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PROPOSAL

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Subject:	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Council Directive 96/53/EC laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic

Delegations will find attached document SWD(2023) 445 final.

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COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

[…]

Accompanying the document

Proposal for a Directive of the European Parliament and of the Council

amending Council Directive 96/53/EC laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic

{COM(2023) 445 final} - {SEC(2023) 445 final} - {SWD(2023) 446 final} -
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Glossary[1]

Term	Definition
45-foot container	Shipping container designed according to ISO 668[2] standardised dimensions with a length of 13.72 meters, compatible with intermodal transportation systems.
Axle weight	Weight supported by a laden axle or group of axles, including the weight of the vehicle itself and any load it is carrying.
Containerised Transport	Intermodal freight transport where the goods are transported in standardized containers or swap bodies.
High-Capacity Vehicle	A High-Capacity Vehicle (HCV) refers to heavy-duty vehicles or vehicles combinations exceeding the maximum weights and/or dimensions set in Council Directive 96/53/EC, including European Modular Systems. HCV are designed to transport a larger volume or weight of goods compared to standard vehicles.
Powertrain	The integrated system in a truck that comprises the engine, transmission, and other components responsible for generating and transmitting power to the wheels, enabling the vehicle's movement.
Rear Flaps	Devices installed on trucks and trailers to optimize airflow and reduce aerodynamic drag, positioned on the rear end of the vehicle.
Swap body	Type of freight container suitable for its transhipment between road and rail transport.
Swap body trailer	Specialised trailer consisting of a rigid frame or chassis for the transport of swap bodies or containers by road
TEN-T network	Trans-European transport network of roads, railways, inland waterways, airports, and seaports across Europe

[1] See Annex 15 for accompanying visuals for the terms.

[2] Current version: ISO 668:2020-01, Series 1 freight containers — Classification, dimensions and ratings.

	identified in the maps contained in Annex I of Regulation (EU) 1315/2013[3] and strategically planned and developed to strengthen the social, economic and territorial cohesion of the Union and contribute to the creation of a single European transport area.

Abbreviations

Term or acronym	Full name
AFIR	Alternative Fuel Infrastructure Regulation
BEV	Battery Electric Vehicle
BPG	European Best Practice Guidelines for Abnormal Road Transports
EMS	European Modular System
GDP	Gross Domestic Product
GHG	Greenhouse gases
GVW	Gross Vehicle Weight
GVCW	Maximum Gross Vehicle Combination Weight
HCV	High-Capacity Vehicle
HDV	Heavy-Duty Vehicle
FCEV	Fuel Cell Electric Vehicle

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

HGV	Heavy Goods Vehicle
ICE	Internal Combustion Engine
OBW	On-Board Weighing
PM	Policy Measure
PO	Policy Option
SO	Specific Objective
TCO	Total Cost of Ownership
TEN-T	Trans-European Transport Network
W&D	Weights and Dimensions
WIM	Weighin-Motion
ZE	Zero-Emission
ZEV	Zero-Emission Vehicle

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

This Impact Assessment accompanies a legislative proposal for a revision of **Council Directive 96/53/EC on the maximum dimensions of certain road vehicles authorised for national and international traffic and the maximum weight authorized in international traffic** (hereinafter "the Weights and Dimensions Directive", or "the W&D Directive" or "the Directive").

1.1. Political context

Road transport plays a vital role in connecting businesses and consumers across the EU, facilitating trade, and supporting economic growth and employment. It facilitates mobility of people and supports many industries, such as manufacturing, construction and retail, by providing the means for the transport of goods. It also plays a critical role in emergency response.

In 2020, road freight transport represented 53.3% (1,745 billion tonne-kilometres) of all the goods transported within the EU and more than three-quarters (77.4%) of the total inland freight transport (based on tonne-kilometres performed)[4]. The bus and coach transport activity amounted to 294 billion passenger-kilometres, representing 6.6% of total passenger transport activity in 2020. The road transport sector employs more than 5 million people in the EU, of which 3.3 million work in freight and almost 2 million in passenger transport[4]. Road freight transport has proven critical in ensuring the delivery of essential products and the transport of humanitarian aid in emergency situations, such as the COVID-19 pandemic and the unprovoked invasion of Ukraine by Russia[5].

While the road transport sector brings substantial economic and social benefits, it also has negative impacts on the environment, including air pollution and greenhouse gas emissions (GHG), as well as noise. Too much road traffic can generate congestion and increase wear and tear of infrastructure. It can also lead to accidents and injuries. For example, it is estimated that heavy-duty vehicles were involved in road accidents causing around 3,000 out of the 22,800 fatalities on the EU roads in 2019[6] (i.e. approximately 13% of the total).

Transport[7] accounted for 26% of all EU greenhouse gas emissions (GHG) emissions in 2020, with road transport alone representing 20% of the total. Around 28% of road transport emissions originate from heavy-duty vehicles, such as lorries and buses (6% of EU's total GHG emissions)[8]. Road transport is the principal source of nitrogen oxides, responsible for 37% of emissions in 2020, and also accounts for a significant share of emissions of other main air pollutants (except for SOx)[9]. Road transport was responsible for 77% of total energy consumption in transport[10] in 2020. Heavy-duty vehicles (HDV) account for 38% of the EU's diesel consumption in road transport[11].

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[4] Statistical pocketbook 2022 (europa.eu)
[5] The Solidarity Lanes are currently the only option for Ukraine for all their imports and for exports of non-agricultural goods (e.g. iron, steel, animal products).
[6] Source: CARE database. Figures from 2019 are considered more representative given that the decline in the number of fatalities registered in 2020 is affected by the overall reduction in the mobility during the COVID-19 pandemic.
[7] Including international aviation and maritime.
[8] Statistical pocketbook 2022 (europa.eu)
[9] Sources and emissions of air pollutants in Europe — European Environment Agency (europa.eu)
[10] Including international aviation and maritime.
[11] European Union (Convention). 2022 Common Reporting Format (CRF) Table | UNFCCC

The **European Green Deal** Communication[12] adopted in 2019 sets the long-term goal of achieving climate neutrality by 2050, showing the need for reducing GHG emissions from transport by 90% until that date. The **European Climate Law**[13] enshrines in legislation the EU's commitment to reach climate neutrality by 2050 and sets a target of at least 55% net GHG emissions reduction by 2030 compared to 1990. To achieve this target the Commission adopted in 2021 the **Fit for 55**[14] package of measures focusing, among others, on reducing the reliance on fossil fuels, expanding the use of renewable energy sources, accelerating the deployment of alternative fuels infrastructure and revising the CO_2 standards for new cars and vans. In response to the hardships and global energy market disruption caused by Russia's invasion of Ukraine, the European Commission has presented in May 2022 the **REPowerEU Plan**[15]**.** The key objective of the Plan is to end the EU's dependence on Russian fossil fuels, improve energy efficiency and fast forward green transition, including towards zero-emission vehicles. In addition, on 14 February 2023 the Commission proposed to revise the **CO_2 standards for new HDVs** to ensure that they are in line with the increased climate ambition of the European Green Deal and to contribute to reducing the EU's energy dependency.

To operationalise the green and digital transformation of the transport system and contribute to the achievement of Green Deal objectives, the Commission adopted in 2020 the **Sustainable and Smart Mobility Strategy**[16] together with an Action Plan of 82 initiatives. The initiatives under the Strategy are based on three strands: making all transport modes more sustainable, making sustainable alternatives widely available in a multimodal system, and putting in place the right incentives to drive the transition. The **revision of the W&D Directive** will contribute to the Strategy's objectives of *boosting the uptake of zero-emission vehicles, renewable & low-carbon fuels and related infrastructure* (flagship 1) and *greening freight transport* (flagship 4). In this context, it forms part of the **Greening freight package**, a set of initiatives catering for more sustainable solutions to improve the operational and system efficiency of the transport sector.

The initiative fits under the broader objectives of the green and digital transformation of the EU economy, including the Zero Pollution Action Plan[17]. Finally, the revision of the W&D Directive also contributes towards the **Sustainable Development Goal** SDG 13 ("Take urgent action to combat climate change and its impacts") and SDG 3 ("Ensure healthy lives and promote well-being for all at all ages").

1.2. Legal context

The **Council Directive 96/53/EC** sets out the maximum permitted weights and dimensions for commercial heavy-duty vehicles[18] (HDV) that circulate on EU roads carrying goods or passengers. The Directive specifies the maximum weight and dimensions of those vehicles including their length, width, height and axle loads. Annex 7 provides additional information on the current legal framework. These common standards aim to ensure that HDVs do not exceed limits that can compromise road safety, infrastructure and the environment. The rules also aim to facilitate cross-border transport and ensure that

[12] COM(2019) 640 final.
[13] Regulation (EU) 2021/1119.
[14] COM(2021) 550 final.
[15] COM(2022) 230 final.
[16] COM(2020) 789 final.
[17] COM(2021) 400 final.
[18] Heavy-duty vehicles are defined for the purpose of this Directive as freight motor vehicles and trailers with a technically permissible maximum laden mass of more than 3.5 tonnes (lorries) or passenger transport vehicles of more than 9 seats including the driver (buses and coaches).

road transport operators can compete on equal footing in the internal market in terms of the loading capacity of their vehicles.

The original Directive adopted in 1996 was subsequently amended in 2002 by **Directive 2002/7/EC**, and in 2015 by **Directive (EU) 2015/719**[19]. The 2002 revision harmonised the maximum authorised dimensions of buses in national and international traffic, to enable seamless passenger transport by road within the EU. The 2015 revision provided for certain derogations from the maximum authorised weights and dimensions of vehicles and vehicle combinations, in order to encourage the uptake of alternatively fuelled powertrains, to improve vehicles' aerodynamics and to ensure interoperability with other modes of transport. The reduction of GHG emissions, improving road safety and driver's comfort in commercial (freight) transport were the main driving purpose of these derogations.

In addition, following the commitments of the Paris Agreement on climate change, **Regulation (EU) 2019/1242**[20] setting CO_2 performance standards for HDV introduced the notion of "zero-emission heavy-duty vehicle" promoting its use by the introduction of additional weight derogations applicable to this vehicle kind, and **Decision (EU) 2019/984**[21] brought forward the initial deadline for placing more aerodynamic cabs in the market from 2 December 2022 to 1 September 2020.

1.3. Synergies with other EU policy instruments

The revision of the W&D Directive is complementary to other initiatives that aim at reducing emissions from transport, improve energy and operational efficiency of cross-border operations and promote intermodal cooperation. In particular, it offers synergies with three initiatives put forward as part of the Greening freight package, namely:

- The revision of the **Combined Transport Directive,** aimed at incentivising the uptake of intermodal transport;
- **The CountEmissions EU** initiative, aimed at establishing a harmonised methodology to measure door-to-door GHG emissions of transport operations, which could be used by transport companies to monitor and benchmark their transport services;
- The initiative on **rail capacity planning and management** aimed at improving the reliability, punctuality and availability of rail services by optimising the use of rail infrastructure and improving their multimodal integration.

Although these initiatives cover different modal and cross-modal aspects of the regulatory framework for land transport, they complement each other in delivering a more efficient and sustainable land transport system. There are particularly strong connections with the revision of the Combined Transport Directive whose main objective is to incentivise the uptake of freight intermodal transport in order to contribute to reducing GHG emissions and other externalities from transport such as air pollutant emissions, congestion and accidents. The W&D Directive aims to provide additional incentives to intermodal transport, by eliminating the disadvantages of the road legs by HDV involved in intermodal transport operations in terms of loading capacity and by extending the support of the Directive to non-containerised intermodal transport.

[19] Directive 2002/7/EC.
[20] Regulation (EU) 2019/1242.
[21] Decision (EU) 2019/984 of the European Parliament and of the Council.

There are also clear synergies between this initiative and the Regulation setting **HDV CO_2 emission performance standards**[22], which sets requirements on vehicle manufacturers as to the supply of more fuel-efficient and zero-emission heavy-duty vehicles. The proposal for the revision of the Regulation, adopted by the Commission on 14 February 2023, extends the scope to almost all newly registered HDVs with certified CO_2 emissions and sets new CO_2 emission targets from 2030 onwards[23]. To effectively reach its targets and achieve the greening objectives as swiftly as possible, the CO_2 standards for HDVs need to be complemented by enabling measures targeting the demand side. The revision of the W&D Directive aims to put in place the right incentives for the transport operators to invest in cleaner HDV, contributing to the uptake of ZEV and the achievement of the GHG emission reduction target set in the European Green Deal and the Sustainable and Smart Mobility Strategy.

The **Eurovignette Directive**[24] addresses the need to internalise road transport's external costs, applying "the polluter pays" and "the user pays" principles. In addition, a recent legislative proposal to revise the Eurovignette Directive takes account of the environmental performance of trailers and semitrailers in the calculation of road charges[25]. This will further reinforce the incentives provided by the W&D Directive to boost the uptake of zero-emission HDVs and to encourage the use of energy efficient trailers and semitrailers. As part of the Fit for 55 package, the Commission also put forward a proposal for the revision of the **Energy Taxation Directive**[26] that promotes clean technologies and remove outdated exemptions and reduced rates that currently encourage the use of fossil fuels. In addition, road transport will be covered by **emissions trading**[27], putting a price on pollution, stimulating cleaner fuel use, and re-investing in clean technologies.

On the infrastructure side, the most relevant initiatives that could strengthen the effects of W&D Directive are: the **EU Action Plan on Military Mobility**[28] and the **Alternative Fuel Infrastructure Regulation (AFIR)**[29]. The **EU Action Plan on Military Mobility** aims to remove the obstacles that hamper military mobility in the EU. A key part of the Action Plan is to identify the infrastructure capable of accommodating bigger and heavier vehicles than those within the limits of the W&D Directive. A gap analysis conducted to this end[30] concluded that 91% of the road TEN-T network would be suitable for military transport needs, which either match or (mostly) exceed the standards set in the W&D Directive. **AFIR** sets mandatory minimum targets for the roll-out of recharging and refuelling infrastructure across the TEN-T core and comprehensive network and thus strengthening the W&D objectives to facilitate the uptake of ZEV.

The Cross-Border Enforcement (CBE) Directive aims to improve road safety and to ensure equal treatment of drivers, namely resident and non-resident offenders. In March 2023 the Commission adopted a legislative proposal[31] to amend the CBE Directive, extending its scope to other road safety related traffic

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[22] Regulation (EU) 2019/1242.
[23] COM(2023) 88 final.
[24] Directive 1999/62/EC.
[25] The amendment to the Eurovignette Directive relies on the optimisation of trailers with regard to their aerodynamic performance, rolling resistance and weight. It does not cover electric trailers and semitrailers.
[26] COM/2021/563 final.
[27] COM/2021/551 final;
[28] Joint Communication to the European Parliament and the Council on the Action Plan on Military Mobility JOIN (2018)05 final, referred to as the "Action Plan".
[29] The proposal for the revised AFIR (COM (2021)559) was part of the Fit for 55 package. The political agreement between the European Parliament and the Council, regarding the revised AFIR, was reached on 28 March 2023.
[30] SWD(2020) 144 final.
[31] COM (2023)126.

offences. The "use of an overloaded vehicle" is one of them. Hence, the mechanism provided by the CBE Directive could be used to identify the offenders and facilitate their prosecution for infringing the provisions of the W&D Directive.

1.4. Evaluation of the Directive

An evaluation of the W&D Directive has been carried out 'back-to-back' (i.e. at the same time) with the impact assessment. The evaluation of the W&D Directive is annexed to this report.

The main conclusion of the evaluation is that the Directive was only partially successful in achieving its objectives of strengthening the internal market, improving energy and operational efficiency of road transport operations, contributing to road safety and to the protection of road infrastructure. On the one hand, the common technical standards for HDVs enabled more effective, safe and fair cross-border operations within the EU internal market, and on the other hand, the variety of national derogations and requirements established by Member States in line with the Directive, led to fragmentation of certain segments of the market and to operational inefficiencies.

While the Directive helped to increase the share of containerised intermodal transport and to improve the energy and operational performance of operations in the Member States allowing for longer and heavier vehicles, its overall contribution to the energy efficiency of freight transport operations in the EU, including through the uptake of aerodynamic devices and of alternatively fuelled powertrains (including zero-emission ones), has been very limited. The Directive is considered effective in promoting road safety and in reducing infrastructure wear and tear.

The partial ineffectiveness and inconsistency of the Directive has been attributed in the evaluation to a combination of factors, including a lack of clarity in the Directive's provisions and a lack of enforcement by Member States. Both of these aspects contribute to the challenges in achieving harmonisation and correct implementation of the Directive.

As to the lack of clarity, the evaluation confirmed that the Directive contains provisions that are open to interpretation or lack specificity in certain areas, in particular as regards the use of longer/heavier vehicles in cross-border operations and requirements for authorisations for abnormal transport. This led to varying interpretations and inconsistent application across Member States, resulting in a fragmentation of the market (its segments such as: longer/heavier HDVs, including European Modular Systems (EMS), car transporters, indivisible load transport). The lack of clear provisions and common standards created confusion and hindered the full achievement of the harmonisation objective of the Directive.

Ineffective and inconsistent enforcement by Member States, including inadequate or insufficient checks, penalties, and monitoring, undermined the effectiveness of the Directive in the area of internal market, ensuring free movement of goods and fair competition. It has also affected the performance of the Directive in eliminating the risks to road safety and damage of infrastructure posed by overloaded vehicles.

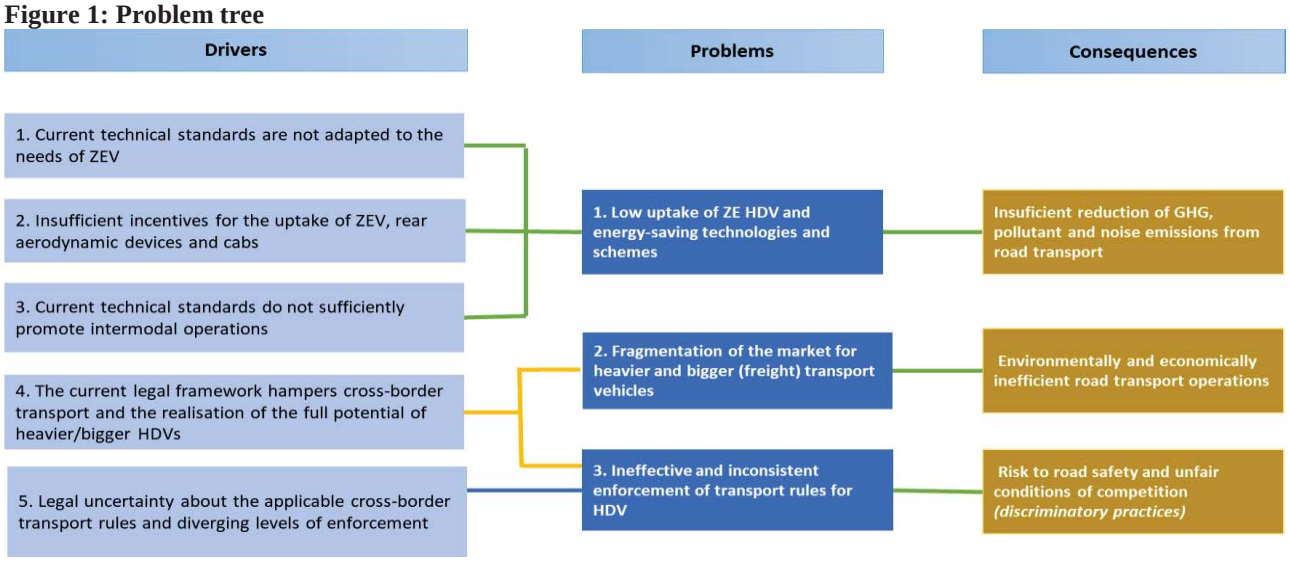
The lack of clarity in the Directive's provisions and the lack of enforcement are interconnected. The ambiguity in the provisions created challenges for enforcement authorities, while weak enforcement further exacerbated non-compliance and undermined the harmonization objectives.

The links between the conclusions of the ex-post evaluation and the impact assessment are summarised in Annex 9.

2. PROBLEM DEFINITION

The key problems, corresponding drivers and consequences that are relevant for the revision of the Directive are presented in Figure 1.

Figure 1: Problem tree



2.1. What are the problems?

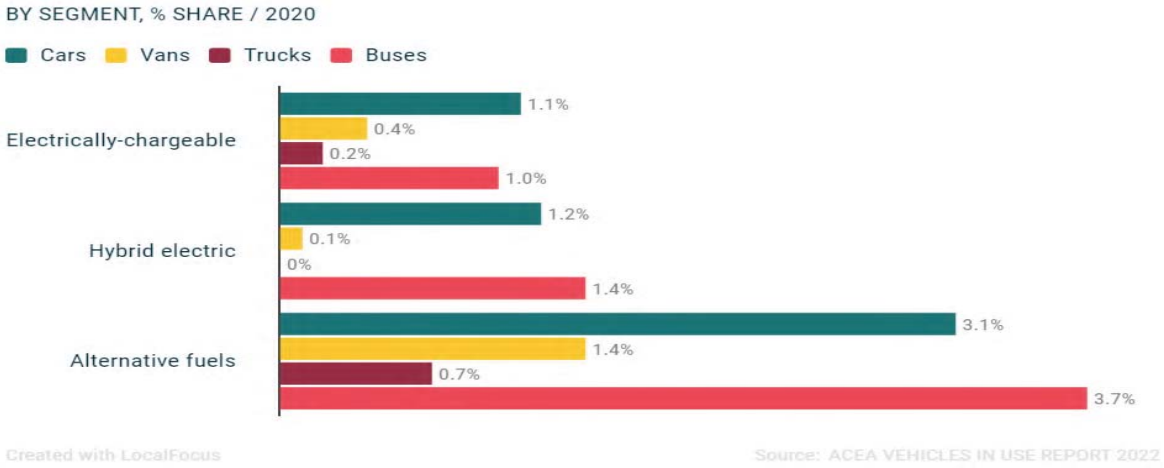
2.1.1. Problem 1: Low uptake of zero-emission heavy-duty vehicles and energy saving technologies and schemes

The evaluation has shown that the incentives to improve the energy efficiency of road transport and to reduce the GHG emissions via the deployment of alternatively-fuelled HDVs (including ZEVs) and improved aerodynamics were insufficient and not reflecting the operational and zero-emission technology requirements, and that intermodal transport remains partially disadvantaged.

The amendments introduced in 2015 (Directive (EU) 2015/719[32]) provided for certain derogations from the maximum authorised weights and dimensions of HDV to encourage deployment of new "greening" technologies and more sustainable transport schemes, in particular the use of alternatively fuelled vehicles (including zero-emission vehicles), the improvement of vehicles' aerodynamics and the support to intermodal containerised transport. The share of alternatively fuelled medium and heavy-duty vehicles in the EU yearly registrations has slowly increased from 0.5% in 2016 to 7% in 2020[33]. Even though the registrations of ZEVs are increasing, their current share of the EU fleet is still very low. In 2020, 0.2% of all lorries above 3.5 tonnes and nearly 1% of buses in use in the EU were electrically rechargeable[34] (Figure 2).

[32] OJ L 115, 6.5.2015, p. 1–10.
[33] https://www.acea.auto/files/ACEA-report-vehicles-in-use-europe-2022.pdf
[34] Including battery electric and plug in hybrids.

Figure 2: Share of alternatively fuelled vehicles in the EU fleet in 2020



Source: ACEA

Overall, the uptake of zero-emission vehicles in the HDV (in particular truck) fleet is very limited. **The EU truck fleet** (above 3.5 tonnes) **continues to be strongly dominated by fossil fuel engines.** Road freight transport relies predominantly on diesel (96.3% of all trucks in the EU run on diesel), with only 0.7% of all trucks being run on alternatively fuelled internal combustion engines (natural gas and LPG). The share of electrically chargeable trucks, including battery electric and plug in hybrid vehicles, is as low as 0.2%. **Buses** make more use of alternative fuels in internal combustion engines (3.7% of the EU fleet) than trucks. The figures also show higher uptake of hybrid electric (1.4%) and electrically chargeable (1%) buses, mostly used in urban transport. The sales of zero-emission buses over 7.5t are growing rapidly[35].

One position paper[36] and other stakeholders' feedback provided to the Commission[37] identify the availability of recharging and refuelling infrastructure, the price, total cost of ownership (TCO[38]) and duration of charging, as the main barriers to the broad uptake of zero- and low-emission vehicles. At the same time, the stakeholders in the trucking industry call for rapid decarbonisation of the road freight sector and for an ambitious quick and broad roll-out of the related infrastructure to enable the uptake of ZE HDVs[39]. They call on the EU and the national governments to put in place enabling policies to accelerate the market uptake of ZEV and removing barriers holding back the transition, including the current limits on weights and dimensions of HDVs. These issues are being addressed by different legislative initiatives mentioned in section 1.3, and W&D Directive can also play an important role in providing a comprehensive solution by removing the technical and administrative barriers to the deployment of ZE HDVs.

In addition to switching to alternative fuels, research projects and testing activities show that emission

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[35] Over 10% of buses sold in 2020 were electrically chargeable (including battery electric and plug in hybrids).
[36] See https://www.iru.org/resources/iru-library/iru-position-accelerating-decarbonisation-road-transport-through-faster-update-alternative-fuels from the International umbrella association of road transport operators IRU, 12.11.2020.
[37] For instance, the on-line public consultation carried out in the context of the impact assessment for the revision of the HDV CO2 Emission Standards Regulation, available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13168-Reducing-carbon-emissions-review-of-emission-standards-for-heavy-duty-vehicles_en
[38] The TCO of a vehicle is the cost of purchase plus the cost to operate the vehicle over its useful life, such as fuel, maintenance, taxes and charges.
[34] Joint declaration - The road freight transport is ready to fully decarbonise - European Clean Trucking Alliance

reductions are possible via **energy savings through improved vehicle aerodynamics** for the complete vehicle, **of about 5-10%**[40]. However, the uptake of devices enabling such savings (notably aerodynamic cabs and rear flaps) has been very low until now due to past regulatory obstacles as well as a limited type of operations (mainly long-distance motorway driving) which the use of these devices has been economically beneficial so far. The 2015 amendments to the W&D Directive supported the improvement of vehicles' aerodynamics by allowing extra length for HDVs equipped with rear aerodynamic devices and for HDVs equipped with cabs improving the aerodynamics and safety of the vehicle, as well as the visibility, safety and comfort of drivers. However, the type-approval legal framework necessary for the introduction of aerodynamic devices and cabs, and the complementary rules to ensure uniform operational conditions of rear flaps[41] apply only since December 2019[42]. In addition, the length derogation for the new cabs applies only from September 2020[43], which delayed their placing on the market.

The first and the only truck equipped so far with an **elongated cab** was placed on the market on 9 June 2021[44]. It is reported[45,46] that the cab was elongated by 160mm at the front and 330mm at the rear. Coupled with re-designed windows and packaging, the elongated cab is claimed to have substantially improved direct vision, beneficial for road safety. However, the re-shaping of the front is less radical than was envisaged by concepts studied in the development of the Directive[47], limiting the potential energy savings only to high-speed long-distance trips.

The requirements of the HDV CO_2 Standards Regulation in combination with the need for improved aerodynamics to reduce energy consumption and the Direct Vision Regulation[48] is expected to drive widespread introduction of elongated cabins[49]. However, it appears likely that, in response to market demands and the prioritisation of manufacturers to roll-out zero-emission powertrains over improved aerodynamics, much of the length increase possible under the legislation will be put at the rear of the cab, where it can be used to benefit interior space for driver comfort and/or additional space for zero-emission equipment, such as hydrogen tanks.

As regards the implementation of **rear flaps**, although neither technology suppliers, nor manufacturers have provided figures that would allow to quantify the actual use of rear devices in freight transport, they

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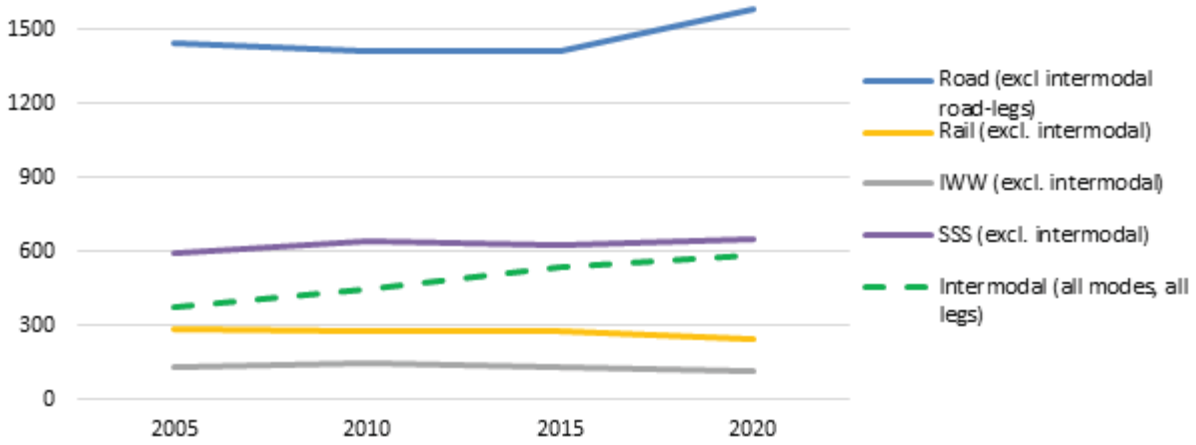
[40] https://aeroflex-project.eu/wp-content/uploads/2018/04/Uniresearch_AEROFLEX_flyer_A4_1816_web.pdf.
[41] Commission Implementing Regulation (EU) 2019/1916, amended by Implementing Regulation 2020/349.
[42] Commission Regulation (EU) 2019/1892.
[43] Article 9a(3) of the Weights and Dimensions Directive.
[44] Next Generation DAF truck launched on the 9th June 2021. https://youtu.be/4wLUrs4tmQE
[45] https://www.daf.com/en/news-and-media/news-articles/global/2021/q2/daf-is-starting-the-future-with-an-entirely-new-line-up-of-trucks-short
[46] https://startthefuture.daf.com/-/media/files/document-library/brochures/ngd/new-generation-daf-brochure-06-2021-en_web.pdf
[47] According to the estimations of the Impact Assessment accompanying the legislative proposal for a revision of the W&D Directive (SWD(2013) 108 final), based on FKA Report 104190, Aachen 2011, on high-speed long-distance trips "*if the lower part of the front of the driving cabin was streamlined and extended by 0.8 m, the aerodynamic drag coefficient (CD) would drop by 6.4% resulting in a reduction of fuel consumption by 3.2 to 5.3%. Shorter extensions (0.4 m) of cabins would yield markedly poorer results (4.5% reduction in CD). With a longer extension (1.2 m) the gain would increase to 8.9%.*"
[48] The 'Direct Vision Regulation' are standards being negotiated in the context of UNECE Working Party on General Safety Provisions (WP.29) with the goal of reducing blind spots for truck drivers. The Regulation is currently in the latest stages for final approval https://unece.org/transport/documents/2021/10/informal-documents/iwg-vru-proxi-draft-un-regulation-direct-vision
[49] According to the information gathered during the consultation activities Daimler and Scania are considering to introduce elongated cabs for ZE trucks.

all agree that there is no increase in the demand for such devices. According to the Automobile Manufacturers Association (ACEA) "*implementation of the measures envisaged by the W&D Directive at the national level caused delays in the real world uptake, as did uncertainties related to other legislation (General Safety Regulation, Direct Vision Regulation) which occurred in parallel with the W&D developments*".

In addition to these improvements to the HDVs, increased use of intermodal transport is considered an important element in the decarbonisation of freight transport in the EU, due to its energy and emission saving potential. It combines the better environmental performance and energy efficiency of non-road transport with the accessibility and flexibility of road transport on the 'last mile'. The volume of intermodal freight transport in tonne-kilometres has more than doubled in the last 30 years, since the adoption of the Combined Transport Directive, and has been the fastest growing market segment in three important non-road freight modes (i.e. rail, inland waterways, short sea shipping), even if this relative growth advantage has in recent years slowed (Figure 3).

Figure 3: Freight transport activity of unimodal (excluding the intermodal respective legs) and total intermodal transport (including road and non-road legs), 2005-2020 (in billon tkm)



Source: Statistical pocketbook 2022, REFIT evaluation of Combined Transport Directive (2016) and Ricardo et al. support study (2023)[50]

The use of 45-foot containers and swap bodies, which is estimated to account for 19% of the ISO-container category, has similarly been increasing during this period as it is considered the most efficient cargo unit for intermodal transport. Enabling[51] the use of standard 45-foot containers and swap bodies has been highly welcomed by the market operators and the expectation is that the large containers (45-foot and high-cube) will increase gradually their market share of containerised transport in the future. Swap bodies are large containers designed to be easily transferred between road and rail modes of transport without special handling equipment by lifting them from below, as they are equipped with up-folding legs. Compared to traditional shipping containers, swap bodies have more inside space despite the same external dimensions, and thus allow for greater cargo capacity. Directive (EU) 2015/719 introduced weight derogations for 5- and 6-axle HDV combinations involved in intermodal transport operations (from 40 tonnes to 42 tonnes or 44 tonnes depending on the axle configuration) to compensate for the extra weight of the empty containers and swap bodies.

[50] Ricardo et al. (2023), Impact assessment support study on amendment of Combined Transport Directive.
[51] Directive (EU) 2015/719.

Figure 4: Swap body trailer with extended legs, during loading process.

Source: Schmitz Cargobull

However, the effects of this measure to promote intermodal transport have been partially cancelled out in eleven Member States[52] (representing 24.6% of the total road freight transport activity in the EU in 2020[53]) where the weight limits for the vehicle combinations used in domestic road-only operations were increased to at least 44 tonnes. As a result, while overall energy and operational efficiency of road transport operations increased in those Member States, shippers and operators involved in (containerised) intermodal transport have been put in a disadvantaged position by having lower loading capacity as compared to road-only transport. The cost efficiency of road-rail intermodal transport is particularly sensitive to pre- and post-haulage costs[54], since this activity typically has a larger cost compared with its share of the total distance in the transport chain. Improving the efficiency of pre- and post-haulage activities is, therefore, of utmost importance for the competitiveness of the intermodal transport system[55].

2.1.2. Problem 2 – Fragmentation of the market for heavier and bigger (freight) transport vehicles

The W&D Directive establishes the maximum weight and dimensions for different types of heavy-duty vehicles (e.g. 16.50 m and 40 tonnes for articulated vehicles with 5 or 6 axles). Vehicles complying with these requirements can freely circulate throughout the EU territory. At the same time, the Directive allows for **national derogations for heavier or bigger vehicles to circulate on the national territory only**. Member States have granted national derogations, allowing increased weights and dimensions, in an

[52] Belgium, Czech Republic, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Sweden, Denmark and Finland allow the circulation in national transport of 5 or 6-axle vehicle combinations with a maximum weight of 44 tonnes. Czech Republic allows a maximum weight of up to 48 tonnes, the Netherlands of up to 50 tonnes and Italy allows a maximum weight of up to 56 tonnes for the transport of excavation and mining materials.

[53] Source: Statistical pocketbook 2022.

[54] Pre- and post-haulage costs refer to the expenses incurred before and after the actual transportation of goods. In intermodal containerised transport, this includes the costs associated with transhipment as well as the movement of the empty container before and after its use for transport of goods.

[55] Bergqvist, R. and Behrends, S. (2011), Assessing the effects of longer vehicles: The case of pre- and post-haulage in intermodal transport chains, Transport Reviews, available at: https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.1080%2F01441647.2011.584980

uncoordinated manner (see problem driver 4 for details). This has created a patchwork of rules, which hampers the free circulation of HDVs within the EU, distorts competition, renders enforcement ineffective and leads to loss of operational and energy efficiency. It affects particularly the market segments of high-capacity vehicles, vehicle transporters and indivisible loads and limits the pursued economic and environmental savings in these segments. For instance, due to the lack of harmonisation at the EU level in this regard, high-capacity vehicles (e.g. 44 tonne vehicles and vehicle combinations European modular systems – EMS[56]) allowed to circulate in national transport in neighbouring Member States cannot, in principle, cross the borders of those Member States to continue the operation. The call for evidence[57] revealed that 80% of 174 contributors, representing companies and business associations (mainly road transport and logistic operators, truck manufacturers, construction businesses, agricultural producers and chemical industry), considered the lack of harmonisation in this respect a significant hurdle and demanded the allowance of 44 tonnes in international transport.

European Modular Systems (EMS) are particular case. EMS are allowed in cross-border operations based on bilateral agreements, limited to one single border crossing between two neighbouring Member States who allow EMS on their territories. This is based on the broad interpretation of the W&D Directive[58] which is meant to preserve the international competition in the transport market. However, it has also created geographical areas within which cross-border transport is allowed but that are unconnected. For instance, international transport by EMS between Finland and Sweden cannot continue to Denmark, even though the latter also allows EMS on its territory. International transport between Germany and the Netherlands cannot continue to Belgium, although Belgium allows EMS. According to information from national authorities in the context of the stakeholders' consultation, discussions are ongoing to possibly allow cross-border transport of EMS between Portugal and Spain and between Germany and Denmark in the near future.

The national rules and trials allowing the circulation of EMS impose specific additional conditions mostly citing reasons of road safety and protection of the infrastructure. These national requirements are diverging and hamper even more the use of EMS in cross-border operations. For example, in Germany EMS are limited to a maximum weight of 40 tonnes while in the Netherlands EMS can reach 60 tonnes of weight but must be equipped with sideguard warnings and drivers must follow specific training. The bilateral agreement between the Netherlands and Germany reflects these national requirements creating specific legal frameworks for these regional markets within the EU internal market.

Abnormal transport or transport of indivisible loads[59] is a relatively small, though important segment, as it is linked with the strategic areas of renewable energy, civil engineering and infrastructure, oil and gas, heavy industry and power generation sectors. This segment also suffers from diverging national rules,

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[56] According to article 4.4(b) of the W&D Directive, Member States may allow longer and/or wider vehicles or vehicle combinations in national transport under the condition that they also allow the circulation of standard vehicles (motor vehicles, trailer and semitrailer) in such combinations as to reach the same loading length authorised in the given Member State. These combinations are known as modular concept or European modular systems (EMS).

[57] A call for evidence was open for feedback from 1 January 2022 to 21 February 2022: Commercial vehicles – weights and dimensions (evaluation) (europa.eu) and gathered 224 contributions, out of which 174 were from companies and sectoral organisations.

[58] The explanation provided by former Vice-President Siim Kallas in 2012 – see Annex 12.

[59] Indivisible load is defined by article 2 of the W&D Directive as "*a load that cannot, for the purpose of carriage by road, be divided into two or more loads without undue expense or risk of damage and which owing to its dimensions or mass cannot be carried by a motor vehicle, trailer, road train or articulated vehicle complying with this Directive in all respects*".

procedures and requirements for obtaining a permit to circulate across the EU. The patchwork of rules creates administrative burden, causes delays and makes cross-border operations inefficient and prone to fraud (it is estimated that 25% of such transport in the EU is not covered by special permits[60]) adversely affecting road safety and the infrastructure. In 2011, the European association of abnormal road transport and mobile cranes (ESTA) conducted an economic impact assessment and concluded that, if all recommendations of the European Best Practice Guidelines for Abnormal Road Transports[61] were followed, particularly in terms of simplification and harmonisation of the rules and procedures to obtain the special permits, the savings could amount to EUR 800 million every year[62].

2.1.3. Problem 3 – Ineffective and inconsistent enforcement of transport rules for HDV

The variety and complexity of the regulatory frameworks (EU, national and bilateral/multilateral) and the resulting lack of legal certainty have led to inefficient and inconsistent enforcement of the rules in cross border transport. For instance, the cross-border transport between France and Belgium by 44 tonnes HDVs (both Member States allow a maximum weight of 44 tonnes in national transport) was for many years tolerated, even if not allowed by the W&D Directive[63]. The recent enforcement actions taken by France[64], which according to the complaints by operators, target only incoming transport (to France), while outgoing transport with 44t HDVs can continue to and through Benelux countries without restrictions, could lead to discriminatory controls and create a competitive advantage for international transport operators carrying goods from France to the Benelux countries compared to their counterparts serving the French territory.

Similarly, it is the current practice that cross-border transport of vehicle carriers with extended length (i.e. longer than the W&D limits, but allowed under national derogations) is accepted all over the EU as long as the extensions used are permitted in the Member States crossed.

The evaluation shows that exceeding the maximum allowed masses and axle loads of HDV is the most frequent infraction. A survey conducted by the Conference of European Directors of Roads CEDR among its members (i.e. road authorities) reveals that the percentage of overloaded vehicles in Europe varies between 2% and 18%[65]. The circulation of overloaded vehicles, resulting from low compliance and weak enforcement, not only leads to distortions of competition between hauliers, but can endanger road safety

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[60] Commission Staff Working Document, Report on the implementation of the amendments to Directive 96/53/EC introduced by Directive (EU) 719/2015. SWD(2023) 70 final.

