles to undergo a test **before** the due dates. These circumstances include:

- after an accident;
- when the holder of the registration certificate has changed;
- when the safety and environmental systems and components of the vehicle have been altered or modified
- When the vehicle reaches a mileage of 160,000 km; and
- in cases where road safety is seriously affected.

Certain types of vehicles may be **exempted** from roadworthiness tests, including:

- vehicles of historic interest;
- diplomatic vehicles;
- vehicles used by the armed forces, police, customs, fire services or for agricultural and forestry purposes only; and
- vehicles used exclusively on small islands.

Member States are responsible for establishing and maintaining a national system of periodic roadworthiness testing that complies with the requirements set out in the directive. In particular, they have to, ensure that authorised testing centres meet the required standards, and are conducting appropriate checks to monitor their performance, ensuring. They have to implement the required frequency of tests, where needed using the flexibility provided by the Directive. Also, they shall set rules to further detail content and methods of the tests, as well as the qualifications and training requirements for testers.

Additionally, they are tasked with establishing effective systems for registering and maintaining records of the results of roadworthiness tests.

Furthermore, the directive requires ensuring the independence and impartiality of the testing centres, preventing conflicts of interest, and to guarantee that the testing centres operate in a fair and transparent manner. To facilitate cross-border mobility and ensure the harmonisation of standards, the directive also encourages cooperation and information exchange among Member States including records of roadworthiness tests,

The directive places responsibility on vehicle owners to present their vehicles for roadworthiness testing in accordance with established requirements and timelines, and to ensure that their vehicles are always maintained in a safe and roadworthy condition.

Defects are classified as **minor**, **major** or **dangerous**, with minor defects being insufficient to fail vehicles. Where defects are dangerous, the use of the vehicle on public roads may be suspended until the fault is rectified.

When a vehicle already registered in another Member State is re-registered, its **roadworthiness certificate** must be recognised by other Member States.

To detect **odometer fraud** (manipulating the device used to measure distance travelled), data from the preceding roadworthiness test is to be made available to the inspectors. Manipulating the odometer is a punishable offence.

The directive had to be transposed into national law by 20 May 2017, and it applied from 20 May 2018.

Directive 2014/46/EU on vehicle registration documents (amending Directive 1999/37/EC - "VRD directives")

In order to provide a comprehensive overview of the legislation on vehicle registration documents, this summary includes the provisions of the 2014 Directive and the 1999 "mother" Directive.

The VRD Directives outline the required activities and responsibilities of the authorities in the Member States to ensure efficient and harmonised processes for vehicle registration and documentation. The directives aim to facilitate the free movement of vehicles within the EU while ensuring proper identification, traceability, and compliance with legal and administrative requirements.

Member States are required to keep an electronic record of data on all vehicles registered on their territory, including the outcome of mandatory PTIs and the period of validity of the PTI certificate

Member States shall issue a registration certificate for vehicles which are subject to registration under their national legislation. The Directives provide that the registration certificate issued by a Member State shall be recognised by the other Member States for the identification of the vehicle in international traffic or for its re-registration in another Member State.

The Member States must issue registration documents in a standardised format that contain essential information about the vehicle, such as its identification number, technical characteristics, and information about the holder (and optionally the owner) of the registration certificate.

Where a Member State's competent authority is notified that a roadworthiness test shows the authorisation to use a particular vehicle has been suspended, this suspension must be recorded electronically and an additional roadworthiness test carried out. The suspension is effective until a new roadworthiness test has been passed successfully.

The directives emphasise the importance of cooperation and information exchange among Member States, in particular so as to check, before any registration of a vehicle, the legal status of the vehicle in the member state in which it was previously registered.

Directive 2014/47/EU (RSI Directive)

Directive 2014/47/EU on technical roadside inspections provides the legal framework for Member States to implement technical roadside inspections of commercial vehicles. These inspections focus on assessing the technical condition of vehicles, including their components, systems and equipment.

The requirements set out in the directive apply to the following types of vehicles: capable of speeds of more than 25 km/hour:

- **Taxis, ambulances**, **buses and minibuses** (M2, M3);
- **heavy goods vehicles** (N2, N3);
- **heavy trailers** (O3, O4); and
- **wheeled tractors** with a design speed above 40 km/h (T1b, T2b, T3b, T4.1b, T4.2b and T4.3b) and used mainly public roads for commercial road haulage purposes.

Member States may also carry out inspections on vehicles not covered by this Directive, such as light commercial vehicles, or carry out inspections in places other than public roads.