[61] In 2008, an expert group comprising experts designated by the Member States established the European Best Practice Guidelines for Abnormal Road Transports (BPG), with the positive opinion of the Road Safety High Level Group, which were primarily addressed to the public authorities in the Member States. Source: European Commission (2008), Abnormal Road transports: European best practice guidelines, Publications Office. Available at: https://op.europa.eu/en/publication-detail/-/publication/fa2d050b-24d2-469c-af61-43838653f075

[62] According to the economic impact assessment this amount can be disaggregated as follows: 1) efficiency improvement: EUR 50 million; 2) corridors: EUR 30 million; 3) introduction of SERT: EUR 270 million; 4) private escorts replacing police effort: EUR 450 million.

[63] As explained under Problem 2, national legislation can allow for trucks beyond the 40 tonnes of the Directive in the national territory, but those are not allowed to cross the border, even when similar national rules exist in the neighbouring Member State.

[64] Décret n° 2021-1006 du 29 juillet 2021 relatif aux poids et dimensions des véhicules terrestres à moteur et modifiant le code de la route. ELI: https://www.legifrance.gouv.fr/eli/decret/2021/7/29/TRAT2109942D/jo/texte.
JORF n°0176 du 31 juillet 2021. Texte n° 58.

[65] CEDR Report 2017/05 (2017). *Conditions for efficient road transport in Europe.*

and create risks of damage to the infrastructure, in particular its parts that are not adapted to accommodate the traffic by heavier/bigger vehicles (e.g. old bridges, certain roads).

According to the recent biennial report on the implementation of the W&D Directive[66], around 17 million vehicles and vehicle combinations were checked at the roadside in 2019 and 2020 in the territories of the nineteen Member States that have provided data. More than half million offences (3.3% of the HDV controlled) of exceeding the maximum weight or the maximum axle weight were detected. There are, however, very significant differences among Member States in the number of controls performed. In the reporting period 2019-2020, Ireland performed the highest number of controls (around 12.6 million controls), followed by Poland (around 3 million controls) and Italy (almost 600,000 controls). Substantial differences were also observed in the efficiency of controls measured as the percentage of infractions detected per control carried out. The detection rates range from 72.2% in Estonia (2,166 infractions detected out of 2,929 controls carried out) to 0.2% in Poland (7,217 infractions detected out of 3,050,851 controls carried out).

The legal uncertainty about the applicable rules in cross-border transport and the diverging levels of enforcement were considered as the most important issues to be addressed by the revision of the W&D Directive in the two workshops with industry stakeholders and with national experts of the Member States held on the 15 and 16 December 2022, respectively.

2.2. What are the problem drivers?

Problem driver 1: Current technical standards are not adapted to the needs of ZEV

The existing provisions are inadequate and/or insufficient to encourage the investment in zero-emission vehicles. To reach the same range as a diesel vehicle (or other fossil fuel vehicles), zero-emission vehicles typically need a higher mass (battery electric trucks) or volume (fuel cell electric trucks). The amendments introduced by Directive (EU) 2015/719 and by Regulation (EU) 2019/1242 increased the permitted weight for zero-emission vehicles to compensate for the loss of loading capacity caused by the extra weight linked to the zero emission powertrains. Truck manufacturers and technology suppliers argue, however, that these allowances are insufficient and that additional weight and axle-weight[67] is needed, in particular for long-haul freight transport, because batteries need to be bigger and heavier.

The extra weight allowance applies to certain buses, rigid trucks and tractors only, excluding 4-axle motor vehicles, 2-axle rigid buses and vehicles forming part of a vehicle combination other than the tractor. These allowances neither consider new technological developments such as electric trailers equipped with auxiliary motors and batteries which reduce the demand of energy from the motor vehicle and/or power other elements, such as cooling units of reefers. These innovative solutions cannot benefit nowadays from extra weight allowance to compensate for the weight of the system, which discourages their market uptake.

Battery electric vehicles (BEV) and fuel cell electric vehicles (FCEV powered with hydrogen) require space to store the batteries and the hydrogen tanks[68] which are commonly installed behind the cab. Current rules do not allow for extra length to compensate for the space needed for this type of energy

[66] COM(2023) 183 final.
[67] ACEA position paper on the "Review of the Weights & Dimensions", December 2022.
[68] ACEA position paper on the "Revision of the Weights & Dimensions", 1 Feb 2021.

storage. This means that investment in such vehicles under the current rules would lead to the reduction of the loading length capacity of the vehicle combination or the reduction of the space inside the cabin. In the first case, the competitiveness of these HDVs is affected as they cannot offer the same payload capacity as an internal combustion engine (ICE) truck. In the second case, the driver's comfort and safety pursued via the introduction of new elongated cabs might be affected.

The needs for extra weight and length have been consistently reported by truck manufacturers and technology developers[69]. Hydrogen Europe, ACEA[70] and one truck manufacturer estimated the necessary increases of the Gross Vehicle Weight (GVW) by 2 tonnes and of length (by 0.9 to 1.5 m) for a long-haul hydrogen-powered HDV that would enable those vehicles to cover the range of at least 600 km on one refill.

The need to adapt the weights and dimensions standards was also confirmed during the public consultation. During a workshop with 115 industry stakeholders, organised in December 2022, participants considered the inadequacy of current technical standards for the needs of ZEV as one of the three most important issues to be addressed. This is in line with the results of the open public consultation in which 93 out of 127 respondents stated that adapting the technical standards to the needs of ZEV would be a very useful or useful measure.

Problem driver 2: Insufficient incentives for the uptake of ZEV, rear aerodynamic devices and aerodynamic cabs

Vehicle manufacturers are committed to reducing CO_2 emissions by bringing a wide range of zero-emission vehicles to the market[71]. However, their uptake largely depends, according to European manufacturers, on transport operators being able to invest in them and operate them profitably[72]. The lack of technological maturity currently keeps the costs of the available solutions high and thus impedes the uptake of alternative fuels, including zero-emission vehicles[73]. Nonetheless, the impact assessment accompanying the revision of the HDV CO_2 performance standards[74] found that, in all policy combinations considered, the TCO is positive along the vehicle lifespan. The positive TCO determines net economic savings, even without considering the monetisation of the CO_2 and air pollutants emissions, since the fuel savings outweigh the capital costs and other costs. Other recent studies indicate that long-haul battery-electric trucks will reach TCO[75] parity in the coming years, which will very much depend on the amount and intensity of available policy incentives and the technological developments[76]. High upfront vehicle costs pose a serious market barrier for the EU hauliers, the great majority of which are micro and small enterprises, as addressed by the Impact Assessment of the revised HDV CO_2 Standards.

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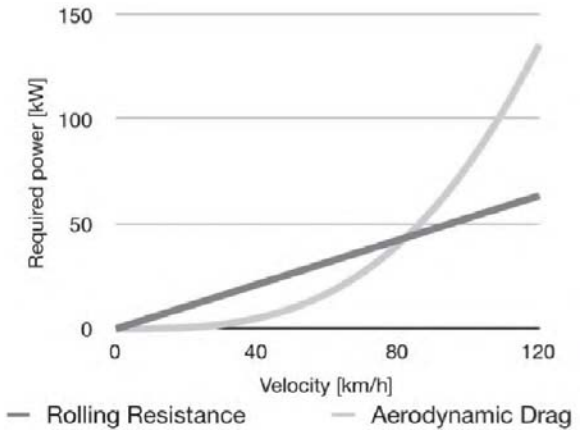
[69] ICCT (International Council on Clean Transportation), Fuel cell electric tractor-trailers: technology overview and fuel economy: https://theicct.org/wpcontent/.
[70] ACEA position paper on the "Review of the Weights & Dimensions", December 2022.
[71] ACEA's overview of 34 zero-emission trucks that are already available or soon to come to the market, 19 September 2022.
[72] https://www.acea.auto/files/ACEA-position-paper-2022_HDV-CO2-Review.pdf
[73] Van Grinsven: Alternative fuels infrastructure for heavy-duty vehicles,. Brussels: European Parliament, Policy Department for Structural and Cohesion Policies, 2021.
[74] SWD/2023/88 final.
[75] See footnote 38.
[76] ICCT, 2021 "Total cost of ownership for tractor-trailers in Europe: Battery electric versus diesel"; Traton group: "Both BEV and FCEV are likely to ultimately beat Diesel on cost; H2Accelerate: Analysis of cost of ownership and the policy support required to enable industrialisation of fuel cell trucks. 18 July 2022.

Regarding energy-saving technologies such as improved aerodynamics, the interest within the sector has been low. Despite the estimated benefits[77] highlighted by environmental associations and flaps manufacturers, the operators consider that the use case for the rear flaps is limited. Firstly, because they are not suitable for certain types of vehicles (e.g. car transporters), cargo (e.g. indivisible loads), operations (e.g. intermodal operations) or weather conditions (e.g. snow and ice). Secondly, the rear flaps are mostly effective in vehicles when travelling at constant high speed on long distances. Hence the return on investment is not warranted. As shown in Figure 5: **Power required for a 40-tonne vehicle combination to overcome the aerodynamic drag and rolling resistance, as a function of the vehicle speed**, aerodynamic drag only starts affecting fuel consumption significantly at higher speeds (60km/h and above), which makes their use interesting for long-distance transport and on motorways.

Figure 5: Power required for a 40-tonne vehicle combination to overcome the aerodynamic drag and rolling resistance, as a function of the vehicle speed



Source: Martini, 2016

Road transport operators also argue that the use of those devices requires additional skills and work of a driver and involves the risk of unintentional damage. The lack of direct economic benefit has also eliminated the demand from trailer rental/leasing companies and poses a significant market barrier to the adoption of more energy-efficient vehicles[78].

According to the Impact Assessment accompanying the current HDV CO_2 standards, the main drivers hindering the uptake of more fuel-efficient technologies (other than ZEV) were found to be environmental externalities, imperfect and asymmetric information in the new vehicle market, access to finance and cost pass through.

As regards aerodynamic cabs, truck manufacturers had insufficient time to bring them into the market. Firstly, the length allowance necessary for their placing unto the market was not applicable until 1 September 2020[79]. Secondly, cab designs usually have a fixed lifespan of the order of 10-20 years for economic reasons. Thirdly, there has been competing pressure from other regulations, such as the General Safety Regulation and the Direct Vision Regulation. Manufacturers have also indicated that their efforts were dedicated to the development of alternative powertrains as their preferred way to improve energy

[77] According to the impact assessment accompanying the revision of the WDD in 2013, the use of rear aerodynamic devices could lead to a reduction in fuel consumption in the range of 5-8% [SWD(2013) 108 final]. More up-to-date assessment in SWD(2018) 185 final.
[78] SWD (2023) 70 final.
[79] Thanks to the adoption of Commission Decision (EU) 2019/984.

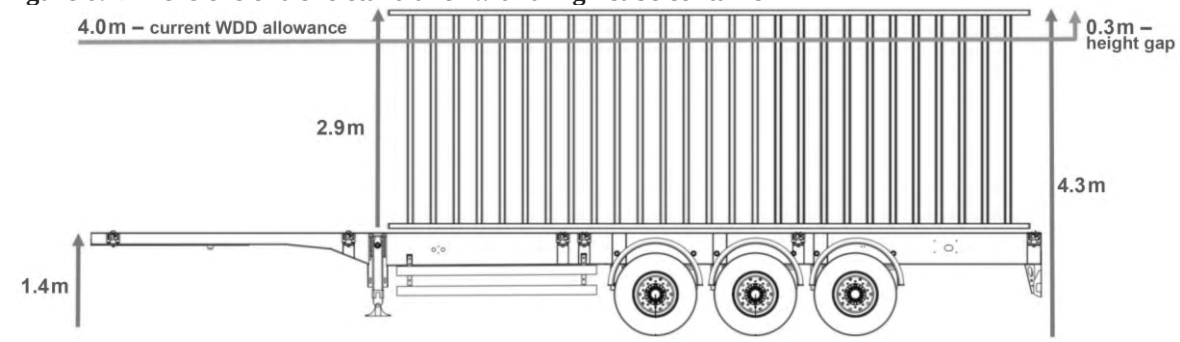
efficiency in the transport sector. Nevertheless, they also indicated that they would continuously design more aerodynamic cabs, which will become the standard for all BEV trucks.

Problem driver 3: Current technical standards do not sufficiently promote intermodal operations

According to a recent comparative evaluation of transhipment technologies for intermodal transport[80] the most common type of containers, in terms of length, used in containerised transport are 20' (about 6.10m) and 40' (about 12.20m) containers, with a standard external height of 8' 6'' (about 2.60m) or 9' 6'' (about 2.90m, so-called high-cube container). The advantage of high-cube containers is their much better ratio in terms of volume per tonne.

Skeletal trailers (container only – no deck), used for the transport of containers, typically have 1.4m height from floor to deck/container locks. With a height of about 2.90m high-cube containers and high swap bodies, HDV transporting them reach a total height of 4.30m, therefore exceeding the maximum authorised height by 20 cm. In the absence of additional height allowance of 20cm for HDVs in cross-border operations, the use of high cube containers is limited to the domestic operations in the territories of Member States that granted national derogations increasing the maximum height[81]. Transport of high cube containers in cross-border operations requires a special permit for abnormal transport by HDV or necessitates the use of a special equipment (low wheels skeletal trailers) which adds costs to the transport operation.

Figure 6: Dimensions of a skeletal trailer with a high cube container



Source: Own representation

In addition, the national derogations from the authorised weight limits allowed under W&D Directive for national transport put intermodal transport in a disadvantaged position as regards loading capacity. Under national weights derogations the HDVs gain a payload, while the extra 2 or 4t allowance for HDVs in intermodal transport only compensates the weight of an empty container to maintain the usual payload of 40t HDV.

[80] doi: 10.2832/743839.

[81] Finland, France, Ireland, Sweden and Slovenia have a permissible height of ≥4.2m applicable to containerised transport. Source: https://www.itf-oecd.org/sites/default/files/docs/dimensions-2019.pdf. Estonia and Italy have reported to grant ISO-containers at height of 4.3m. Source: CEDR Report 2017/05 (2017), https://www.cedr.eu/download/Publications/2017/2017-5-Conditions-for-efficient-road-transport-report.pdf. According to the information gathered during the consultation activities Sweden and Finland allow HDV of 4.5m height provided that the infrastructure allows it (no low bridges). Other height derogations for vehicle carriers are also allowed in several Member States.

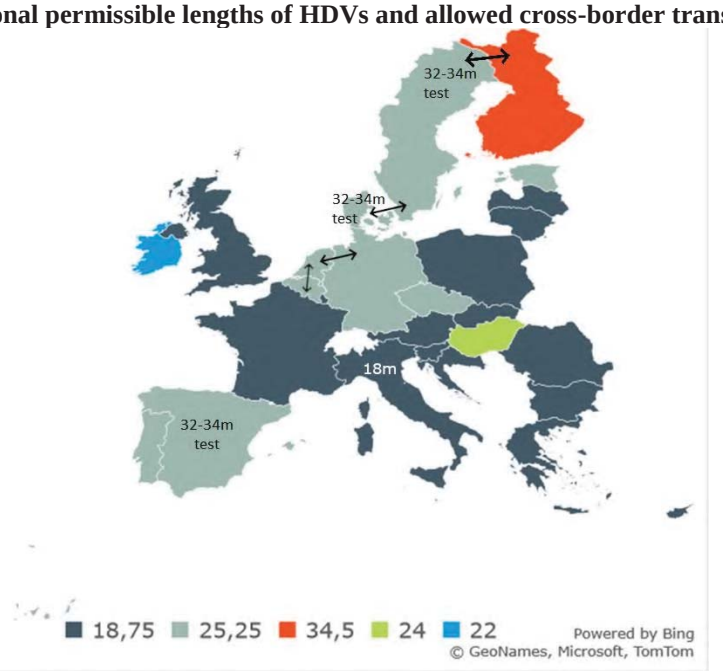
Problem driver 4: The current legal framework hampers cross-border transport and the realisation of the full potential of heavier and/or bigger HDVs

In line with the W&D Directive Member States may authorise the circulation on their national territory of HDV exceeding the maximum authorised by the Directive weights, without any restrictions, and maximum dimensions in prescribed cases, namely: specialised vehicles (e.g. used in the forestry industry), European Modular System (EMS) and trial schemes with vehicles incorporating new technologies or new concepts. Several Member States have launched trials to test the circulation of EMS, where the most common combinations are 25.25 m and 60 tonnes.

The W&D Directive does not explicitly allow the use of heavier or longer vehicles (i.e. exceeding the limits set in the Directive) in international transport. The HDVs used in international transport are bound by the limits set in the Directive even when they cross the territory of two neighbouring Member States that allow the same higher maximum authorised weights and/or dimensions on their territories. However, based on the broad interpretation of the W&D Directive, it was considered lawful to cross one border with such heavier and/or longer vehicles between neighbouring countries that allow the same weight and/or dimensions excesses (further explained in problem driver 5).

Currently, the use of **modular systems (EMS)** of at least 25.25m long is allowed in Finland and Sweden, and is being tested in Denmark, the Netherlands, Belgium, Spain, Portugal, Czech Republic and Germany. Italy authorises longer semitrailers to allow for a maximum length of the vehicle combination of 18m. Cross-border transport of EMS is allowed between Finland and Sweden, Sweden and Denmark, Belgium and the Netherlands and between Germany and the Netherlands.

Figure 7: Maximum national permissible lengths of HDVs and allowed cross-border transport

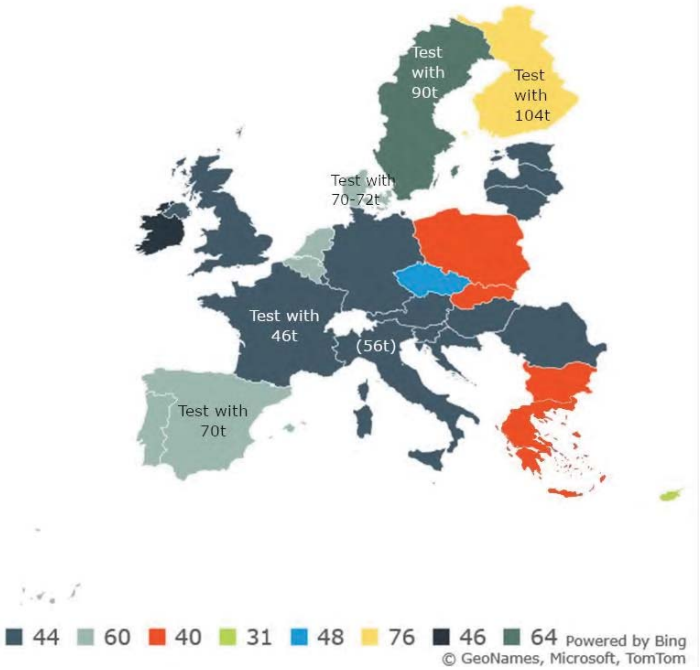


Sources: ITF-OECD, Volvo, and CEDR and road authorities' webpages and consultation activities

All Member States authorising the circulation of EMS allow them with a maximum gross vehicle combination weight of at least 60 tonnes, with the exception of Germany where it is limited to 40 tonnes (44 tonnes in intermodal transport). Belgium, Czech Republic, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Sweden, Denmark and Finland allow the circulation in national transport of five and/or six-axle vehicle combinations (standard articulated vehicles and road trains) with a weight of 44

tonnes and beyond, in some cases[82]. There is a particular situation of the Benelux countries. It originates in the Treaty Establishing the Benelux Economic Union[83], which was recognised by article 350 of the Treaty of the Functioning of the EU[84]. As a result, Belgium, Luxembourg and the Netherlands are allowed to conduct trials with heavier and longer HDV in cross-border operations between them in the context of the Benelux internal market. Currently, the Benelux countries allow for cross-border transport by heavier vehicles up to 44t.

Figure 8: Maximum national permissible weights of HDVs and allowed cross-border transport



Sources: ITF-OECD, Volvo, and CEDR and road authorities' webpages and consultation activities

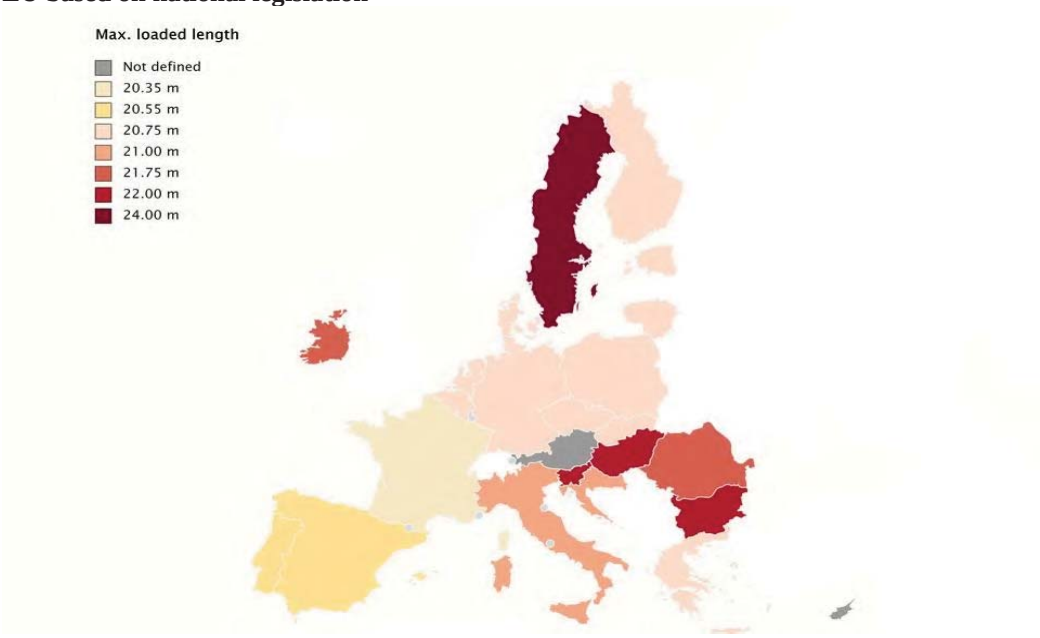
Member States in which EMS are authorised, report that their use brings substantial savings in terms of energy consumption, greenhouse gas (GHG) emissions and operational costs. According to their ex-post

[82] Czech Republic allows a maximum weight of up to 48t, the Netherlands of up to 50t and Italy allows a maximum weight of up to 56t for the transport of excavation and mining materials.
[83] Consolidated version of the Treaty Establishing the Benelux Economic Union.
[84] Article 350 of the TFEU: "The provisions of the Treaties shall not preclude the existence or completion of regional unions between Belgium and Luxembourg, or between Belgium, Luxembourg and the Netherlands, to the extent that the objectives of these regional unions are not attained by application of the Treaties."

assessment the use of EMS does not attract freight transport from other modes of transport, and it slightly improves road safety without significant infrastructure investments[85].

The so called 'loaded length' of **vehicle transporters** is not regulated under the W&D Directive. Member States introduced national rules allowing the extra length via the use of front and/or rear overhangs when loaded. These national rules have been granted in all Member States but one[86] and they allow for extra length for loaded vehicle transporter starting from 20.35m and beyond. In practice, cross-border transport of vehicles carriers exceeding the maximum length set in the WDD is considered lawful by most Member States as long as national standards in the territories crossed are met.

Figure 9: Maximum "loaded" length (via front and/or rear overhangs) of vehicle transporters in meters in the EU based on national legislation



Source: ECG

The **transport of indivisible loads** is subject to a national permit as required by the W&D Directive. National rules vary significantly between Member States as regards the conditions assigned to each type of permit (long-term permits and/or one-time/one-route permits), the number of authorities to be consulted by the applicant, the time needed to issue permits[87] and the route selection and check[88]. To address these

[85] See among others the study Cider L, Larsson L, HCT DUO2-project Gothenburg-Malmö in Sweden, 2019; Road Accidents in Denmark Involving EMS; Evaluation of Trial with European Modular System. December 2011. Danish Road Directorate; presentations from Finland, Sweden and Denmark at "The Nordic perspective: EMS and EMS2 trucks—the positive outcomes and lessons learned"; position paper for the Finish Ministry of Transport of 8.4.2022; Socio-Economic effects of loner and/or heavier road transport vehicles-the Swedish case; Monitoring Modal Shift. Longer and heavier vehicles. The follow-up measurement (2011). Ministry of Infrastructure and the Environment, The Netherlands; Monitoring traffic safety Longer and Heavier Vehicles. March 2020. Ministry of Transport, public works and water management, The Netherlands; Lahti. O. (2020): Fuel economy. Fuel economy 16.5 semitrailer 25.25 EMS. 32 EMS2; University of Zaragoza. Análisis del comportamiento en pruebas de funcionamiento de vehículos modulares en conjuntos DUOTRAILER. March 2020; Accident analysis for traffic safety aspects of High-Capacity Transports. May 2014. Chalmers University of Technology, Department of Vehicle Safety.

[86] Malta that does not allow extra length for car transporters.

[87] According to the road transport operators the time for issuing a national permit varies from 1-2 weeks to up to 12 weeks depending on the Member State issuing the authorisation, the selected route or the period of validity of the permit.

administrative hurdles, the Commission Expert Group elaborated and adopted in 2008 the European Best Practice Guidelines for Abnormal Road Transports (BPG). Although the BPGs, as endorsed by Member States, offered a list of rules and procedures promoting harmonisation, safer operations and improved transparency, the Guidelines have barely been followed by Member States. No progress has been made as regards the implementation of the uniform SERT document[89] nor the abnormal transport corridors and only a few Member States have fully implemented the one-stop-shop principle.

The Directive does not regulate the weight of **5- and 6-axle rigid trucks.** Therefore, in cross-border transport these vehicles must comply with the 32t weight limit set by the Directive for 4-axle rigid trucks (four-axle motor vehicles with two steering axles). This legislative loophole adds to operational and energy inefficiencies when using such 5- or 6- axle rigid trucks in cross-border operations.

Problem driver 5: Legal uncertainty about the applicable rules to cross-border transport and levels of enforcement

The use of EMS in national transport in nine Member States triggered the question of the lawfulness of the cross-border transport between neighbouring Member States that allow the use of longer and/or heavier vehicles on their territories[90]. The Directive is not sufficiently clear about that. Some Member States considered that as there is nothing in the Directive clearly forbidding such cross-border operations, they can allow the cross-border operations by longer and/or heavier (EMS and 44t HDVs) based on bilateral agreements. These diverging interpretations of the rules in force have led to diverging enforcements practices or even lack of controls of compliance.

Another ambiguity stemming from the Directive relates to the rules for vehicle carriers in cross-border transport. These HDVs use overhangs to increase the maximum length when they are loaded. As the Directive does not define a 'loaded length', some Member States and vehicle carriers consider that the Directive does not forbid cross-border operations by HDVs, the loaded length of which exceeds the length limits set in the W&D Directive. It is the general practice that cross-border transport of vehicle carriers is accepted as long as the extensions used (type and length) are permitted in the Member States crossed. According to the complaint submitted by one of the key stakeholders in this segment, at least one Member State started fining foreign car transporters for using vehicles with a loaded length exceeding 18.75m (maximum authorised by the WDD in international traffic) even though that loaded length does not exceed the national extra length allowance in that Member State. Such inconsistencies in enforcement create legal uncertainty and raise the issue of discrimination against foreign operators.

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[88] Whenever predefined corridors have not been identified, routes must be selected by the applicant to apply for the authorisation of a given abnormal transport. Furthermore, some countries also require outlining at least one alternative path.

[89] The Special European Registration of Trucks and Trailers (SERT) document is a single document that covers the needs of the different national authorities as regards detailed vehicle information that is not available on the registration certificate. Most countries have developed their own information documents (the majority not recognising the validity of the documents emitted in a different Member State). The BPG proposed a concrete format for the SERT document, with the aim to harmonise the technical vehicle information needed both for trailers and tractive units (tractors and lorries). This document would ideally develop into an electronic format making the information available on-line for the national authorities. The SERT document is only issued by the Netherlands and it is recognised in other 5 Member States.

[90] The explanation provided by former Vice-President Siim Kallas in his letter of 13 June 2012 to MEP Brian Simpson, Chairman of the TRAN Committee of the European Parliament, stated that the cross-border use of longer (not heavier) vehicles was lawful for journeys crossing one single border between two Member States that allow such longer vehicles on their territories if the derogation conditions were met, as it would not significantly affect international competition.

As regards the number and effectiveness of controls of overloaded HDV, the W&D Directive requires that Member States carry out in each calendar year an appropriate number of checks on the weight of vehicles or vehicle combinations in circulation, proportionate to the total number of vehicles inspected each year in its territory. However, the Directive does not specify what can be considered "proportionate" and does not oblige Member States to notify the total number of HDVs inspected each year, which would enable to assess whether the share of controls on the maximum weights in the total number of controlled vehicles is proportionate. The biennial implementation reports reveal that there are huge discrepancies between Member States as regards the number of controls of weight of HDVs carried out every year, ranging from 5.2 million and 3 million (in 2020, in Ireland and Poland, respectively) to 370 and 700 controls (in 2020, in Latvia and the Netherlands, respectively). The effectiveness of those controls of compliance (detection rate calculated as a percentage of detected overloaded vehicles in total number of vehicles controlled) also differs vastly, ranging from 73% and 45% (in 2020, in Estonia and in Belgium, respectively) to 0.2% and 1% (in 2020, in Poland and Sweden, respectively). These differences in performance of compliance checks undermine the harmonisation and internal market objectives of the Directive, leading to uneven competition, as companies in countries with lax enforcement may gain an unfair advantage over those in countries with stricter and more effective enforcement.

Additional information on problem analysis

The relative importance of the three identified problems (low uptake of zero-emission HDVs, fragmentation of the market for longer and heavier vehicles, and ineffective and inconsistent enforcement of transport rules for HDV) vary in the context of the underperformance of the Directive.

Low uptake of zero-emission (ZE) HDVs and of energy-saving solutions have multiple underlying causes, among which the Directive's deficiency has a limited contribution. The Directive focuses on the demand side of the ZE HDV market, but it fails to provide sufficient incentives for the sector to encourage the investment in zero-emission technologies, such as sufficient weights or dimensions to compensate the weight and/or size of the technology and ensure at least the same loading capacity as conventional fossil fuel HDVs. There are numerous other causes of the low uptake of zero-emission vehicles (ZEV), both on supply and demand side, which cannot be attributed to or solved by the revision of the Directive. As regards the low uptake of energy-saving solutions, such as aerodynamic devices and cabs, their deployment was dependent on the adoption of the type-approval legal framework, which effectively started applying only since 2020. Hence, this part of the problem does not stem directly and entirely from the Directive.

The other two problems, fragmentation of the market for longer and heavier vehicles and ineffective and inconsistent enforcement, result greatly from the deficiencies of the Directive. Unclear and missing provisions of the Directive led to the patchwork of national rules and requirements, diverging interpretations and control practices. The inconsistent enforcement (strict controls and sanctions in some Member States and lenient in others) results from the lack of mandatory level of controls and minimum common control requirements. These are the main causes of the Directive's underperformance with regard to its objectives of ensuring free and efficient movement of goods and fair competition. These are also sources of potential risks to road safety and damage to infrastructure.

As to the comprehensiveness of the problem analysis, it must be noted that the identified problem drivers focus only on those aspects that stem directly from the deficiencies of the Directive and which can be addressed entirely (e.g. through adapting the technical standards, clarifying the rules for cross-border operations, strengthening enforcement requirements) or partially (e.g. by providing incentives for ZEV and energy-saving solutions) by the revision of the Directive. There are other issues, independent from the

Directive, that contribute to the Directive's overall underperformance in achieving decarbonisation and harmonisation objectives. The low uptake of zero-emission vehicles for freight transport is also due to: higher Total Cost of Ownership (TCO) compared to conventional vehicles, low availability of recharging/refuelling infrastructure, long duration of charging, limited range of vehicles, lack of ZEV offer. Those issues are being addressed by other initiatives, such as the 'Fit for 55' initiatives, in particular, the Alternative Fuel Infrastructure Regulation (AFIR), the Eurovignette and the proposed revision of the CO_2 standards Regulation for HDVs. The external factors contributing to challenges with harmonisation include: economic considerations (e.g. stakeholders prioritize cost-effectiveness, profitability, and competitiveness), safety concerns (stakeholders have differing perspectives on the safety implications of longer and heavier vehicles), technological challenges (availability, affordability, and maturity of zero-emission HDV technologies and supporting infrastructure), national interests and specificities (e.g. types of key industrial sectors, transport infrastructure capacities)

The revision of the Directive is not the right tool to address those external aspects, therefore they are not included in this impact assessment analysis.

2.3. How likely are the problems to persist?

Without EU action the issues related to the current technical standards that are not adapted to the needs of ZE HDVs and do not sufficiently promote intermodal operations are likely to persist.

The road sector is composed mainly of SMEs[91]. Hauliers in the hire and reward market are often price takers rather than price makers for highly competitive work that yields low profit margin (1-3%)[92]. The IRU's Market Analysis report of 2021 found that small companies with fewer than 10 employees had an average net profit margin of just 0.7% in 2020, while larger companies with more than 50 employees had an average net profit margin of 3.5%[93].

While the Impact Assessment supporting the revision of CO_2 HDV standards Regulation showed that, also for SMEs[94], the fuel savings outweigh the increased capital costs of the vehicles, it is crucial, notably for SMEs, that profits are not negatively affected by the reduced payload for this to happen. The uptake of aerodynamic devices and energy-saving technologies is expected to be driven by the road toll discounts (possible under the Eurovignette Directive) received on the basis of mandatory energy efficiency certification of box shaped trailers[95.] and the uptake of ZE HDV[96], as better aerodynamics increase the

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[91] According to Eurostat data 99% of all companies providing road transport services are SMEs (as defined by Commission Recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises - OJ L 124, 20.5.2003, p. 36–41-, i.e. enterprises employing up to 250 people and with a turnover of less than €50 million). According to IRU 80% of companies operating commercial transport (including passenger cars professional services as taxis, rent a car, etc.) in the EU are SMEs and 30% of commercial road transport companies hold no more than 25 vehicles in their fleet.

[92]Multiple sources: Commission report: *An Overview of the EU Road Transport Market in 2015. Task A - Collection and Analysis of Data on the Structure of the Road Haulage Sector in the European Union*; Commercial Motor, 17 February 2020;

[93] IRU Market Analysis report, 2021;

[94] The SMSs analysis took into account both: the increased capital costs (due to higher interest rate) and the fact that smaller companies value less future (energy) savings. It showed that the TCO is positive also for micro enterprises.

[95] Commission Implementing Regulation (EU) 2022/1362.

[96] According to the EU funded AEROFLEX project "*innovations reduce the energy need for the complete vehicle combination: less energy need means more range with the same battery capacity and/or fuel cell in the pulling unit or the same range with a smaller battery and/or fuel cell*". https://aeroflex-project.eu/wp-content/uploads/2021/10/AEROFLEX_D6.6-Final-technical-assessment-results-CO-PUBSUM.pdf

autonomy range of ZEV. Intermodal transport is likely to remain partially disadvantaged (in terms of payload) compared to 44t HDVs allowed in national transport[97] and reduce the effectiveness of the revision of the Combined Transport Directive.

The rising costs of fuel and increasingly stringent measures to reduce CO_2 emissions from road transport (e.g. in the forms of fuel taxes and the ETS) as well as the scarcity of professional drivers will intensify the already fierce competition between hauliers in the road transport sector. In search for savings, the operators would likely resort to alternatives with lower costs of capital than ZEVs, such as the use of biofuels, which are the preferred option for many road transport operators[98], as well as to increase the loading capacity of trucks to the maximum extent possible.

In the absence of EU action and changes to the legal framework, the fragmentation of the market will intensify. Diverging national rules and bilateral agreements will continue to be adopted among Member States, as already announced by some Member States, to address specific circumstances and to improve the operational and economic efficiency of road transport as well as cope with the shortage of professional drivers.

As regards the effectiveness of controls, some improvements can be expected thanks to gradual deployment of weigh-in-motion systems in all Member States and, to a lesser extent, of systems allowing the direct enforcement of the weight rules. However, the level of enforcement will vary from Member State to Member State and the compliance with the rules on maximum weights and dimensions will continue to be subject to interpretation by the national authorities, and to the willingness of Member States to enforce the rules in international (intra-EU) transport. Without providing legal clarity on the rules applicable to cross-border operations by certain vehicles and the increase in effectiveness of enforcement, the number of overloaded vehicles on the EU roads may further increase causing quicker road wear, endangering road safety and distorting competition.

The analysis incorporates throughout all its dimensions relevant *foresight tools*. It does so to anticipate trends and issues that may affect the initiative and build a robust, future-proof evidence base for its likely impact. The megatrend "climate change and environmental degradation"[99] is relevant for the problem related to the low uptake of zero-emission heavy-duty vehicles and energy saving technologies and schemes. According to the 2022 Strategic Foresight Report[100], the aspect of "enabling a greener transport sector with digital technologies" is one of the areas where the twinning of the green and digital transitions is expected to have a major effect. It is particularly relevant to the challenges linked to the continuously growing population, increasing consumer awareness, evolving costs of sustainable transport options and new supply chain business models affecting the transport sector. This has been duly taken into account in the analysis presented in the following sections.

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[97] Only France has adopted measures to (partially) compensate for the loss payload of containerised transport via the adoption in July 2022 of a Decree (Décret n° 2022-1045) to increase the maximum weight of trucks involved in combined transport from 44t to 46t as part of an 18 months experiment.

[98] Among others Accelerating the decarbonisation of road transport through the faster update of alternative fuels, IRU position paper 12 November 2020, and UPS, Delivering sustainable logistics and smart recharging, 14 September 2022.

[99] https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en

[100] COM(2022) 289 final.

3. WHY SHOULD THE EU ACT?

3.1. Legal basis

Title VI (Transport, Articles 90-100) of the Treaty on the Functioning of the European Union (TFEU) establishes the EU's right to act in the area of transport. Article 91(1)(a) of the TFEU provides that the Union has competence in the field of transport to lay down common rules applicable to international transport between the EU Member States and Article 91(1)(d) TFEU provides the same competence to adopt any other appropriate provisions in the transport policy area.

3.2. Subsidiarity: Necessity of EU action

The on-going deepening of the EU Internal Market together with the liberalisation of the road freight transport market have increased cross-border trade and the transnational dimension of the road transport services. To facilitate cross-border operations by HDVs while ensuring fair competition and road safety on the EU internal market, the EU has already adopted legislation – Directive 96/53/EC – setting the limits as to the size and weights of the HDVs used in such operations. At the same time, in line with the subsidiarity principle, the Directive safeguards the right of each Member State to allow the circulation of bigger and/or heavier vehicles on its own territory according to their geographical and economic specificities, such as industry needs, transport infrastructure, availability and capacity of other transport modes, etc.

While the Directive represents a step forward in the process of harmonisation of certain technical standards of the HDVs circulating on the EU roads, the deficiencies of the Directive identified during the evaluation, result in diverging interpretations and applications of the rules and inefficient and inconsistent controls of compliance performed by Member States. A growing patchwork of national technical, administrative and control requirements go against the policy goal of achieving a Single European Transport Area that should ease the movements of citizens and freight, reduce costs and enhance the sustainability of European transport. EU action is necessary to remove these unnecessary barriers to efficient, fair and sustainable transport operations on the EU internal market. It is for the same reason necessary to provide legal certainty and to ensure the compliance with the rules applicable in cross-border transport, in particular as regards HDV exceeding the maximum weights and dimensions set in the W&D Directive as allowed in national traffic.

In addition, the Directive has proven ineffective in boosting the uptake of alternative fuels and energy saving technologies and only partially effective in promoting intermodal transport. In the context of emerging technological developments in the automotive industry and new EU targets on decarbonisation of transport sector as a whole, it is necessary to take further EU actions to incentivise and accelerate the deployment of zero-emission HDVs, improve compatibility with other modes of transport and contribute to the EU greening objectives.

The revision of the Directive does not affect the possibility for Member States to develop solutions according to local circumstances and for operations on national territories.

The public consultation revealed that 93 respondents out of 125 fully agreed that EU action is essential to the effective cross-border cooperation, to ensure the smooth functioning of the internal market and to improve the environmental performance of the transport sector.

3.3. Subsidiarity: Added value of EU action

The evaluation of the Directive confirmed its added value by establishing EU standards for weights and dimensions of HDVs used in cross-border operations. It has also revealed the Directive's deficiencies, including legal loopholes and ambiguities, standards not adapted to the technological progress, hampering the use of the latest decarbonisation technologies and improving efficiency of cross border transport.

A lack of coordinated EU action would translate into the need for Member States to act individually and to reach bilateral agreements, leading to a risk of further market fragmentation due to the diversity of national rules. Market fragmentation would potentially translate into competitive distortions and discriminatory control practices. It would also weaken the incentive to deploy zero-emission vehicles and energy efficient technologies to the overall EU market. Furthermore, while public financial support plays a role to promote the market uptake of zero-emission vehicles, they differ among Member States, some of which may not adopt them at all, and they would not provide with the necessary stability and irreversibility for a long-term business case that would allow strategical planning for road transport operators and HDV manufacturers.

Overall, initiatives at the national, local and sectoral level will not be sufficient or adequate to address the identified EU-wide problems and their underlying drivers and to deliver on decarbonisation targets set at the EU level.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1. General objectives

The general objectives of this initiative are to improve the energy and operational efficiency of road transport operations in the broader context of increased EU environmental and climate ambition by 2030 and EU climate neutrality by 2050 (i.e., achieve net zero GHG emissions by 2050) and to ensure the free movement of goods and fair competition on the internal road transport market.

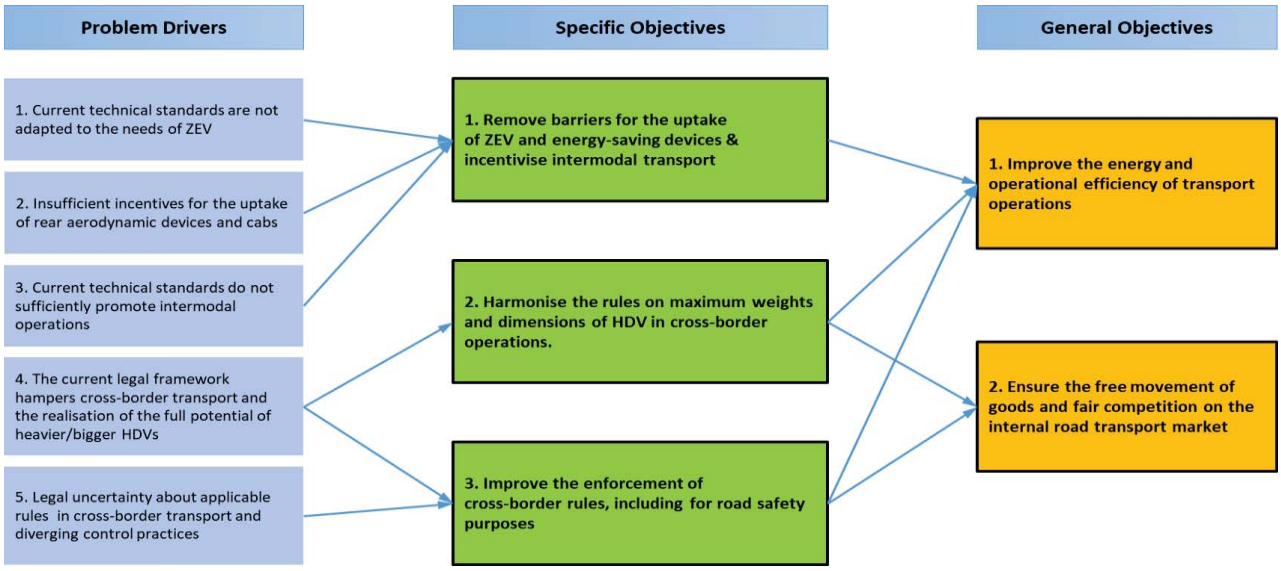
4.2. Specific objectives

The specific objectives of this initiative are threefold:

1. To remove barriers for the uptake of ZEV and energy-saving devices and incentivise intermodal transport.
2. To harmonise the rules on maximum weights and dimensions of HDV in cross-border operations.
3. To improve the enforcement of cross-border rules, including for road safety purposes.

These objectives must be achieved while safeguarding the balance between the requirements of infrastructure maintenance, road safety and the reduction of the GHG and pollutant emissions from the transport system. The connection between problem drivers, specific objectives and general objectives is presented in Figure 10.

Figure 10: Correspondence between the problem drivers and the specific objectives



The first specific objective is related to the EU Green Deal goals. It reflects the need to remove the existing technical and economic barriers to facilitate and speed up the uptake of the "greening measures" (ZEVs, energy-saving technologies and intermodal transport). It addresses problem drivers 1, 2 and 3 by providing clear incentives and/or requirements for road transport operators to improve energy and operational performance of transport operations including through enhanced modal cooperation.

The second objective is related to the policy goal of achieving the EU Single Market and addresses problem driver 4. This specific objective will provide an adequate, stable and enforceable regulatory framework for more efficient and more sustainable transport operations by bigger and/or heavier HDVs. More efficient road transport operations by such vehicles will also contribute to economic growth and bring environmental and social benefits including by reducing the number of vehicles and drivers needed to carry the same amount of cargo.

The third specific objective relates to a general EU goal of effective enforcement and uniform application of the EU law. It addresses problem driver 5 and is closely linked with the specific objective 2 to harmonise and streamline the rules to be enforced. It will step up enforcement by providing for better, more targeted, more efficient and consistent controls of compliance. This serves the general objective of ensuring fair conditions of competition and ensures road safety and the protection of the infrastructure.

The specific objectives will also contribute towards the Sustainable Development Goal SDG 13 ("Take urgent action to combat climate change and its impacts") and SDG 3 ("Ensure healthy lives and promote well-being for all at all ages").

5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1. What is the baseline from which options are assessed?

The EU Reference scenario 2020 (REF2020) is the starting point for the impact assessment of this initiative. The REF2020 takes into account the impacts of the COVID-19 pandemic that had a significant impact on the transport sector. More detailed information about the preparation process, assumptions and

results are included in the Reference scenario publication[101]. Building on REF2020, the baseline has been designed to include the initiatives of the 'Fit for 55' package proposed by the Commission on 14 July 2021[102] and the initiatives of the RePowerEU package proposed by the Commission on 18 May 2022[103]. The baseline scenario factors in the proposals for a revision of the HDV CO_2 standards Regulation[104] and the new Euro 7 standards[105] as well as other initiatives being part of the Road Safety Package[106]. The baseline scenario assumes no further EU level intervention beyond the current W&D Directive. More details on the baseline are provided in Annex 4[107].

The baseline also incorporates foresight megatrends[108] and developments captured in the 2022 Strategic Foresight Report[109]. Among others, it captures the trend of increasing demand for transport as population and living standards grow as well as the links between the digital and green transition. In particular, the projected transport activity draws on the long-term population projections from Eurostat and GDP growth from the *Ageing Report 2021*[110] by the Directorate General for Economic and Financial Affairs.

In the baseline scenario, EU transport activity is projected to grow post-2020, following the recovery from the COVID pandemic. Road transport would maintain its dominant role within the EU by 2050. Buses activity (expressed in passenger-kilometres) is projected to grow by 13% between 2015 and 2030 (42% for 2015-2050). For freight, heavy goods vehicles activity (expressed in tonne-kilometres) is projected to go up by 30% by 2030 relative to 2015 (57% for 2015-2050). The activity of heavy goods vehicles above 32 tonnes would grow at slightly slower pace, by 27% by 2030 relative to 2015 (47% for 2015-2050). Rail transport activity is projected to grow significantly faster than for road, driven in particular by the completion of the TEN-T core network by 2030 and of the comprehensive network by 2050, supported by the CEF, Cohesion Fund and ERDF funding, but also by measures of the 'Fit for 55' package that increase to some extent the competitiveness of rail relative to road and air transport. Passenger rail activity is projected to go up by 24% by 2030 relative to 2015 (67% for 2015-2050). Freight rail traffic would increase by 42% by 2030 relative to 2015 (91% for 2015-2050)[111]. Congestion costs would increase by about 14% by 2030 and 32% by 2050, relative to 2015. Congestion on the inter-urban network would be the result of growing freight transport activity along specific corridors, in particular where these corridors

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[101] https://energy.ec.europa.eu/data-and-analysis/energy-modelling/eu-reference-scenario-2020_en
[102] COM(2021) 550 final.
[103] COM(2022) 230 final.
[104] COM(2023) 88 final.
[105] COM(2022) 586 final.
[106] Proposal for a Directive amending the Driving Licence Directive, proposal for a Directive amending the Cross-Border Enforcement Directive and proposal for a Directive on the Union-wide effect of certain driving disqualifications.
[107] The baseline scenario does not consider the forthcoming revision of the Combined Transport Directive, the rail capacity initiative and the CountEmissions EU initiative. It should be noted that including the proposed revision of the Combined Transport Directive in the baseline would lead to higher uptake of intermodal transport. Thus, the policy options would result in somewhat lower reduction in external costs of transport relative to the baseline, and thus somewhat lower net benefits. This is however not expected to result in a change in the ranking of the policy options.
[108] https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en#explore
[109] COM(2022) 289 final.
[110] doi:10.2765/733565.
[111] The Sustainable and Smart Mobility Strategy uses 2015 as the base year for the milestones on the growth in rail and waterborne transport activity. In addition, due to the COVID-19 pandemics, the lockdowns and all the consequent effects on the transport sector do not qualify 2020 as representative base year. For these reasons, 2015 has also been selected as a base year for showing the growth in road transport activity. Using 1995 as a base year the growth in heavy goods vehicles activity (expressed in tonne-kilometres) is projected at 79% by 2030 relative to 1995 (116% for 1995-2050) in the baseline scenario. For buses, the growth for 1995-2030 is projected at 17% (47% for 1995-2050).

cross urban areas with heavy local traffic.

The share of zero-emission vehicles in the total heavy goods vehicles stock is projected at 5% in 2030, going up to 30% in 2040 and 71% in 2050 in the baseline scenario. In terms of tonne-kilometres, zero-emission heavy goods vehicles are projected to account for 136.8 billion tonne-kilometres in 2030 (around 7% of total tonne-kilometres by heavy goods vehicles), 1,060.7 billion tonne-kilometres in 2040 (around 48% of the total tonne-kilometres by heavy goods vehicles) and 2,147.3 billion tonne-kilometres in 2050 (around 88% of the total tonne-kilometres by heavy goods vehicles).

CO_2 emissions from transport[112] are projected to be 26% lower by 2030 compared to 2015, and 94% lower by 2050. The baseline scenario shows that the emission reductions from the transport sector would contribute towards the ambition of at least 55% emission reductions by 2030 and climate neutrality by 2050, while relying to a significant extent on technological solutions (i.e. the uptake of low- and zero-emission vehicles and of renewable and low carbon fuels) and carbon pricing. This would depart from the balanced approach underpinning the impact assessments accompanying the 'Fit for 55' package and the staff working document accompanying the REPowerEU initiatives[113], showing a combined approach of carbon pricing instruments and regulatory-based measures to deliver on the increased climate ambition[114]. NOx emissions are projected to go down by 56% between 2015 and 2030 (87% by 2050), mainly driven by the electrification of the road transport and in particular of the light duty vehicles segment. The decline in particulate matter (PM2.5) would be slightly lower by 2030 at 53% relative to 2015 (91% by 2050)[115].

Heavy duty vehicles can generate increased wear and tear of infrastructure. In the baseline scenario, the road maintenance costs attributed to HGVs above 32 tonnes are projected to increase from EUR 13.9 billion in 2015 to EUR 15.5 billion in 2030 and EUR 18.9 billion in 2050.

The baseline scenario reflects the projected higher energy prices driven by the Russian invasion of Ukraine[116]. Beyond this aspect, it was however not possible to quantify the impact of the Russian invasion of Ukraine in the context of the baseline scenario, as there is large uncertainty with respect to its impacts, in particular for the medium to long term. While its impact is felt in terms of trade (e.g. grain, bulk fertilizers and hydrocarbons) and in certain geographical areas, the impact on the baseline of this initiative is expected to be relatively limited.

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[112] Including international aviation but excluding international maritime.
[113] SWD(2022) 230 final.
[114] The scenarios underpinning the impact assessments accompanying the 'Fit for 55' initiatives and the staff working document accompanying the REPowerEU initiatives incorporated a broader range of policies (including this initiative) that were represented in a stylised way ahead of the actual proposals, to show the delivery of at least 55% emissions reduction target by 2030 and to account for the interaction with the forthcoming initiatives. Therefore, this initiative contributes towards at least 55% emissions reductions target by 2030 and achieving climate neutrality by 2050.
[115] The baseline projections are quantified with the PRIMES-TREMOVE model, which projects the evolution of demand for passengers and freight transport, by transport mode, and transport vehicle/technology, following a formulation based on microeconomic foundation of decisions of multiple actors. Operation, investment and emission costs, various policy measures, utility factors and congestion are among the drivers that influence the projections of the model. The projections of activity, equipment (fleet), usage of equipment, energy consumption and emissions (and other externalities) constitute the set of model outputs. More details are provided in Annex 4.
[116] SWD(2022) 230 final.

5.2. Description of the policy options

Based on the consultation activities and desk research undertaken in the context of the Impact Assessment[117], the Commission identified a set of individual measures having the potential to address the problem drivers identified in the problem definition in section 2.

The following process was applied for establishing the policy packages: (i) identifying the policy measures which can be discarded based on a first preliminary assessment; (ii) identifying a list of retained policy measures addressing the problems and respective problem drivers; (iii) combining retained measures into policy packages constituting viable policy alternatives for achieving the objectives of the initiative.

5.2.1. Discarded policy measures

Some policy measures considered in the preparatory phase of the impact assessment were discarded based on pre-screening and preliminary assessment of their potential contribution to solving the problems and addressing the problem drivers. These measures include: (i) the mandatory craneability[118] of semitrailers; (ii) mandatory equipping of HDVs with aerodynamic devices; (iii) mandatory equipping of HDVs, exceeding the maximum weights set in the Directive, with on-board weighing (OBW) device. The detailed explanations of the discarded policy measures are provided in Annex 8.

In addition, a simplification of the HDV weights and dimensions regulatory framework based on fit-for-purpose approach has not been considered. First, the issue of weights and dimensions of HDVs is complex and interconnected with various factors, such as road safety, infrastructure capacity, environmental impact, and market competitiveness. Simplifying the regulatory framework while ensuring these aspects are adequately addressed can be very challenging. Secondly, stakeholder interests differ. The weights and dimensions of HDVs involve multiple stakeholders, including manufacturers, transport operators, infrastructure managers, and public authorities. Each stakeholder has specific interests and concerns, which can make it difficult to reach a consensus on a simplified regulatory framework that satisfies all parties involved. Thirdly, there are various technical and operational considerations that have to be addressed. HDVs come in various configurations and are used for different purposes, such as long-haul transport, urban delivery, or specialized operations. Designing a simplified regulatory framework that accommodates these diverse needs and ensures safe and efficient operations can be a considerable challenge.

5.2.2. Retained policy measures

The retained policy measures have been grouped in 3 policy options: policy option A (PO-A), policy option B (PO-B) and policy option C (PO-C). Table 1 provides an overview of the retained policy measures and their links with specific objectives and policy options. A more detailed description of the policy measures is included in Annex 6.

Table 1: Policy options and policy measures

[117] Details on all consultation activities are provided in Annex 2.

[118] Craneability refers to the feature of a vehicle that make it suitable for handling by cranes to move a loading unit (e.g. semitrailer) from road vehicle to pocket wagon or on another mode vehicle. Craneable vehicles usually have reinforced frames and chassis and accessory features such as hydraulic systems and must be compatible with crane type and capacity.

Specific objective	No.	Policy measure	PO A	PO B	PO C
Common policy measures (PMc) to all policy options					
SO1: Remove barriers for the uptake of ZEV and energy-saving technologies & incentivise intermodal transport	**PMc1**	Allow for extra weight and extra length for ZE heavy goods vehicles and 2-axle rigid buses	X	X	X
	PMc2	Allow for extra height to accommodate high-cube containers in intermodal transport	X	X	X
SO2: Harmonise the rules on maximum W&D of HDV in cross-border operations	**PMc3**	Harmonise maximum permitted weight of 5- and 6-axle HDV (40t)	X	X	X
	PMc4	Allow cross-border transport of 44t-HDV and EMS between "allowing" MS	X	X	X
	PMc5	Harmonise the loaded length of vehicle carriers	X	X	X
SO3: Improve the enforcement of cross-border rules, including for road safety purposes	**PMc6**	Reinforced MS obligation to conduct minimum level of checks of HDV's weight	X	X	X
	PMc7	Set common principles for the voluntary implementation of intelligent access policies	X	X	X
Policy measures (PM) assigned to one or two different policy options (PO)					
SO1: Remove barriers for the uptake of ZEV and energy-saving technologies & incentivise intermodal transport	**PM1**	Allow for extra weight for HDV which are ZEVs regardless the weight of the ZE technology used		X	
	PM2	Align definition of intermodal transport with the Combined Transport Directive (to include all intermodal loading units)		X	X
	PM3	Allow international (intra-EU) transport of EMS1[119] at least in core and comprehensive TEN-T network conditioned to be ZEV or part of an intermodal transport operation			X
SO2: Harmonise the rules on maximum W&D of HDV in cross-border operations	**PM4**	Set minimum administrative and safety requirements for the transport of indivisible loads		X	X
	PM5	Set international transport corridors for indivisible loads			X
SO3: Improve the enforcement of cross-border rules, including for road safety purposes	**PM6**	Require a minimum number of Weigh-in-motion systems to be deployed in the TEN-T network		X	
	PM7	Require a minimum amount of "certified" Weigh-in-motion (WIM) systems to be deployed in the TEN-T network for direct enforcement purposes			X
	PM8	Require EMS to comply with higher safety standards for HDV than those provided for in the General Safety Regulation and driver's minimum experience or training			X

5.2.3. Description of policy options

Policy option A

Policy option A (PO-A) includes seven policy measures that are common to all three policy options. The inclusion of the "common" policy measures in all three policy options reflects the extensive feedback gathered from public and private stakeholders related to their needs, as well as to the current practices and experiences reported by Member States and by the private sector. Both public and private stakeholders

[119] EMS1 is a modular combination of standard vehicles (motor vehicle, tractor, trailer, semitrailer), where (typically) the maximum length of the combination is 25.25 m and the weight 60t, depending however on the number of axles.

were supportive of the common policy measures in the context of the stakeholders' consultation process[120].

PO-A guarantees the minimum progress needed to address all problem drivers and specific objectives, ensuring legal clarity and a certain level of harmonisation of rules consolidating current positive practices. Namely, in relation to Specific Objective 1 (SO1: *Remove barriers for the uptake of ZEV and energy-saving technologies & incentivise intermodal transport)*, PO-A seeks to ensure that zero-emission HDVs and intermodal transport are on equal footing compared to diesel trucks and road-only transport in terms of payload capacity and height of high-cube containers, respectively. To do that PO-A allows extra weight and length to accommodate ZE technologies, including in trailers, semitrailers and dollies and in two-axle rigid buses (PMc1), and allows extra height to accommodate for the transport of high-cube containers used in intermodal operations (PMc2).

PMc1 would address the needs identified in problem drivers 1 and 2. It provides for increasing the maximum gross vehicle combination weight (GVCW) up to a maximum of 4 tonnes[121], the maximum axle weight, when necessary, and the maximum length up to 90 cm, in order to compensate for the weight and the size of ZE powertrains (i.e. weight of electric batteries and space for hydrogen tanks) thus preventing the loss of payload. This allowance for ZE HDVs would apply to any zero-emission technology installed in any vehicle, including 2-axle rigid buses, which under current rules are excluded from extra weight allowance for ZE powertrains, and any combination of vehicles (motor vehicle, semi/trailers and dollies). As regards the heaviest vehicle combinations, i.e. those with 5 or more axles, this measure would enable a maximum GVCW of 44 tonnes for HDVs in road-only operations and of 46 or 48 tonnes (depending on the axle combination) for HDVs in intermodal operations. The current legal framework allows already circulation of vehicles with a maximum GVCW of up to 46 tonnes in case of ZE HDV (extra 2 t) involved in intermodal transport operations (extra 4 t). PMc1 as well as the measure PMc2 on increasing the height of HDV to accommodate high-cube containers will address the problem driver 3 by ensuring that the technical requirements of HDVs are compatible with technical standards in

[120] In particular, the extra weight or dimensions to accommodate the ZE technology (and prevent the loss of payload) and allowing 44t HDVs and EMS in operations between Member States allowing those vehicles on their territories have been broadly supported. Among more than 700 contributions in total, around 10% of contributions opposed or not fully supported the higher weights and dimensions of vehicles in cross-border transport. These positions were mainly from rail sector concerned about increased competitiveness of road sector and from few Member States who do not allow heavier vehicles due to the concerns of a damage to infrastructure and risks to road safety. The contributions from multimodal stakeholders showed support to additional weights and dimensions if it benefits intermodal transport. The workshops with Member States (53 participants) and with industry stakeholders (171 participants), organised separately, revealed that both types of stakeholders have the same priorities as regards removing barriers to the uptake of ZE HDVs and to the use of energy and operational efficient vehicles and schemes (EMS). They have voted equally high on increasing the weights and dimensions for ZE HDVs and for allowing EMS and 44t HDVs between allowing Member States or broader, but on the TEN-T network. They have also equally prioritized the need to improve enforcement by increasing the level of controls as well as ensuring that EMS comply with the latest safety standards.

[121] Currently the W&D Directive allows an additional GVW of 2 tonnes for certain ZE HDVs which would be incremented in another 2 tonnes resulting in a potential increased GVW of 4 tonnes.

other modes of transport thus facilitating intermodal operations[122].

To address the Specific Objective 2 (SO2: *Harmonise the rules on maximum W&D of HDV in cross-border operations*), PO-A builds on the current practices regarding the excesses in weights and dimensions that have been tolerated or considered lawful by the Member States, in particular, in cross-border transport of 44-tonnes HDV, European Modular System (EMS) and vehicle carriers. A certain level of harmonisation is provided based on the national rules shared among neighbouring Member States. PO-A offers three measures to address Specific Objective 2: PMc3, PMc4 and PMc5. PMc3 aims to further harmonise the maximum permitted weight of 5- and 6-axle HDV in cross-border transport (set at 40t) by including also 5- and 6-axle rigid trucks in scope of the Directive. PMc4 will allow cross-border transport of 44t HDV (articulated vehicles and road trains) and/or EMS between allowing Member States (i.e. Member States that allow such heavier and/or longer vehicles in national transport). Both measures – PMc3 and PMc4 - will address the problem driver 4 by removing unjustified barriers to using heavier/longer vehicles in cross-border operations between Member States that use such vehicles in domestic operations. PMc5 will introduce a harmonised maximum loaded length of vehicle carriers of 20.75m which will also contribute to solving problem driver 4. This measure will also contribute to the harmonisation objective of the intervention by removing the national divergences as regards the type and length of overhangs allowed.

Responding to Specific Objective 3 (SO3: *Improve the enforcement of cross-border rules, including for road safety purposes*), PO-A improves enforcement by setting a minimum number of controls per million vehicle-km to be performed yearly by Member States as regards compliance of HDVs with the rules on maximum weights (PMc6), corresponding to the median level in the EU. In addition, PO-A provides for a harmonised approach for the voluntary implementation of intelligent access policies[123] based on general principles of accessibility, non-discrimination and interoperability of systems (PMc7). This measure aims to further facilitate efficient enforcement and to prevent a risk of damage to infrastructure and of road safety by some types of heavier and/or longer HDV[124]. These measures will address problem driver 5 and will contribute to stepping up enforcement of the rules in force, providing with a comprehensive

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[122] The W&D Directive sets the maximum authorised height in international (intra-EU) transport at 4m, which requires road transport operators involved in the transport of high-cube containers to resort to special equipment (low skeletal trailers and gooseneck trailers) or to request special permits for indivisible loads (only possible in cases where the road infrastructure can accommodate 4.3m high HDV). Twelve Member States allow higher limits in national transport: Slovenia, Hungary and Slovakia allow a maximum authorised height of 4.2 meters and Finland, France, Ireland, Sweden, Estonia, Italy, Bulgaria, Portugal and Spain allow 4.3 meters or more. PMc2 aims at removing the "legal" limitation to the circulation of HDVs transporting high-cube containers (or swap bodies of equivalent height), without prejudice to the application of road traffic national provisions limiting the maximum height of HDV on certain roads of civil engineering structures.

[123] Intelligent Access Policies (IAP) is an extension of already existing Urban Vehicle Access Regulation. IAP primarily ensures matching the performance and characteristics of a road freight vehicle with the state and capability of specific section of an infrastructure network, i.e. it ensures that the correct vehicles runs on the correct road at the correct time. The IAP concept is tested in some projects like the NORDICWAY project.

[124] Intelligent access policies (IAP) are in their initial stages of conception and testing, which limits PMc7 to the establishment of common general principles to facilitate their harmonised deployment in the future. The actual implementation of IAP would have the potential to facilitate the introduction of a performance-based approach to allowing the circulation of heavier and/or longer HDVs and to facilitate the enforcement of rules. However, it cannot provide support for greening or enable the harmonisation of rules. Therefore, it can only be considered as a complementary measure. At the same time, Member States have opted for the deployment of weighing systems installed in the infrastructure (the so-called weigh-in-motion or WIM systems), as opposed to on-board-weighing equipment to be installed in the vehicle. The WIM systems allow to achieve the same results as the IAP rendering the mandatory deployment of IAP redundant. Hence, IAP are considered to be deployed on a voluntary basis.

framework for the safe and fair circulation of HDVs exceeding the maximum authorised weights and dimensions, including those in support of zero-emission propulsion systems and intermodal transport.

Overall, PO-A is expected to largely contribute to removing the existing regulatory barriers for the uptake of ZE technologies and to indirectly promote the uptake of aerodynamic devices which will render the use of ZE powertrains more efficient (e.g. longer range travelled and longer battery life) by reducing their energy consumption. As regards the harmonisation of the rules, PO-A will sanction existing practices that have proven successful in several Member States in terms of economic and environmental benefits. This policy option will only partially address the fragmentation of the market, given that not all Member States allow any excesses in weights and dimensions in national transport, leaving a variety of rules that would also pose a challenge in terms of enforcement in cross-border operations. The barriers to the development of intermodal transport would also be partially eliminated. This policy option will ensure a common minimum level of enforcement to check maximum permitted weights (total and per axle) and support the voluntary implementation of innovative enforcement tools in a harmonised way, as overload of vehicles is one of the most common infringements and has a direct impact on competition, road safety and damage to road infrastructure.

Policy option B

Policy Option B (PO-B) includes all seven common policy measures and additional ones providing further incentives for the deployment of ZE HDVs, encouraging intermodal transport, more harmonisation in terms of administrative requirements for specific cross-border operations requiring permits and more requirements related to enforcement.

In PO-B, in relation to specific objective 1, support to greening goes further than in PO-A by offering a competitive advantage to road operators using ZEV or being involved in intermodal transport (i.e. by considering lorries, trailers and semitrailers as intermodal transport units). In addition to the common policy measures discussed above, PO-B will address SO1 by two measures. PM1 will allow a fixed 4 extra tonnes for HDV which are ZEV, irrespective of the ZE powertrain technology used, thus addressing problem driver 2. While maintaining the same maximum GVW as in PO-A, this policy measure will incentivise investment in the newest technologies that will become lighter/smaller allowing for gains in payload. Those Member States which already allow the circulation of HDV of up to 44 tonnes will be allowed to continue to do so during a transition period also in cross-border traffic, as enabled by PO-A[125].

PM2 will address problem driver 3 by aligning the definition of intermodal transport in the W&D Directive with the Combined Transport Directive in order to consider semitrailers as intermodal transport units (now limited to containers and swap bodies)[126]. As a consequence, HDVs for which trailers or semitrailers are used for intermodal operations would benefit from 4 additional tonnes of payload as there

[125] PM1 will limit the possibilities granted under PMc4 as regards the circulation of 44-t HDVs in cross-border transport after the transition period, which will only be possible if they are zero-emission or, as it is the case under the current legal framework, involved in intermodal transport. PO-B will also maintain the possibility to cumulate the extra weight of the zero-emission technologies (4 tonnes under PM1) to the additional allowance granted to HDVs involved in intermodal transport.

[126] Under the W&D Directive, HDVs involved in intermodal transport 5/6-axle articulated vehicles and road trains are granted an additional GVW of 2 tonnes or 4 tonnes, reaching up to 42 tonnes or 44 tonnes, depending on the axle configuration. PM2 will allow the same extra weight also for intermodal (non-containerised) transport where lorry, trailer, semi-trailer are the intermodal loading units. When the heaviest vehicle combinations involved in intermodal transport are zero-emission they also benefit from the extra weight allowance envisaged in PM1. PO-B will thus result in a maximum weight of the heaviest vehicle combinations used in intermodal transport of 48 tonnes if they are ZEV.

is no weight of empty containers or swap bodies to be compensated. This extra weight allowance will cover also compensation for the weight of craneable semitrailers, which is estimated between 200 kg and 1 tonne[127]. To verify whether the transport loading unit was/will be used in intermodal operation, controllers can currently check a consignment note (CMR[128]) in combination with evidence of reloading, from other modes operators[129]. These controls will be facilitated by the implementation of eFTI (Electronic Freight Transport Information) Regulation[130] as operators will be able to record all the freight transport data in a digital format in a certified eFTI platform prior to an operation, and authorities would have access to this data for control purposes.

In relation to specific objective 2, PO-B goes further than PO-A by providing for limited harmonisation of the market sector of indivisible loads, where a first step was made with the adoption of the Best Practice Guidance for Abnormal Transport. PO-B will address SO2 and contribute to solving problem driver 4 by adding a measure (PM4) on harmonisation of the requirements and procedures for issuing permits (currently subject to different national rules) for performing transport of indivisible load requiring longer HDVs. The measure envisages the implementation of the one-stop-shop concept, at national level, for the submission of applications for national permits at a single national location and the use of digital documents. Public administrations where the one-stop-shop is not yet implemented will have to adapt their national procedures to handle permission requests. The use of a digital document, namely the introduction of a common abnormal road transport registration document at EU level, could be done in two stages. The first stage would be the mutual acceptance between Member States of existing abnormal road transport registration documents. The second stage would be to agree on the SERT document and its utilisation by the EU permit granting authorities.

Finally, to address SO3 and contribute to solving problem diver 5, PO-B imposes a minimum amount of Weigh-in-Motion (WIM) systems to be deployed by Member States on the TEN-T network (every 300 km) for targeting controls[131] (PM6). This measure will also entail an assessment of the most adequate locations within the TEN-T network to install such systems. This measure aims to further enhance the efficiency and effectiveness of controls and contribute to improving compliance.

Policy Option B is expected to further increase the greening impact of the intervention, by providing additional incentives (e.g. potential extra payload to the deployment of ZEV). The aim is to incentivise the uptake of ZEV as well as of aerodynamic devices and cabs which will allow lighter technologies by reducing the energy consumption and increasing the vehicle autonomy (range between the charging/refuelling points). This policy option will further facilitate intermodal transport operations in which semitrailers are used as intermodal loading units, remove current fragmentation of the market for the transport of indivisible loads and strengthen enforcement via more targeted controls.

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[127] Position paper from the Austrian Federal Economic Chamber (WKO) "Creating favourable framework conditions for businesses on the way to decarbonisation of the transport sector", from September 2022.

[128] Although CMR is the document containing information about the carriage by road, it contains a section where the details about successive carriers should be added as well as carrier's reservations and observations on taking over the goods.

[129] It is a common practice that a train company issues a confirmation that semitrailer has been loaded/unloaded in order to determine the moment when responsibility passes form one operator to another.

[130] Regulation (EU) 2020/1956.

[131] MS are currently obliged to deploy WIM systems in the infrastructure to, at least, detect HDV that could be overloaded. MS are free to decide where and how many WIM systems can be installed in any part of to install.

Policy Option C

PO-C includes all seven common policy measures, two measures (PM2 and PM4) from PO-B and four additional measures. Altogether, this policy option is the most ambitious in terms of decarbonisation, harmonisation and enforcement efforts.

PO-C will strengthen SO1 by one additional measure - PM3 which will allow international operations (intra-EU) by EMS1 (of up to 25.25m long and 60 tonnes of GVCW), at least on the core and comprehensive TEN-T network, under the condition that they are ZEV or involved in intermodal transport operation. PM3 will thus address problem drivers 2 and 3. The verification of the intermodal nature of the operation, will be facilitated by certified eFTI platforms containing all data related to the cargo and its movements, including transport modes used through the entire transport operation chain. An assessment of the TEN-T network by Member States will also be necessary, in particular to ensure the manoeuvrability and visibility of EMS at critical infrastructure points, such as roundabouts, and the suitability of the network to bear the increased weight of the vehicle combinations. This assessment could take advantage of the gap analysis conducted under EU Action Plan on military mobility, as military transport share many of the critical aspects with EMS. Those Member States which already allow the circulation of non-ZE EMS would be allowed to continue to do so during a transition period in cross-border traffic, as enabled by Policy Option A.

PO-C will further contribute to SO2 by setting "abnormal transport corridors" for indivisible loads (PM5) thus addressing problem driver 4. With this measure abnormal transport (carriage of indivisible loads) would be allowed within those corridors, including crossing borders, without the need for national permits.

Finally, to address SO3, PO-C proposes two measures that contribute to solving problem driver 5. PM7 will require a minimum amount of certified Weigh-in-motion (WIM) systems to be deployed in the TEN-T network (every 300 km) allowing for automated enforcement (from detecting the overweight vehicles to automatically issuing a penalty or alerting authorities for further action). The certified WIM systems will significantly increase their effectivity (controls could be performed 24h/7d) by reducing the need for additional resources (certified secondary scales and enforcement officers at the site) and replacing random ineffective roadside controls. The measure will increase the cost of the systems and require their certification and regular calibration. This policy measure is directly related to PM3, allowing EMS in the TEN-T network, and to PM5 requiring setting international abnormal transport corridors primarily on the TEN-T network. PM8 will require EMS to comply with higher safety standards for HDV than those provided for in the General Safety Regulation, such as a minimum power engine or side-warning devices. It will also require that drivers of EMS have a minimum number of years of experience driving HDV for which an EC driving licence is required or completing a specific training course for EMS drivers. This policy measure is directly related to PM3.

While the cross-border transport of EMS is envisaged in all policy options via PMc4, it is limited to traffic between those Member States that already allow them. These "allowing" Member States have tested EMS and assessed their impacts in terms of road safety, infrastructure protection and modal cooperation and they have reported, among others, that the use of EMS leads naturally to the renewal of the fleet (operators tend to acquire new vehicles to be used in EMS combinations), which brings safety improvements due to more modern vehicles, and that operators also employ their best and most experienced drivers to drive EMS.

Building on PO-A and PO-B, Policy Option C aims to bring higher operational efficiency of road transport and higher environmental benefits, in particular, by allowing for a wider use of EMS at EU level and by linking them with ZE technologies and/or intermodal operations. PO-C will thus provide a higher level of harmonisation and environmental performance. Road safety and better enforcement of the rules in

force are also addressed for these vehicles, with more stringent conditions related to the vehicle specifications and to driver's experience.

6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

This section summarises the main expected economic, social and environmental impacts of each policy option[132]. The proposed measures included in the policy options are assumed to be implemented from 2025 onwards, so the assessment has been performed for the period 2025-2050 and covers EU27. Costs and benefits are expressed as present value over the 2025-2050 period, using a 3% discount rate. Further details on the methodological approach are provided in Annex 4.

6.1. Economic impact

The assessment of the economic impacts includes the costs and benefits which the various policy options entail for public administrations, the European Commission and road transport operators. In addition, this section covers the impacts on the functioning of the internal market and competition, SMEs and competitiveness, and digital by default.

6.1.1. Impact on public administrations

All policy options are expected to lead to adjustment costs, administrative costs and adjustment costs savings for national authorities. In addition, PO-B and PO-C are also expected to result in administrative costs savings. Each category of costs/costs savings is discussed below (see also Table 2 to Table 4), while a detailed analysis including the estimates and the assumptions used for deriving the costs and costs savings for each policy measure included in each policy option is provided in Annex 4.

Adjustment costs for Member States administrations. The recurrent adjustment costs for MS administrations in 2030, 2040 and 2050 relative to the baseline are provided in Table 2, while the one-off costs are shown in Table 3**Error! Reference source not found.**. In terms of recurrent costs, PO-A is estimated to result in the lowest additional costs among the options (EUR 46.6 million in 2030 going down to zero up to 2050) relative to the baseline. These costs relate to the maintenance of road infrastructure, due to the extra weight allowance for ZEV in PMc1 (included in PO-A). They are projected to decrease over time due to the improvement in technology, leading to the reduction of the weight of the batteries, and the lower number of trips required for transporting the same amount of cargo. It should also be noted that in PMc1, the purpose of the extra length and weight for ZE technologies is only to prevent the loss of payload capacity and/or range in comparison with diesel vehicles. The recurrent adjustment costs are higher in PO-C (EUR 50.3 million in 2030 and EUR 3.7 million in 2050), which in addition to the maintenance costs for road infrastructure due to PMc1 also includes the recurrent costs for the calibration of the Weigh-in-Motion (WIM) systems (PM7). PO-B shows the highest recurrent adjustment costs among the options (EUR 71.6 million in 2030 and EUR 547.5 million in 2050), relative to the baseline, driven by the combined effect of PMc1 and PM1. It should be noted that in PM1 the extra weight for HDV which are ZEV is granted regardless of the weight of the ZE technology used and thus the impact on maintenance costs of road infrastructure, as explained in Annex 4, is estimated to be significantly higher.

[132] The analysis in this section is based on TML et al. (2023), *Impact assessment support study for the revision of the directive on weights and dimensions of heavy-duty vehicles*, and on the analysis of stakeholders' feedback.

In addition, PO-A is estimated to result in one-off adjustment costs (see Table 3) of EUR 10.5 million for updating the inventory of bridges and tunnels (PMc2). In PO-B, in addition to the costs related to updating the inventory of bridges and tunnels, one-off adjustment costs are expected for the implementation of the one-stop-shop principle at national level (PM4) and the deployment of Weigh-in-Motion (WIM) systems every 300 km in the TEN-T network (PM6). Thus, total one-off adjustment costs in PO-B are estimated at EUR 102.7 million. PO-C shows the highest one-off adjustment costs relative to the baseline (EUR 7.7 billion), mainly due to the adaptation costs for infrastructure and reinforcement costs for bridges in PM3[133].

Expressed as present value over 2025-2050, total adjustment costs for Member States administrations are estimated at EUR 446.6 million in PO-A, EUR 4.3 billion in PO-B and EUR 8.3 billion in PO-C relative to the baseline (see Table 4). Over 95% of total adjustment costs for Member States administrations in all policy options relate to maintenance and reinforcement of road infrastructure.

Administrative costs for Member States administrations. PO-B and PO-C are estimated to lead to recurrent administrative costs (EUR 0.9 million per year from 2025 onwards) driven by the maintenance and management of the one-stop-shop systems at national level for the submission of applications and the Special European Registration of Trucks and Trailers (PM4 in both PO-B and PO-C)[134]. In PO-A, the recurrent administrative costs (EUR 39.1 million in 2030 and EUR 48.7 million in 2050) are driven by the

[133] As explained in Annex 4 (section 3), the need for adapting specific elements of the infrastructure will be the outcome of inspections. A number of Member States (SE, DK, DE) have already undertaken such inspections. Based on this information, the adaptation costs per km of the road infrastructure to the dimensions of EMS (e.g. upgrading of roundabouts, adaptation of acceleration and deceleration lanes to enter and exit a motorway and provision of adequate parking spaces) was estimated at EUR 10,000 per km. The analysis for Germany was used as starting point. By extrapolating to all the affected Member States, the one-off adjustment costs are estimated at EUR 727 million. In addition, the one-off adjustment costs for the reinforcement of bridges are estimated at EUR 6.9 billion, drawing on a study by TML et al. (Effects of adapting the rules on weights and dimensions of heavy commercial vehicles as established within Directive 96/53/EC). Thus, the total one-off adjustment costs for public authorities are estimated at EUR 7.6 billion for PM3.

[134] As explained in Annex 4 (section 3), the introduction of the one-stop-shop concept will require national procedures to be adapted to handle permission requests across all authorities involved within each Member State. Each Member States shall appoint a single authority to handle the permission request. The single authority will also be in charge of internally involving other national or regional competent authorities. The application process will be digital by default, and therefore PM4 shall be based on an IT tool. The development of the IT tool and the implementation phase will entail one-off costs. According to the Better Regulation toolbox, these one-off costs for the IT tool are classified as adjustment costs and explained in detail in Annex 4, including detailed costs per Member State. Recurrent annual maintenance costs for the IT tools and management of the systems are also to be expected and are classified under administrative costs in line with the Better Regulation toolbox. Based on a study by COWI and TRT (COWI and TRT (2021), Study on Implementation of the Weights and Dimension Directive), the recurrent annual costs related to the maintenance and management of the systems are estimated at 5% of development costs. These refer to additional costs with respect to the baseline. The countries with (partial) systems in place were already incurring some maintenance costs. This is why the additional maintenance costs are assumed to be proportional to the additional development costs. The additional costs are thus estimated at EUR 0.9 million per year from 2025 onwards.

obligation to conduct a minimum level of checks on HDV's weight (PMc6)[135]. In addition, in PO-C one-off administrative costs for inspections will be needed to assess the suitability of the infrastructure to accommodate EMS[136]. Total administrative costs, expressed as present value over 2025-2050 relative to the baseline (see Table 4), are estimated to be the highest in PO-A (EUR 762.7 million), followed by PO-C (EUR 25.4 million) and PO-B (EUR 16.4 million).