Member States play a key role in implementing and enforcing the provisions of the directive. They are responsible for establishing a system of technical roadside inspections within their territories, including the designation of competent authorities and inspection bodies. Member States must ensure that the designated bodies have the necessary expertise, resources and equipment to conduct effective inspections.

Member States are also responsible for establishing rules regarding the content and methods of the inspections, as well as the qualifications and training requirements for the personnel involved in conducting them. Competent authorities are responsible for supervising and monitoring the activities of inspection bodies to ensure their compliance with the directive. They must carry out regular assessments of the inspection bodies' performance and take corrective actions if deficiencies are identified.

Inspections comprise **initial** and, where necessary, **more detailed inspections** focusing in particular on brakes, tyres, wheels and chassis, as well as nuisances (noise, exhaust emissions, etc.). The rate of initial inspections is expected to be proportionate to the number of vehicles registered in each EU country. The aim is for at least 5–% of all commercial vehicles registered in the EU to be inspected (initial inspection) each year.

Inspectors must not discriminate on grounds of the nationality of the driver or of the country of registration when selecting a vehicle for inspection. They must be free from any conflict of interest that might compromise their impartiality, and remuneration must not be dependent on the outcome of their inspections.

Risk-rating system - From 2019, EU countries must introduce information on deficiencies found during RSI tests into the risk-rating system, enabling Member States to check undertakings with a high-risk profile more closely and frequently.

The Directive includes principles for inspections and applicable standards for (optional) testing of **cargo securing**,

Defects are classified as minor, major or dangerous. Any major or dangerous deficiency revealed by an inspection must be rectified before the vehicle is further used on public roads.

Furthermore, the directive emphasises the importance of cooperation and coordination among Member States to ensure consistent inspection practices and to prevent non-compliant vehicles from circulating within the EU. This includes sharing inspection results, identifying repeat offenders and collaborating on cross-border enforcement activities. Member States are required to designate a contact point to ensure information exchange and assist the contact points of other Member States.

Member States are required to define the responsibilities of undertakings to maintain vehicles in a safe and roadworthy condition.

In addition, Member States shall require undertakings and drivers to cooperate with the inspection authorities during roadside inspections, and to provide access to the vehicle, its parts, and all relevant vehicle documentation. Furthermore, competent authorities are responsible for monitoring the number of roadside inceptions and reporting to the European Commission on a biannual basis.

ANNEX VII. THE MINIMUM REQUIREMENTS SET OUT IN THE DIRECTIVES AS EXCEEDED BY SOME MEMBER STATES

During the evaluation, the Commission contacted Member States to identify the matters in which the Member States had exceeded the minimum requirements as set out in the Directives. The responses from Member States illustrate that there are several areas in which at least some Member States exceed the minimum requirements, as permitted by the Directives.

PTI Directive

- On the scope, BG, BE, DE, EE, ES, FI, HR, HU, LT, LV, SE, SI and SK.
- On the frequency of tests, AT, BG, BE, DE, EE, ES, FI, HR, LV, NL, SE, SI and SK.
- On the contents of testing:
  - On the braking equipment, AT, BG, DE, ES, FI, HR, LV, SE and SK.
  - On the steering, AT, BG, ES, LV, SE and SK.
  - On the visibility, AT, BG, ES, IE, SE and SK.
  - On the lighting equipment and parts of the electrical system, AT, BG, DE, ES, FI, LV, SE and SK.
  - On the axles, wheels, tyres, suspension, AT, BG, BE (partially), ES, FI, IE, LV, SE and SK.
  - On the chassis and chassis attachments, AT, ES, LV, SE and SK.
  - On other equipment, AT, ES, SE and SK.
  - On nuisance, AT, BE, DE, ES, NL, SE and SK.
  - On supplementary tests for passenger-carrying vehicles of categories M2 and M3, AT, BG, DE, ES and SE.
- On inspectors (competence and training), AT, BG, DE, EE, ES, FI, IE, LV and SE.
- LV has introduced specific training requirements for testing electric vehicle.
- AT, EE, ES, FI, LV, NL and SK have introduced electronic roadworthiness certificates.

RSI Directive

AT, BE[78], EE, ES, FI, HR, HU, LV, PL, RO, SE and SK include vehicles currently outside the scope .

VRD Directive

AT, BG, BE[79], DE, FI, HR, HU, LT, LV, NL, PL and SI regularly update vehicle data.