Administrative costs savings for Member States administrations. PO-B and PO-C are also expected to result in administrative costs savings for Member States administrations. The implementation of the one-stop-shop systems at national level is estimated to lead to costs savings for processing the permit requests by public authorities (PM4) in both PO-B and PO-C (EUR 81.5 million in 2030 and EUR 64.1 million in 2050, relative to the baseline). In addition, in PO-B the non-certified WIM systems are expected to considerably increase the effectiveness of controls for pre-identifying the HDVs that are likely to be overloaded, although some manual/roadside checks would remain necessary. The reduction in the number of manual/roadside checks is estimated to lead to costs savings of EUR 1.1 billion in 2030 and EUR 1.5 billion in 2050 relative to the baseline, considering the combined effect of PM6 and PMc6 in PO-B. In PO-C, the certified WIM systems (PM7) eliminate the need for roadside controls with certified scales in the TEN-T network, where 67% of the circulation of HDVs occurs. PM7 will allow Member States to reach the minimum level of controls envisaged by PMc6 while increasing the ratio of infractions detected and will reduce the administrative costs for public authorities linked to roadside inspections (EUR 1.1 billion in 2030 and EUR 1.5 billion in 2050, relative to the baseline). In addition, setting international transport corridors for indivisible loads (PM5) in PO-C would result in additional costs savings for public authorities due to a reduction in the time for processing the permits (EUR 5.8 million in 2030 and EUR 8.4 million in 2050). Total administrative costs savings, expressed as present value over 2025-2050 (see Table 4), are estimated at EUR 22.8 billion in PO-B and EUR 23.6 billion in PO-C relative to the baseline.

Adjustment costs savings for Member States administrations. The adjustments costs savings for Member States authorities (see Table 2) are related in all policy options to a reduction in the maintenance costs for road infrastructure. This is an effect of a decrease in the number of trips and road transport activity in vehicle-kilometres relative to the baseline, driven by an increase in payload (PMc3, PMc4), the shift from road-only to intermodal transport (PM2, PM3) or the reduction in the frequency and severity of

[135] As explained in Annex 4 (section 3), PMc6 will require public authorities to perform additional tests in the 9 Member States below the threshold of 6.4 weight tests per million vehicle-kilometres (Belgium, Bulgaria, Germany, Estonia, Spain, Finland, Latvia, Netherlands, Poland and Sweden). More details on the Member States above and below the threshold are provided in Annex 4. The evolution of the total number of weight tests over time in the baseline and under PMc6 takes into account the projected transport activity. For instance, in 2025 these Member States will have to undertake 239.2 thousand additional weight tests to reach the threshold, going up to 275.3 thousand in 2030 and 343.3 thousand in 2050. No additional tests are required in the 8 Member States above the threshold (Austria, Denmark, Greece, Ireland, Italy, Luxembourg, Slovenia and Slovakia). In addition, for Cyprus, Czechia, France, Croatia, Hungary, Lithuania, Malta, Portugal and Romania for which there is no information provided on their enforcement activity in compliance with article 10g of the W&D Directive, it is assumed that they meet the EU threshold. Based on the stakeholders' consultation and the REMOVE project (i.e. data was obtained for Croatia, Italy, Finland, Estonia, Poland, Latvia, Malta and Luxembourg. Source: Wermskerken (2005), Project REMOVE work package 4 final report on cost benefit analysis), each weight test is considered, on average, to require one hour for two officers (one hour for each). The cost per check is estimated at EUR 142. Taking into account the additional number of tests required and the cost per test, the administrative costs for public authorities under PMc6 are estimated at EUR 39.1 million in 2030 and EUR 48.7 million in 2050 relative to the baseline.

[136] As explained in Annex 4 (section 3), inspections will be needed to assess the suitability of the infrastructure, to accommodate EMS. In case specific elements of the infrastructure are considered not suitable for EMS circulation, this will lead to the need of reinforcement (discussed under adjustment costs). The inspection costs are estimated at EUR 0.5 million per Member State, for the Member States that currently do not allow EMS. The one-off administrative costs for public authorities due to PM3 are thus estimated at EUR 9 million relative to the baseline.

overloading practices (PMc6, PM6, PM7). The total adjustment costs savings are estimated to be the highest in PO-C (EUR 377.3 million in 2030 and EUR 487.9 million in 2050), followed by PO-B (EUR 154.4 million in 2030 and EUR 188.9 million in 2050) and PO-A (EUR 31 million in 2030 and EUR 38 million in 2050). Expressed as present value over 2025-2050 (see Table 4), the adjustment costs savings for Member States administrations are estimated at EUR 7.5 billion in PO-C, EUR 3 billion in PO-B and EUR 0.6 billion in PO-A.

Net costs savings/net costs for Member States administrations. As shown in Table 2, PO-B and PO-C are estimated to result in net costs savings relative to the baseline in 2030, 2040 and 2050 while PO-A would result in net costs for Member States administrations. Expressed as present value over 2025-2050, PO-C is projected to lead to net costs savings of EUR 22.8 billion and PO-B to net costs savings of EUR 21.5 billion, while PO-A would result in net costs of EUR 0.6 billion relative to the baseline (see Table 4).

Table 2: Recurrent costs and costs savings for public administrations in the POs relative to the baseline scenario (EU27), in 2030, 2040 and 2050, in million EUR (2022 prices)

	Difference to the Baseline								
	PO-A			PO-B			PO-C		
	2030	2040	2050	2030	2040	2050	2030	2040	2050
Adjustment costs	**46.6**	**26.1**	**0.0**	**71.6**	**336.8**	**547.5**	**50.3**	**29.8**	**3.7**
PMc1	46.6	26.1	0.0				46.6	26.1	0.0
PM1&PMc1				67.8	333.1	543.8			
PM3									
PM4									
PM6				3.7	3.7	3.7			
PM7							3.7	3.7	3.7
Administrative costs	**39.1**	**43.7**	**48.7**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**	**0.9**
PMc6	39.1	43.7	48.7						
PM4				0.9	0.9	0.9	0.9	0.9	0.9
Administrative costs savings	**0.0**	**0.0**	**0.0**	**1,186.5**	**1,286.9**	**1,538.5**	**1,226.5**	**1,332.1**	**1,592.4**
PM4				81.5	55.0	64.1	81.5	55.0	64.1
PM5							5.8	7.0	8.4
PM6&PMc6				1,105.0	1,231.9	1,474.3			
PM7&PMc6							1,139.2	1,270.0	1,519.9
Adjustment costs savings	**31.0**	**34.6**	**38.0**	**154.4**	**171.1**	**188.9**	**377.3**	**430.3**	**487.9**
PMc3	0.9	1.8	2.0	0.9	1.8	2.0	0.9	1.8	2.0
PMc4	5.6	5.8	6.2	5.6	5.8	6.2	5.6	5.8	6.2
PMc6	24.4	27.0	29.9						
PM2				16.0	17.6	19.5	16.0	17.6	19.5
PM3							16.0	30.3	46.0
PM6&PMc6				131.9	145.9	161.3			
PM7&PMc6							338.9	374.7	414.3
Net costs savings/net costs	**-54.7**	**-35.2**	**-10.7**	**1,268.5**	**1,120.4**	**1,179.0**	**1,552.7**	**1,731.7**	**2,075.7**

Source: TML et al. (2023), impact assessment support study; Note: negative values for 'Net costs savings/net costs' represent net costs.

Table 3: One-off costs for public administrations in the POs relative to the baseline scenario (EU27), in million EUR (2022 prices)

	Difference to the Baseline		
	PO-A	PO-B	PO-C
Adjustment costs	10.5	102.7	7,728.1
PMc2	10.5	10.5	10.5

	Difference to the Baseline		
	PO-A	PO-B	PO-C
PM3			7,590.9
PM4		17.8	17.8
PM6		74.4	
PM7			108.9
Administrative costs	0.0	0.0	9.0
PM3			9.0

Source: TML et al. (2023), impact assessment support study

Table 4: Costs and costs savings for public authorities by policy option and measure relative to the baseline, expressed as present value over 2025-2050 (in million EUR, 2022 prices)

	Difference to the Baseline		
	PO-A	PO-B	PO-C
Adjustment costs	466.6	4,346.6	8,252.5
PMc1	456.1		456.1
PMc2	10.5	10.5	10.5
PM1&PMc1		4,175.4	
PM3			7,590.9
PM4		17.8	17.8
PM6		142.9	
PM7			177.1
Administrative costs	762.7	16.4	25.4
PMc6	762.7		
PM3			9.0
PM4		16.4	16.4
Administrative costs savings	0.0	22,796.3	23,586.0
PM4		1,203.5	1,203.5
PM5			121.9
PM6&PMc6		21,592.8	
PM7&PMc6			22,260.6
Adjustment costs savings	609.6	3,028.0	7,540.6
PMc3	25.0	25.0	25.0
PMc4	106.2	106.2	106.2
PMc6	478.4		
PM2		312.9	312.9
PM3			459.3
PM6&PMc6		2,583.8	
PM7&PMc6			6,637.1
Net costs savings/net costs	**-619.8**	**21,461.3**	**22,848.8**

Source: TML et al. (2023), impact assessment support study; Note: The baseline scenario is also expressed as present value over 2025-2050, for consistency reasons. Negative values for 'Net costs savings/net costs' represent net costs.

6.1.2. Impact on the European Commission

Adjustment costs for the European Commission. All policy options are expected to lead to adjustment costs for the European Commission. For PMc7 (included in all policy options), the development of IAP standards will proceed in two steps. First, a study will be carried out followed by the use of the findings and the assessment of the study to draft the standards assisted by an expert group. The cost of the initial study is estimated at EUR 400,000. The average cost for a two-day workshop hosted by European Commission (EC), where participants are reimbursed by the EC is estimated at around EUR 30,000. Two of such in-person workshops may be required as well as two online meetings. Compensation for the

experts contributing to the meetings is estimated at EUR 5,000 for each meeting. Therefore, the one-off adjustment costs for PMc7 are estimated at EUR 0.47 million. For PM4 (included in both PO-B and PO-C), technical and operational standards for information exchange will need to be established. This will also be done in two steps. A study will be carried out to compile the required elements and propose several options for the establishment of the standards. In a second stage, the findings and assessment of the study will be used to draft the standards with the help of an expert group. The one-off adjustment costs for PM4 are estimated at EUR 0.46 million. For PM8 (included in PO-C) the reinforced safety features in vehicles beyond the General Safety Regulation and Type Approval legal framework are also expected to be developed with the help of an expert group, drawing on a study commissioned by the European Commission. The one-off adjustment costs for PM8 are estimated at EUR 0.47 million[137]. Thus, total one-off adjustment costs for the European Commission are estimated at EUR 0.47 million in PO-A, EUR 0.93 million in PO-B and EUR 1.4 million in PO-C relative to the baseline.

6.1.3. Impact on road transport operators

All policy options are expected to result in adjustment costs but also in adjustment costs savings and administrative costs savings for road transport operators (see Table 5 and Table 6). Detailed explanations on the estimates and assumptions used for deriving the costs and costs savings for each policy measure included in each policy option are provided in Annex 4. In addition, this section also provides the impacts on the transport activity performed by zero-emission vehicles.

Adjustment costs for road transport operators. In PO-A, the reinforced Member States obligation to conduct a minimum number of checks of HDV's weight (PMc6) is expected to lead to additional costs for road transport operators for cooperating with public authorities for performing the manual/roadside checks and also to additional operation costs for the operators that were operating overloaded trucks (i.e. non-compliant operators) in the baseline and now comply with the weight limits. The additional operation costs for non-compliant operators are due to the need of performing more vehicle-kilometres to transport the same quantity of goods. For PO-A, the recurrent adjustment costs for transport operators are thus estimated at EUR 32.7 million in 2030 and EUR 41.7 million in 2050 relative to the baseline (see Table 5). In PO-B, the joint effect of the reinforced Member States obligation to conduct a minimum number of checks of HDV's weight (PMc6) and the requirements on the installation of WIM systems (PM6) enhances the efficiency and effectiveness of controls. PO-B achieves higher level of compliance than PO-A with lower number of manual/roadside checks than in the baseline, due to the use of WIM systems as a filter to pre-identify HDV that are likely to be overloaded. The adjustment costs for non-compliant operators are estimated to be higher in PO-B than in PO-A (EUR 107.3 million in 2030 and EUR 140.1 million in 2050, relative to the baseline) due to the higher number of vehicle-kilometres to transport the same quantity of goods. In PO-C, the joint effect of the requirement on a minimum amount of certified Weigh-in-motion (WIM) systems and PMc6 will significantly increase the effectiveness of controls, relative to PO-A and PO-B, and the operation costs for non-compliant operators (EUR 265 million in 2030 and EUR 346.9 million in 2050, relative to the baseline), with controls potentially being carried out 24 hours per day while eliminating the need for ad-hoc manual/roadside checks. By minimising the proportion of overloaded vehicles, compliant operators will benefit from a levelled playing field. PO-C additionally includes adjustment costs related to the requirement for EMS to comply with higher safety

[137] Compared to PM4, PMc7 and PM8 also foresee a compensation for the experts contributing to the online meetings estimated at EUR 5,000 for each meeting.

standards for HDV under PM8, for training EMS drivers under PM8[138]. Thus, PO-C results in adjustment costs estimated at EUR 295 million in 2030 and EUR 381.8 million in 2050 relative to the baseline. Expressed as present value over 2025-2050, the adjustment costs for road transport operators are estimated at EUR 6.8 billion in PO-C, EUR 2.1 billion in PO-B and EUR 0.6 billion in PO-A (see Table 6).

Adjustment costs savings for road transport operators. In PO-A, the extra length and weight to accommodate ZE technologies (PMc1), the harmonisation of the maximum permitted weight of 5- and 6-axle HDV in cross-border transport (PMc3), allowing cross-border transport of 44t and EMS between "allowing" MS (PMc4) and the harmonisation of the loaded length of vehicle carriers (PMc5) leads to operation costs savings for road transport operators due to the increase in the average payload and the reduction in the number of trips (see Table 5). The total adjustment costs savings for PO-A are estimated at EUR 603.4 million in 2030 and EUR 793.2 million in 2050, relative to the baseline. In PO-B, the combined effect of PMc1 and PM1 (allowing 4 extra tonnes for HDV for ZEVs, irrespective of the ZE powertrain technology) leads to higher operation costs savings for road transport operators than in PO-A, due to the increase in the average payload and the larger reduction in the number of trips. In addition, aligning the definition of intermodal transport with the Combined Transport Directive (PM2) results in adjustment costs savings due to the shift from road-only to intermodal operations, while PM6 and PMc6 lead to lower costs relative to the baseline due to the reduced time required for cooperating with the public authorities for manual/roadside weight checks. Thus, PO-B is estimated to lead to total adjustment costs savings for road transport operators of EUR 2.1 billion in 2030 and EUR 2.9 billion in 2050, relative to the baseline. In PO-C, the common measures for all options (PMc1, PMc3, PMc4, PMc5) and the common measure with PO-B (PM2) lead to similar adjustment costs savings. However, PO-C additionally results in operation costs savings due to the extra payload allowed through the use of EMS1 in the core and comprehensive TEN-T network, conditioned to be ZEV or part of an intermodal transport operation (PM3) and lower costs relative to the baseline due to the reduced time required for cooperating with the public authorities for manual/roadside weight checks (PM7 and PMc6). The costs savings for PM7 and PMc6, relative to the baseline, are larger than those for PM6 and PMc6 (included in PO-B), due to the elimination of the need for ad-hoc manual/roadside checks thanks to the use of certified WIM systems. PO-C is thus expected to result in total adjustment costs savings for transport operators, estimated at EUR 2.3 billion in 2030 and EUR 3.7 billion in 2050 relative to the baseline. Expressed as present value over 2025-2050 relative to the baseline (see Table 6), total adjustment costs savings for road transport operators are estimated to be the highest in PO-C (EUR 49.1 billion), followed by PO-B (EUR 42.8 billion) and PO-A (EUR 12.1 billion).

Administrative costs savings for road transport operators. All policy options result in administrative costs savings for road transport operators (see Table 5). In PO-A, allowing for extra height (+0.3m) to accommodate high-cube containers in intermodal transport (PMc2) eliminates the administrative costs linked to the authorisation of higher trucks (i.e. the costs of permits). PO-A is estimated to lead to administrative costs savings of EUR 168.5 million in 2030 and EUR 196.9 million in 2050 relative to the baseline. The average number of permits over 2025-2035 is estimated at 2.37 million per year. Considering the cost per permit of EUR 70, based on the stakeholders' consultation activities, the average annual cost savings are estimated at EUR 165.9 million. These administrative costs savings are not subject to the application of the 'one in, one out' approach.

[138] These costs are estimated at EUR 996.5 million in 2025, going down to EUR 30.1 million in 2030 and EUR 35 million in 2050 relative to the baseline.

PO-B results in higher total administrative costs savings (EUR 250.3 million in 2030 and EUR 261.1 million in 2050, relative to the baseline) than PO-A due to the reduction in the time needed to prepare and submit the requests for the issuance of special permits for the transport of indivisible loads[139,140], driven by the application of the one-stop-shop principles at national level and the digitalisation of documents (PM4). For PM4, for the purpose of the *application of the 'one in, one out' approach*, the annual average cost saving per permit over 2025-2035 has been estimated at EUR 64.1. Considering the average number of permits over 2025-2035, estimated at 1.12 million, the average annual cost savings are estimated at EUR 71.8 million.

Total administrative costs savings for road transport operators in PO-C are estimated at EUR 256.2 million in 2030 and EUR 269.4 million in 2050, relative to the baseline. PO-C additionally envisages (in addition to PMc2 and PM4) setting abnormal transport corridors for indivisible loads up to certain excesses in W&D and for EMS (PM5). Road transport operators are expected to benefit from the simplification of procedures under PM5. Permits will continue to be required for all trips as any trip will always begin or end outside the TEN-T network. However, PM5 is expected to result in a reduction of the time needed for preparing and submitting the request for the permits. The annual average cost saving per permit over 2025-2035 has been estimated at EUR 5.3. Considering the average number of permits over 2025-2035, estimated at 1.12 million, the average annual cost savings due to PM5 are estimated at EUR 5.9 million for the purpose of the *application of the 'one in, one out'*.

Expressed as present value over 2025-2050 relative to the baseline (see Table 6), total administrative costs savings for road transport operators are estimated to be the highest in PO-C (EUR 4.5 billion), followed by PO-B (EUR 4.4 billion) and PO-A (EUR 3.2 billion).

Table 5: Recurrent costs and costs savings for transport operators in the POs relative to the baseline scenario (EU27), in 2030, 2040 and 2050, in million EUR (2022 prices)

	Difference to the Baseline								
	PO-A			PO-B			PO-C		
	2030	2040	2050	2030	2040	2050	2030	2040	2050
Adjustment costs	**32.7**	**37.1**	**41.7**	**107.3**	**122.4**	**140.1**	**295.0**	**335.0**	**381.8**
PMc6	32.7	37.1	41.7						
PM6&PMc6				107.3	122.4	140.1			
PM7&PMc6							265.0	303.4	346.9
PM8							30.1	31.6	35.0
Adjustment costs savings	**603.4**	**693.5**	**793.2**	**2,086.2**	**2,511.3**	**2,941.3**	**2,305.2**	**2,883.6**	**3,661.0**
PMc1	23.7	9.1	-1.9				23.7	9.1	-1.9
PMc3	28.8	58.9	65.5	28.8	58.9	65.5	28.8	58.9	65.5
PMc4	106.6	139.0	175.2	106.6	139.0	175.2	106.6	139.0	175.2
PMc5	444.2	486.5	554.4	444.2	486.5	554.4	444.2	486.5	554.4
PM1&PMc1				78.8	294.7	485.6			
PM2				1,160.2	1,233.9	1,303.6	1,160.2	1,233.9	1,303.6

[139] Article 2 of Council Directive 96/53/EC defines an indivisible load as "*a load that cannot, for the purpose of carriage by road, be divided into two or more loads without undue expense or risk of damage and which owing to its dimensions or mass cannot be carried by a motor vehicle, trailer, road train or articulated vehicle complying with the W&D Directive in all respects*."

[140] The transport of an indivisible load requiring longer HDVs and specific safety measures is subject to the issuance of special permit for each trip or for the number of trips performed in a given period of time. Special permits may include conditions such as vehicle escorts, allowed time frames, authorised speeds, etc. Different countries and regions have different rules and procedures in place for obtaining such permits.

	Difference to the Baseline								
	PO-A			PO-B			PO-C		
	2030	2040	2050	2030	2040	2050	2030	2040	2050
PM3							265.8	648.6	1,196.2
PM6&PMc6				267.6	298.3	357.0			
PM7&PMc6							275.9	307.5	368.0
Administrative costs savings	**168.8**	**180.5**	**196.9**	**250.3**	**235.6**	**261.1**	**256.2**	**242.6**	**269.4**
PMc2	168.8	180.5	196.9	168.8	180.5	196.9	168.8	180.5	196.9
PM4				81.5	55.0	64.1	81.5	55.0	64.1
PM5							5.8	7.0	8.4
Net costs savings	**739.5**	**837.0**	**948.5**	**2,229.2**	**2,624.4**	**3,062.2**	**2,266.3**	**2,791.1**	**3,548.6**

Source: TML et al. (2023), impact assessment support study; Note: negative values for 'adjustment costs savings' represent net costs.

Table 6: Costs and costs savings for road transport operators by policy option and measure relative to the baseline, expressed as present value over 2025-2050 (in million EUR, 2022 prices)

	Difference to the Baseline		
	PO-A	PO-B	PO-C
Adjustment costs	643.0	2,132.6	6,816.9
PMc6	643.0		
PM6&PMc6		2,132.6	
PM7&PMc6			5,273.4
PM8			1,543.4
Adjustment costs savings	12,138.5	42,831.1	49,093.5
PMc1	344.5		344.5
PMc3	808.5	808.5	808.5
PMc4	2,317.2	2,317.2	2,317.2
PMc5	8,668.2	8,668.2	8,668.2
PM1&PMc1		3,907.8	
PM2		21,900.6	21,900.6
PM3			9,664.0
PM6&PMc6		5,228.7	
PM7&PMc6			5,390.4
Administrative costs savings	3,218.2	4,421.7	4,543.6
PMc2	3,218.2	3,218.2	3,218.2
PM4		1,203.5	1,203.5
PM5			121.9
Net costs savings	**14,713.7**	**45,120.2**	**46,820.3**

Source: TML et al. (2023), impact assessment support study; Note: the baseline scenario is also expressed as present value over 2025-2050, for consistency reasons.

Net costs savings for road transport operators. As shown in Table 5, all policy options are expected to result in net costs savings for road transport operators relative to the baseline in 2030, 2040 and 2050. Expressed as present value over 2025-2050 (see Table 6), PO-C is projected to lead to the highest net costs savings (EUR 46.8 billion) followed by PO-B (EUR 45.1 billion) and PO-A (EUR 14.7 billion).

Transport activity performed by zero-emission vehicles. The measures incentivising the uptake of zero-emission HDVs (PMc1 and PMc4 in PO-A, PMc1, PMc4 and PM1 in PO-B and PMc1, PMc4 and PM3 in PO-C) are estimated to lead to a reduction in the operation costs per tonne for these vehicles relative to the baseline, due to the higher average payload relative to the baseline. The combined effect of the reduction in the operation costs per tonne and higher average payload is the increase in the transport

activity in tonnes and tonne-kilometres for the zero-emission vehicles, coupled with a decrease in the number of trips and vehicle-kilometres driven relative to the baseline.

As explained in Annex 4 (section 1), based on literature review[141,142], the price elasticity of demand for road transport (-0.3) is used to calculate the changes in the number of tonnes transported by road, relative to the baseline, due to the changes in the transport costs per unit of transport. In addition, a price elasticity of -0.1 is used to reflect rebound effects due to the use of more energy-efficient vehicles, with lower operating costs. The changes in transport activity in tonnes-kilometres due to the policy measures relative to the baseline are calculated based on the changes in transport activity in tonnes and the average mileage per origin-destination from the baseline scenario. In the following step, the changes in the number of trips are derived using the average payload corresponding to the policy measures[143] and the activity in tonne-kilometres. The activity in vehicle-kilometres is further derived by multiplying the number of trips with the average mileage per origin-destination from the baseline scenario.

The increase in the transport activity of zero-emission vehicles by policy option relative to the baseline (in billion tonne-kilometres and percentage change to the baseline) for 2030, 2040 and 2050 is provided in Table 7.

Table 7: Increase in transport activity of zero-emission vehicles by policy option relative to the baseline (in billion tonne-kilometres and percentage change to the baseline)

	2030	2040	2050
Baseline (billion tonne-kilometres)	136.8	1,060.7	2,147.3
Difference to the baseline (billion tonne-kilometres)			
PO-A	1.5	2.8	3.5
PO-B	5.4	8.3	8.6
PO-C	7.3	19.3	36.2
% change relative to the baseline			
PO-A	1.1%	0.3%	0.2%
PO-B	3.9%	0.8%	0.4%
PO-C	5.3%	1.8%	1.7%

Source: TML et al. (2023), impact assessment support study

In addition, sensitivity analysis has been performed to show the impacts of different price elasticities of demand for road transport on the transport activity by ZEV. Two cases have been considered: (i) case A, using a price elasticity of demand of -0.2, and (ii) case B, using a price elasticity of demand of -0.4. These are to be compared with the central case, using a price elasticity of demand of -0.3 (see Table 7). Considering the range of elasticities, the transport activity performed by ZEV is estimated to increase in PO-A by 0.8 to 1.4% in 2030 and 0.1 to 0.2% in 2050 relative to the baseline (see Table 8). The increase would be higher in PO-B, estimated at 2.7 to 5.2% in 2030 and 0.3 to 0.5% in 2050 relative to the baseline, and the highest in PO-C (4.9 to 5.7% in 2030 and around 1.7% in 2050 relative to the baseline). The ranking of the policy options in terms of transport activity performed by ZEV remains unchanged considering the different price elasticities of demand for road transport.

[141] De Jong et al (2010). Price sensitivity of European road freight transport - towards a better understanding of existing results. A report for Transport & Environment. The Hague: Significance.
[142] Rijkswaterstaat (2020). DP07 - Eindanalyse BasGoed 5.0. Rijswijk: Rijkswaterstaat
[143] For example, the changes in average payload capacity for PMc1 and PM1 are described in detail in Annex 4.

Table 8: Increase in transport activity of zero-emission vehicles by policy option relative to the baseline in case A and case B (in billion tonne-kilometres and percentage change to the baseline)

	2030	2040	2050
Difference to the baseline (billion tkm)			
PO-A			
Case A (elasticity -0.2)	1.1	2.2	3.0
Case B (elasticity -0.4)	2.0	3.4	4.0
PO-B			
Case A (elasticity -0.2)	3.7	5.9	6.4
Case B (elasticity -0.4)	7.1	10.7	10.8
PO-C			
Case A (elasticity -0.2)	6.7	18.7	35.7
Case B (elasticity -0.4)	7.8	19.9	36.7
% change to the baseline			
PO-A			
Case A (elasticity -0.2)	0.8%	0.2%	0.1%
Case B (elasticity -0.4)	1.4%	0.3%	0.2%
PO-B			
Case A (elasticity -0.2)	2.7%	0.6%	0.3%
Case B (elasticity -0.4)	5.2%	1.0%	0.5%
PO-C			
Case A (elasticity -0.2)	4.9%	1.8%	1.7%
Case B (elasticity -0.4)	5.7%	1.9%	1.7%

Source: TML et al. (2023), impact assessment support study

6.1.4. Impact on the internal market and competition of the road transport sector

All policy options are expected to have a positive impact on the functioning of the internal market. Removing the barriers to the free movement of goods via the harmonisation of the rules allows road transport operators to provide transport services more efficiently for the benefit of the customers throughout the EU. The harmonisation measures in PO-A (PMc3, PMc4 and PMc5) will remove the main barrier to cross-border operations by heavier/longer HDVs between "allowing" Member States, while Member States will retain the flexibility to adapt the rules for domestic operations to national circumstances, such as infrastructure standards and operational conditions. PO-B and PO-C will, in addition, streamline and digitalise the authorisation procedures for the issuing of national permits for the transport of indivisible loads (PM4 in PO-B and PO-C) and further simplify procedures by setting abnormal transport corridors for indivisible loads (PM5 in PO-C) improving transport services, as well as reducing unauthorised runs.

A higher level of compliance with the rules on the maximum authorised weight and axle weight of HDV will contribute to eliminating unfair business practices. All policy options set a minimum level of controls, as envisaged by PMc6, as well as a harmonised approach to the voluntary implementation of intelligent access policies (PMc7). The efficiency and effectiveness of such controls on compliance with the maximum authorised weights is further strengthened in PO-B by the deployment of WIM systems in the TEN-T network for targeting controls (PM6). PO-C will in addition require the certification of WIM

systems to allow for direct (automatic) enforcement in the TEN-T network (PM7), eliminating the need to deploy inspectors to carry out roadside checks, analyse the findings and issue fines.

6.1.5. Impact on the competitiveness of the road, rail, inland waterways and intermodal transport sectors

The main positive impact on the competitiveness of the road transport sector is linked to the common policy measures addressing the Specific Objective 2 (SO2: *Harmonise the rules on maximum W&D of HDV in cross-border operations*), namely PMc3, PMc4 and PMc5. They aim at removing existing barriers to cross-border road freight transport and improving the efficiency of road transport operations. At the same time, the improved competitiveness of road freight transport needs to be achieved without attracting freight transport from other modes with generally even lower externalities, namely rail and waterborne transport, which would affect the competitiveness of those sectors. For this reason, all policy options include policy measures supporting intermodal transport[144].

The possible impact of the policy options on modal shift has also been assessed. More specifically, the changes in transport activity due to the changes in the road transport prices and due to the changes in the relative prices between transport modes are assessed based on price elasticities from the literature. Two sources[145,146] have been identified that look at elasticities for the EU freight transport sector and have been used for the assessment, as explained in section 1 of Annex 4.

Given that PMc4 (included in all policy options) generally extends the use of EMS and 44t HDV in cross-border transport without any distance limitation, while other modes are considered more suitable for long distance transport, the reverse modal shift from rail and inland navigation towards road has been estimated based on the potential reduction in the costs of the road transport services and the cross-price elasticities of

[144] It should be noted that there is no robust evidence based on Member States experience with the EMS supporting the statement that harmonisation measures that improve efficiency of transport operations without additional requirements (not conditioned to be ZEV or involved in intermodal transport) would lead to a reverse modal shift from rail and/or water base modes of transport to road. The feedback provided by Member States that have allowed the circulation of EMS in national and cross-border transport (Finland and Sweden, and EMS is being tested in Denmark, the Netherlands, Belgium, Spain, Portugal, Czech Republic and Germany authorise EMS in national transport, while cross-border transport is allowed between Finland and Sweden, Sweden and Denmark, Belgium and the Netherlands and between Germany and the Netherlands) and to a lesser extent of those allowing 44 tonnes HDVs in national traffic (Belgium, Czech Republic, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Sweden, Denmark and Finland), as well as the feedback from the transport and logistics operators that have made use of EMS, 44 tonnes HDVs and vehicle carriers with additional length (road operators, shippers and producers, as well as EU representatives of the finished vehicle logistics), shows positive impacts in terms of road safety and negligible modal shift effects. This evidence also shows that shifts in activity occur rather between different categories of HDVs, as more efficient ones (such as EMS) substitute standard 40 tonne trucks. However, one concern stressed during the consultation activities as regards the coherence of the Weights and Dimensions Directive with other EU policies is that the Directive would put other, more sustainable modes of transport in a competitive disadvantage, ultimately contributing to a reverse modal shift. For this reason, all policy options include policy measures that support the shift from road-only to intermodal transport (PMc2 in PO-A, PM2 in PO-B and PM2 and PM3 in PO-C) thus mitigating possible negative impacts on modal shift.

[145] De Jong et al (2010). Price sensitivity of European road freight transport - towards a better understanding of existing results. A report for Transport & Environment. The Hague: Significance.

[146] Rijkswaterstaat (2020). DP07 - Eindanalyse BasGoed 5.0. Rijswijk: Rijkswaterstaat

demand (see Annex 4)[147]. This is estimated at 4.9 billion tonne-kilometres in 2030 and 5.5 billion tonne-kilometres in 2050 relative to the baseline, or 0.7% of the total rail and inland navigation activity in the baseline in 2030 and 0.6% in 2050.

At the same time, PO-A is expected to increase the efficiency of intermodal transport of high-cube containers (PMc2) and enable the use of ZE HDVs in intermodal containerised operations as the extra weight and length for ZEVs provided under PMc1 can be combined with the extra weight granted to HDV involved in intermodal transport. The shift from road-only to intermodal transport is estimated at around 12 billion tonne-kilometres in 2030 and 14 billion tonne-kilometres in 2050, relative to the baseline, as explained in Annex 4. The risks of reverse modal shift will be further mitigated in PO-B, as PM2 will further support intermodal transport by considering trailers and semitrailers as intermodal loading units. This measure will render a non-containerised intermodal transport more attractive to the operators using standard vehicles, who will be able to benefit from the 4t extra weight for intermodal operations (see Annex 4 for more details). In addition, PO-B will require that as of 2035, 44-t HDV that are used in cross-border non-intermodal operations between allowing Member States (under PMc4) are ZEV (PM1). The shift from road-only to intermodal transport in PO-B is estimated at around 21 billion tonne-kilometres in 2030 and 26 billion tonne-kilometres in 2050, relative to the baseline. PO-C will enable further reductions in transport costs, alongside with further incentives for the uptake of ZEV and intermodal transport, thanks to PM3 which allows for the circulation of EMS in international (intra-EU) transport on TEN-T network provided that they are either ZEV or part of an intermodal transport operation (see Annex 4). The shift from road-only to intermodal transport in PO-C is estimated at around 23 billion tonne-kilometres in 2030 and 28 billion tonne-kilometres in 2050, relative to the baseline.

In addition, the sector of indivisible loads transport will benefit from the streamlining of the procedures to obtain national permits, including the digitalisation of documents (PM4) in PO-B and PO-C, while PO-C will further improve the efficiency of this market segment by setting abnormal transport corridors which will further simplify the authorisation of abnormal transport in certain cases.

All policy options may improve the international competitiveness of the EU commercial road transport sector by making it greener and more efficient, including by encouraging involvement in intermodal operations. They may also positively affect the road transport sector's capacity to innovate, by providing incentives to the deployment of zero-emission HDVs and intermodal operations that may drive innovation in logistics and supply chain management.

6.1.6. Impact on small and medium enterprises (SMEs)

In the road transport sector 99% of companies are SMEs (enterprises employing up to 250 people and with a turnover of less than EUR 50 million[148,149]). Intermodal transport involves by definition many different economic agents. While many operators in rail transport and shipping are medium and some even large companies, operators in inland waterways and many intermodal organisers are often SMEs.

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[147] As explained in Annex 4 (section 1), the following elements have been taken into account for estimating the changes in the number of tonnes transported and the potential reverse modal shift: the price elasticity of demand for road transport, the cross-price elasticity of demand for rail transport, the cross-price elasticity of demand for inland navigation, the cross-price elasticity of demand for different road vehicle categories. In addition, a price elasticity of -0.1 is used to take into account rebound effects due to the use of more energy-efficient vehicles, with lower operation costs.

[148] Commission SWD(2017) 194 final.

[149] https://ec.europa.eu/eurostat/databrowser/view/SBS_SC_1B_SE_R2__custom_3493320/default/table

Therefore, the initiative is considered relevant for the SMEs and the SME test has been performed (see Annex 11).

As explained in section 6.1.3, all policy options are expected to result in net costs savings for road transport operators, estimated at EUR 46.8 billion in PO-C, followed by PO-B with net costs savings estimated at EUR 45.1 billion and PO-A with net costs savings of EUR 14.7 billion, expressed as present value over 2025-2050 relative to the baseline (in 2022 prices). Considering the very large share of SMEs in the road transport sector, most of these net costs savings are expected to be attributed to them although the available data did not allow a split of these costs savings between the two groups of operators (i.e. SME and others). In addition, the increase in intermodal transport in all policy options will have a positive economic impact on the SMEs involved, which the highest benefits expected in PO-C and PO-B.

6.1.7. Digital by default

PO-B and PO-C are expected to have a positive impact on the application of the 'digital by default' principle, by stimulating the transition to the digitalisation of documents (e.g. permits for abnormal transport) and transport data related to cargo, vehicle, route, etc. (e.g. on eFTI platforms) due to PM4.

6.2. Social impact

The social impacts are assessed in terms of impacts on road safety, health and fundamental rights.

6.2.1. Road safety

All policy options are estimated to reduce the number of fatalities from road accidents in which HDVs are involved. The main driver is the reduction in the number of trips and vehicle-kilometres driven relative to the baseline due to the increased payload of HDVs (the same amount of goods transported with less vehicles) and the shift from road-only to intermodal transport. Thus, the risk exposure is reduced, offsetting the potential higher risk represented by heavier and/or bigger HDVs. Cumulatively, over the period 2025-2050, PO-A is estimated to result in 237 lives saved and to lead to a reduction in the external costs of accidents by EUR 0.5 billion relative to the baseline (expressed as present value over 2025-2050). PO-B is expected to result in 411 lives saved and external costs savings of roughly EUR 0.9 billion, while PO-C accounts for 642 lives saved and external costs savings of approximately EUR 1.4 billion over the same period[150].

Two factors were considered in assessing the impacts of the policy measures on road safety: i) the change in risk per vehicle-kilometre relative to the baseline, and ii) the change in the number of vehicle-kilometres driven relative to the baseline. The change in the risk factor associated to each policy measure draws on literature review and additional analysis performed in the context of the impact assessment support study. The changes in the vehicle-kilometres driven are derived for each policy measure, drawing on the changes in costs and price elasticities.

For the risk factor, as explained in section 4 of Annex 4, the assessment was based, on the one hand, on literature focusing on engineering predictions, which studies the engineering effects of overloading

[150] To monetise the external costs of fatalities, the unit costs at Member State level from the Handbook on external costs of transport have been used. At EU level, the unit cost per fatality is estimated at EUR 3.9 million in 2022 prices. Source: Essen, H. et al. (2020), Handbook on the external costs of transport: version 2019 – 1.1, Publications Office, available at: https://data.europa.eu/doi/10.2832/51388

vehicles both within and beyond their design limit as well as the specific additional risks of EMS of 60 tonnes versus standard 44 tonne HGVs[151]. On the other hand, post-hoc statistical methods were also considered. These included a comparison of the fatality rates of different vehicles within existing length limits (16.5/18.75) by gross vehicle weight (GVW) and number of axles[152], which was updated and extended to smaller vehicles in the context of the impact assessment support study, and a comparison of EMS with HGVs of up to 40 tonnes and 18.75m in Sweden[153], which found that the actual fatality rate in the EMS group was 21% lower than that for the 40 tonne vehicles.

Policy measures PMc1, PM1 and PMc3 envisage a modest increase in the mass of HDVs. Based on the sources mentioned above, for PMc1 and PM1, the increase in mass from 42 tonnes to 44 tonnes was considered to increase the risk by 0.5%. In PMc3, permitting 5 and 6-axle rigid vehicles was estimated to lead to a 1% risk increase. It should be noted that this factor represents an increase in risk per vehicle. Given that the measures lead to an overall decrease in the number of vehicle-kilometres driven, the overall effect is a decrease in the number of fatalities.

PMc4, PM3 and PM8 envisage larger capacity increases connected to EMS. Engineering assessments show a large increase in risk per km, associated with the larger weight gain and the addition of length related risks (e.g. poor manoeuvrability)[154]. However, statistical observations suggest a reduction in the risk per kilometre associated with EMS compared with standard vehicles[155]. This apparent contradiction is explained by the fact that EMS are implemented with additional safety features compared to standard HGVs and that they are used differently than standard HGVs such that their exposure to risk is different (e.g. more of their time is spent on safer parts of the road network). Operators also tend to use their best drivers on EMS. The anecdotal evidence suggests that drivers of EMS drive them more carefully than they would drive a standard HGV because of the perception of increased difficulty and risk that the additional length and articulation point brings. Moreover, EMS tend to be newer compared to other HGVs and are thus equipped with more modern safety features than the average HGV. Taking into account all these factors, a 5% reduction in risk has been estimated for PMc4 and PM3, which is further reduced to 6% with the introduction of PM8. Here again, besides the inherent risk per vehicle, the effect of the measures on the number of vehicle-kilometres has been taken into account to calculate the overall impact on road safety.

For PMc5 (i.e. vehicle carriers), it was considered that front and rear overhangs, that cause additional swept path that fall outside of turning circle limits, would be the main risk rather than load. Based on an analysis of collision data identifying typical manoeuvring related collisions, undertaken in the context of the support study, it was estimated that PMc5 would increase the fatality risk of each vehicle by 0.02%. As in previous cases, the effect of the measure on the number of vehicle-kilometres has been taken into account to calculate the overall impact on road safety.