[78] Flanders

[79] Brussels and Flanders

ANNEX VIII. EVALUATION MATRIX AND THE EVALUATION QUESTIONS

Q1: To what extent do the scope and objectives of the intervention remain relevant for current and future needs?

Operational sub-questions

- Is there still a need to improve road safety?
- Is there still a need to reduce the emissions GHG and air pollutants from road transport over the whole lifetime of vehicles?
- Is there still a need to facilitate the free movement for EU citizens and smooth functioning of the internet market?

Judgement criteria

- Road safety and environmental protection are important considerations for EU citizens.
- EU citizens consider that PTI and roadside inspections are necessary to safeguard road safety and air quality.
- There is still pollution from vehicles because of substandard repair, malfunctioning and tampering of the emission control systems.
- There are still accidents and fatalities due to defects in vehicles.
- Stakeholders consider that the facilitation of the free movement for EU citizens and smooth functioning of the internal market are still important

Indicators	**Sources**			
• Number of accidents due to defects. • Share of pollution from road transport by high emitting vehicles, with malfunctioning emission control systems. • Number of positive opinions on the relevance of each sub-question in the survey • Number of free moving people within the EU	• Targeted interviews • Survey • Desk research • Data analysis (databases)			
	Targeted interviews Interviews with: Inspection bodies (PTI) Market surveillance authorities CITA National vehicle emission prognoses and authorities Agencies responsible for transport, road safety, air quality, and law enforcement	**Survey** Relevant stakeholders: Police Urban authorities Inspection bodies (PTI) Agencies responsible for transport, road safety, air quality, and law enforcement	**Desk research** Academic studies - Martín-de los Reyes LM, Effect of Periodic Vehicle Inspection on Road Crashes and Injuries: A Systematic Review. Int J Environ Res Public Health. 2021 Roadside observation reports National PTI reports National regulations Vehicle safety reports Official reports, especially at EU-level, MS-level authorities such as: • OECD, Road Safety – Annual Report 2021, • ISTAT, Road accident, Italy, (2021) link • Spanish Interior Ministry, Number of fatalities by type of vehicles, link • INNSSE, Road accident, Romania, (2017), link • French Government, Road Safety Review 2021, link Academic and scientific literature and articles; Position papers, e.g. from technical expert associations	**Data analysis (databases)** IGLAD / Initiative for the Global Harmonisation of Accident Data EU Data (CARE) Accident databases (GIDAS) Remote Sensing databases for typical fleet average emission performance CONOX/CARES database and study data

Q2: To what extent are the 3 Directives still relevant for the wider EU policy goals, and to the objectives of the intervention?

Operational sub-questions

- How are road safety, environmental protection and free movement articulated in current EU policy goals, such as the European Green Deal, Fit-for-55, Market Surveillance, Euro 7, improving air quality and reducing GHG emissions?
- To what extent is 2014/45/EU relevant for the EU policy goals related to road safety, air quality, and free movement? Have these goals evolved since the adoption of the RWP, and if so, in what way?
- To what extent is directive 2014/46/EU on the registration documents for vehicles relevant for the EU policy goal of free movement? Have these goals evolved since the adoption of the RWP, and if so, in what way?
- To what extent is 2014/47/EU on the technical roadside inspection of the roadworthiness of commercial vehicles circulating relevant for the EU policy goals related to road safety and air quality? Have these goals evolved since the adoption of the RWP, and if so, in what way?

Judgement criteria

- Road safety and environmental protection are still important, relevant, and well-integrated in current EU policy goals.
- Evidence of the importance of free movement for the EU, especially in the context of information exchange mutual recognition of inspection certificates.
- Periodic technical inspection is relevant to the EU policy goals related to road safety and air quality
- Roadside inspection is relevant to the EU policy goals related to road safety and air quality**.**

Indicators	**Sources**		
• Progression towards EU targets in terms of road safety (Zero casualty by 2050) and air quality • Statistics on the PTI tests, high emitting vehicles, and vehicles registered in the EU • The use of cross-border registration documents for EU citizens moving free in Europe	• Targeted interviews • Survey • Desk research		
	Targeted interviews <u>Interviews with:</u> DG MOVE Expert Group MEPs from Transport Committee	**Survey** <u>Relevant stakeholders:</u> Road users' associations Cities participating in the Climate-Neutral and Smart Cities Mission, Eurocities POLIS	**Desk Research** EU policies (Fit for 55, Green Deal, Vision 0, etc…) Official reports, especially at EU-level, MS-level authorities Academic and scientific literature and articles Position papers, e.g. from technical expert associations

Q3: How well adapted is the intervention to the technological, environmental, and scientific advances that have appeared since its introduction?