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[151] Breemersch, T. et al. (2021). Overweight vehicles' impacts on road infrastructure and safety. Transport and Mobility Leuven.
[152] Knight, I., et al. (2008). Longer and/or longer and heavier goods vehicles (LHVs) - a study of the likely effects if permitted in the UK. Crowthorne: TRL Published Project Report PPR 285.
[153] Balint, A. et al. (2014). Accident analysis for traffic safety aspects of High Capacity Transports. Chalmers University of Technology, Department of Vehicle Safety.
[154] Breemersch, T. et al. (2021). Overweight vehicles' impacts on road infrastructure and safety. Transport and Mobility Leuven.
[155] Balint, A. et al. (2014). Accident analysis for traffic safety aspects of High Capacity Transports. Chalmers University of Technology, Department of Vehicle Safety.

PMc6, PM6, and PM7 reduce the number of overloaded vehicles. When the overloaded vehicles are within their design limit, the effect on safety risk per kilometre is expected to be the same as for legally loaded vehicles. However, when overloads go above the design limit the safety risks substantially increase. No studies were identified that could provide a quantification of the scale of this increase. Based on expert opinion in the context of the support study, 2% higher risk per kilometre was assumed for all overloaded vehicles compared to the legally loaded vehicles.

6.2.2. Impacts on health

All policy options are expected to reduce air pollutant and noise emissions as a consequence of the uptake of ZEV, which will progressively increase their share in the HDV fleet as shown in section 6.1.3, but also due to the reduction in the number of trips and thus vehicle-kilometres driven. The reduction in the external costs of air pollution (in terms of impacts on human health) and noise will benefit society by improving the quality of the air and reducing the acoustic contamination. It will also improve the working conditions of HDVs drivers thanks to the reduced levels of noise and vibrations inside the vehicles. PO-A is estimated to result in external costs savings for air pollutant emissions (NOx and Particulate Matter) estimated at EUR 1.6 billion, expressed as present value over 2025-2050 relative to the baseline, while PO-B results in external costs savings of EUR 2.1 billion, and PO-C of EUR 6.2 billion. With regard to acoustic contamination, the external costs of noise emissions are projected to decline by EUR 0.6 billion in PO-A, EUR 0.7 billion in PO-B and EUR 1 billion in PO-C relative to the baseline[156]. All policy options contribute towards Sustainable Development Goal 3 ("Ensure healthy lives and promote well-being for all at all ages").

6.2.3. Impacts on fundamental rights

The policy options were assessed to determine if they have an impact on the fundamental rights and/or equal treatment of EU citizens. The starting point of the assessment of the fundamental rights is the Charter of Fundamental Rights of the European Union[157]. All POs were assessed having regard to the relevant EU instrument and it was concluded that they maintain full respect for human and fundamental rights and none will have any negative impact thereon.

6.3. Environmental impact

The environmental impacts are assessed in terms of impacts on CO_2 emissions, air pollution emissions and noise. Air pollution emissions and noise related external costs were analysed in section 6.2.2.

[156] To calculate the external costs of air pollution emissions and noise, the unit costs from the Handbook on external costs of transport have been used (expressed in 2022 prices). Source: Essen, H. et al. (2020), Handbook on the external costs of transport: version 2019 – 1.1, Publications Office, available at: https://data.europa.eu/doi/10.2832/51388
[157] OJ C 326 of 26.10.2012 p.2

Nevertheless, Table 9 additionally provides the reduction in thousand tonnes of NOx and PM emissions in the policy options relative to the baseline for 2030 and 2050[158].

Similarly, the reduction in the CO_2 emissions is estimated as a result of the increase in the share of zero-emission vehicles in the HDVs fleet (due to PMc1 in PO-A, PMc1 and PM1 in PO-B, PMc1 and PM3 in PO-C), the increase in the intermodal transport (due to PMc2 in all policy options, PM2 in PO-B and PO-C and PM3 in PO-C) and the improved efficiency of transport operations (PMc3, PMc4 and PMc5 in all policy options). As explained in section 6.1.5, the measures supporting the increase in the intermodal transport are estimated to mitigate the risk of modal backshift resulting from the harmonisation measures. The reduction in CO_2 emissions relative to the baseline in 2030 and 2050 is provided in Table 9. For 2030, in PO-A the reduction is estimated at 0.4% of the CO_2 emissions from freight transport relative to the baseline, in PO-B at 1% and in PO-C at 1.1%. Cumulatively, over 2025-2050, PO-A is estimated to reduce CO_2 emissions by 10.7 million tonnes relative to the baseline (0.5% of the CO_2 emissions from freight transport). PO-B would reduce CO_2 emissions by 27.8 million tonnes (1.2% of the CO_2 emissions from freight transport) and PO-C by 29.8 million tonnes (1.3% of the CO_2 emissions from freight transport), over the same period. The external costs savings of CO_2 emissions, expressed as present value over 2025-2050 relative to the baseline, are estimated to reduce by EUR 1.3 billion in PO-A, EUR 3.5 billion in PO-B and EUR 3.7 billion in PO-C.

Table 9: Reduction in CO_2 emissions and air pollution emissions in the POs relative to the baseline scenario (EU27), in 2030 and 2050

	Difference to the Baseline					
	PO-A		PO-B		PO-C	
	2030	2050	2030	2050	2030	2050
Reduction in CO_2 emissions (thousand tonnes)	609.6	25.1	1,592.7	54.6	1,714.3	63.8
Reduction in NOx emissions (thousand tonnes)	2.6	0.5	5.1	0.7	7.3	3.3
Reduction in PM emissions (thousand tonnes)	0.9	0.4	1.0	0.4	2.8	3.0

Source: TML et al. (2023), impact assessment support study

All policy options are consistent with the environmental objectives of the **European Green Deal** and the **European Climate Law**[159]. All policy options contribute towards Sustainable Development Goal 13 ('Take urgent action to combat climate change and its impacts'). **No significant harm** is expected on the environment in any of the policy options.

[158] As explained in Annex 4 (section 1) of the impact assessment report, the CO_2 emissions intensity by vehicle type and transport mode from the baseline scenario (including its evolution over time) is used together with the transport activity to calculate the CO_2 emissions. For NOx and PM2.5, the EEA/EMEP emission inventory guidebook for road transport was used (Tier 2 emission factors for heavy duty vehicles, EURO VI D/E) for the base year, adjusted over time to match the NOx and PM2.5 emissions from the baseline scenario developed with the PRIMES-TREMOVE model. To calculate the external costs of CO_2 emissions, the unit costs from the Handbook on external costs of transport have been used (expressed in 2022 prices). Source: Essen, H. et al. (2020), Handbook on the external costs of transport: version 2019 – 1.1, Publications Office, available at: https://data.europa.eu/doi/10.2832/51388.

[159] Regulation (EU) 2021/1119.

7. HOW DO THE OPTIONS COMPARE?

7.1. Effectiveness

The assessment of effectiveness looks at the extent to which the general and specific objectives (SO) of the intervention, as previously described, are met. Table 10 provides the links between policy objectives and assessment criteria. A detailed assessment is provided in Annex 10.

Table 10: Links between objectives and assessment criteria

General objectives	Specific objective	Assessment criteria
The general objectives are: (i) improve the energy and operational efficiency of transport operations in the broader context of increased EU climate ambition by 2030 and EU climate neutrality by 2050; (ii) ensure the free movement of goods and fair competition on the internal road transport market.	**SO1** - Remove barriers for the uptake of ZEV and energy-saving devices and incentivise intermodal transport	Increase of transport activity performed by ZE HDVs Expected increase in intermodal transport Expected reduction in CO_2 emissions
	SO2 - Harmonise the rules on maximum weights and dimensions of HDV in cross-border operations	Expected reduction in the number of barriers to cross-border transport, including the need for special permits Simplification of authorization procedures for issuing permits for abnormal transport
	SO3 - Improve the enforcement of cross-border rules, including for road safety purposes	Infringement detection ratio Level of controls on maximum weights of HDVs Duration of controls

Each of the policy options addresses the problems identified, their drivers and the general and specific objectives. All three policy options provide support to a wider range of operations than the current W&D Directive, though the effectiveness varies between the different options.

Regarding **SO1**, PO-A effectively contributes to the uptake of ZEV, as operators do not lose any payload when using such vehicles due to the PO's measures increasing weight and length for ZE technologies. However, PO-B is more effective, as weight allowances are granted irrespective of the weight of the technology used, which could result in higher payloads for operators and thus creating more incentives for them to invest in ZE technologies. While PO-A facilitates somewhat intermodal containerised transport, PO-B significantly improves the attractiveness of intermodal transport by extending the allowance of extra 4t (currently to compensate the weight of empty container or swap body used in intermodal operations) also for non-containerised intermodal operations. In practice, it means that operators using conventional HDVs may, in fact, benefit from additional payload when using their trucks, trailers and semitrailers in intermodal operations. Consequently, the alignment of the W&D Directive with the CTD under PO-B would bring along synergy effects in promoting growth of intermodal transport. PO-C is more effective in addressing SO1 than PO-A and PO-B, by further incentivising the use of ZEV and shift to intermodal transport as it removes regulatory barriers for the use of EMS in cross-border operations, and at the same time introduces several conditions for the use of EMS (which must be ZEV or/and intermodal and used in dedicated parts of the TEN-T road network). These conditions imposed by PO-C entail upfront investment or a change of a business model by operators, limiting the use cases.

For **SO-2**, PO-A harmonises the rules for cross-border operations by certain types of HDVs (5- and 6-axle), heavier HDVs (44t) and introduces the harmonised loaded length for car carriers. PO-A allows the cross-border transport of EMS between Member States that already allow these vehicles combinations. It does not fully harmonise the rules as EMS are subject to the national limits in terms of length, weight and axel weight, which provides Member States with the possibility to adapt their use to the national

circumstances. PO-A will also reduce the need for special permits linked to the transport of high-cube containers. These measures effectively contribute to smooth cross-border operations and eliminate legal barriers to certain intermodal transport operations, ensuring fair competition between operators on the internal road transport market. Through the harmonisation of the rules, PO-A creates legal certainty and a clear regulatory framework for operators and enforcers. PO-B further extends this effectiveness in harmonisation by providing common requirements, harmonised documents and procedures for the authorisation of abnormal transport, including the transport of indivisible loads. Although the segment is small, it is mostly involved in international operations, as the type of goods (e.g. wind turbines, large industrial equipment, specialised components) are often transported across borders for assembly or to a remote construction or mining site. Therefore, harmonisation of administrative and safety requirements render the operations more efficient reducing unnecessary burden for operators. PO-B is thus more effective than PO-A in providing clear rules facilitating fair, safe and efficient cross-border operations. PO-C brings additional effect compared to PO-B by setting corridors in the EU for abnormal transport operations which enhances clarity as regards the part of network that can be used. PO-C also harmonises the use of EMS of 25.25m long and 60t all over the EU, but it creates new barriers impeding the currently existing cross-border transport of EMS beyond those limits.

For **SO3**, PO-A is effective in enhancing enforcement obligations on Member States by introducing minimum thresholds for controls on overloaded vehicles. The overall significance of such controls is strong, as their increased frequency and effectiveness discourage non-compliant behaviours, thus reducing the number of overloaded vehicles circulating on EU roads, contributing to less risks to road safety. However, PO-A maintains random controls which are not an efficient way of detecting infringements and, as a consequence of the increase in the overall number of checks PO-A will also increase the time and resources dedicated to performing those roadside checks. PO-A provides for additional possibilities of enhancing effectiveness of controls and improving compliance via the implementation of intelligent access policies. However, its voluntary nature may result in a limited outreach. PO-B introduces the obligation to deploy a minimum number of WIM systems per Member State, to help enforcers detect overloaded vehicles while they are in motion. Thus, PO-B is more effective than PO-A as it allows for targeting checks at non-compliant (overloaded) vehicles rendering the controls more efficient (increasing the infringement detection rate) further dissuading from non-compliant behaviour. The use of WIM systems will in addition increase the ratio of controls performed by Member States with the same (or lower) level of resources dedicated to performing roadside checks. PO-C introduces even more advanced enforcement tools by requiring the use of certified WIMs, which do not only detect overloaded vehicles, but also automatically analyse the type and severity of infringement and issue a fine. However, the efficiency of enforcement is not as significantly increased between PO-B and PO-C as it is between PO-B and PO-A. Moreover, PO-C measure imposing extra safety requirements on vehicles and drivers of EMS (PM8) does not bring significant safety gains, as EMS are usually carried out with better and newer vehicles by experienced and specifically trained drivers.

7.2. Efficiency

Efficiency concerns the 'extent to which objectives can be achieved for a given cost (cost effectiveness)'. In all policy options, the benefits outweigh the increase in costs, relative to the baseline. The estimates of costs and benefits are summarised in Table 11.

Table 11: Summary of costs and benefits of policy options – net present value for 2025-2050 compared to the baseline (in million EUR), in 2022 prices

	Difference to the Baseline		
	PO-A	PO-B	PO-C
Transport operators			

	Difference to the Baseline		
	PO-A	PO-B	PO-C
Adjustment costs	643.0	2,132.6	6,816.9
Adjustment costs savings	12,138.5	42,831.1	49,093.5
Administrative costs savings	3,218.2	4,421.7	4,543.6
Public authorities			
Adjustment costs	466.6	4,346.6	8,252.5
Administrative costs	762.7	16.4	25.4
Administrative costs savings	0.0	22,796.3	23,586.0
Adjustment costs savings	609.6	3,028.0	7,540.6
European Commission			
Adjustment costs	0.47	0.93	1.40
External costs savings			
Reduction in external costs of CO_2 emissions	1,319.5	3,451.0	3,695.0
Reduction in external costs of air pollution emissions	1,642.7	2,113.1	6,232.9
Reduction in external costs of noise emissions	599.9	702.5	957.0
Reduction in external costs of accidents	535.8	877.4	1,363.9
Total costs	1,872.9	6,496.5	15,096.1
Total benefits	20,064.2	80,221.1	97,012.6
Net benefits	18,191.4	73,724.5	81,916.5
Benefits to costs ratio	10.7	12.3	6.4

Source: TML et al. (2023), impact assessment support study; Note: The baseline scenario is also expressed as present value over 2025-2050, for consistency reasons.

The major cost elements of the policy options are related to adjustment costs for public authorities and for road transport operators. Over 95% of total adjustment costs for public authorities in all policy options relate to maintenance and reinforcement of road infrastructure. PO-C shows the highest total costs, estimated at EUR 15.1 billion, followed by PO-B (EUR 6.5 billion) and PO-A (EUR 1.9 billion). PO-C is also estimated to result in the highest total benefits, estimated at EUR 97 billion expressed as present value over 2025-2050 relative to the baseline, followed by PO-B (EUR 80.2 billion) and PO-A (EUR 20.1 billion).

Overall, all policy options result in **net benefits** relative to the baseline. PO-C shows the highest net benefits, estimated at EUR 81.9 billion expressed as present value over 2025-2050, followed by PO-B (EUR 73.7 billion) and PO-A (EUR 18.2 billion). PO-B shows the highest benefit to cost ratio among the options (12.3), followed by PO-A (10.7) and PO-C (6.4).

7.3. Coherence

Internal coherence assesses how well the various provisions of the revised Directive fit together and work in a coordinated manner to achieve its objectives. The measures under each policy option are compatible with each other, however, the effectiveness of some of them may be limited by the co-existing provisions of the Directive. This is the case of PO-A, whose measures aimed at advancing the intermodal transport (PMc2) and the uptake of zero-emission HDVs (PMc1), coexist with the existing (and to be maintained) national derogations allowing for higher weights and dimensions for conventional HDVs used in national road-only operations. The extra weight/length under national derogations allow for extra payload while the extra weight/length/height under PO-A only compensate the weight and size of zero-emission powertrain or a container. This incompatibility restricts the effectiveness of the incentives to ‘green’ the fleet and the freight operations provided under PO-A.

PO-B significantly reduces this incompatibility by allowing the extra weight/length for ZE HDVs, irrespective the weight of the technology (PM1) and by classifying trailers and semitrailers as intermodal transport units able to benefit from extra 4t allowance for intermodal transport (PM2). At the same time, by bringing extra 4t of payload to HDVs used in non-containerised operations, PM2 slightly weakens the incentive for containerised transport provided by the Directive, where extra 4 t is used greatly to compensate the weight of empty container or swap body and not to increase payload.

PO-C contains the same slight inconsistency between incentives for containerised and non-containerised transport. The potential inconsistency between PMc4 allowing for cross-border operations by conventional EMS and 44t HDVs between allowing Member States allowing and PM1 and PM3 is eliminated by introducing the target date of end 2035 as of which, in order to participate in cross-border operations, 44t HDVs must be ZEV, and EMS must be either ZEV or part of intermodal operations. External coherence assesses compatibility and consistency of the revised Directive with other EU laws and relevant EU policies as well as international obligations. All policy options are consistent with the EU, national and international standards related to road safety, access to the road transport market, free movement of goods and protection of environment. They allow for synergy effect with the initiative on CO_2 standards for HDVs and are co-dependent with the Alternative Fuel Infrastructure Regulation, TEN-T Regulation and Connecting Europe Facility as regards development of high-quality road infrastructure and charging/fuelling stations on the road network necessary for the efficient deployment and use of zero-emission and longer/heavier vehicles. In addition, PO-B brings stronger consistency with Combined Transport Directive by aligning the concepts of intermodal and combined transport (PM 2). PO-B and PO-C strengthen the links with TEN-T Regulation by introducing mandatory installation of WIMs on the TEN-T road network (PM 6 and PM 7) and are in line with the EU digitalisation objectives by introducing digitalise documents and automated WIMs (PM4 and PM7).

7.4. Subsidiarity and proportionality

In terms of subsidiarity, all policy options fulfil this principle, as they all bring about the harmonisation of the legal framework applicable on the EU internal road transport market. This harmonisation allows for fair and seamless cross-border freight transport operations and for aligning the pace of decarbonisation of national HDV fleets operating on the EU market, which would not be achieved through individual national initiatives or through bilateral or multilateral agreements between Member States. The initiative allows to reduce the negative externalities that are not domestic in nature such as emissions (GHG and air pollutants) and congestion reducing their impacts across national borders. All policy options preserve the prerogative of Member States to grant national derogations that reflect national and regional needs and operational conditions. PO-A provides for lowest level of intervention but is not so effective in incentivising the decarbonisation of transport operations and increasing consistency and effectiveness of enforcement across the borders. PO-C provides for most intensive intervention by introducing the obligation on Member States to allow the circulation on the TEN-T network of European Modular Systems (longer/heavier combination of vehicles) provided that they are zero-emission or involved in intermodal operations (PM 3). This measure may be seen by the Member States who currently do not allow weight or length excesses from the limits set in the Directive, as too interventionist. PO-B strikes the balance between establishing minimum standards at the EU level for decarbonisation and enforcement of freight operations and leaving Member States flexibility in setting more ambitious solutions, in particular as regards enforcement tools.

As to the proportionality, PO-A and PO-B contribute to improving energy and operational efficiency of cross-border transport operations and strengthening enforcement effectively, without imposing significant costs for operators and entailing only some upfront investment costs for Member States (PMc6 and PM6).

PO-C may raise concerns of disproportionality, due to the high level of policy intervention regarding high-capacity transport (indivisible loads, EMS) and enforcement requirements, resulting in significant changes to the existing approaches in Member States as well as considerable upfront investments necessary to implement measures PM5, PM7 and PM8.

7.5. Conclusion – ranking of the policy options

Table 12 provides a summary of the comparison of the options against the baseline scenario in terms of effectiveness, efficiency, coherence, subsidiarity and proportionality. The following ranking symbols have been used: from '+' (more effective/efficient/coherent/ proportionate than the baseline) to '++++' (much more effective/efficient/coherent/ proportionate than the baseline); from '-' (less effective/efficient/ coherent/proportionate than the baseline) to '----' (much less effective/efficient/coherent/ proportionate than the baseline).

Table 12: Comparison of options in terms of effectiveness, efficiency, coherence, subsidiarity and proportionality relative to the baseline

Criteria	POA	POB	POC
Effectiveness	++	+++	++++
Efficiency	++	+++	+
Coherence	-/+	++	++
Subsidiarity and proportionality	++	++	-/+

8. PREFERRED OPTION

8.1. Identification of the preferred policy option and stakeholders' views

All policy options address the identified problems and their drivers and contribute to achieving specific and main objectives, although with a different level of effectiveness and efficiency.

Policy option A sanctions what is a general practice in Member States, harmonising the conditions for cross-border traffic with longer and/or heavier vehicles. By adapting the technical standards of HDV ensuring that ZE HDVs do not lose the payload compared with conventional combustion engine, it incentivises the uptake of zero-emission technologies. It also further improves the efficiency of containerised transport and promotes intermodal transport. It somewhat strengthens enforcement by mandating a minimum level of controls. These measures do not entail additional investments by operators, and imply additional insignificant enforcement costs, mainly in Member States where the current level of controls is low. However, it requires certain investments in the infrastructure by Member States. The measures contained in this option greatly reflect the demands of the stakeholders gathered during consultations activities.

Policy option B goes further in enabling intermodal operations and in encouraging greening of the HDV fleet by providing additional economic incentives through additional loading capacity to HDVs with zero-emission powertrains or HDVs involved in intermodal (non-containerised) operations. It harmonises the authorisation requirements and administrative procedures for cross-border transport by certain longer/heavier vehicles and introduces mandatory weight control equipment to be installed in road infrastructure for more effective and efficient enforcement. This option requires certain investments and administrative reforms by Member States, while for operators it brings benefits such as reduced administrative burdens and possibility of additional payload in emission-free and intermodal operations.

Policy option C promises the highest level of harmonisation, decarbonisation and enforcement. However, compared to the other options, this comes with a much higher level of intervention and upfront costs to be

borne by operators and national authorities. In addition, due to the high level of interventionism, this policy option may be more difficult to adopt and implement.

From the comparison of the policy options presented in section 7 of this report, it appears that PO-C is the most effective in addressing specific objective 1 (*Remove barriers for the uptake of ZEV and energy-saving devices and incentivise intermodal transport*) in terms of increase in transport activity performed by ZE HDVs, increase in intermodal transport and reduction in CO2 emissions. It is also the most effective in addressing specific objective 2 (*Harmonise the rules on maximum weights and dimensions of HDV in cross-border operations*) and specific objective 3 (*Improve the enforcement of cross-border rules, including for road safety purposes*). It shows the highest net benefits, but at the same time entails the highest level of costs. The total costs of PO-C are 132% higher than those resulting from PO-B, while the total benefits are only 21% higher for PO-C compared to PO-B. The higher costs of PO-C are linked to the mandatory measures (PM3, PM7 and PM8) that require higher adjustment costs for public authorities and transport operators. These costs relate in particular to maintenance and reinforcement of road infrastructure due to the obligation on Member States to allow the circulation on the TEN-T network of European Modular Systems (longer/heavier combination of vehicles) provided that they are zero-emission or involved in intermodal operations (PM3), investments in "certified" Weigh-in-motion (WIM) systems (PM7) and training for the EMS drivers (PM8).

PO-B appears to be less effective than PO-C in achieving the specific objectives. However, this will be achieved in a more progressive and efficient way, entailing a higher benefit to cost ratio than PO-C, and allowing a smooth transition for authorities and operators. Measures under PO-B are easier and quicker to implement. PO-B strikes the balance between establishing minimum standards at the EU level for decarbonisation and enforcement of freight operations and leaving Member States flexibility in setting more ambitious solutions, in particular as regards enforcement tools. Thus, PO-B is assessed to be more proportionate than PO-C.

Hence, based on the trade-off between effectiveness and efficiency of different policy options, it is concluded that PO-B is the preferred policy option. It provides for the rights balance between achieving the desired objectives effectively while ensuring that the measures proposed under this policy option do not go further than what is necessary to resolve the problem efficiently.

Stakeholders widely supported the measures common to all policy options. During the open public consultations, majority of respondents considered it important to increase the maximum weights and dimensions to the limits most used in Members States (67 out of 125 respondents) and to authorise cross-border transport by heavier/longer vehicles between the neighbouring Member States who allow the same standards (74 out of 131 respondents). The dedicated workshops confirmed these findings and further specified the supported measures. The authorities and industry representatives considered that: an extra length/weight to accommodate for ZE technologies (in all vehicles and units), a cross-border transport by 44t HDVs and EMS in allowing Member States, harmonisation of a vehicle carrier loaded length at 20.75m and establishing minimum level of checks of HDVs' weight, are the most important measures for decarbonisation, harmonisation and enforcement.

At the same time, a few Member States (four national authorities) and rail/intermodal transport stakeholders (two associations) showed some resistance to allowing cross-border operations by heavier/longer HDVs, even if only among allowing Member States. This was due to concerns of impacts on road infrastructure and of possible modal backshift from rail to road. However, no robust arguments or evidence of potential modal backshift or damage to infrastructure resulting from the cross-border nature of operations have been demonstrated.

In addition to these common measures, the other PO-B measures, such as allowing maximum extra weight of 4t regardless the weight of ZE technology and considering trailers and semitrailers as intermodal transport units (thus eligible to benefit from extra 4t weight for intermodal operations) were much welcomed by the transport sector and by manufacturers (87 of 128 and 74 of 123 respondents, respectively). The great majority of stakeholders demanded and supported the harmonisation of certain technical requirements for loaded length of car transporters and simplification of administrative procedures concerning the permits for abnormal transport operations (80 of 124 respondents). These measures have been considered crucial for ensuring fair competition and increasing environmental efficiency of freight transport.

8.2. REFIT (simplification and improved efficiency)

This initiative is part of the Commission Work Programme 2022 under Annex II (REFIT initiatives), under the heading 'A New Push for European Democracy'. It has an important REFIT dimension in terms of simplification and alignment of the technical requirements and administrative procedures that Member States apply to a circulation of longer and/or heavier vehicles on their territories and in cross border operations. The initiative will reduce administrative burdens for operators related to diverging and costly requirements for permits for a transport of abnormal/indivisible load. An important cost burden resulting from the current WDD are the implications for operators who are hindered from performing cross-border operations by longer/heavier vehicles that are allowed in two (or more) neighbouring Member States. Lack of clarity in WDD provisions leads to diverging national interpretations as to cross-border operations by such vehicles and consequently to a patchwork of practices, where in some cases operators are obligated to partially un-load the vehicle before crossing the border and in others, they may freely cross the border based on bilateral arrangements between the two Member States. The initiative will remove the legal uncertainty regarding border crossing operations by longer/heavier vehicles (e.g., car transporters, EMS, 44t HDVs) and the related administrative burdens. In addition, by establishing common standards for the enforcement of cross-border rules, more legal certainty for operators, manufacturers and authorities will be created. Overall, by the introduction of harmonised rules and conditions for cross-border operations by vehicles exceeding certain weights and dimensions, the initiative will simplify and improve the efficiency of the legislation reducing regulatory burdens for operators and contributing to the smooth fair and safe functioning of the internal road transport market.

8.3. Application of the 'one in, one out' approach

PO-B is expected to lead to administrative costs savings for road transport operators from the reduction in the time needed to prepare and submit the requests for the issuance of special permits for the transport of indivisible loads (EUR 1.2 billion, expressed as present value over 2025-2050 relative to the baseline) enabled by the application of the one-stop-shop principles at national level and the digitalisation of documents. For the purpose of the 'one in, one out' approach, the annual administrative costs savings are estimated at EUR 71.8 million per year from the reduction in the time needed to prepare and submit the requests for the issuance of special permits for the transport of indivisible loads, enabled by the application of the one-stop-shop principles at national level and the digitalisation of documents[160].

[160] As explained in section 6.1.3, the annual average cost saving per permit over 2025-2035 has been estimated at EUR 64.1. Considering the average number of permits over 2025-2035, estimated at 1.12 million, the average annual cost savings are estimated at EUR 71.8 million.

In addition, as explained in section 6.1.3, PO-B is also expected to result in adjustment costs and adjustment costs savings for road transport operators. Overall, PO-B would result in net costs savings for road transport operators, estimated at EUR 45.1 billion, expressed as present value over 2025-2050 relative to the baseline.

9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The Commission will monitor and evaluate the actual impacts of the legislation through different actions and a set of indicators allowing to measure progress in achieving specific and operational objectives. The monitoring actions include regular (biennial) reporting by Member States about number and type (random, targeted, and automated) of controls of compliance performed and number and category of infringements detected. Based on these national submissions the Commission will prepare biennial reports to the European Parliament and the Council on the implementation by the Member States of the provisions on weights and dimensions of HDVs and drawing conclusions on the compliance by Member States with their enforcement obligations and on the observance by operators of the rules on weights of HDVs.

The regular reporting will also help to observe the trends in compliance levels and in effectiveness of enforcement activities and tools. The Commission will be assisted by the Road Transport Committee and the Expert Group on Weights and Dimensions in identifying and discussing cases of divergent interpretations of the EU rules on weight and dimensions, different national requirements and enforcement practices with the aim to establish common approach and issue guidance, where needed. The Committee will also facilitate collection of statistics on different road transport segments, such as abnormal transport or vehicle transporters. To monitor the uptake of zero-emission HDVs the Commission will collect the data from manufacturers, suppliers and type approval national authorities and will continue the cooperation with the European Environment Agency (EEA). The Commission may also encourage and support the exchange of best practices among Member States, by sharing information on effective enforcement techniques, training programs for inspectors and promoting cooperation between enforcement agencies. The EEA combines the data on all newly registered HDVs in Member States, which the Commission collects from the national authorities, with the monitoring data from manufacturers. The Commission publishes these monitoring data every year. To measure the progress and the actual effects of the initiative, a list of operational objectives and indicators for assessing the progress towards them have been identified and are detailed in Annex 13. Regular evaluation of the implementation of the W&D Directive will be important in order to assess its effectiveness and efficiency and in order to measure progress against the specific objectives. In future, reporting and monitoring may be further automated and digitalised. The regular contacts with the members of the Commission's Committee on Road Transport and of a dedicated Expert Group will also facilitate the monitoring of the implementation of the Directive and taking mitigation measures in a timely manner.

The success of the W&D Directive can be measured against operational objectives as follows:

1) The success in removing barriers to the internal market can be determined by the degree to which the revised Directive achieves harmonization of weights and dimensions regulations across Member States. This can be measured by the number of eliminated national requirements and by monitoring the administrative and operational costs reductions related to streamlined authorisation procedures and facilitated cross-border operations. The relevant information will be collected from the key stakeholders, including hauliers associations, abnormal load transport organisations and statistics from national competent authorities.

2) The success in boosting the uptake of zero-emission HDVs and energy-saving devices can be assessed based on the increased number of zero-emission HDVs registered, sales volumes, and their share in the overall HDV fleet, increased number of HDVs sold with energy-saving devices installed. The relevant information will be gathered from statistics from Member States, automotive manufacturers and hauliers' associations.

3) The success in promoting intermodal operations can be measured by monitoring the increase in volume of intermodal operations (containerised and non-containerised), increase in number of hauliers that are involved in intermodal operations, increase in volume of transport of high-cube containers. The information will be gathered from the sectoral organisations, official statistics on volumes of operations by transport mode and changes in modal shares of freight transport. The relevant data can also be collected from eFTI platforms, containing information on cargo transportation.

4) The success in enforcement can be assessed by evaluating the effectiveness of enforcement measures. Data on the number of inspections, detected infringements, detection ratio, penalties imposed, and compliance rates as well as number and types of WIM systems installed would be collected from national authorities, in particular enforcement agencies. Stakeholders can also provide insights into the consistency and effectiveness of enforcement practices.

5) The success of the revised Directive can also be measured by improvements in road safety and environmental outcomes. Data on accident rates involving HDVs, emissions reductions, and the overall environmental impact of HDV operations would be gathered from the enforcement agencies, statistics from road safety monitoring and the European Environment Agency.

The key stakeholders involved in providing data for monitoring and evaluation purposes include national authorities responsible for inspections and enforcement, vehicle manufacturers, industry associations, transport operators, European Environmental Agency and relevant EU and national databases. The EU can use these data to assess the Directive's effectiveness, identify areas for improvement, and make informed policy decisions related to weights and dimensions regulations.

The EU social, market and technical rules applicable to road transport are closely interlinked and they are accompanied by well-established monitoring and enforcement system at the EU and national levels. The enforcement of Weights and Dimensions Directive is part of this system. When non-compliance with the prescribed weights and dimensions requirements is detected during the roadside inspections, enforcement actions are taken by the competent authorities in accordance with the national penalty system. While the type and level of sanctions is the competence of Member States, they must ensure that penalties are non-discriminatory, effective, dissuasive and proportionate to the seriousness of infringement committed. The level of seriousness of infringements is determined by the EU secondary legislation (Implementing Regulation (EU) 2016/403). In addition, the infringements of the Directive must be recorded in the national register of road transport undertakings, exchanged via the European Register of Road Transport Undertakings (ERRU) and reflected in the risk rating score of the undertaking (as required by Regulation 1071/2009). The undertakings with the higher risk score shall be subject to targeted more frequent controls. The non-compliance with the Directive may affect the good repute of road transport operator and the right to operate on the internal market (Regulation 1071/2009). In future, cross-border implementation of sanctions will be facilitated through the proposed revision of the Cross-Border Enforcement Directive.

ANNEX 1: PROCEDURAL INFORMATION

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

The lead DG is the Directorate-General for Mobility and Transport DG MOVE, Unit C1: Road Transport.

DECIDE reference number: PLAN/2021/11805.

Item 8.b) in Annex I to Commission Work Programme 2023, headline 'A European Green Deal', part of the Greening freight package[161].

2. ORGANISATION AND TIMING

The Call for evidence[162] was published on 8 March 2022.

This impact assessment was coordinated by an Inter-Service Steering Group (ISSG), involving the following Commission Services: Secretariat-General, Legal Service, Directorate-General for for Climate Action (CLIMA), Directorate-General for the Internal Market, Industry, Entrepreneurship and SMEs (GROW) and Directorate-General for Environment (ENV).

The Inter-Service Steering Group met 5 times: on 30 November 2021, 3 June 2022, 15 November 2022, 9 March 2023 and 31 March 2023. It was consulted throughout the different steps of the evaluation and the impact assessment processes: notably on the draft staff working documents.

3. CONSULTATION OF THE RSB

The draft report was submitted to the RSB on 26 April 2023 and discussed by the Board on 24 May 2023. RSB issued a postivie opinion with reservations on 26 May 2023. The comments received from the Board have been addressed in the revised version of the Impact Assessment as detailed in the table below.

Table 13: Modifications of the impact assessment report in response to RSB comments

What to improve	Modifications to the impact assessment
(1) The report should better explain the approach and assumptions that underpin the modelling and its link to the cost-benefit analysis. In particular, it should provide a better explanation of the analysis of the expected increase in transport activity by zero-emission vehicles by policy option. It should detail better how the (one-off and recurrent) adjustment and administrative costs and cost savings have been calculated. It should also revise the 'One In, One Out' section and correctly identify the costs and cost savings in scope of offsetting.	The explanations on the approach used and the increase in activity of ZEV by policy option, relative to the baseline, have been added in section 6.1.3. In addition, sensitivity analysis has been performed to account for the impact of higher/lower price elasticity of demand for road transport on the transport activity performed by ZEV. The results are presented in section 6.1.3. Further explanations on the quantification of the adjustment and administrative costs have been added in section 6.1.1, including references to Annex 4 (section 3) where the costs and costs savings for each measure are

[161] COM (2022) 548 final of 18 October 2022.
[162] Commercial vehicles – weights and dimensions (evaluation) (europa.eu).

	discussed in detail (including the assumptions used and the results). In addition, tables with the impacts by policy option and policy measure expressed as present value over 2025-2050 relative to the baseline have been added in sections 6.1.1 and 6.1.3 (in addition to the impacts for 2030, 2040 and 2050 relative to the baseline). Explanations on the infrastructure maintenance costs and infrastructure reinforcement and upgrading costs have been added in section 1 of Annex 4. Sections 8.3 and 6.1.3 and Annex 3 to the impact assessment report have been revise in order to clarify that under the scope of the 'one in, one out' approach PO-B is expected to lead to administrative costs savings for road transport operators from the reduction in the time needed to prepare and submit the requests for the issuance of special permits for the transport of indivisible loads (EUR 1.2 billion, expressed as present value over 2025-2050 relative to the baseline), enabled by the application of the one-stop-shop principles at national level and the digitalisation of documents. For the purpose of the 'one in, one out' approach, the annual administrative costs savings are estimated at EUR 71.8 million per year due to the reduction in the time needed to prepare and submit the requests for the issuance of special permits for the transport of indivisible loads.
(2) The report should better explain the methodology and evidence used to conclude that the overall impact on road safety will be positive.	Further explanations as regards the methodology and evidence used in the analysis of road safety impacts have been added to section 6.2.1 of the impact assessment report.
(3) The report should clarify in its problem definition the relative importance of the problem drivers. The report should assess to what extent these problem drivers are sufficiently exhaustive to design the revision as effective as possible.	The additional information on problem analysis has been added to section 2.2 of the impact assessment report. It explains the relative importance of the key problems and identifies other external problem drivers (beyond the Directive) that contribute to the underperformance of the Directive.
(4) The report should better explain why there are three policy options designed around six common policy measures and to what extent these options can be considered complete. The report should also explain how the other policy measures, in particular on enforcement and training, are assigned to specific options	Additional explanations have been added to section 5.2.3 about the differences between the policy options, the interrelation between their respective policy measures and, in particular between PM3 and PM7 and PM8 (on enforcement and safety requirements for vehicles and drivers) within PO-C. In addition, PO-A has been revised to include measure PMc7, which was previously included only in PO-B and PO-C. The adjustment costs for the European Commission in section 6.1.2 and the summary of costs and benefits of policy options presented in section 7.2 have been revised accordingly. The addition of PMc7 to PO-A has not changed the ranking of the policy options in terms of benefits to costs ratio (Table 11).
(5) The report should set out the scoring methodology used when comparing the options, particularly when comparing the options on effectiveness and efficiency, and align the scoring better with the analysis. It should highlight the key trade-offs between effectiveness and efficiency for the selection of the preferred option.	The scoring of policy options has been modified in Table 12 to better reflect the analysis performed in section 7. The choice of the preferred policy option was based on the analysis of trade-offs between the effectiveness and efficiency of different policy options. The description of key trade-offs has been added to section 8 of the impact assessment report.

4. EVIDENCE, SOURCES AND QUALITY

The impact assessment is based on several sources, using both quantitative and qualitative data, collected from Member States and industry. This includes:

- The Commission Report on the implementation of the amendments to Directive 96/53/EC introduced by Directive (EU) 719/2015[163].
- The ex-post evaluation of the Weights and Dimensions Directive (see Annex 15).
- External support study to the ex-post evaluation of the Weights and Dimensions Directive carried out by an independent consortium led by Transport & Mobility Leuven and Ramboll Management Consulting, further consisting of Panteia, LNEC, Apollo Vehicle Safety, and individual subcontracted experts.
- External technical support to carry out the desk research, consultation activities and the measurement of impacts of the policy options and policy mesaures of the impact assessment by an independent consortium led by Transport & Mobility Leuven and Ramboll Management Consulting, further consisting of Panteia, LNEC, Apollo Vehicle Safety, and individual subcontracted experts.
- Stakeholder consultation activities (see Annex 2)
- Commission's experience in monitoring and implementing the Weights and Dimensions Directive
- The Member States' reports on the carry out of controls of overloaded heavy-duty vehicles in accordance with Article 10g of the Weights and Dimensions Directive.

[163] Commission Staff Working Document: Report on the Implementation of the amendments to Directive 96/53/EC introduced by Directive (EU) 719/2015, SWD(2023) 70 final.

ANNEX 2: STAKEHOLDER CONSULTATION (SYNOPSIS REPORT)

Synopsis Report — Weights and Dimensions Directive Evaluation SWD

This annex provides a summary of the outcomes of the consultation activities carried out for the review of the WDD, including in the context of the external support study. It notes the range of stakeholders consulted, describes the main consultation activities, and provides a succinct analysis of the stakeholders' views and the main issues they raised. The full analysis of the consultation results is presented in the stakeholder consultation report annexed to the final report of the support study.

In the context of the preparation of a back-to-back ex-post evaluation and impact assessment, four types of consultation activities were performed. The purposes of these activities were:

- to collect information and opinions of stakeholders on the main issues related to the implementation of the WDD, key problems and their drivers as well as on the desirable changes to the regulatory framework;
- to gather specialized input (data and information, expert views) on specific aspects of the regulatory framework;
- to gather information and views on potential impacts of different policy measures.

1. OVERVIEW OF CONSULTATION ACTIVITIES

Consultation activities took place in 2022 with the following activities carried out:

- A consultation on the Call for Evidence[164] (CfE) (21 January 2022 to 21 February 2022),
- An open public consultation[165] (OPC) (26 April 2022 to 19 July 2022)
- A survey targeted to different stakeholder groups (19 September 2022 to 13 October 2022),
- Two workshops, one targeted at industry stakeholders, one targeted at Member States (15 December 2022 and 16 December 2022).