Operational sub-questions

- Do the current directives sufficiently address changes in the composition of vehicle fleets due to changes in vehicle powertrains and emission control technologies?
- Do the current directives sufficiently address technological advancement in automated and smart mobility, such as ADAS systems and other technologies?
- Are the current directives sufficiently advanced in their approach with regard to the digital evolution of today (the IoT, connectivity, on-board computer, etc)

Judgement criteria

- The directives of the roadworthiness package address technological, environmental, and scientific advances, including changes in the composition of vehicle powertrains emission control technologies, and OBD.
- The European goals on the shift towards zero-emission vehicles, as laid out in the European Green Deal and subsequent targets and frameworks like Euro-7 for cleaner vehicles.

Indicators	**Sources**
• Data on real-world environmental performance of different powertrains[1]	• Targeted interviews • Survey • Desk research

• Data on the safety concerns regarding vehicle batteries in EVs[2] • Data on the safety concerns regarding misaligned and/or defective sensors/hardware of safety assistance systems and automated driving systems[3] • Data on the impact of defects and poor maintenance on the performance of ADAS and ADS[4]	**Targeted interviews** Targeted stakeholders: Vehicle manufacturers associations CITA Testing equipment providers DG MOVE Expert Group UNECE Working Groups ETSC Type approval Authorities (safety systems) CLOVE consortium on Euro-7 implementation Parties participating in development of national PTI improvements	**Survey** Targeted stakeholders: Vehicle manufacturers associations CITA Testing equipment providers DG MOVE Expert Group UNECE Working Group	**Desk Research** Mapping of new systems and powertrains and whether they are covered by the directives Available studies on the links between defects and the performance of ADAS and ADS Official reports, especially at EU-level, MS-level authorities Academic and scientific literature and articles Position papers, e.g. from technical expert associations

Q4: Have the circumstances changed in the meantime so much that the intervention has to change/adapt to them?	
Operational sub-questions • What are the implications of knowledge about the real-world environmental performance of vehicles for the intervention of the three Directives? • What are the implications of new vehicle safety standards? • What are the implications of mandatory on-road tests? • What are the implications of ADS and ADAS in terms of PTI and maintenance? Is there a need for self-check features on these new systems?	
Judgement criteria • There is a need to expand or modify the intervention in the light of the new challenges occurred or what has been learned.	
Indicators	**Sources**
• Data on real-world vehicle emissions and effects of undetected malfunctions and tampering on air quality • Reliability of ADAS systems • Frequency of software updates necessary to ensure ADAS performance • Cybersecurity requirements to mitigate risks	• Targeted interviews • Desk research
	Targeted interviews Targeted stakeholders: Inspection bodies CITA ACEA/CLEPA ETSC ERMES[5] T&E
	Desk Research GIDAS database CITA SET I and CITA SET II studies (https://citainsp.org/studies/4259-2/) ADAS/ADS investigations by NTSB[6] and NHTSA[7] Road Performance Reports (OECD/International Transport Forum, UN high-level meetings on road safety, etc.) Official reports, especially at EU-level, MS-level authorities Academic and scientific literature and articles Position papers, e.g. from technical expert associations

Effectiveness

Q5: To what extent have the three Directives been effective in improving road safety and contributing to the reduction of road fatalities and serious injuries in road transport, in line with the EU Road safety policy framework 2010 to 2020, as well as to its successor?

Operational sub-questions

- Compared to what would have happened in absence of the three Directives, in quantitative and qualitative terms, to what extent have road fatalities and serious injuries decreased?
- To what extent did fatal and serious crashes change at the EU level in terms of absolute numbers considering vehicle age and vehicle type variables?
- To what extent did involvements in fatal and serious crashes change at the Member States' level in terms of absolute numbers considering vehicle age and vehicle type variables?

Judgement criteria

- Changes in the involvement of defective vehicles after the implementation of the directives. The reduction of defects, improved control and detection of malfunctions with environmental and safety risks (see "data analysis" on page 18 and 19).
- Vehicle roadworthiness affects and will continue to affect road safety and environmental performance.

Indicators	**Sources**		
• Involvements of older vehicles in accidents of different severities • Share of vehicles found with defects in PTI • Share of vehicles found with defects in roadside inspections • Proportion of vehicles found failing emission test at PTI	• Accident analysis • Desk research • Targeted interviews		
	Targeted interviews <u>Targeted stakeholders:</u> National Police Authorities National Road Safety Authorities	**Accident analysis** EU Data (CARE) GIDAS database IGLAD / Initiative for the Global Harmonisation of Accident Data	**Desk Research** National reports on road safety Roadside inspections reports PTI reports Official reports, especially at EU-level, MS-level authorities Academic and scientific literature and articles Position papers, e.g. from technical expert associations "Grey literature", such as publications by relevant research centres and think tanks

Q6: To what extent have the three Directives been effective in increasing the detection of defects and to reduce the number of vehicles in circulation with dangerous defects?

Operational sub-questions

- Compared to what would have happened in absence of the three Directives, in quantitative and qualitative terms, to what extent are PTI and roadside inspections able to detect defects and fraud?
- To what extent did the detection of defects at EU level and member state level increase?
- To what extent did the number of vehicles in circulation with dangerous defects decrease?

Judgement criteria

- Increase in the detection of vehicle defects in the PTI and the RSI after the implementation of the RWP.

Indicators	**Sources**
• Number of periodic tests by member states each year	• Targeted interviews • Desk research

• Number of vehicle defects detected in PTI each year • Number of roadside inspections each year • Number of vehicle defects detected in RSI each year • Removals of vehicles with serious defects vehicles from operation • Age of vehicles when put out of circulation	**Targeted interviews** Targeted stakeholders: Inspection bodies CITA	**Desk Research** Reports by Member States National reports on road safety MS National Institutes of Statistics Roadside inspections reports PTI reports Official reports, especially at EU-level, MS-level authorities Academic and scientific literature and articles Position papers, e.g. from technical expert associations "Grey literature", such as publications by relevant research centres and think tanks

Q7: To what extent have the three Directives been effective in contributing to the reduction of the emissions of GHG and air pollutants from road transport, and to moving towards eliminating the "gross emitting" vehicles from the fleet?

Operational sub-questions

- Are current PTI tests able to detect malfunctions and tampering leading to high emissions of air pollutants?
- Compared to what would have happened in absence of the three Directives, to what extent have emissions of GHG and air pollutants from road transport decreased, in particular Euro-7 and fuel consumption monitoring?

Judgement criteria

- Evidence on detection of high-emitting vehicles
- Reduction in of the emissions of GHG and air pollutants from road transport due to the implementation of the Directives, by detecting high emitting vehicles in the fleet as not-roadworthy.

Indicators	**Sources**			
	• Targeted interviews • Survey • Desk research • Data analysis (databases)			
• Rate of detection of malfunctions and tampering from great emitters during PTI tests • Emission share of gross emitters in the fleet, well above the type-approval limits and EOBD requirements. • Sensitivity of current tests to relevant emission levels • Level of in emissions of GHG and air pollutants from road transport	**Targeted interviews** Targeted stakeholders: Environmental Associations/ ONG Municipalities National Ministries of Environment Environmental agencies DG ENV DG CLIMA DG MOVE	**Survey** Targeted stakeholders: Environmental Associations/ ONG Municipalities National Ministries of Environment POLIS	**Desk research** EEA – European Environment Agency reports World Health Organisation OECD Academic and scientific literature and articles Position papers, e.g. from technical expert associations	**Data analysis (databases)** World Health Organisation Remote Sensing databases for typical fleet average emission performance CONOX database National Institutes of Statistics

Q8: To what extent have the Directives 2014/46/EU, 2014/45/EU and 2014/47/EU improved the framework for exchange of information between actors and Member States involved in the enforcement of testing results?

Operational sub-questions

- What information is being exchanged with respect to the mandatory parts in the directive?

- Are other Member States than those where vehicles are registered able to effectively enforce roadworthiness in cross-border use?
- Is the level of exchange of information improved?

Judgement criteria

- Exchange of information – quantitative evolution of information flows and qualitative assessment of stakeholders
- Remaining obstacles to information exchange

Indicators	**Sources**		
• Increase in information exchange • Incidence of failures to acquire desired information • The number of Member States that allows for electronic exchange	• Targeted interviews • Survey • Desk research		
	Targeted Interviews Targeted stakeholders: National Authorities Inspection bodies (PTI)	**Surveys:** Targeted stakeholders: National Authorities Inspection bodies (PTI)	**Desk Research:** European Court of Justice decisions EUCARIS database Reports from member states

Q9: To what extent have the three Directives been effective in improving the consistency, objectivity, and quality of testing throughout the Union?