In addition, a number of bilateral and multilateral meetings with different stakeholders (from road, rail, combined transport sectors, truck manufacturers, business associations, road infrastructure authorities, national authorities) have taken place and several position papers received and analysed throughout the year 2022 and in the first quarter of 2023.

2. STAKEHOLDER GROUPS CONSULTED

The following stakeholder groups were targeted by the consultation strategy, which was created by the Commission services at the outset of the process:

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[164] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13278-Commercial-vehicles-weights-and-dimensions-evaluation-/feedback_en?p_id=27827305

[165] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13278-Commercial-vehicles-weights-and-dimensions-evaluation-/public-consultation_en

High-level stakeholder group	Description	Stakeholder engagement activity
Road infrastructure authorities	**Infrastructure managers** are responsible for directing traffic flows, ensuring the maintenance of existing and the development of new infrastructure. They also gather data for official statistics or conduct analyses in relevant areas, particularly with regards to infrastructure protection and development, intermodal transport and road safety.	CfE OPC Survey
Road transport undertakings (freight and passenger transport operators)	**Road transport undertakings** are responsible for providing actual transportation services (carriage of goods or of passengers). Their responsibilities include ensuring that their vehicles are roadworthy and complying with the applicable regulations and providing reliable and efficient transportation services to their customers.	CfE OPC Survey Workshop
Business associations	Business organisations represent the interests of their members who are usually companies engaged in transportation of goods by road, rail or a combination of both. Road transport associations represent companies that operate HDVs for transporting goods or passengers by road. Rail transport associations represent companies that operate trains for transporting goods by rail. Combined transport associations represent companies that provide transportation services using a combination of road and rails. All those associations advocate for the interests of their members by lobbying for better regulatory framework, infrastructure , fair competition.	CfE OPC Survey Workshop
Shippers	**Shippers** are responsible for arranging the transportation of goods by road. They are, usually, the ones who contract with the road transport undertakings to transport their goods. Shippers' responsibilities include packing goods, providing accurate information about the goods and ensuring that all the documentation is in order.	CfE OPC Survey
Forwarders;	**Forwarders** are responsible for managing the transportation of goods by road on behalf of shippers. They act as intermediaries between shippers and road transport undertakings, coordinating the transportation of goods from start to finish. Their responsibilities include negotiating rates with road transport undertakings arranging for the pickup and delivery of	CfE OPC Survey

High-level stakeholder group	Description	Stakeholder engagement activity
	goods and managing all necessary documentation.	
EU Member States national authorities	**National authorities** are responsible for transposing, implementing and enforcing WDD. The national authorities' responsibilities include managing national registries of road transport undertakings and of commercial vehicles, issuing permits, authorisations, granting derogations, adopting the safety measures and ensuring compliance with all the relevant EU and national legislation applicable to the commercial road transport sector.	CfE OPC Survey Workshop
HDV manufacturers and OEMs (Original Equipment Manufacturers)	**Manufacturers** of HDV and manufacturers of their equipment (components, systems needed tobuild a complete vehicle), supplying road transport operators with the needed machinery and being bound by the WDD regarding the design of their products.	CfE OPC Survey
Other relevant stakeholders (civil society, NGOs, academia)	**Other relevant stakeholder groups** include consumer organisations, non-governmental organisations (NGOs) and academic experts/ research and knowledge partners (public and private organisations). They provide additional sectoral viewpoints and help us understand the details of the measures and policy options, including in terms of achieving environmental policy objectives, and what impacts could affect the industry, the consumers and the environment.	CfE OPC Survey
Citizens	Although representing a rather small group of stakeholders, **Citizens of the EU** were able to provide their contribution during the evaluation.	CfE OPC

3. CONSULTATION ACTIVITIES—METHODOLOGY AND TOOLS

The **Call for Evidence** focused on collecting information and views to support the work on the evaluation of the WDDand the impact assessment for its revision. More than 98% of respondents were the stakeholders from the EU Member States, and 4 contributions were received from the stakeholders from non-EU countries. The big part of contributions came from Germany and Belgium (25% and 21% respectively).

Stakeholder category	Number of responses	% of responses*
Companies and businesses	88	39.3%

Business associations	84	37.5%
EU citizens	28	12.5%
Public authorities	7	3.1%
NGOs	5	2.2%
Trade Unions	3	1.3%
Other	9	4.0%
TOTAL	**224**	**100%**

*Does not add up to 100% due to rounding

The **OPC** focused on collecting views and information in order to identify problems and their drivers, define objectives of the revision and identify potential solutions to the problems. The OPC questions were prepared in order to identify gaps, which would then be addressed in the following survey and workshops.

In total, 132 participants responded to the OPC, representing a rather high response rate considering that more specialized consultation activities were also conducted. Not all respondents answered every question, which is why the number of respondents is lower than 132 in all cases, with commonly around 125 answers to each question. The majority of the respondents are professionally related to road transport, including the citizens. More details about the results of the OPC are available in the Factual Summary report available on the Commission's *Have your Say* website, and the consultation report forming part of the impact assessment support study.

Stakeholder category	Number of responses	% of responses
Business associations	58	44.0%
Companies/Business associations	53	40.1%
Public authorities	9	6.9%
EU Citizens	3	2.3%
NGOs	3	2.3%
Trade unions	3	2.3%
Consumer organizations	1	.75%
Non-EU citizens	1	.75
TOTAL	**132**	**100%**

*Does not add up to 100% due to rounding

The **online stakeholder survey** was developed to gather information to validate the problem definition and the objectives of the policy intervention, and to obtain input to further define the policy measures and options. Major parts of the survey were focused on obtaining the data needed to support the assessment of impacts of measures and expected costs. The survey addressed mainly to infrastructure managers, manufacturers, national authorities and enforcement agencies, transport operators, and other road (transport) stakeholders.

Stakeholder category	Number of responses	% of responses
Operators	24	18.3%
National authorities and enforcement agencies	21	16.0%

Infrastructure managers	14	10.7%
Manufacturers	9	6.9%
Other road stakeholders	63	48.0%
TOTAL	**131**	**100%**

*Does not add up to 100% due to rounding

Subsequently, two **stakeholder workshops** were organised, separately for industry stakeholders and for Member States' administrations. The industry stakeholder workshop was attended by 171 participants representing: EU road hauliers, passenger road transport operators, shippers, rail industry, transport and trade associations, transport trade unions, automotive industry, road authorities, homologation bodies, tachograph manufactures and others. The Member States workshop was attended by 53 participants representing: transport and infrastructure ministries, road authorities, transport agencies from 21 Member States. The participants provided answers to questions posed via an online polling tool following the presentation of the WDD's policy context and aspects of the revision to achieve the policy objectives.

The stated objectives of the WDDwere:

- Ensuring the free movement of goods
- Ensuring equal conditions of competition in the internal (intra-EU) road transport market
- Protecting the road infrastructure
- Ensuring road safety
- Improving working conditions for HDV drivers
- Improving energy efficiency and reducing GHG emissions in road transport

4. LIMITATIONS OF THE STAKEHOLDER CONSULTATION

It was particularly difficult to gather robust data on the direct and indirect costs arising from the WDD. Stakeholders were asked to comment on how they might be impacted by the various proposed measures, but they were rarely able to provide estimates on the monetised costs and benefits. The limitations regarding data availability affected somewhat a robustness of certain conclusions.

The policy measures were further refined after they were presented to some stakeholder groups. Therefore, not all stakeholder groups were consulted on the wording used in the impact assessment. Nevertheless, the nature of the measures and their essential elements did not change.

5. FEEDBACK RECEIVED

The key themes explored in the first three stakeholder consultation activities largely followed the various elements of the evaluation matrix, namely effectiveness (specifically, implementation of the internal market, road safety and protection of infrastructure, energy efficiency and emissions, compliance, and derogations), efficiency, relevance, coherence, and EU-added value.

Problem definition and objectives

The key objectives of the WDD revision were grouped into three areas:

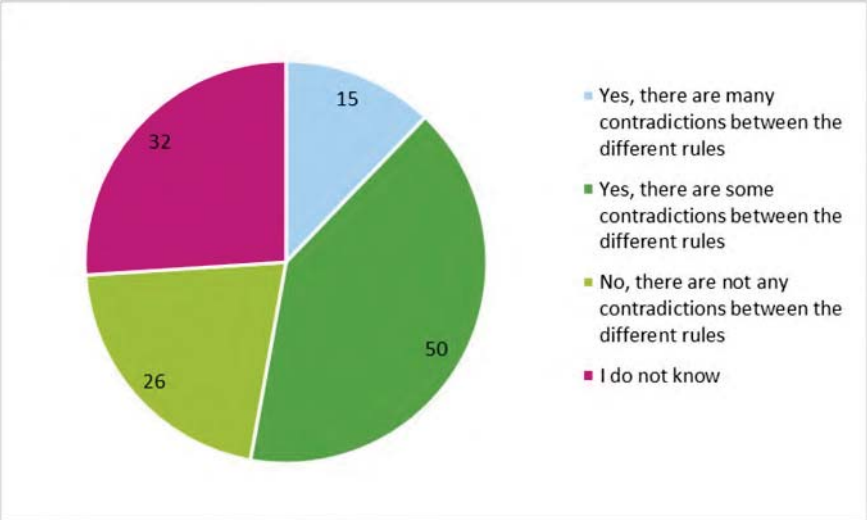
- Decarbonisation: Boost uptake of ZEV & energy-saving technologies and incentivise intermodal transport
- Harmonisation: Remove barriers to cross-border operations while ensuring fair competition in the internal market
- Enforcement: Improve compliance with the EU rules to ensure road safety and fair competition

While the CfE and OPC focused on the problem at a broader level, the survey and workshops took a more detailed and systematic approach to specifying the problems and associated objectives for the revision of the WDD.

A common theme in the feedback to the CfE was a lack of uniform EU rules regarding cross-border transport between Member States allowing longer and heavier HDVs under the current Weights and Dimensions Directive. The need for harmonisation of this issue was mentioned more than 80 times in the 224 submissions. Respondents also raised the issue of missing alignment with other EU directives and regulations.

Coherence. In the OPC, the respondents were asked detailed questions about perceived problems. One major issue identified by respondents was **lacking coherence**: 65 out of 123 stakeholders (53%) perceived problems with internal coherence and in particular the inconsistency in the rules applicable to cross-border traffic of 44 t HDVs (see below).

Public consultation: Q9: In your view, are there any contradictions or inconsistencies between the different rules of the Directive? (N = 123)

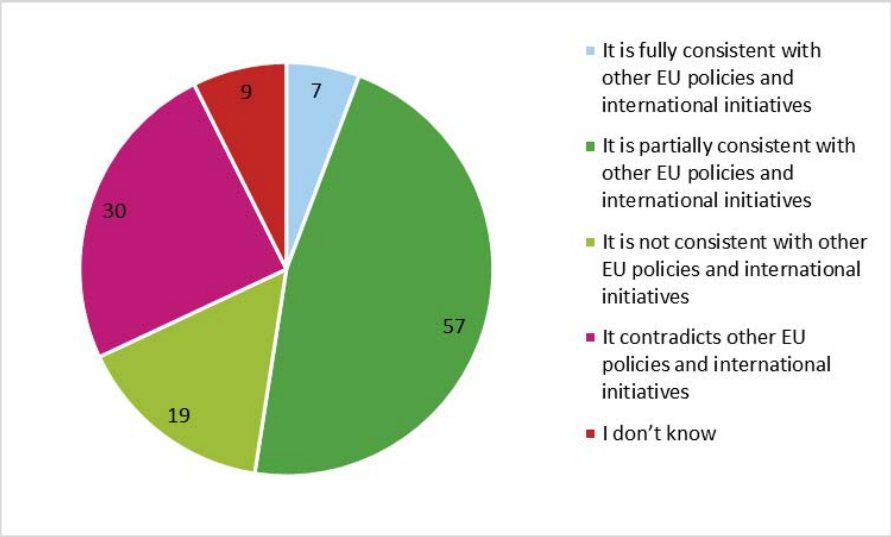


Source: W&D Directive OPC, 2022

The issue most often mentioned by the stakeholders in the qualitative follow-up question relates to the fact that the current Directive has not achieved a sufficient level of harmonisation across Member States because of excessive scope for national derogations. While 64 out of 122 participants assessed that the WDD is coherent with other EU policies (external coherence), 49 respondents (out of 122) claimed the opposite, especially regarding the relations to European Green Deal, the Combined Transport Directive, EU-type approval and driving time and rest periods (see

below). One concern stressed was that the WDD would put other, more sustainable modes of transport in a competitive disadvantage, ultimately contributing to reverse modal shift.

Public consultation: Q 10: In your view, is the Directive consistent with other EU policies and objectives (e.g. European Green Deal, sustainable and smart mobility strategy, the EU road safety policy framework 2021-2030, legislation on the type approval of road vehicles, Combined Transport Directive) and other international initiatives (e.g. Sustainable Development Goals)? (N = 122)



Source: W&D Directive OPC, 2022

Effectiveness. Respondents also identified the WDD's failure to **effectively** address energy efficiency of road transport. Many respondents (80 of 131) answered that the Directive is 'ineffective' or 'very ineffective' in this respect. A majority of the infrastructure managers, manufacturers, national authorities and enforcement agencies and operators consider that the WDD helped to ensure fair conditions of competition in the provision of transport services in the EU. They often referred to the need to have common market rules for heavy goods transport. However, some respondents disagreed, e.g. one authority arguing that the WDD was inimical to abnormal sized indivisible load transports. Three national authorities responding to the OPC referred to the risk of modal shift towards road transport from more sustainable modes and to the specific allowances for zero-emission vehicles that they still considered insufficient. 9 of 63 (14%) road stakeholders believed that the WDD facilitated the development of alternative-fuel and zero-emission technologies for HDV moderately (6) or very much (3), whereas 4 think it hindered it slightly (3) or even very much (1). 8 other road stakeholders (13% of all stakeholders) think that the WDD has not facilitated nor hindered the development of alternative-fuel and zero-emission technologies. Road transport operators seemed not to have extensive experience with ZEV, as only one reported the on-going pilot projects. Two manufacturers consider that the WDD has supported the development of zero-emission HDVs by granting them an extra-weight allowance. However, the lack of flexibility on axle-loading is limiting potential vehicle designs. The length limits are also creating issues for fuel cell electric trucks that require space for hydrogen storage. With today's directive, fuel cell trucks need to use shorter trailers or to reduce cargo space and payload to accommodate hydrogen tanks.

As regards the impacts of WDD on promoting intermodal transport, 17 stakeholders of 24 (71%) who expressed an opinion (2 infrastructure managers, 1 manufacturer, 1 national authority, 3 operators and 10 other road stakeholders) responded that the WDD facilitated intermodal transport

at least moderately, while the remaining 7 of 24 (29%) stated that the WDD has hindered intermodal transport at least slightly. The remaining 95 participants from all stakeholder categories did not express any opinion.

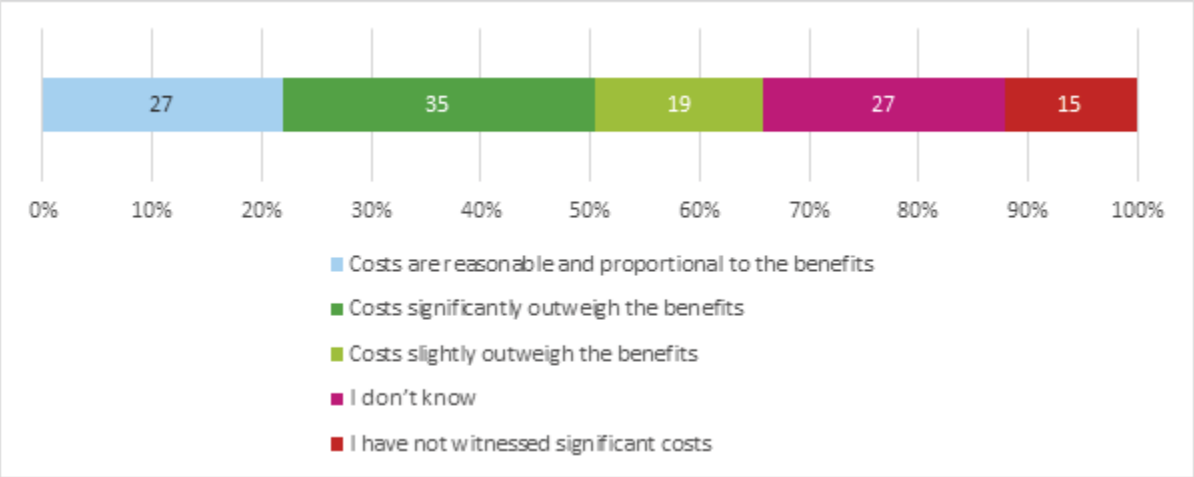
In terms of **effectiveness** in general, the OPC respondents mostly perceived the WDD's standards "effective" or "very effective" in the dimensions of the free movement of goods, road infrastructure and road safety, and to a lesser extent in equal competition, working conditions, and energy and emissions (see below).

Public consultation: Q3: In your view, how effective are the standards set out under the Directive in achieving the following objectives?

Source: W&D Directive OPC, 2022

Efficiency. As to the **efficiency** of the Directive, 27 out of 123 (22%) respondents in the OPC considered the costs of implementation of the Directive as reasonable and proportional to the benefits. 35 out of 123 respondents found that the costs of applying the Directive significantly outweigh the benefits. However, most of the surveyed stakeholders did not express their opinion about the efficiency criterion. Four operators (out of 24 who responded) referred to the administrative burden that is related to the different authorisations required to operate vehicles in different Member States and sometimes within Member States, in particular for EMS combinations and abnormal transport.

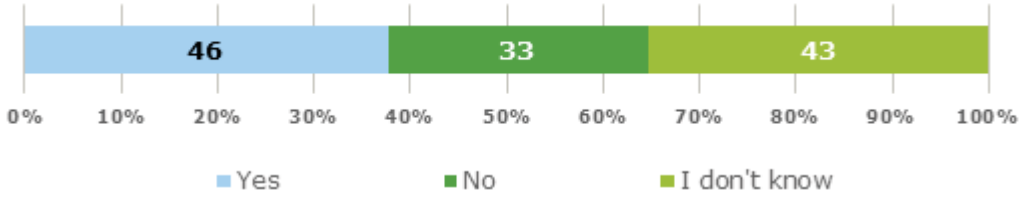
Public consultation: Q5: What do you think about the costs caused by the application of the Directive? (n=125)



Source: W&D Directive OPC, 2022

Moreover, 38% of respondents (46 of 122) perceived a potential for a reduction of costs arising from the Directive, while 27% disagreed and 35% could not provide an answer (see below). The main aspects mentioned for these costs reductions concerned the harmonisation of rules/set of common rules, especially for exceptional transport, as all differences imply additional bureaucracy and costs; administrative simplification by digitising the processes for both carriers and the competent authorities; increased use of high capacity vehicles will optimise load capacity, reduce fuel consumption and emissions; and allowing bilateral agreements for cross-border allowing higher weights.

Public consultation: Q6: Do you think it is possible to reduce costs caused by the Directive? (n=124)



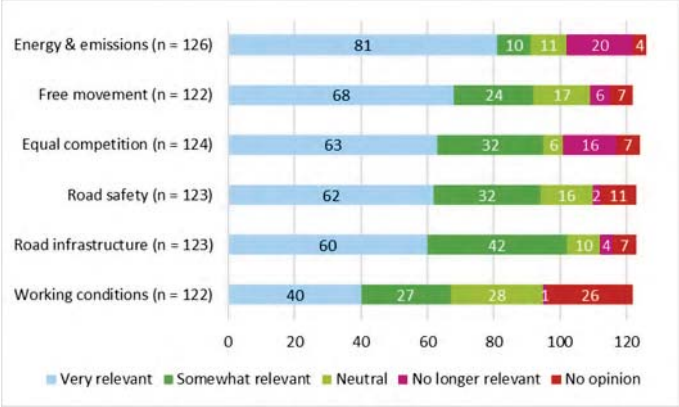
Source: W&D Directive OPC, 2022

Relevance. Regarding the **relevance** criterion, the respondents were asked concerning the stated objectives of the WDD, being:

- Ensuring the free movement of goods
- Ensuring equal conditions of competition in the internal (intra-EU) road transport market
- Protecting the road infrastructure
- Ensuring road safety
- Improving working conditions for HDV drivers
- Improving energy efficiency and reducing GHG emissions in road transport

Most of the respondents found the objectives of the WDD still very relevant, whilst no more than 20 out of the 126 respondents found at least one of the objectives mentioned above no longer relevant, with the lowest relevance acknowledged for working conditions (see below). The main topics that should be addressed by a revised Directive are new technologies and innovations, intermodality of transport (especially rail and road), sustainability (especially alternatively fuelled vehicles) and the cross-border aspect of road transport.

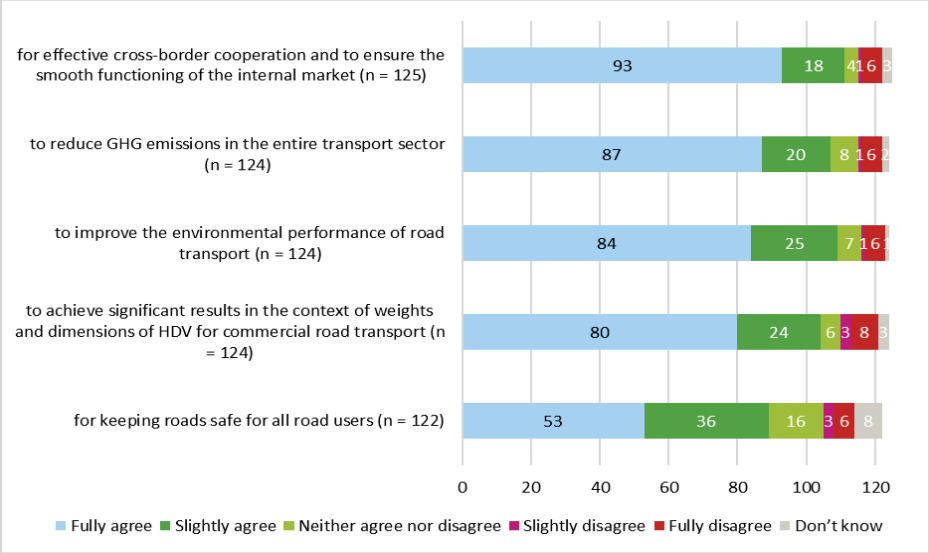
Public consultation: Q7: In your view, are the Directive's objectives still relevant in addressing current and emerging needs and challenges?



Source: W&D Directive OPC, 2022

EU added value. Regarding the **EU added value** criterion, the OPC results show that most respondents fully agreed on EU action is being essential for the dimensions of effective cross-border cooperation, reduction of GHG emissions in the transport sector, improving environmental performance of road transport, results in the context of weights and dimensions for HDV, as well as road safety, with only a maximum 8 out of 124 of the respondents fully disagreed for any of the topics. Most fully agreeing opinions were expressed regarding the essentialness of effective cross-border cooperation, lowest on road safety (see below).

Public consultation: Q11: To what extent do you agree with the following statements: EU action is essential:



Source: W&D Directive OPC, 2022

The survey, following the OPC, revealed more detailed insights. Regarding the design of truck cabins, 3 manufacturers confirmed having introduced more aerodynamic, safer, and more comfortable cabs, with one underlining that the 2015 amendments to WDD were crucial for this development, also regarding the higher weight of battery electric trucks. One road transport operator mentioned that, even though the WDD did integrate aerodynamic devices, in practice, such devices have not been taken up by the market. Most vehicles have not been retrofitted while main producers of semi-trailers have not integrated this device as standard equipment in their production. One manufacturer does not notice any increase of market uptake of aerodynamic devices and indicates that no quantitative information is available yet. In terms of alternative powertrains, 9 of 63 road stakeholders (14%) believe that the WDD has facilitated the development of alternative-fuel and zero-emission technologies for HDV moderately (6) or very much (3), whereas 4 think it hindered it slightly (3) or even very much (1). 8 other road stakeholders think that the WDD neither facilitated nor hindered the development of alternative-fuel and zero-emission technologies. 42 respondents of these 63 did not provide any opinion (66%). Only one operator confirmed the usage of ZEV, while another stated that ZEV are not available.

Most of the infrastructure managers, manufacturers, national authorities and enforcement agencies and operators consider that the WDD helped to ensure fair conditions of competition in the provision of transport services in the EU. They often refer to the need to have common market rules for heavy goods transport. However, some respondents disagree, e.g. one authority arguing that the WDD was inimical to abnormal sized indivisible load transports. Regarding enforcement, 4 manufacturers state that OBW is not preferred as automated control via infrastructure sensor technology is more efficient. Lastly, none of the participating operators stated that national weight derogations and/or trials of EMS resulted in modal shifts. They pointed out that their experience showed that longer and heavier trucks mainly replace conventional trucks (i.e., reducing the number of trucks used rather than substituting other modes), or the recourse to other modes not being possible due to the type of good being transported. 4 operators stated that longer and heavier vehicles are more environmentally efficient, and 4 national authorities reported successful trials at improving road energy efficiency and reducing GHG emissions from transport. 8 other road stakeholders agreed on that observation.

The workshops revealed that the majority of participants are mainly concerned about the legal uncertainty on the rules applicable to cross-border transport and diverging level of enforcement, which should be addressed by the revision (3.60 points out of 5 in polling system).

Overall, the stakeholders confirmed the identified problems and their European dimension and supported broadly the objectives for the revision of the WDD.

Potential solutions

The stakeholder consultations also suggested potential solutions to the identified problems.

The CfE responses focused on the measures needed to facilitate cross-border operations and the usage of the EMS. Most respondents expressed support for the initiative (especially business associations and companies). Moreover, support for weight adjustments and incentives for ZEV were generally agreed upon. Stakeholders called for more than the currently allowed additional 2 tons to accommodate ZE powertrains, reminding about the battery placement in relation to the truck's cabin. The need for additional measures to promote intermodal transport (e.g. by allowing

increased loading capacity), and ensuring interoperability of HDV was acknowledged. However, some stakeholders argued against a possible increase to the allowed weight to 44 t as this would eliminate the exemption that is provided so far for combined transport. Others suggested that the WDD should focus on additional weight and/or length allowances for ZEV to accommodate the technology needed. In the survey, 5 manufacturers indicated that flexibility to axle loads, additional weight allowances and length derogations should be provided to better accommodate the new powertrain technologies.

Agreement prevailed regarding the need for **harmonisation** of the rules between Member States. Most stakeholders seem to support the principle that transport across borders should be allowed automatically if the vehicle weights or dimensions do not exceed the smallest of the values that are applicable in the individual Member States.

Regarding the alignment of maximum weights and dimensions to the most common limits currently allowed, the stakeholders presented different levels of agreement. Some stakeholders supported an increase of the maximum weight to 44 t for the traffic on the entire EU road transport network, or at least along the TEN-T core and comprehensive network. Moreover, some stakeholders advocated an extension of the maximum permissible weight to 60 t and/or an extension of the permitted length to 25.25 m, while others opposed this increase mainly due to the risk of reverse modal shift. Moreover, a few stakeholders indicate that the use of high-capacity vehicles should not be tied to alternative fuels or zero emissions as it could lead to negative effects otherwise. Some suggestions for additional measures could not be taken into consideration, as they are being addressed by other Commission initiatives, or are not within the scope of the WDD revision.

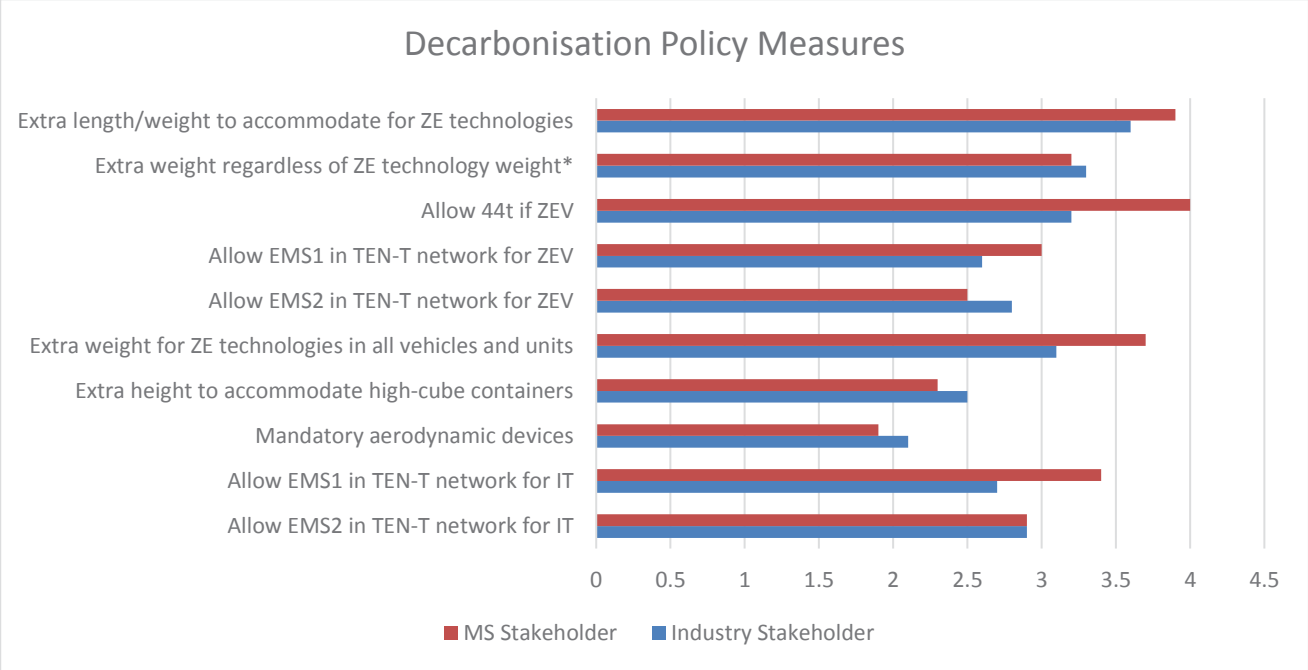
All manufacturers acknowledged the need for a further extension of the WDD's provisions regarding cab design. Implementing the flexibilities provided by the 2015 revision of the WDD is, according to the manufacturers, instrumental for development of future generation of trucks. Manufacturers stated that aerodynamic components and packages improve transport energy efficiency, and the required robustness of such systems brings with it an additional mass which, given the investment required to acquire it, should not also have a negative impact on payload.

Two manufacturers further referred to the obligation resulting from the WDD that Member States should take specific measures to identify vehicles that are likely to have exceeded weight limits, i.e. weighing mechanisms in the road infrastructure (WIM).

The poll launched within the two workshops after the presentation revealed the most supported policy measures in different dimensions perceived by industry and Member States stakeholders. The following figures explore the direct comparison of the workshop polls and the assessment of the policy measures through the stakeholders

Addressing **decarbonisation measures**, Member States stakeholders supported to allow 44t if ZEV (4/5 points), extra length/weight to accommodate for ZE technologies (3.9/5 points), and extra weight for ZE technologies in all vehicles and units (trailers, dollies, all trucks and buses) (3.7/5 points) the most. A similar picture emerged from the poll among industry stakeholders, who also supported extra length/weight to accommodate for ZE technologies (3.64 points out of 5) and to allow 44 t for ZEV (3.17/5), though valuing extra weight to accommodate for ZE technologies regardless the weight of the technology higher (3.28/5 points) than Member States. The remaining policy measures were rated comparably.

Ratings of Industry Stakeholders and Member States Stakeholders regarding decarbonisation policy measures, 0 = less effective, 5 = more effective.

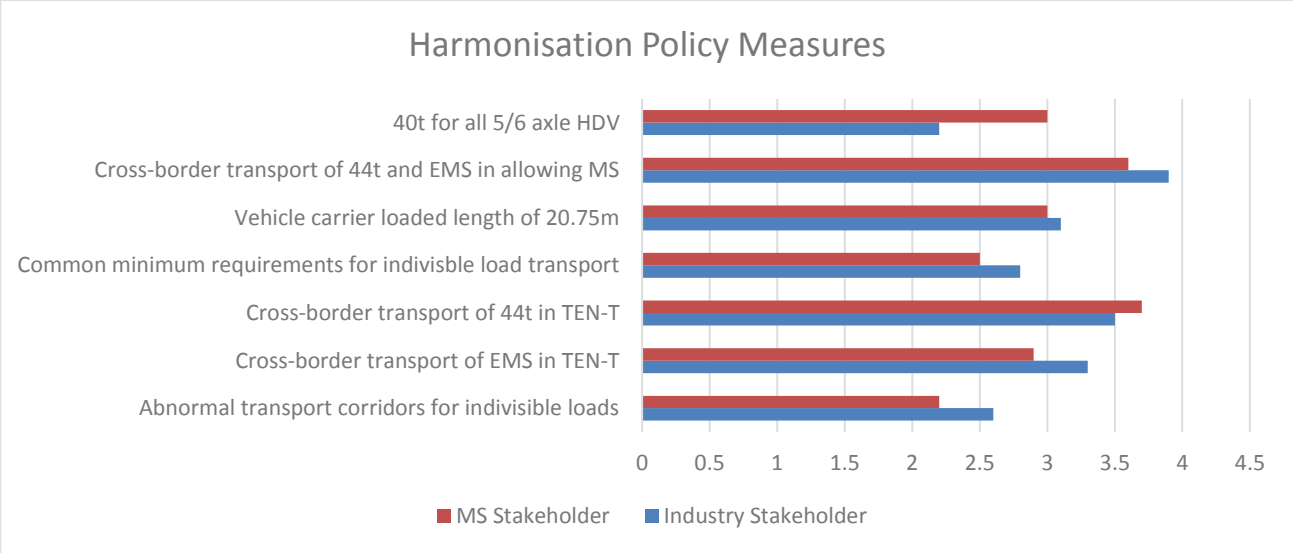


*Extra weight to accommodate for ZE technologies regardless the weight of the technology

Source: W&D Directive Workshop Poll, 2022

Regarding possible **harmonisation policy measures**, Member States and industry stakeholders rate almost every measure similarly, only Member States express considerably higher support for allowing 40 t for all 5- and 6-axle HDV (3/5 points vs. 2.2/5 points) and, to a lesser extent, for cross-border transport of 44 t in TEN-T, whereas industry stakeholders expressed the highest support for cross-border transport of 44 t and EMS in allowing EMS (3.9/5 points).

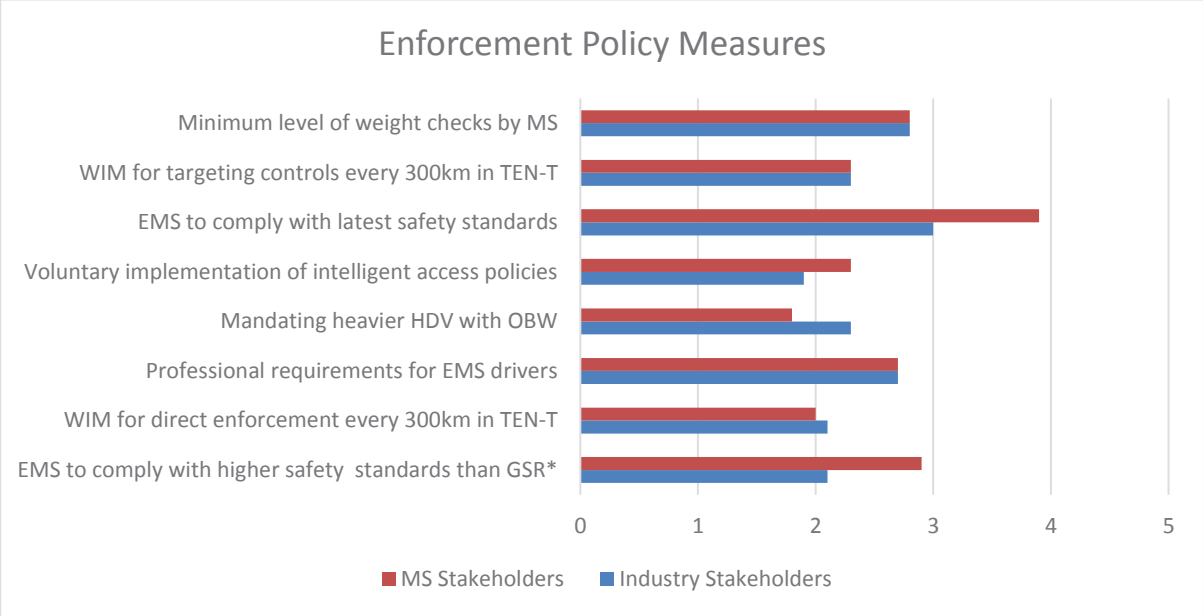
Ratings of Industry Stakeholders and Member States Stakeholders regarding harmonisation policy measures, 0 = less effective, 5 = more effective.



Source: W&D Directive Workshop Poll, 2022

In terms of **enforcement policy measures**, both Member States and industry stakeholders rated the minimum level of weight checks at 2.8/5 points, making it the second-most supported policy options through both stakeholders after the measures of having EMS to comply with latest safety standards, which is much more preferred by the Member States (3.9/5 points) than by the industry (3/5 points). Compared to industry stakeholders, Member States also signalized more support for higher safety standards than foreseen in the GSR (2.9/5 points in contrast to 2.1/5 points). With regard to the other measures, however, the assessments of industry and Member States stakeholders are on similar levels.

Ratings of Industry Stakeholders and Member States Stakeholders regarding enforcement policy measures, 0 = less effective, 5 = more effective.



*GSR = General Safety Regulation

Source: W&D Directive Workshop Poll, 2022

Overall, most support was received for the measures related to increased weight limits for ZEV (e.g. +2 tons for the e-motor vehicle and +2 tons for the e-trailer), the harmonisation of rules for cross-border traffic by longer/heavier HDVs among Member States who allow such vehicles on their territories and the harmonisation of the rules related to the abnormal transport. Less support was shown for a measure on a general increase of the maximum authorised weight to 44 t, as this would eliminate the incentive that is provided for combined transport in the form of extra weight of 4t. To sum up, the workshop confirmed the need and broad support for accelerating the uptake of ZE HDV and other solutions improving operational and energy efficiency and safety of road freight transport as well as enabling/increasing modal cooperation.

6. USE OF CONSULTATION RESULTS

The results of the consultation activities were profoundly used as a source of information for the ex-post evaluation regarding issues perceived by stakeholders as problematic. In a similar manner, the policy measures included in the Impact Assessment for analysis directly reflect the suggestions and

opinions expressed by the stakeholders in the consultation activities. Finally, the open public consultation was mostly used to validate the Commission's understanding of the problems at stake and of the most adequate solutions thereto. The results overwhelmingly confirmed the Commission's initial views and approach to the ex-post analysis and to the Impact Assessment.

While the absolute numbers of responses to each of the consultation activities are varying, they must be seen in the context of the heterogeneous road transport sector, which provides a wide range of specialized transport operations and is divided into a number of, sometimes very small, transport market segments. Many stakeholders did not decide to answer individually but contributed to the drafting of co-ordinated positions of industry representative organisations.

Obviously, there were differences in the positions expressed in individual contributions, but a general consensus emerged as to the assessment of the current situation and the changes to be made to the legislation. This is particularly visible in the answers to the open public consultation, where a clear majority opted for the same or similar answers to each question, e.g. regarding the WDD's relevance for addressing energy and emission issues, the added value for cross-border transport, or the existence of inconsistencies.

This consensus is less clearly visible – at first sight – in the other consultation activities, but this is only because they allowed for free text answers. Detailed analysis of the latter confirmed, however, the trend of answers converging to common positions of all stakeholder groups. This convergence is certainly the result of a high degree of organisation of the industry.

ANNEX 3: WHO IS AFFECTED AND HOW?

1. PRACTICAL IMPLICATIONS OF THE INITIATIVE

The revision of the Directive on the maximum weights and dimensions of heavy-duty vehicles (HDVs) aims at increasing the sustainability of road transport, deepening the internal market and ensuring road safety.
The preferred policy option will provide incentives for speeding up the uptake of zero-emission powetrain technologies and for enhanced involvement in intermodal operations. It will bring legal certainty for carrying out cross-border operations by heavier and/or longer vehicles, harmonising the conditions for such operations. Finally, it will strenghten and harmonise enforcement across the EU, improving compliance with the rules in force.

The impacts of the preferred policy option are expected to be significant, affecting various stakeholders in different ways. The main groups of affected stakeholders are: road transport operators, HDV drivers, manufacturers, national administrations, transport services clients and society at large.