Operational sub-questions

- What is the trend in test frequency?
- What is the trend in test quality?
- What is the trend in test consistency throughout the union?

Judgement criteria

- The tests are more frequent and more comprehensive (test and inspection frequency, manhours and number of items checked during inspection)
- The number of differences between the tests among MS is limited.

Indicators	**Sources**		
• Change in frequency of tests • Regularity of tests (1 Y, 2 Y, etc) • Quality of tests- number of items checked (thoroughness) and level of training required for accredited providers • Time spent on PTI testing the vehicle in manhours throughout the union	• Targeted interviews • Desk research • Consultation with CITA		
	Targeted interviews Targeted stakeholders: National Authorities Inspection bodies (PTI) Agencies responsible for transport and road safety	**Desk research** Reports by member states Member States' testing protocols	**Consultation with CITA**

Q10: To what extent have the three Directives been effective in facilitating free movement for EU citizens/ and smooth functioning of the Internal Market?

Operational sub-questions

- Have the directives made it easier for citizens to register vehicles in another MS when they move permanently?
- How have the directives contributed to smooth functioning of the Internal Market?

Judgement criteria

- Principles of safe movement and the Internal Market, investigating the correspondence between free movement and the Directives
- Assessment of unfair competition from tampered vehicles

Indicators	**Sources**	
• Member States feedback • Stakeholder feedback • Number of cross border registrations per year (for the few countries where this data is available)	• Targeted interviews • Desk research	
	Targeted Interviews Targeted stakeholders: National inspection bodies National Authorities Agencies responsible for transport and road safety European vehicle register implementation (EUCARIS)	**Desk Research** Data on tachograph tampering ECJ cases regarding export of vehicles Consultation by EC in 2021

Q11: Which factors have driven or hindered the achievement of objectives?

Operational sub-questions

- What are the driving forces behind the achievements of the roadworthiness package?
- What are the obstacles for the roadworthiness package to achieve its objectives?

Judgement criteria

- impact of the obstacles have to be significant.
- impact of the drivers have to be significant.

Indicators	**Sources**		
• Severity, magnitude of an obstacle • Scale of an obstacle • Magnitude of a driver	• Targeted interviews • Survey • Desk research		
	Targeted interviews Targeted stakeholders: EU Commission National Authorities Road Associations CITA	**Survey** Targeted stakeholders: National Authorities Road Associations CITA	**Desk research** Published studies and reports on cross-border information exchange Consultation by EC in 2021 - European Commission, Vehicle safety – revising the EU's roadworthiness package, Inception impact assessment, link Official reports, especially at EU-level, MS-level authorities - European Parliament, Implementation of the roadworthiness package, 2020, link Academic and scientific literature and articles Position papers, e.g. from technical expert associations

			"Grey literature", such as publications by relevant research centres and think tanks

Q12: What implementation measures have been introduced in the Member States in order to ensure the effectiveness of the three Directives? Are there any significant differences in implementation measures and effectiveness across the Member States? Is national transposition law sufficiently clear and enforceable to work in practice?				
Operational sub-questions • Which implementation measures have the member states introduced? • What is the pattern between characteristics of implementation measures and effectiveness across member states? • How does the member states implementation measures and transposition laws work in practice? • What are the obstacles, if any, to implementation at national level?				
Judgement criteria • Effective implementation measures across member states • Implementation success measure by the effectiveness of the directives.				
Indicators	**Sources**			
• Relation between effective implementation measures and effectiveness • Measures adopted in compliance with Directive 2014/45/EC • Measures adopted in compliance with Directive 2014/46/EC • Measures adopted in compliance with Directive 2014/47/EC • Measures lacking with respect to Directive 2014/45/EC • Measures lacking with respect to Directive 2014/46/EC • Measures lacking with respect to Directive 2014/47/EC	• Targeted interviews • Survey • Desk research/ member state reports • Responses to OPC consultation by EC			
	Targeted interviews Targeted stakeholders: MS with varying practices (number of roadside inspections, date of first inspection and frequency of subsequent ones, inspections houses vs. local garages, etc)	**Survey** Targeted stakeholders: MS authorities (e.g. RDW/Dutch) Inspection bodies/Police	**Desk research:** Member States' relevant legislation Member States reports Commission implementation reports	**Responses to OPC consultation by EC**

Efficiency

Q13: To what extent, and in respect of which specific aspects, have the three Directives generated costs and benefits, for the relevant national authorities, citizens and businesses? To what extent have the cost associated with the three Directives been proportionate to the overall benefits achieved?
Operational sub-questions • What are the benefits of the implementation of the roadworthiness package for the relevant national authorities, citizens, and businesses? • What are the costs of the implementation of the roadworthiness package for the relevant national authorities, citizens, and businesses?
Judgement criteria • Estimation of costs and benefits

Indicators	Sources			
• Costs incurred compared to monetised benefits	• Targeted interviews • Survey • Desk research • Data analysis (databases)			
	Targeted interviews Targeted stakeholders: Consumers' groups (BEUC) FIA Road transport companies/associations	**Survey** Targeted stakeholders: Consumers' groups FIA Road transport companies/associations	**Desk research** Reports from members states (Academic) studies Hidden costs (maintenance scrappage) Position papers, e.g. from technical expert associations IA report on the RWP in 2012	**Data analysis (databases)** Accident databases (GIDAS) EU Data (CARE) database IGLAD National Institutes of Statistics Methods of internalisation of external costs of transport

Q14: What is the administrative burden for Member States generated by the three Directives? Is there a potential in the Member States to simplify and reduce administrative burden without undermining the intended objectives of the Directives?

Operational sub-questions

- What are the administrative costs, time, and red tape of the implementation of the roadworthiness package for the relevant authorities in the member states?
- What are the identified best practices in terms of administrative burden in relation to the implementation of the roadworthiness package?

Judgement criteria

- Additional administrative burden created by the three directives

Indicators	Sources	
• Efficiency in achieving outcomes • Administrative cost • Manhours spent on inspection • Level of digitalisation of administration	• Survey of member states • Stakeholder views	
	Survey of member states Targeted stakeholders: National Authorities	**Stakeholder discussion** Targeted stakeholders: National Authorities Road transport associations Consumer Associations

Q15: What is the administrative burden for citizens and businesses generated by the three Directives? Is there a potential to simplify and reduce administrative burden for citizens and businesses without undermining the intended objectives of the Directives?

Operational sub-questions

- What are the administrative costs of the implementation of the roadworthiness package for citizens and businesses?
- What are the identified best practices in terms of administrative burden in relation to the implementation of the roadworthiness package?

Judgement criteria

- Additional administrative burden created by the three directives

Indicators	Sources

• Efficiency in achieving outcomes, by assessing the costs and benefits for citizens and businesses • Cost of implementation by MS per capita over average cost • Time spent at inspection by citizens • Increase in cost for owner by RWP	• Stakeholder discussion e.g., with organisations representing transport companies and civil society • Stakeholder organisations around national implementations of PTI (e.g. SMO/Netherlands) **Stakeholder discussion** Targeted stakeholders: ACEA IRU ITF FIA Consumer organisations such as BEUC

Coherence

Q16: To what extent are the three Directives' objectives coherent with the objectives of relevant EU legislation and policies in the field of EU road safety, such as the EU safety Road Policy Framework 2021-2030, and the Sustainable and Smart Mobility Strategy?		
Operational sub-questions • What is the degree of coherence, overlap, and gaps between the three Directives' objectives and relevant EU legislation and policies in the field of EU road safety? • What is the degree of coherence, overlap, and gaps between the three Directives' objectives and relevant EU legislation and policies in the field of environment and climate? • What is the degree of coherence, overlap, and gaps between the three Directives' objectives and relevant EU legislation and policies in the field of free movement?		
Judgement criteria • Alignment of the objectives of the three directives of the roadworthiness package with current EU policy goals and targets, including Vision 0 on road safety		
Indicators	**Sources**	
• Changes in EU policies that would justify changing the elements of the package	• Targeted interviews • Discussion with DG MOVE • Desk research	
	Targeted interviews Targeted stakeholders: EURONCAP ETSC T&E ACEA	**Desk research** EU legislation and policies in the field of EU road safety, including EU safety Road Policy Framework 2021-2030 Official reports, especially at EU-level, MS-level authorities - European Parliament, Impact Assessment, 2012, link - European Parliament, REPORT on the EU Road Safety Policy Framework 2021-2030 – Recommendations on next steps towards 'Vision Zero', link - European Commission, Report on the application by the Member States of Directive 2000/30/EC of the European Parliament and of the Council of 6 June 2000 on the technical roadside inspection of the roadworthiness of Commercial vehicles circulating in the Community- Reporting period 2017- 2018, 2020, link Academic and scientific literature and articles Position papers, e.g. from technical expert associations - ETSC, Mid Term Review of the European Commission's Road Safety Policy Orientations 2011-2020, link

Q17: To what extent are the three Directives' objectives coherent with the relevant EU legislation and policies in other fields, such as the General Safety Regulation and Euro 6/VI legislation?