The **road transport operators** will benefit from the possibility of extra payload when they involve in intermodal operations and/or when they use zero-emission (ZE) HDVs. The possibility of extra payload and improved energy efficiency of ZE HDVs will ensure a faster return on investment in the ZE powetrains for operators. Clarification and harmonisation of the rules applicable to cross-border transport by longer and/or heavier vehicles, such as: 44t HDVs and European Modular Systems (EMS) between allowing Member States, and car transporters and indvisible load carriers throughout the EU, will improve energy and operational efficiency of operations. This will bring, among others, operation costs savings for operators and will allow them to optimise the use of their fleets and of drivers' working time. The streamlining and digitalisation of procedures for the issuing of permits for abnormal transport will benefit operators active in this segment. The road transport operators will also benefit from more targeted controls which will eliminate idle time of drivers and vehicles durings unnecessary roadside controls of compliant vehicles.

Drivers driving ZE HDVs will enjoy improved working conditions thanks to the reduction of vibrations, noise and air pollution in the cabins of their vehicles. Drivers who will have more opportunities to involve in intermodal operations, performing only first and/or last mile deliveries, will benefit from spending less time away from home. Drivers driving vehicles compliant with the authorised maximum weights will also benefit from the elimination of costs linked with the unnecessary stops for roadside inspections of vehicles.

Manufacturers who, anyway will have to comply with the targets imposed by the HDV CO_2 Standards Reguation, will benefit from the higher demand for the ZE HDVs from operators who will want to realize the benefits of energy and operational efficiencies linked with the use of ZE HDVs as well as other energy saving solutions.

National administrations will initially bear some upfront adjustment costs related to the installation of a minimum number of weigh-in-motion (WIM) systems and introduction of the one-stop-shop mechanism and procedures for authorisations of transport of abnormal/individible loads, including the electronic register for HDVs and their trailers used for such operations. They will also bear some adjustment costs linked to a more intensive wear and tear of the road infrastructure caused by the circulation of heavier HDVs equipped with zero-emission powertrains, as well as to

more inspections of sensitive civil engineering structures (old bridges). Public authorities will incur regular maintenance and calibration costs of WIMs and will benefit from more efficient targeted controls with the use of WIMs and a reduction in the processing time for permits due to the one-stop-shops, which will bring administrative costs savings. In addition they will benefit of adjustment costs savings linked to lower maintenance costs for infrastructure due to the decrease in the number of trips (driven by the increased payload), the shift from road-only to intermodal transport and the reduction in the frequency and severity of overloading practices.

Transport service clients will benefit from more efficient and sustainable transport operations which may also result in more competitive prices compared with operations performed by standard HDVs.

The society at large will benefit from a reduction in road transport externalities, in particular CO_2 emissions, air polutant and noise emissions due to the growing use of ZE HDVs in road operations, the increase in the intermodal transport and broader use of energy saving modular schemes. Road safety will improve due to the reduced HDV traffic and better compliance with the rules on maximum authorised weights through gradual eliminations of overloaded HDVs on the roads.

2. SUMMARY OF COSTS AND BENEFITS

I. Overview of Benefits (total for all provisions) – Preferred option (PO-B)		
Description	***Amount***	***Comments***
Direct benefits		
Adjustment costs savings for road transport operators, expressed as present value over 2025-2050 relative to the baseline	EUR 42.8 billion	Benefits to road transport operators, estimated at EUR 42.8 billion expressed as present value over 2025-2050 relative to the baseline, due to the reduction in the operation costs and the reduced time required for cooperating with the public authorities for manual/roadside weight checks. The reduction in operation costs is driven by an increase in the average payload and the reduction in the number of trips (due to the extra length and weight to accommodate ZE technologies, the harmonisation of the maximum permitted weight of 5- and 6-axle HDV in cross-border transport, allowing cross-border transport of 44t and EMS between "allowing" MS and the harmonisation of the loaded length of vehicle carriers), and by the shift from road-only to intermodal operations (due to the alignment of the definition of intermodal transport with the Combined Transport Directive).
Administrative costs savings for road transport operators, expressed as present value over 2025-2050 relative to the baseline	EUR 4.4 billion	Benefits to road transport operators, from the elimination of permits for the use of higher trucks to accommodate high-cube containers in intermodal transport (EUR 3.2 billion, expressed as present value over 2025-2050 relative to the baseline), and from the reduction in the time needed to

I. Overview of Benefits (total for all provisions) – Preferred option (PO-B)		
Description	***Amount***	***Comments***
		prepare and submit the requests for the issuance of special permits for the transport of indivisible loads (EUR 1.2 billion, expressed as present value over 2025-2050 relative to the baseline) enabled by the application of the one-stop-shop principles at national level and the digitalisation of documents.
Adjustment costs savings for national public authorities, expressed as present value over 2025-2050 relative to the baseline	EUR 3 billion	Benefits to national public authorities, estimated at EUR 3 billion expressed as present value over 2025-2050 relative to the baseline, due to a reduction in the maintenance costs for road infrastructure. This is an effect of a decrease in the number of trips relative to the baseline (driven by an increase in payload), the shift from road-only to intermodal transport and the reduction in the frequency and severity of overloading practices.
Administrative costs savings for national public authorities, expressed as present value over 2025-2050 relative to the baseline	EUR 22.8 billion	Benefits to national public authorities, estimated at EUR 22.8 billion expressed as present value over 2025-2050 relative to the baseline, due the implementation of the one-stop-shop systems at national level and thus the costs savings for processing the permit requests, and the reduction in the number of manual/roadside checks enabled by the WIM systems.
Indirect benefits		
Reduction in external costs of CO_2 emissions, expressed as present value over 2025-2050, relative to the baseline	EUR 3.5 billion	Indirect benefit to society at large, due to the tonnes of CO_2 emissions saved, enabled by the higher use of ZE HDVs, the shift to intermodal transport and the decrease in the number of trips (driven by the increased payload). The reduction in the external costs of CO_2 emissions is estimated at EUR 3.5 billion, expressed as present value over the 2025-2050 horizon relative to the baseline.
Reduction in external costs of air pollutant emissions, expressed as present value over 2025-2050, relative to the baseline	EUR 2.1 billion	Indirect benefit to society at large, due to the tonnes of air pollutant emissions saved, enabled by the higher use of ZE HDVs, the shift to intermodal transport and the decrease in the number of trips (driven by the increased payload). The reduction in the external costs of air pollutant emissions is estimated at EUR 2.1 billion, expressed as present value over the 2025-2050 horizon relative to the baseline.
Reduction in external costs of noise emissions, expressed as present value	EUR 0.7 billion	Indirect benefit to society at large, due to the reduction in noise emissions, enabled by the higher use of ZE HDVs, the shift to

I. Overview of Benefits (total for all provisions) – Preferred option (PO-B)		
Description	***Amount***	***Comments***
over 2025-2050, relative to the baseline		intermodal transport and the decrease in the number of trips (driven by the increased payload). The reduction in the external costs of noise emissions is estimated at EUR 0.7 billion, expressed as present value over the 2025-2050 horizon relative to the baseline.
Reduction in external costs of road accidents (i.e. fatalities), expressed as present value over 2025 2050, relative to the baseline	EUR 0.9 billion	Indirect benefit to society at large, due to the lives saved, enabled by the shift to intermodal transport and the decrease in the number of trips (driven by the increased payload). The reduction in the external costs of accidents is estimated at EUR 0.9 billion, expressed as present value over the 2025-2050 horizon relative to the baseline.
Administrative cost savings related to the 'one in, one out' approach*		
Administrative costs savings for road transport operators, per year relative to the baseline	EUR 71.8 million per year	Direct benefit to road transport operators estimated at EUR 71.8 million per year from the reduction in the time needed to prepare and submit the requests for the issuance of special permits for the transport of indivisible loads, enabled by the application of the one-stop-shop principles at national level and the digitalisation of documents. Expressed as present value over 2025-2050 relative to the baseline, the benefits are estimated at EUR 1.2 billion.

II. Overview of costs – Preferred option (PO-B)						
	Citizens/Consumers		**Businesses**		**Administrations**	
	One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
Direct adjustment costs, expressed as present value over 2025-2050, relative to the baseline	-	-	-	For road transport operators: EUR 2.1 billion	For national public authorities: EUR 102.7 million For the European Commission: EUR 0.9 million	For national public authorities: EUR 4.2 billion
Direct administrative costs, expressed as present value over 2025-2050, relative to the baseline	-	-	-	-	-	For national public authorities: EUR 16.4 million
Direct enforcement costs	-	-	-	-	-	-
Costs related to the 'one in, one out' approach						

II. Overview of costs – Preferred option (PO-B)							
		Citizens/Consumers		Businesses		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Total	Direct adjustment costs, expressed as present value over 2025-2050, relative to the baseline	-	-	-	For road transport operators: EUR 2.1 billion		
	Indirect adjustment costs	-	-	-	-		
	Administrative costs (for offsetting)	-	-	-	-		

3. RELEVANT SUSTAINABLE DEVELOPMENT GOALS

III. Overview of relevant Sustainable Development Goals – Preferred Option (PO-B)		
Relevant SDG	**Expected progress towards the Goal**	**Comments**
SDG 13 ("Take urgent action to combat climate change and its impacts")	1,592.7 thousand tonnes of CO_2 emissions saved in 2030 and 54.6 thousand tonnes of CO_2 emissions saved in 2050.	The reduction in CO_2 emissions is driven by the higher use of ZE HDVs, the shift to intermodal transport and the decrease in the number of trips (driven by the increased payload).
SDG 3 ("Ensure healthy lives and promote well-being for all at all ages")	5.1 thousand tonnes of NOx emissions saved in 2030 and 0.7 thousand tonnes of NOx emissions saved in 2050; 1 thousand tonnes of Particulate Matter emissions saved in 2030 and 0.4 thousand tonnes of NOx emissions saved in 2050. Reduction in the external costs of noise emissions, estimated at EUR 0.7 billion expressed as present value over 2025-2050 relative to the baseline. 411 lives saved, cumulatively over 2025-2050, relative to the baseline.	The reduction in air pollution and noise emissions is driven by the higher use of ZE HDVs, the shift to intermodal transport and the decrease in the number of trips (driven by the increased payload). The lives saved are enabled by the shift to intermodal transport and the decrease in the number of trips (driven by the increased payload).

ANNEX 4: ANALYTICAL METHODS

1. Description of the analytical methods used

The main model used for developing the baseline scenario for this initiative is the PRIMES-TREMOVE transport model by E3Modelling, a specific module of the PRIMES models. The model has a successful record of use in the Commission's energy, transport and climate policy assessments. In particular, it has been used for the impact assessments underpinning the "Fit for 55" package[166], the impact assessments accompanying the 2030 Climate Target Plan[167] and the Staff Working Document accompanying the Sustainable and Smart Mobility Strategy[168], the Commission's proposal for a Long Term Strategy[169] as well as for the 2020 and 2030 EU's climate and energy policy framework and the impact assessments accompanying the Road Safety Package[170].

For the assessment of the impacts of the policy options an excel-based tool has been developed by TML et al.[171] in the context of the impact assessment support study[172]. The tool draws on the Standard Cost Model for the assessment of the costs and includes an assessment of the impacts on transport activity, costs for transport operators and public authorities, environment and road safety. The excel-based tool builds on data from Eurostat, the analysis of stakeholders' feedback and desk research undertaken in the context of the impact assessment support study. The proposed measures which involve the amendment of the Directive are assumed to be implemented from 2025 onwards, so that the assessment has been undertaken for the 2025-2050 period and refers to EU27. Costs and benefits are expressed as present value over the 2025-2050 period, using a 3% discount rate.

PRIMES-TREMOVE model

The PRIMES-TREMOVE transport model projects the evolution of demand for passengers and freight transport, by transport mode, and transport vehicle/technology, following a formulation based on microeconomic foundation of decisions of multiple actors. Operation, investment and emission costs, various policy measures, utility factors and congestion are among the drivers that influence the projections of the model. The projections of activity, equipment (fleet), usage of equipment, energy consumption and emissions (and other externalities) constitute the set of model outputs.

The PRIMES-TREMOVE transport model can therefore provide the quantitative analysis for the transport sector in the EU, candidate and neighbouring countries covering activity, equipment, energy and emissions. The model accounts for each country separately which means that the

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[166] Delivering the European Green Deal | European Commission (europa.eu)
[167] SWD(2020)176 final.
[168] "https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020SC0331"
[169] Source: 2050 long-term strategy (europa.eu)
[170] https://transport.ec.europa.eu/news/european-commission-proposes-updated-requirements-driving-licences-and-better-cross-border-2023-03-01_en
[171] Consortium led by TML, including Ramboll, Panteia, Apollo, LNEC.
[172] The analysis in this section is based on TML et al. (2023), Impact assessment support study for the revision of the directive on weights and dimensions of heavy-duty vehicles, and on the analysis of stakeholders' feedback.

detailed long-term outlooks are available both for each country and in aggregate forms (e.g. EU level).

In the transport field, PRIMES-TREMOVE is suitable for modelling *soft measures* (e.g. eco-driving, labelling); *economic measures* (e.g. subsidies and taxes on fuels, vehicles, emissions; ETS for transport when linked with PRIMES; pricing of congestion and other externalities such as air pollution, accidents and noise; measures supporting R&D); *regulatory measures* (e.g. CO_2 emission performance standards for new light duty vehicles and heavy duty vehicles; EURO standards on road transport vehicles; technology standards for non-road transport technologies, deployment of Intelligent Transport Systems) and *infrastructure policies for alternative fuels* (e.g. deployment of refuelling/recharging infrastructure for electricity, hydrogen, LNG, CNG). Used as a module that contributes to the PRIMES energy system model, PRIMES-TREMOVE can show how policies and trends in the field of transport contribute to economy-wide trends in energy use and emissions. Using data disaggregated per Member State, the model can show differentiated trends across Member States.

The PRIMES-TREMOVE has been developed and is maintained by E3Modelling, based on, but extending features of, the open source TREMOVE model developed by the TREMOVE[173] modelling community. Part of the model (e.g. the utility nested tree) was built following the TREMOVE model.[174] Other parts, like the component on fuel consumption and emissions, follow the COPERT model.

Data inputs

The main data sources for inputs to the PRIMES-TREMOVE model, such as for activity and energy consumption, come from EUROSTAT databases and from the Statistical Pocketbook "EU transport in figures[175]. Excise taxes are derived from DG TAXUD excise duty tables. Other data comes from different sources such as research projects (e.g. TRACCS project) and reports.

In the context of this exercise, the PRIMES-TREMOVE transport model is calibrated to 2005, 2010 and 2015 historical data. Available data on 2020 market shares of different powertrain types have also been taken into account.

Excel-based tool for W&D impact assessment

The excel-based tool is in essence a cost and emission calculation tool, based on Eurostat data, the baseline projections developed with the PRIMES-TREMOVE model, price elasticities and other data, allowing a split into different dimensions. This tool was developed to calculate the economic,

[173] Source: "https://www.tmleuven.be/en/navigation/TREMOVE"

[174] Several model enhancements were made compared to the standard TREMOVE model, as for example: for the number of vintages (allowing representation of the choice of second-hand cars); for the technology categories which include vehicle types using electricity from the grid and fuel cells. The model also incorporates additional fuel types, such as biofuels (when they differ from standard fossil fuel technologies), LPG, LNG, hydrogen and e-fuels. In addition, representation of infrastructure for refuelling and recharging are among the model refinements, influencing fuel choices. A major model enhancement concerns the inclusion of heterogeneity in the distance of stylised trips; the model considers that the trip distances follow a distribution function with different distances and frequencies. The inclusion of heterogeneity was found to be of significant influence in the choice of vehicle-fuels especially for vehicles-fuels with range limitations.

[175] Source: https://ec.europa.eu/transport/facts-fundings/statistics_en

social and environmental impacts of the policy measures and policy options compared to the baseline scenario.

It includes data on transport activity by origin-destination, price elasticities, the vehicle stock and vehicle characteristics, the payload by vehicle category, energy consumption and emissions, fatalities, vehicle-related costs and infrastructure maintenance costs. It also includes the calculations of the costs and cost savings due to the measures for transport operators and public authorities. The main input sources used are provided below.

Transport activity

Eurostat[176] provides the transport activity in terms of tonnes, tonne-kilometres and vehicle-kilometres for national and international transport by Member State (MS). For international transport, this also includes the data by origin and destination. This is needed because several policy measures relate to international transport between Member States. The evolution of the transport activity over time draws on the baseline projections developed with the PRIMES-TREMOVE model. The changes in transport activity (including the split between internal combustion engine, battery electric and fuel cell electric vehicles) due to the policy measures relative to the baseline are used to calculate the impacts on energy consumption and emissions, road safety, transport operators' costs, maintenance costs for infrastructure, etc.

Vehicle characteristics and costs

The vehicle characteristics[177] used in the excel-based tool draw on the New Mobility Patterns study[178], the Maut statistics[179] and the baseline scenario developed with the PRIMES-TREMOVE model. This information allowed to split the transport activity, including for international and domestic transport, by vehicle type (internal combustion engine, battery electric and fuel cell electric), weight class and number of axles.

The transport-related costs and their evolution over time draw on the New Mobility Patterns study[180] and the baseline scenario developed with the PRIMES-TREMOVE model. The vehicle cost components considered are the purchase costs, registration costs, ownership costs, maintenance costs, insurance costs, labour costs, tolls and fuel costs by vehicle type. Variations in purchase costs of zero-emission heavy-duty vehicles as compared to the baseline consequence of the increased availability of such zero-emission vehicles (effect of earlier achievement of mass production) that

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[176] International tonnes and tonne-kilometres:
"https://ec.europa.eu/eurostat/databrowser/view/road_go_ia_rc/default/table?lang=en"
National tonnes and tonne-kilometres:
"https://ec.europa.eu/eurostat/databrowser/view/road_go_na_tgtt/default/table?lang=en"

[177] Vehicle characteristics refer to the actual average payload and maximum payload, the type of powertrain (internal combustion engine, battery electric and fuel cell electric), weight class and number of axles.

[178] European Commission, Directorate-General for Mobility and Transport, Papadimitriou, G., Mellios, G., Borgato, S., et al., Study on new mobility patterns in European cities: final report. Task C, Development of a consistent dataset for quantitative analysis, Publications Office of the European Union, 2022,

[179] This source has been used to identify the vehicle characteristics of international transport. Germany is considered a good proxy for EU27 due to the exports/imports and transit traffic.

[180] European Commission, Directorate-General for Mobility and Transport, Papadimitriou, G., Mellios, G., Borgato, S., et al., Study on new mobility patterns in European cities: final report. Task C, Development of a consistent dataset for quantitative analysis, Publications Office of the European Union, 2022,

may occur as a consequence of the policy measures assessed in this Impact Assessment are not considered.

Energy intensity, emissions intensity and external costs (including for noise)

The energy intensity and CO_2 emissions intensity (for road, rail and inland navigation), and their evolution over time, draw on the baseline scenario developed with the PRIMES-TREMOVE model.

For NOx and PM2.5, the EEA/EMEP emission inventory guidebook for road transport was used (Tier 2 emission factors for heavy duty vehicles, EURO VI D/E), adjusted to match the NOx and PM2.5 emissions from the baseline scenario developed with the PRIMES-TREMOVE model. For zero-emission vehicles, all exhaust emissions are set to zero.

To calculate the external costs of CO2 emissions, air pollution emissions and noise, the unit costs from the Handbook on external costs of transport[181] have been used (expressed in 2022 prices). For noise, the unit value corresponding to battery electric vehicles was assumed to be half of that of diesel vehicles.

Road safety

The CARE database[182] was used for the total number of fatalities in the base year. It was also used to identify the share of fatalities from accidents involving HGVs. The evolution of the number of fatalities over time draws on the baseline scenario developed with the PRIMES-TREMOVE model.

The CARE database does not allow to split the fatalities from accidents in which EMS are involved. The difference in risk per vehicle-kilometre for EMS was estimated based on a literature review, covering predictive engineering methods[183] (suggesting an increase by 10%) and post-hoc statistical methods (suggesting a 21% decrease in risk). The mid-point of this range (a 6% reduction, or a 'risk multiplier' of 0.94) was selected for the analysis.

To monetise the external costs of fatalities, the unit costs at Member State level from the Handbook on external costs of transport[184] have been used. At EU level, the unit cost per fatality is estimated at EUR 3.9 million in 2022 prices.

Price elasticities

To calculate the changes in the number of tonnes transported due to the policy measures, the following price elasticities were used.

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[181] Essen, H. et al. (2020), Handbook on the external costs of transport: version 2019 – 1.1, Publications Office, available at: https://data.europa.eu/doi/10.2832/51388. Note: To transform the unit costs from the Handbook, which are expressed in 2016 prices, in 2022 prices the HICP (PRC_HICP_AIND) from Eurostat has been used.

[182] CARE database (europa.eu)

[183] Knight, I., et al. (2008). Longer and/or longer and heavier goods vehicles (LHVs) - a study of the likely effects if permitted in the UK. Crowthorne: TRL Published Project Report PPR 285.

[184] Essen, H. et al. (2020), Handbook on the external costs of transport: version 2019 – 1.1, Publications Office, available at:

Table 14: Price elasticities used to estimate the changes in the number of tonnes transported

Elasticity	Value
Price elasticity of demand for road transport[185]	-0.3
Cross price elasticity of demand for rail transport[186]	0.5
Cross price elasticity of demand for inland navigation[187]	0.2
Cross price elasticity of demand for different road vehicle categories[188]	-0.1
Rebound effects	-0.1

Source : TML et al. (2023), impact assessment support study

Price elasticity of demand for road transport: This elasticity was used to calculate the changes in tonnes transported by road, relative to the baseline, due to changes in the transport costs per unit of transport. This elasticity is also used to assess the impact on the transport activity by internal combustion engine and zero-emission vehicles.

Cross price elasticity of demand for rail transport: This elasticity is used to assess the impact of a possible shift from rail to road transport, relative to the baseline, when road transport becomes more cost efficient. The elasticity is used only for those origin-destination pairs that have a rail connection.

Cross price elasticity of demand for inland navigation: This elasticity is used to assess the impact of a possible shift from inland navigation to road transport, relative to the baseline, when road transport becomes more cost efficient. The elasticity is used for transport in and between EU countries where inland navigation plays a significant role.

Cross price elasticity of demand for different road vehicle categories: This elasticity is used to assess the impact of a shift between road vehicle categories, more specifically from trucks below 32 tonnes and 4 axles to trucks above 32 tonnes and 4 axles.

Rebound effects: This price elasticity takes into account rebound effects due to the use of more energy-efficient vehicles, with lower operation costs.

Building on the changes in tonnes relative to the baseline, the changes in the transport activity in tonne-kilometres and vehicle-kilometres is subsequently calculated, taking into account the annual mileage and the average payload.

Infrastructure maintenance costs

The infrastructure maintenance costs in the baseline scenario draw on data from the OECD database[189]. The infrastructure maintenance costs from OECD cover spending on preservation of the

[185] De Jong et al (2010). Price sensitivity of European road freight transport - towards a better understanding of existing results. A report for Transport & Environment. The Hague: Significance.
[186] Rijkswaterstaat (2020). DP07 - Eindanalyse BasGoed 5.0. Rijswijk: Rijkswaterstaat
[187] Rijkswaterstaat (2020). DP07 - Eindanalyse BasGoed 5.0. Rijswijk: Rijkswaterstaat
[188] Rijkswaterstaat (2020). DP07 - Eindanalyse BasGoed 5.0. Rijswijk: Rijkswaterstaat
[189] OECD (2023), Infrastructure maintenance (indicator). doi: 10.1787/c73dc965-en (Accessed on 06 April 2023)

existing transport network. It only covers maintenance expenditures by public authorities. Heavy duty vehicles are the main responsible for road maintenance costs[190].

The impact on the infrastructure of the different policy measures is presented as part of the adjustment costs for public authorities in section 3 of Annex 4, with a distinction between maintenance costs and reinforcement costs.

The main damage mechanisms directly from heavy traffic are the damage target fatigue cracking and secondary rutting (COST 334, 2001). How aggressive a vehicle is in terms of pavement wear was determined based on the 'standard axles' approach that converts axle weights and configurations to the equivalent number of standard 10 tonne axles. Once the aggressiveness of each group of axles has been calculated, the overall aggressiveness of a truck can be obtained by adding the number of standard axles represented by each individual group of axles fitted to the vehicle under consideration (OECD ITF, 2011). This was calculated for a range of baseline vehicle configurations and for some modified vehicles (e.g. plus 2 tonnes GVW and plus 1 tonne max axle weight), needed for the assessment of the policy measures and options.

The impact on pavement wear depends not only on the weight per axle but also on the type of pavement. Thus, three road factors were assumed for each vehicle type, corresponding to the three main types of pavement: flexible, semi-rigid and rigid.

According to the load per axle, the damage induced to pavement will increase according to a power function, depending on the type of pavement. The individual aggressiveness of an axle of X tonnes is assessed as an equivalent number of 10 tonne standard axles (Neq) by using the formula[191]: Neq=(X/10)^a. The exponent *a* is 4, 6 and 12 for flexible, semi-rigid and rigid pavement respectively. The lifetime of a pavement structure, for a given traffic history, is inversely proportional to the number of equivalent standard axles[192,193]. The road wear factors by type of pavement in the baseline scenario are provided in Table 15.

Table 15: Road wear factors by type of pavement in the baseline scenario

Type of pavement	Value
Flexible	0.75
Semi-rigid	0.32
Rigid	0.03

Source : TML & Ramboll et al. (2023), impact assessment support study

The road wear factors are used in the calculation of the infrastructure maintenance costs, by taking into account the share by type of pavement in each country. As the results are directly related to the

[190] Low, J.M. et al. (2023), The hidden cost of road maintenance due to the increased weight of battery and hydrogen trucks and buses - a perspective, Clean Technologies and Environmental Policy volume 25, pages 757–770. The analysis indicates that vehicles under 7.5 tonnes have a negligible impact on road wear. It is assumed that 90.5% of road wear is attributed to HGVs (of which 58.7% to HGVs above 32 tonnes), 7.5% to heavy buses, and 2% to cars and other vehicles.
[191] AASHTO (1993), Guide for design of pavement structures.
[192] COST334 (2001), Effects of wide single tyres and dual tyres.
[193] PIARC (2022), Overweight vehicles: impact on road infrastructure and safety.

type of pavement, for the EU countries where this information was not available[194], the average shares by pavement type at EU level were used as proxy.

To calculate the infrastructure maintenance costs in the baseline and for each policy measure and option, the values of road wear are multiplied by the transport activity expressed in vehicle-kilometres and by the unit maintenance costs per vehicle-kilometre.

The elements determining the variation in axle weight, are the extra axle weight directly granted by some policy measures (PMc1 and PM1), as well as the changes in the average payload that are a consequence of the improvement in technology leading to the reduction of the weight of the batteries over time and the lower number of trips required for transporting the same amount of cargo with less vehicles. The impact of those variations in axle weight are measured by applying the relevant road wear factors (presented in Table 15 above) taking into account the share by type of pavement in each country (flexible, semi-rigid and rigid) as provided by public sources of information were available.

Infrastructure reinforcement and upgrading costs

The potential need for reinforcement of pavements or bridges and infrastructure upgrading due to the authorisation of heavier and longer HDVs is also considered. In particular, for PM3 (authorisation of EMS in the TEN-T network conditioned to be ZEV or involved in intermodal transport) based on the experience and infrastructure assessments carried out prior to allowing EMS like in Sweden, Germany and Denmark. These costs consist of inspection costs to determine the needs for upgrading or for limitation of access (e.g. in PMc2) and costs for the upgrading of the infrastructure. The type of investments necessary for PM3, are related to the extra length of these vehicles and the need to ensure their manoeuvrability, visibility of these vehicles, as well as the provision of adequate parking space. One-off adjustment costs for the reinforcement of bridges are also considered.

The infrastructure costs linked to the current maximum weights and dimensions authorised in national and international transport are considered as part of the baseline. As a consequence, some policy measures such as PMc4 (authorisation of 44 tonnes HDVs and EMS among the Member States that already allow the m in national transport) will not generate adjustment costs linked to the infrastructure. Similarly, the increase in maximum weight below the limits currently allowed by the Weights and Dimensions Directive (i.e. 42 tonnes for ZEVs, 44 tonnes for intermodal and 46 tonnes for ZEV involved in intermodal transport) are considered as part of the baseline.

2. Baseline scenario

In order to reflect the fundamental socio-economic, technological and policy developments, the Commission prepares periodically an EU Reference Scenario on energy, transport and GHG emissions. The socio-economic and technological developments used for developing the baseline scenario for this impact assessment build on the latest "EU Reference scenario 2020"

[194] Data was available for Austria, Germany, Denmark, Spain, Finland, France and Portugal.

(REF2020)[195]. The same assumptions have been used in the policy scenarios underpinning the impact assessments accompanying the "Fit for 55" package[196].

Main assumptions of the Baseline scenario

The main assumptions related to economic development, international energy prices and technologies are described below.

Economic assumptions

The modelling work is based on socio-economic assumptions describing the expected evolution of the European society. Long-term projections on population dynamics and economic activity form part of the input to the model and are used to estimate transport activity, particularly relevant for this impact assessment.

Population projections from Eurostat[197] are used to estimate the evolution of the European population, which is expected to change little in total number in the coming decades. The GDP growth projections are from the Ageing Report 2021[198] by the Directorate General for Economic and Financial Affairs, which are based on the same population growth assumptions.

Table 16: Projected population and GDP growth per Member State

	Population			GDP growth	
	2020	2025	2030	2020-'25	2026-'30
EU27	447.7	449.3	449.1	0.9%	1.1%
Austria	8.90	9.03	9.15	0.9%	1.2%
Belgium	11.51	11.66	11.76	0.8%	0.8%
Bulgaria	6.95	6.69	6.45	0.7%	1.3%
Croatia	4.06	3.94	3.83	0.2%	0.6%
Cyprus	0.89	0.93	0.96	0.7%	1.7%
Czech Republic	10.69	10.79	10.76	1.6%	2.0%
Denmark	5.81	5.88	5.96	2.0%	1.7%
Estonia	1.33	1.32	1.31	2.2%	2.6%
Finland	5.53	5.54	5.52	0.6%	1.2%
France	67.20	68.04	68.75	0.7%	1.0%
Germany	83.14	83.48	83.45	0.8%	0.7%
Greece	10.70	10.51	10.30	0.7%	0.6%
Hungary	9.77	9.70	9.62	1.8%	2.6%
Ireland	4.97	5.27	5.50	2.0%	1.7%
Italy	60.29	60.09	59.94	0.3%	0.3%
Latvia	1.91	1.82	1.71	1.4%	1.9%
Lithuania	2.79	2.71	2.58	1.7%	1.5%
Luxembourg	0.63	0.66	0.69	1.7%	2.0%

[195] EU Reference Scenario 2020 (europa.eu)
[196] Policy scenarios for delivering the European Green Deal (europa.eu)
[197] EUROPOP2019 population projections: Eurostat - Data Explorer (europa.eu)
[198] The 2021 Ageing Report : Underlying assumptions and projection methodologies The 2021 Ageing Report: Underlying Assumptions and Projection Methodologies | European Commission (europa.eu)

	Population			GDP growth	
	2020	2025	2030	2020-'25	2026-'30
Malta	0.51	0.56	0.59	2.7%	4.1%
Netherlands	17.40	17.75	17.97	0.7%	0.7%
Poland	37.94	37.57	37.02	2.1%	2.4%
Portugal	10.29	10.22	10.09	0.8%	0.8%
Romania	19.28	18.51	17.81	2.7%	3.0%
Slovakia	5.46	5.47	5.44	1.1%	1.7%
Slovenia	2.10	2.11	2.11	2.1%	2.4%
Spain	47.32	48.31	48.75	0.9%	1.6%
Sweden	10.32	10.75	11.10	1.4%	2.2%

Beyond the update of the population and growth assumptions, an update of the projections on the sectoral composition of GDP was also carried out using the GEM-E3 computable general equilibrium model. These projections take into account the potential medium- to long-term impacts of the COVID-19 crisis on the structure of the economy, even though there are inherent uncertainties related to its eventual impacts. Overall, conservative assumptions were made regarding the medium-term impacts of the pandemic on the re-localisation of global value chains, teleworking and teleconferencing and global tourism.

International energy prices assumptions

Alongside socio-economic projections, transport modelling requires projections of international fuel prices. The table below shows the oil prices assumptions of the baseline and policy options of this impact assessment, that draw on the modelling underpinning the REPowerEU package[199].

Table 17: Oil prices assumptions

Oil	2015	2020	2030	2040	2050
in $'15 per boe	52.3	39.8	92.1	97.4	117.9
in €'15 per boe	47.2	35.8	83.0	87.8	106.3

Technology assumptions

Modelling scenarios is highly dependent on the assumptions on the development of technologies, both in terms of performance and costs. For the purpose of the impact assessments related to the "Climate Target Plan" and the "Fit for 55" policy package, these assumptions have been updated based on a rigorous literature review carried out by external consultants in collaboration with the JRC. Continuing the approach adopted in the long-term strategy in 2018, the Commission consulted on the technology assumption with stakeholders in 2019. In particular, the technology database of the PRIMES and PRIMES-TREMOVE models (together with GAINS, GLOBIOM, and CAPRI) benefited from a dedicated consultation workshop held on 11th November 2019. EU Member States representatives also had the opportunity to comment on the costs elements during a workshop held on 25th November 2019. The updated technology assumptions are published together with the EU Reference Scenario 2020[200]. The same assumptions have been used in the context of this impact assessment.

[199] SWD(2022)230 final.
[200] EU Reference Scenario 2020 (europa.eu)

Policies in the Baseline scenario

Building on REF2020, the baseline has been designed to include the initiatives of the 'Fit for 55' package proposed by the Commission on 14 July 2021[201] and the initiatives of the RePowerEU package proposed by the Commission on 18 May 2022[202]. It also reflects the Commission proposal of 2023 for a revision of the Regulation on CO2 emission standards for heavy-duty vehicles[203]. The baseline scenario assumes no further EU level intervention beyond the current Weights and Dimensions Directive.

The baseline also incorporates foresight megatrends[204] and developments captured in the 2022 Strategic Foresight Report[205]. Among others, it captures the trend of increasing demand for transport as population and living standards grow as well as the links between the digital and green transition. In particular, the projected transport activity draws on the long-term population projections from Eurostat and GDP growth from the *Ageing Report 2021*[206] by the Directorate General for Economic and Financial Affairs.

The baseline scenario does not consider the forthcoming revision of the Combined Transport Directive, the rail capacity initiative and the CountEmissions EU initiative. It should be noted that including the proposed revision of the Combined Transport Directive in the baseline would lead to higher uptake of intermodal transport. Thus, the policy options would result in somewhat lower reduction in external costs of transport relative to the baseline, and thus somewhat lower net benefits. This is however not expected to result in a change in the ranking of the policy options.

Baseline scenario results

In the baseline scenario, EU transport activity is projected to grow post-2020, following the recovery from the COVID pandemic. Road transport would maintain its dominant role within the EU by 2050. Buses activity (expressed in passenger-kilometres) is projected to grow by 13% between 2015 and 2030 (42% for 2015-2050). For freight, heavy goods vehicles activity (expressed in tonne-kilometres) is projected to go up by 30% by 2030 relative to 2015 (57% for 2015-2050). The activity of heavy goods vehicles above 32 tonnes would grow at slightly slower pace, by 27% by 2030 relative to 2015 (47% for 2015-2050). Rail transport activity is projected to grow significantly faster than for road, driven in particular by the completion of the TEN-T core network by 2030 and of the comprehensive network by 2050, supported by the CEF, Cohesion Fund and ERDF funding, but also by measures of the 'Fit for 55' package that increase to some extent the competitiveness of rail relative to road and air transport. Passenger rail activity is projected to go up

[201] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en
[202] "https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131"
[203] "https://climate.ec.europa.eu/eu-action/transport-emissions/road-transport-reducing-co2-emissions-vehicles/reducing-co2-emissions-heavy-duty-vehicles_en#raising-our-ambition"
[204] "https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en" \l "explore"
[205] COM(2022) 289 final of 29 June 2022.
[206] The 2021 Ageing Report : Underlying assumptions and projection methodologies The 2021 Ageing Report: Underlying Assumptions and Projection Methodologies | European Commission (europa.eu)

by 24% by 2030 relative to 2015 (67% for 2015-2050). Freight rail traffic would increase by 42% by 2030 relative to 2015 (91% for 2015-2050)[207].

The share of zero-emission vehicles in the total heavy goods vehicles stock is projected at 5% in 2030, going up to 30% in 2040 and 71% in 2050 in the baseline scenario. In terms of tonne-kilometres, zero-emission heavy goods vehicles are projected to account for 136.8 billion tonne-kilometres in 2030 (around 7% of total tonne-kilometres by heavy goods vehicles), 1,060.7 billion tonne-kilometres in 2040 (around 48% of the total tonne-kilometres by heavy goods vehicles) and 2,147.3 billion tonne-kilometres in 2050 (around 88% of the total tonne-kilometres by heavy goods vehicles).

Congestion costs would increase by about 14% by 2030 and 32% by 2050, relative to 2015. Congestion on the inter-urban network would be the result of growing freight transport activity along specific corridors, in particular where these corridors cross urban areas with heavy local traffic.

CO_2 emissions from transport[208] are projected to be 26% lower by 2030 compared to 2015, and 94% lower by 2050. The baseline scenario shows that the emission reductions from the transport sector would contribute towards the ambition of at least 55% emission reductions by 2030 and climate neutrality by 2050, while relying to a significant extent on technological solutions (i.e. the uptake of low- and zero-emission vehicles and of renewable and low carbon fuels) and carbon pricing. This would depart from the balanced approach underpinning the impact assessments accompanying the 'Fit for 55' package and the staff working document accompanying the REPowerEU initiatives[209], showing a combined approach of carbon pricing instruments and regulatory-based measures to deliver on the increased climate ambition[210].

NOx emissions are projected to go down by 56% between 2015 and 2030 (87% by 2050), mainly driven by the electrification of the road transport and in particular of the light duty vehicles segment. The decline in particulate matter (PM2.5) would be slightly lower by 2030 at 53% relative to 2015 (91% by 2050)[211].

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[207] The Sustainable and Smart Mobility Strategy uses 2015 as the base year for the milestones on the growth in rail and waterborne transport activity. In addition, due to the COVID-19 pandemics, the lockdowns and all the consequent effects on the transport sector do not qualify 2020 as representative base year. For these reasons, 2015 has also been selected as a base year for showing the growth in road transport activity. Using 1995 as a base year the growth in heavy goods vehicles activity (expressed in tonne-kilometres) is projected at 79% by 2030 relative to 1995 (116% for 1995-2050) in the baseline scenario. For buses, the growth for 1995-2030 is projected at 17% (47% for 1995-2050).

[208] Including international aviation but excluding international maritime.

[209] SWD(2022) 230 final of 18 May 2022.

[210] The scenarios underpinning the impact assessments accompanying the 'Fit for 55' initiatives and the staff working document accompanying the REPowerEU initiatives incorporated a broader range of policies (including this initiative) that were represented in a stylised way ahead of the actual proposals, to show the delivery of at least 55% emissions reduction target by 2030 and to account for the interaction with the forthcoming initiatives. Therefore, this initiative contributes towards the at least 55% emissions reductions target by 2030 and achieving climate neutrality by 2050.

[211] As explained in section 1 of Annex 4, the baseline projections are quantified with the help of the PRIMES-TREMOVE model. The PRIMES-TREMOVE transport model projects the evolution of demand for passengers and freight transport, by transport mode, and transport vehicle/technology, following a formulation based on microeconomic foundation of decisions of multiple actors. Operation, investment and emission costs, various policy measures, utility factors and congestion are among the drivers that influence the projections of the model. The projections of activity, equipment (fleet), usage of equipment, energy consumption and emissions (and other externalities) constitute the set of model outputs.

Heavy duty vehicles are the main responsible for road maintenance costs. The road maintenance costs attributed to HGVs above 32 tonnes are projected to increase by 11% by 2030 relative to 2015 (36% increase during 2015-2050). Table 18 provides the projected evolution of maintenance costs for road infrastructure attributed to HGVs above 32 tonnes in the baseline, by Member State.

Table 18: Maintenance costs for road infrastructure attributed to HGVs above 32 tonnes (EUR million)

	2015	2025	2030	2040	2050
AT	406	489	514	568	628
BE	268	109	114	126	140
BG	284	216	227	251	277
CY	58	82	86	95	105
CZ	402	546	574	635	702
DE	2,126	3,958	4,162	4,602	5,089
DK	638	700	736	814	900
EE	71	112	118	130	144
ES	28	27	28	31	34
FI	299	416	438	484	535
FR	1,526	1,355	1,425	1,576	1,742
EL	104	115	121	134	148
HR	144	147	155	171	190
HU	166	239	251	278	307
IE	48	45	48	53	58
IT	5,325	3,918	4,120	4,555	5,037
LT	93	86	91	101	111
LU	20	24	25	28	31
LV	102	160	168	186	206
MT	8	9	9	10	11
NL	334	370	389	430	475
PL	244	311	327	362	400
PT	104	115	121	134	148
RO	276	305	321	355	393
SE	695	635	667	738	816
SI	59	86	90	100	110
SK	118	143	150	166	184
EU27	13,947	14,717	15,476	17,112	18,921

Source : TML et al. (2023), impact assessment support study

The baseline scenario reflects the projected higher energy prices driven by the Russian invasion of Ukraine[212]. Beyond this aspect, it was however not possible to quantify the impact of the Russian invasion of Ukraine in the context of the baseline scenario, as there is large uncertainty with respect to its impacts, in particular for the medium to long term. While its impact is felt in terms of trade (e.g. grain, bulk fertilizers and hydrocarbons) and in certain geographical areas, the impact on the baseline of this initiative is expected to be relatively limited.