Operational sub-questions

- What is the degree of coherence between the three Directives' objectives and other relevant EU legislation and policies in other fields, including environment and climate policies?
- To what extent do the three Directives' objectives overlap with other relevant EU legislation and policies in other fields, including environment and climate policies?
- Are there any gap between the three Directives' objectives and other relevant EU legislation and policies in other fields, including environment and climate policies?

Judgement criteria

- Alignment with policies and strategies in other relevant policy areas

Indicators	**Sources**		
• Fit to other EU policies • Assistance to delivery of policy objectives in other policy areas	• Targeted interviews • Discussion with DG MOVE • Desk research		
	Targeted interviews Targeted stakeholders: DG CLIMA DG GROW DG ENV Other DGs and EU bodies ETSC T&E ACEA National authorities/implementing bodies	**Discussion with DG MOVE**	**Desk research** General Safety Regulation and Euro 6/VI legislation - European Union, Regulation (EU) 2019/2144 of the European Parliament and of the Council of 27 November 2019 on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users, link Official reports, especially at EU-level, MS-level authorities Academic and scientific literature and articles Position papers, e.g. from technical expert associations - ACEA, Principles for potential post-Euro 6 and post-Euro VI emission regulations, 2020, link

Q18: Are there any inconsistencies/overlaps/gaps between the Directives and other interventions at EU/national/international level which have similar objectives?

Operational sub-questions

- What is the level of consistency, overlaps and/or gaps between the directives and the other national, EU and international policies, such as national legislations, UNECE regulations on whole-lifetime compliance?

Judgement criteria

- Inconsistencies
- Overlaps
- Gaps

Indicators	**Sources**
• Level inconsistencies, overlaps, and gaps	• Targeted interviews • Survey • Desk research • Review of interventions including regulations or impending regulations from UNECE

	Targeted interviews Targeted stakeholders: UNECE Working Groups OECD/International Transport Forum National Authorities (Ministries of Transport) MEPs from the EP Transport Committee	**Survey** Targeted stakeholders: UNECE Working Group OECD/International Transport Forum National Authorities (Ministries of Transport) MEPs from the EP Transport Committee	**Desk research** Regulations on Cybersecurity ADAS Whole-lifetime	Review of interventions including regulations or impending regulations from UNECE Materials for UNECE working Groups under WP.29

EU Added Value

Q19: What is the additional value of the 3 Directives, for citizens and businesses, compared to what has been or what could have been achieved by Member States at national and/or regional and international level with a view to improving road safety and environmental protection?

Operational sub-questions

- What it the EU added value related to the implementation of the roadworthiness package in terms of road safety?
- What it the EU added value related to the implementation of the roadworthiness package in terms of environmental protection?
- What it the EU added value related to the implementation of the roadworthiness package in terms of free movement of people?

Judgement criteria

- Do national differences in implementation acts and enforcement cause problems?
- Would the objectives of the directive be achieved sufficiently by Member States acting alone?

Indicators	**Sources**			
• Avoided fatalities and injuries • Saved emissions	• Targeted interviews • Survey • Desk research • Data analysis (databases)			
	Targeted interviews Targeted stakeholders: MS national authorities Consumers Groups MEPs Road Safety Associations Environmental Associations	**Survey** Targeted stakeholders: MS national authorities Consumers Groups MEPs Road Safety Associations Environmental Associations	**Desk research** Member States' reports on road safety (Academic) studies	**Data analysis (databases)** GIDAS Database CARE Database IGLAD National Institutes of Statistics Remote Sensing databases for typical fleet average emission performance CONOX database

Q20: To what extent would it have been possible to achieve the same results without these Directives?

Operational sub-questions

- How would the estimated road safety situation have been without the implementation of the roadworthiness package at EU level and national level?
- How would the estimated emissions/ environmental situation have been without the implementation of the roadworthiness package at EU level and national level?

Judgement criteria

- Difference in accident and emissions projections compared to the baseline scenario

<table>
<tr><th>Indicators</th><th colspan="4">Sources</th></tr>
<tr><td rowspan="2">Fatalities and injuries in baseline
Projected emissions in baseline</td><td colspan="4">Targeted interviews
Survey
Desk research
Data analysis (databases)</td></tr>
<tr><td>Targeted interviews
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