3. Impacts of policy measure in terms of costs and cost savings

This section explains the inputs used and provides the assessment of costs of the policy measures included in the policy options. The estimates take into account the synergies between the policy measures

[212] SWD(2022) 230 final of 18 May 2022.

included in the policy options. The estimation of the costs draws on the impact assessment support study[213], including input collected through desk research and stakeholder interviews during the impact assessment process.

PMc1: Allow for extra weight and extra length to ZE heavy goods vehicles (HGVs) and 2-axle rigid buses

PMc1 provides for increasing the maximum gross vehicle combination weight (GVCW) up to a maximum of 2 tonnes[214], the maximum axle weight up to a maximum of 1 tonne on the drive axle or a bogie containing a drive axle[215] and the maximum length of the vehicle combination up to 90 cm. The weight allowance for ZE HGVs also applies to 2-axle rigid buses and to any vehicle combination equipped with zero emission technologies (i.e. motor vehicle, semi/trailers and dollies). This accounts for technological developments, such as electric trailers equipped with auxiliary motors and batteries which reduce the demand of energy from the motor vehicle and/or other power elements, such as cooling units of reefers. However, this measure offers no support for using an e-trailer to hybridize a non-zero-emission vehicle.

The purpose of this measure is to compensate for the weight and the size of ZE powertrains (i.e. weight of electric batteries and space for hydrogen tanks) thus preventing the loss of payload capacity and/or range in comparison with diesel vehicles. In other words, the extra weight and dimensions should be allocated to the powertrains and not to expand the payload. As a consequence, the effect of this measure is expected to fade out over time with technology evolution as the weight of batteries is expected to decrease and, therefore, the ZE powertrains become of a similar weight to the equivalent diesel powertrains. Similarly, the need for extra length will be satisfied by the progressive uptake of elongated cabs concepts, for which de facto no length limit applies.

Adjustment cost savings for transport operators

Battery Electric Vehicles (BEV). The energy per kilogram and per cubic meter of batteries is much lower than that of diesel engines. Based on current energy density of batteries (i.e. 180-250 Wh/kg)[216], 44 tonne BEV have an equivalent range with that of 40 tonne diesel vehicles[217].

According to the data from the study on New Mobility Patterns in European Cities[218], a current diesel 40 tonne articulated vehicle has a maximum payload of 25.3 tonnes and an average payload of 10.1 tonnes (i.e. taking into account empty trips). Taking into account the current density of batteries, BEV have a maximum payload of 23.3 tonnes and an average payload of 9.3 tonnes.

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[213] TML & Ramboll et al. (2023), Impact assessment support study for the revision of the directive on weights and dimensions of heavy-duty vehicles.

[214] Currently the W&D Directive allows an additional GVW of 2 tonnes for certain ZE HDVs which under PMc1 would be increased by another 2 tonnes resulting in a potential increase of GVW by 4 tonnes. 2-axle rigid buses do not enjoy any derogation, thus their maximum GVW would only increase by 2 tonnes.

[215] Currently the W&D Directive allows a maximum authorised axle weight on the driving axle of 11.5 tonnes.

[216] Ballard (2022), Fuel Cell Trucks / Weights & Dimensions Directive and ICCT (2021).

[217] The survey undertaken in the context of the impact assessment support study shows that the OEMs request an additional 4 tonnes of Gross Vehicle Weight (GVW) for ZEVs compared to diesel vehicles (an increase from 40 tonnes for diesel to 44 tonnes for ZEV), an extra tonne on the drive axle (from 11.5 to 12.5 tonnes), and an extra 1.5 meters in length to provide long-haul heavy trucks with equivalent range capabilities.

[218] Sustainable transport Studies (europa.eu)

PMc1 will increase the payload of a BEV up to the same level as for a diesel vehicle, estimated at 8.6% in terms of maximum payload or average payload (Table 19).

Table 19: Effect of PMc1 on the payload of BEV HGVs in 2025

	Diesel HGVs	BEV HGVs	BEV under PMc1	Payload increase	
				New vehicle	Fleet
Maximum payload (tonnes)	25.3	23.3	25.3	8.6%	3.4%
Average payload (tonnes)	10.1	9.3	10.1	8.6%	3.4%

Source : TML et al. (2023), impact assessment support study

As explained above, a 40-tonne tractor-semitrailer combination has a maximum payload of 25.3 tonnes, with a total volume of 90m³ and a floor space of 34m². Cargo with a higher mass density than 279 kg/m³ is weight constrained. Based on the evidence collected in the context of the impact assessment support study, around 40% of the loaded trips are estimated to be weight constrained. Therefore, the improvements for the fleet are estimated at 3.4% for the maximum and average payload.

However, as technology progresses, propulsion and energy storage systems will become lighter. Energy density of batteries is expected to increase to 500 Wh/kg by 2030 and to 800 Wh/kg by 2050[219]. Thus, by 2035 new vehicles entering the market would be equivalent to those permitted now (2 tonnes extra for ZEV).

From 2035 onwards, the incentive provided by this policy measure in terms of compensating for the need of heavier batteries is compensated by technological evolution and no additional benefit is foreseen for new vehicles. However, those vehicles that had already entered the market at higher weights would continue to circulate until 2045[220].

Fuel cell electric vehicles (FCEVs). The energy stored per kilogram for hydrogen is higher than for diesel but hydrogen needs to be stored in a highly compressed and very cold state to maximise the energy per unit volume. The need for cooling and compression equipment adds to the weight and space requirements of FCEVs. Ballard (2022)[221] shows that with the current state of the technology, FCEV can already achieve the same performance as diesel vehicles within the current 2 tonne allowance. However, they require more space for the hydrogen storage tanks. The 90 cm additional length included under PMc1 would compensate for that.

Based on the current semitrailer length of 13.6m, the load capacity increase provided by PMc1 for FCEV is estimated at 7.1% per vehicle (see Table 20). This policy measure will only benefit volume constrained cargo. Based on the evidence collected in the context of the impact assessment support study, around 60% of the loaded trips are estimated to be volume constrained.

Table 20: Effect of PMc1 on the payload of FCEVs in 2025

	Diesel HGVs	FCEV HGVs	FCEV	Payload increase

[219] Hill, N., Clarke, D., Blair, L. and Menadue, H., Circular Economy Perspectives for the Management of Batteries used in Electric Vehicles, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-10938-9, doi:10.2760/608912, JRC117790.
[220] The lifetime of BEVs is assumed to be 10 years, higher than that of diesel vehicles (which is around 7 years) due to the lower maintenance requirements and higher capital cost.
[221] Ballard (2022), Fuel Cell Trucks / Weights & Dimensions Directive.

			under PMc1	New vehicle	Fleet
Length	13.6m	12.7m	13.6m	7.1%	4.3%

Source : TML et al. (2023), impact assessment support study

The elongated cab design already allows for additional length, as long as safety, comfort, aerodynamics, and turning criteria are met in line with Regulation (EU) 2021/535. However, a limited number of such vehicles are on the market and day-cab trucks are less likely to be equipped with elongated cabs (which are mainly used as sleeping cabs) in the short term. It is estimated that by 2025 10% of new tractors will have such design, going up to 100% by 2035. Assuming a 10 year lifetime for a FCEV, no vehicles making use of the length derogation will be part of the fleet by 2045.

The increase in payload with respect to the baseline for BEV and FCEV HGVs leads to lower operation costs for these vehicles and a higher uptake.

Operation costs. For BEV HGVs, the increase in payload of 2 tonnes is estimated to lead to an increase in the energy consumption per vehicle kilometre estimated at 0.3% relative to the baseline in 2025. For FCEV HGVs, the increase in lengths of 90 cm is estimated to lead to an increase in energy consumption per vehicle kilometre of 0.4% relative to the baseline in 2025[222]. On the other hand, the increases in payload will reduce the transport costs of ZEV per tonne-kilometre. Overall, the decrease in costs per tonne-kilometre is estimated at 0.3% for BEV HGVs and 0.3% for FCEV HGVs in 2025 with this advantage first increasing to 0.9% and 1.1%, respectively, by 2035 and then fading out over time due to technology development. The increases in transport activity of ZEV are estimated taking into account the price elasticity of demand for road transport (see section 1 of Annex 4). No impact on the modal shares of road and inland navigation are expected due to this measure.

Capital costs. PMc1 is not expected to have an impact on capital costs. First, the tractor would be the same. For BEV, the same semitrailer can carry two extra tonnes without adaptations. For FCEV, the wheelbase of the tractor would need to be extended, adding a weight of 300 kg[222]. However, the cost of conversion is expected to be equivalent to the costs of elongated cabs design.

Effect on buses and coaches

The weight allowance for ZE HGVs would apply also to 2-axle rigid buses which under the current legal framework do not enjoy any extra weight allowance to compensate for the ZEV technology.

Examining the specifications of different vehicles in the market and comparing them to regulated limits showed that only 2-axle touring coaches (no standees) and double decked 2 axle city buses are currently weight constrained. Other buses would not lose significant payload if moving to ZEV technologies. Data on transport activity (expressed in vehicle-kilometres) for 2 axle coaches is not available. Input received during the stakeholders' consultation[223] showed that in terms of vehicle stock, 2 axle rigid coaches represent around one third of the total stock.

[222] A basic semitrailer weighs around 6-7 tonnes. The increase due to PMc1 is estimated at 462 kg. However, the weight of wheelbase and tyres will be the same. Therefore, it is estimated that a longer semitrailer is 300 Kg heavier than a standard semitrailer.

[223] ACEA (European Automobile Manufacturers' Association) and CONFEBUS (the Spanish bus operator association).

The impacts of PMc1 on transport activity, the stock of ZEV and the adjustment costs savings for transport operators for 2030, 2040 and 2050 relative to the baseline are provided in Table 21. Expressed as present value over 2025-2050, the total recurrent adjustments costs savings for transport operators relative to the baseline are estimated at EUR 344.5 million (in 2022 prices), of which EUR 24 million corresponding to buses and coaches. The reduction in the total number of vehicle-kilometres relative to the baseline and the increase in the uptake of zero-emission vehicles is projected to have a positive impact on environment.

Table 21: Impacts of PMc1 on transport operators relative to the baseline

	2030	2040	2050
Reduction in total transport activity (vkm million)	4.4	0.0	0.0
Reduction in the number of trips (million)	21.3	0.0	0.0
Increase in ZEV transport activity (vkm million)	50.0	73.6	63.6
Increase in ZEV transport activity (tkm million)	1,318.9	1,785.0	1,542.1
Increase in the stock of ZEV (thousand)	1.3	2.4	2.5
Adjustment costs savings for HGVs (EUR million)	22.1	8.5	-1.8
Adjustment costs savings for buses and coaches (EUR million)	1.7	0.6	-0.1
Adjustment costs savings for all HDVs (EUR million)	23.7	9.1	-1.9

Source: TML et al. (2023), impact assessment support study; Note: negative values represent adjustment costs.

Adjustment costs (recurrent) for public authorities

Maintenance costs related to infrastructure. Maintenance costs of pavement depend on the type of pavement and the axle weight. PMc1 includes an allowance of one additional tonne per axle and, therefore, this is expected to lead to an increase in the maintenance costs. The extra maintenance costs steam from the extra weight allowance for BEV. For FCEV no impact is expected on pavement maintenance. Two other elements that lead to lower damage to the infrastructure were also taken into account in the calculations: the improvement in technology leading to the reduction of the weight of the batteries over time and the lower number of trips required for transporting the same amount of cargo.

Overall, PMc1 leads to an increase in the maintenance costs of infrastructure, as shown in Table 22 for 2025, 2030 and 2040 relative to the baseline. Expressed as present value over 2025-2050, the adjustment costs for public authorities are estimated in EUR 456.1 million relative to the baseline (in 2022 prices).

Table 22: Impacts of PMc1 on public authorities relative to the baseline

	2025	2030	2040	2050
Adjustment costs for public authorities (EUR million)	5.6	46.6	26.1	0.0

Source : TML et al. (2023), impact assessment support study

Reinforcement costs for pavement and bridges

The potential need for reinforcement of pavements or bridges was also considered. Many factors lead to pavement deterioration. For instance, the icing and de-icing process are among the most aggressive actions, which may lead to severe damages; floods and soil movements also affect the pavement infrastructures. While axle and vehicle loads are an element influencing the pavement, these are already covered under the maintenance costs discussed above. No additional reinforcement of the pavement is required under this policy measure.

Similarly, many elements may affect bridges (e.g. age, wind loads, earthquakes, current and river flow and floods), which are of many different types (e.g. suspended, cable stayed, orthotropic decks, composite girder and plate, arches, bowstrings, integral slabs, reinforced or pre-stressed concrete girder, box girder, cantilever) and materials (e.g. steel, reinforced concrete, pre-stressed concrete, wood) and with lengths varying from 2-5 m up to 1,500 m or more. A bridge is composed of several sub-structures, sensitive either to wheel or axle loads, to group of axles, to single vehicles or to a series of vehicles on one or more lanes. The maintenance of bridges is mainly driven by ageing, corrosion, creep and shrinkage of concrete, and combination of actions (wind, traffic loads, scouring, temperature, etc.).

New EU bridges designed since 1995-2000 are compliant with the Eurocode 1991-2. Several MS (Germany, France, Sweden) have set up or are planning upgrade programs to bring their existing bridge stock in line with those requirements. The design loads are relatively high, with extra safety factors. For bridges designed to comply with these standards, the increase in weight under PMc1 is not expected to require additional costs.

The adjustment costs related to the assessment of the infrastructure for which the load may need to be restricted are considered jointly with PMc2.

PMc2: Allow for extra height to accommodate high-cube containers in intermodal transport

PMc2 provides for increasing the maximum height of HDV to 4.3 meters in order to accommodate high-cube containers using standards skeletal trailers. The W&D Directive sets the maximum authorised height in international (intra-EU) transport at 4 meters, which requires road transport operators involved in the transport of high-cube containers to resort to special equipment (low skeletal trailers and gooseneck trailers) or to request special permits for indivisible loads (only possible in cases where the road infrastructure can accommodate 4.3 meters high HDV).

PMc2 aims at removing the “legal” limitation to the circulation of HDVs transporting high-cube containers (or swap bodies of equivalent height), without prejudice to the application of road traffic national provisions limiting the maximum height of HDV on certain roads of civil engineering structures.

Twelve Member States allow higher limits in national transport: Slovenia, Hungary and Slovakia allow a maximum authorised height of 4.2 meters and Finland, France, Ireland, Sweden, Estonia, Italy, Bulgaria, Portugal and Spain allow 4.3 meters or more.

Table 23: Maximum vehicle height per Member State, in meters

Member States	Height limit
AT	4.0
BE	4.0
BG	4.3*
CZ	4.0
DK	4.0
DE	4.0
EE	4.3
IE	≥4.3
EL	4.0

Member States	Height limit
ES	4.5*
FR	≥4.3
HR	4.0
IT	4.3
CY	4.0
LV	4.0
LT	4.0
LU	4.0
HU	4.2
MT	4.0
NL	4.0
PL	4.0
PT	4.6*
RO	4.0
SI	4.2
SK	4.2
FI	≥4.3
SE	≥4.3

*Source: TML et al. (2023), impact assessment support study; * Member States allowing a maximum height of 4.3m or above, but not for containers.*

In the Member States that already allow 4.3 meters high vehicles, high-cube containers can be used except for Bulgaria, Spain and Portugal. Therefore, the impacts of the measure are limited to 21 Member States.

In 2021, around 6% of road freight activity (expressed in tonne-kilometres) was represented by the transport of containers[224]. In terms of tonnes, of 12.5 billion tonnes transported by road in the EU27, around 1 billion (8%) were transported in containers. Transport in the aforementioned 21 MS account for 81% of this containerised transport, of which around 30% makes use of high-cube containers[225] (around 249 million tonnes). PMc2 is estimated to affect a transport volume of 316 million tonnes in 2030, 338 million tonnes in 2040 and 369 million tonnes in 2050 in the 21 Member States concerned.

Administrative cost savings (recurrent) for transport operators

Currently, two solutions are implemented by operators to transport high-cube containers:

- Obtaining a special permit for abnormal transport to carry high-cube containers exceeding 30cm in height. The cost associated with obtaining a special permit for transport high-cube containers is estimated in EUR 60-75 for a return trip, based on feedback received during the stakeholder consultation process, or EUR 500-EUR 2,300 for a full year.

- Using special equipment of low wheel skeletal trailers (with a loading height of 1.1m instead of the standard 1.4m). This is likely the preferred option as it does not come to extra costs as compared to

[224] Source: Eurostat (ROAD_GO_TA_TCRG).
[225] Based on Woodburn, A. (2008), The challenge of high cube ISO containers for British rail freight operations; PWC and Kombiconsult (2022), Comparative evaluation of transhipment technologies for intermodal transport and their cost.

standard semitrailers, but their use is mostly restricted to operators specialised in containerised transport. Based on the input from a terminal operator, it is estimated that 80% of high cube containers are transported using gooseneck trailers.

PMc2 would address the hauliers making use of the first solution. It will eliminate the administrative cost of obtaining the permits, increasing the attractiveness of this type of transport. In the baseline scenario permits are estimated to be needed for 20% of the trips, based on feedback from a terminal operator. The estimated reduction in the number of permits and the administrative costs savings for transport operators in 2030, 2040 and 2050 relative to the baseline are provided in Table 24. For estimating the costs savings the cost per permit was assumed to be EUR 70 per round trip. Expressed as present value over 2025-2050, the adjustment cost savings for hauliers operating in the 21 Member States affected by PMc2 are estimated at EUR 3.2 billion relative to the baseline (in 2022 prices).

Table 24: Impacts of PMc2 on transport operators relative to the baseline

	2030	2040	2050
Reduction in the number of permits (million)	2.4	2.6	2.8
Administrative costs savings (million EUR)	168.8	180.5	196.9
Shift from unimodal road to intermodal transport (billion tkm)	11.7	12.8	14.4

Source: TML et al. (2023), impact assessment support study

The average number of permits over 2025-2035 is estimated at 2.37 million per year. Considering the cost per permit of EUR 70, based on the stakeholders' consultation activities, the average annual cost savings are estimated at EUR 165.9 million. These administrative costs savings are not subject to the *application of the 'one in, one out' approach*.

The elimination of the need of obtaining a permit for operators that make use of this option in the baseline is estimated to result in costs savings of 2-7% per tonne relative to the baseline depending on the Member State and time period.

Taking into account the price elasticity of transported volume and the estimated decrease in the operation costs due to PMc2, the shift from road-only to intermodal transport is estimated at 12 billion tonne-kilometres in 2030 relative to the baseline and 14 billion tonne-kilometres in 2050. The shift from road-only to intermodal transport is projected to have a positive impact on environment.

Impact on OEMs

The need for low floor container chassis will be significantly reduced but still required under certain circumstances (i.e. to cross under bridges or tunnels not adapted to the 4.3 m height). The latter will permit OEMs to manage their stocks and adapt to the new circumstances.

Adjustment costs for public authorities

This measure will not require adapting the infrastructure as infrastructure managers can restrict the access to the sections of the network where the infrastructure would not allow it. However, infrastructure managers would need to make sure that the inventory of bridges and tunnels is up to date and make this inventory available to road users so that they can plan their journeys accordingly. The one-off adjustment costs for updating the inventory are estimated at EUR 10.5 million for the 21 affected Member States or EUR 0.5 million on average per Member State.

PMc3: Harmonise the maximum permitted weight of 5- and 6-axle HDV (40t)

PMc3 sets the weight standard of 5- and 6-axle rigid vehicles in national and international transport to a maximum permitted weight of 40t. Rigid HDVs of 5 or 6 axles are currently not regulated in the W&D Directive. As a consequence, they are admitted in international transport with the same GVW of a 4-axle rigid trucks, i.e. 32t. The current Directive already establishes a maximum GVW of 40t for articulated vehicles of 5 and 6 axles. This measure extends the same maximum GVW to rigid vehicles.

Adjustment cost savings for transport operators

According to the data compiled in the context of the *New Mobility Patterns Study*[226], the average payload for the category of rigid HDVs above 32t is only 36.5% of the maximum payload (see Table 25). PMc3 is expected to trigger a shift in activity from current 32t 4-axle rigid trucks to 5- and 6-axle rigid trucks. The average payload for rigid trucks over 32t is estimated to increase from the current 7.2t to 9.5t (a 32% increase).

Table 25: Maximum vs average payload for rigid trucks

Vehicle type	Max payload (t)	Avg payload (t)	Ratio
Rigid 3.5 - 7.5 t	2.0	1.1	56.3%
Rigid 7.5 - 12 t	5.0	2.3	47.1%
Rigid 12 - 14 t	7.0	3.4	48.3%
Rigid 14 - 20 t	9.7	4.7	48.3%
Rigid 20 - 26 t	13.7	6.6	48.3%
Rigid 26 - 28 t	16.4	7.9	48.2%
Rigid 28 - 32 t	18.4	8.9	48.3%
Rigid >32 t (currently)	19.7	7.2	36.5%
Average			48.1%
Rigid > 32 t (under PMc3)	19.7	9.5	48.1%

Source: New Mobility Patterns Survey and TML et al. (2023), impact assessment support study

The increase in the payload increases the capital and operation costs but, at the same time, reduces the number of trips needed through the shift in activity from the current 32t 4-axle rigid trucks to 5- and 6-axle rigid trucks[227]. Transport operators can thus improve efficiency and reduce the costs. Overall, total recurrent adjustments costs savings for transport operators relative to the baseline are provided in Table 26. Expressed as present value over 2025-2050, total adjustment costs savings are estimated at EUR 808.5 million relative to the baseline.

Table 26: Impacts of PMc3 on transport operators relative to the baseline

	2030	2040	2050
Decrease in total transport activity in vkm (million)	20.6	41.9	47.0
Reduction in the number of trips (million)	220.4	447.7	500.8
Adjustment costs savings (EUR million, 2022 prices)	28.8	58.9	65.5

Source: TML et al. (2023), impact assessment support study

Adjustment costs savings for public authorities

[226] New Mobility Patterns Study.

[227] To estimate the shift the own elasticity of road transport demand (in tonnes) of -0.10 was used. Source: Rijkswaterstaat (2020).

The heavier a truck the quicker the infrastructure is damaged and need maintenance. On the other hand, the fewer vehicles (i.e. trips) the lower the damage. Under PMc3, the latter effect is larger than the former and the measure is thus expected to generate costs savings for the maintenance of road infrastructure. Overall, the adjustments costs savings for public authorities relative to the baseline in 2030, 2040 and 2050 are provided in Table 27. Expressed as present value over 2025-2050, they are estimated at EUR 25 million relative to the baseline.

Table 27: Impacts of PMc3 on public authorities relative to the baseline

	2030	2040	2050
Adjustment costs savings for public authorities (EUR million, 2022 prices)	0.9	1.8	2.0

Source: TML et al. (2023), impact assessment support study

PMc4: Allow cross-border transport of 44t-HDV and EMS between "allowing" MS

PMc4 allows the cross-border transport, on one hand, of 5- or 6-axle HDV with a maximum GVW of 44t and, on the other, of EMS between allowing Member States (i.e. Member States that allow such heavier and/or longer vehicles in national transport). This measure takes account of the national permissible weights (total and per axle) and length that are common to the respective MS ("minimum common denominator") and to the part of the network where these vehicles are allowed in national traffic, but it does not condition the cross-border transport to the compliance with additional requirements that could be imposed nationally to the vehicle or to the driver.

Making use of the current possibility of granting national derogations, a significant number of MS allow national transport at weights and dimensions in excess of the standard EU limits (see Table 28).

Table 28: Weigh allowance beyond the standard EU limits for "allowing" Members States

44 tonnes (standard HDVs)	EMS
• Belgium	• Belgium (60t)
• Czechia	• Czechia (48t)
• Denmark	• Denmark (60t)
• Estonia	• Germany (40t)
• Finland	• Finland (76t)
• France	• Netherlands (60t)
• Ireland (46 tonne)*	• Portugal (60t)
• Italy (56 tonne)	• Spain (60t, 70t in trial)
• Luxembourg	• Sweden (64t, 74t in a trial)
• Netherlands (50t)	
• Portugal	
• Sweden	

*Notes: * For Ireland, 46t are allowed if the trucks are equipped with EBS and ESC.*
Source: TML et al. (2023), impact assessment support study

Under PMc4, the trucks with allowances beyond the EU limits, which were limited to national traffic, would now be allowed to circulate internationally across "allowing" Member States. There would be no limit to the border crossings as long as the common denominator is respected. PMc4 would affect international transport only among "allowing" Member States. National transport would not be affected.

Based on the current national limits and applying the common denominator, Table 29 shows the extra average payload for international transport for pairs of "allowing" Member States.

Table 29: Extra payload under PMc4 for pairs of Member States

Origin	Destination	*Extra payload*
BE	CZ	*20.0%*
BE	DE	*20.0%*
BE	DK	*20.0%*
BE	FI	*20.0%*
BE	FR	*2.0%*
BE	LU	*3.0%*
BE	SE	*20.0%*
CZ	BE	*20.0%*
CZ	DE	*20.0%*
CZ	DK	*20.0%*
CZ	FI	*20.0%*
CZ	NL	*20.0%*
CZ	SE	*20.0%*
DE	BE	*20.0%*
DE	DK	*20.0%*
DE	FI	*20.0%*
DE	NL	*20.0%*
DE	SE	*20.0%*
DK	BE	*20.0%*
DK	CZ	*20.0%*
DK	DE	*20.0%*
DK	FI	*20.0%*
DK	NL	*20.0%*
DK	SE	*50.0%*
ES	PT	*50.0%*
FI	BE	*20.0%*
FI	CZ	*20.0%*
FI	DE	*20.0%*
FI	DK	*50.0%*
FI	NL	*20.0%*
FR	BE	*2.0%*
FR	IT	*2.0%*
FR	LT	*0.0%*
FR	LU	*2.0%*
FR	NL	*2.0%*
IT	FR	*2.0%*
LU	BE	*3.0%*
LU	FR	*2.0%*
LU	NL	*3.0%*
NL	CZ	*20.0%*
NL	DE	*20.0%*
NL	DK	*20.0%*
NL	FI	*20.0%*
NL	FR	*2.0%*
NL	LU	*3.0%*
NL	SE	*20.0%*
PT	ES	*50.0%*

Origin	Destination	*Extra payload*
SE	BE	*20.0%*
SE	CZ	*20.0%*
SE	DE	*20.0%*
SE	DK	*50.0%*
SE	NL	*20.0%*

Notes: For 44t the extra payload is 2% to 3%. For EMS the extra payload is based on weight constrained goods and limited to 20%. Between Member States that already have a bilateral agreement, there is not extra payload. When there is a choice, EMS prevails over 44 t.
Source: TML et al. (2023), impact assessment support study

Adjustment cost savings for transport operators

The increase in the average payload is expected to lead to a decrease in the costs per tonne-kilometre for international transport as well as to a reduction in vehicle-kilometres, number of trips and an increase in the tonnes-kilometres. As a consequence, PMc4 leads to adjustments costs savings for transport operators (see Table 30) relative to the baseline estimated at EUR 2.3 billion, expressed as present value over 2025-2050.

Table 30: Impacts of PMc4 on transport operators relative to the baseline

	2030	2040	2050
Increase in total volume - number of tonnes (thousand)	11,923	12,314	13,211
Decrease in total transport activity in vkm (million)	125.6	126.3	134.1
Increase in total transport activity in tkm (million)	4,930.5	5,047.3	5,458.6
Reduction in the number of trips (million)	305.5	309.8	326.2
Adjustment costs savings (EUR million, 2022 prices)	106.6	139.0	175.2

Source: TML et al. (2023), impact assessment support study

The increase in efficiency of road transport also induces a modal shift from rail and inland waterways towards road transport, estimated at 4.9 billion tonne-kilometres in 2030 and 5.5 billion tonne-kilometres in 2050 relative to the baseline. This is particularly due to the shift from the vehicle category >32 with 6 axles.

Adjustment costs savings for public authorities

The heavier a truck the quicker the infrastructure is damaged and need maintenance. On the other hand, the fewer vehicles (i.e. trips) the lower the damage. Under PMc4, the latter effect is larger than the former and the measure is thus expected to generate costs savings for the maintenance of road infrastructure. Overall, the adjustments costs savings for public authorities relative to the baseline in 2030, 2040 and 2050 are provided in Table 31. Expressed as present value over 2025-2050, they are estimated at EUR 106.2 million relative to the baseline.

Table 31: Impacts of PMc4 on public authorities relative to the baseline

	2030	2040	2050
Adjustment costs savings for public authorities (EUR million, 2022 prices)	5.6	5.8	6.2

Source: TML et al. (2023), impact assessment support study

PMc5: Harmonise the loaded length of vehicle carriers

PMc5 introduces a standard for the maximum overhang of loads used in road trains specialised in the transport of vehicles (vehicle transporters or vehicle carriers) in national and international traffic. The maximum authorised length of these vehicles is the general 18.75m. However this length can be exceeded when they are loaded (through national derogations), via the use of front

and/or rear cantilevers or overhangs, up to a maximum of 20.75m. This measure aims at removing the national divergences as regards the type and length of overhangs allowed in national transport described in the table below.

In practice, with the exception of France, Luxemburg, Portugal, Spain (and Malta), all MS already allow a loaded length of vehicle of at least 20.75m (see Table 32). Therefore, a harmonisation of the length at 20.75m does not seem to entail any particular problem in terms of safety or infrastructure. This will allow those four Member States an increase by one full vehicle, i.e. from 8 to 9 and by two full vehicles in Malta (where no overhangs are currently allowed).

A further issue is that the distribution of the extra length granted in the form of overhangs is different across Member States. Given that the W&D Directive does not regulate vehicles overhangs, in practice, operators comply with the lowest common denominator of what each Member State allows nationally. This affects particularly the international traffic between France, Belgium, Luxembourg, Germany and Italy.

Table 32: National length limits for vehicle carriers

Country	Total loaded length	Front overhang	Rear overhang	Comment
EU (WDD)	18.75	-	-	
AT	Undefined	Undefined	Undefined	Overhang must be shorter than 1/4 of trailer length
BE	20.75	0.5	1.5	
BG	Undefined	Undefined	Undefined	Vehicles over 18.75m but under 22m can circulate after payment of a tax
HR	21	1	*	*: 1/6 of last vehicle of the load
CY	*	*	*	*:The overall loaded length in Cyprus can be: (A) the total length of the vehicle combination (max 18.75m) plus up to 10% of the rigid vehicle's length as front overhang (provided that there is no overhang to the rear of the vehicle); (B) 18.75m plus part of the 10% overhang as front overhang of the rigid vehicle (the rest of the 10% overhang is then at the rear of the rigid vehicle and not the trailer)
CZ	20.75	Undefined	Undefined	In practice, 0.5m front and 1.5m rear overhang is allowed
DK	20.75	Undefined	2	
EE	20.75	Undefined	Undefined	
FI	Undefined	1	2	
FR	20.35	0	1.6	
DE	20.75	0.5	1.5	
GR	20.75	0.5	1.5	
HU	*	*	*	*: Vehicles up to 22m need a (paid) permit. No overhangs are allowed, so longer vehicles need to use an extension.
IE	21.75	Undefined	3	
IT	21	Undefined	Undefined	Front overhang can only be used with rear overhang
LV	Undefined	Undefined	Undefined	
LT	20.75	Undefined	Undefined	
LU	20	1	Undefined	
MT	18.75	0	0	
NL	20.75	0.5	2	The load should not extend by more than 5.00 m to the rear when measured from the centre of the rear axle of the trailer
PL	20.75	0.5	2	
PT	20.55	0	1.8	
RO	21.75	Undefined	Undefined	
SK	20.75	0	0	Only a rear extension can be used in practice
SI	22	0	1.5	
ES	20.55	0	1.8	
SE	24	Undefined	Undefined	
CH	20.35	0.5	1.1	

Source: ECG (ECG, 2021), https://www.ecgassociation.eu/activities/eu-affairs/

Adjustment cost savings for transport operators

As explained above, this measure will allow Spain, Portugal, France, Luxembourg and Malta to increase the number of vehicles transported in each truck, and therefore reduce transport activity in terms of vehicle-kilometres (vkm). The transport of transport equipment (NST2007 group 12)[228] represented 2% of total tonnes transported by road in the EU, 3.9% of tonnes-kilometres and 5.1% of vehicle-kilometres[229] in 2021. There is no data available on the share of domestic versus international transport at the level of the type of good. At the overall level (for all goods types), loaded domestic transport represents around 52% of all transport activity, while international loaded transport around 28% (in vkm); the rest is empty transport[230]. The share of total vkm potentially affected by this measure would thus be around 1.4%.

A higher load factor would allow a 11.1% decrease in activity in vkm for the same cargo moved for those countries. The total reduction in vkm for the MS affected by PMc5 is shown in Table 33. The cost saving per vkm is estimated at EUR 1.45. The recurrent adjustment costs savings relative to the baseline are provided in Table 33. Expressed as present value over 2025-2050, they are estimated at EUR 8.7 billion relative to the baseline.

Table 33: Impacts of PMc5 on transport operators relative to the baseline

	2030	2040	2050
Reduction in transport activity in vkm (million)	289.0	316.3	360.9
Adjustment costs savings (EUR million)	444.2	486.5	554.4

Source: TML et al. (2023), impact assessment support study

Adjustment costs for public authorities

Carrying 9 cars instead of 7 or 8 will increase the transported mass and could potentially affect infrastructure/pavement. The average mass of a car is 1.481 tonnes (ICCT, 2022). At 7 vehicles, the cargo of a vehicle transported would weigh 10.4 tonnes, which would increase to 13.3 tonnes when 9 cars are loaded. While this increase should have some impacts on pavements, the GVW of such a vehicle would still be well below the maximum allowed GVW and the designed weight limits for pavement. With the additional length likely to be achieved by extending front and rear overhang for those countries currently with lower length limits, there could be some additional cost from damage to roadside furniture etc. when manoeuvring, or the need to restrict tertiary routes where damage could occur, but this impact is likely very small.

Administrative costs for public authorities

There are likely some inspection costs for public authorities associated with slightly increased length in the affected MS. These costs cannot be estimated, but they are expected to be limited.

[228] Not all of this could be transported by vehicles that could make use of this measure, e.g. it also includes transport of vehicle parts.
[229] Eurostat: table ROAD_GO_TA_DCTG.
[230] Eurostat: table ROAD_GO_TA_TOTT.

PMc6: Reinforce MS obligation to conduct a minimum level of checks on HDV's weight

PMc6 will mandate Member States to carry out every year a minimum number of controls of the compliance of HDV with the rules on maximum total weight and maximum axle weight per million vehicle-kilometre (vkm) in each Member State. This measure does not preclude how the controls are performed, i.e. via physical inspection on the roadside or automatic systems allowing for direct enforcement without stopping the HDV controlled. The measure aims at ensuring a minimum level of enforcement in the EU which is expected to improve the competition and road safety.

Data indicates that the number of HDVs controlled regarding their weight[231] is very heterogeneous across Member States, ranging from less than 0.65 weight controls per million vkm in Finland, the Netherlands or Poland, to around 20 or more in Greece, Ireland, and Slovenia (see Table 34). This policy measure aims to reinforce the Member States obligation to conduct a minimum level of checks of HDV weight. Based on the median value for the list of Member States presented in Table 34, the minimum number of weight tests required would be 6.4 per million vkm.

Table 34: Weight checks performed in 2020, checks per million vkm

Member State	Weight checks/million vkm
AT	9.29
BE	1.10
BG	2.80
DE	5.48
DK	10.93
EE	6.41
EL	24.54
ES	6.37
FI	0.50
IE	4539.22
IT	19.01
LU	14.95
LV	0.80
NL	0.14
PL	0.62
SE	3.37
SI	22.42
SK	12.93
MEDIAN	6.41

Notes: The data on transport activity (in vkm) follow the registration criteria.
Source: TML et al. (2023), impact assessment support study, based on data from "31st report from the Commission on the implementation of the social legislation relating to road transport"[232]

Nevertheless, heavy goods vehicle operators also face burden every time they are subject to police control. These controls can include roadside checks, vehicle inspections and documentation reviews. Operators may incur costs related to the time spent to comply with these checks, as well as potential fines and penalties for non-compliance. In addition, if a vehicle is found to be non-

[231] These checks can be made in certified static scales with specialised teams (inspectors/police/…) or by certified WIM systems.
[232] Report from the Commission to the European Parliament and the Council on the implementation in 2019-2020 of Regulation (EC) No 561/2006 on the harmonisation of certain social legislation relating to road transport and of Directive 2002/15/EC on the organisation of the working time of persons performing mobile road transport activities (31st report from the Commission on the implementation of the social legislation relating to road transport).

compliant, it may need to be taken out of service for unloading or repairs, resulting in loss of revenue.

Administrative costs for public authorities

PMc6 will require public authorities to perform additional tests in the 9 Member States below the threshold of 6.4 weight tests per million vkm[233]. The evolution of the total number of weight tests over time takes into account the projected transport activity. For instance, in 2025 these Member States will have to undertake 239.2 thousand additional weight tests to reach the threshold. No additional tests are required in the 8 Member States above the threshold[234].

Based on the stakeholders' consultation and the REMOVE project[235], each weight test is considered, on average, to require one hour for two officers (one hour for each). The cost per check is estimated at EUR 142.

Taking into account the additional number of tests required and the cost per test, the administrative costs for public authorities under PMc6 are estimated at EUR 34 million in 2030 and EUR 48.7 million in 2050 relative to the baseline. Expressed as present value over 2025-2050 the administrative costs are estimated at EUR 0.8 billion relative to the baseline.

Table 35: Impacts of PMc6 on public authorities relative to the baseline

	2025	2030	2040	2050	Cumulative/ present value (2025-2050)
Weight tests in the baseline (thousand)	6,683.5	8,022.4	8,943.7	10,703.7	227,351
Required additional weight tests relative to the baseline (thousand)	239.2	275.3	307.8	343.3	7,752
Additional administrative costs (EUR million)	34.0	39.1	43.7	48.7	762.7

Source: TML et al. (2023), impact assessment support study

Adjustment costs savings for public authorities

Adjustment cost savings for public administrations are related to public expenditures on infrastructure maintenance. PMc6 is expected to reduce the frequency and severity of overloading practices, mitigating the premature damage of the road infrastructure due to overloaded HDVs. Wermskerken (2005)[236] cited research showing that in the Netherlands EUR 18.1 to 42.3 million of road damage was caused by overloaded vehicles. Based on data from the OECD on the total road maintenance costs for the Netherlands, this represents 2.9 to 6.7% (mid-point 4.8%) of all road

[233] These are Belgium, Bulgaria, Germany, Estonia, Spain, Finland, Latvia, Netherlands, Poland and Sweden.
[234] These Member States are Austria, Denmark, Greece, Ireland, Italy, Luxembourg, Slovenia and Slovakia. In addition, for Cyprus, Czechia, France, Croatia, Hungary, Lithuania, Malta, Portugal and Romania for which there is no information provided on their enforcement activity in compliance with article 10g of the W&D Directive it is assumed that they meet the EU threshold.
[235] Data were obtained for Croatia, Italy, Finland, Estonia, Poland, Latvia, Malta and Luxembourg. Wermskerken (2005), Project REMOVE work package 4 final report on cost benefit analysis.
[236] Wermskerken (2005), Project REMOVE work package 4 final report on cost benefit analysis. Deliverable of the REMOVE project funded by the EC.

maintenance costs attributed to overloaded vehicles. It was assumed that this share would apply across the EU.

An essential element to assess such costs savings is how effective increased checks are at reducing the frequency and/or magnitude of overloading. Some quantitative analysis has been undertaken so far[237]. Winter & Campbell (2009)[238] identified that the use of WIM data to target checks more effectively in Montana, US produced a 20% reduction. Studies of a pause in checks found that the incidence of overloaded vehicles (by GVW) increased from 2.27% before to 3.67% during the pause and decline to 3.19% after. Based on driver hours enforcements, Elvik & Erke (2006)[239] found that increasing the frequency of checks by 200% would result in benefits of around 85% of the maximum achievable. Regan et al. (2006)[240] found that replacing low frequency manual checks with high frequency automated checks reduced overloading by 89% (Florida) to 97% (Maryland) at the enforcement sites (not necessarily across the whole network).

Based on the above estimates, it was assumed that due to routes not encountering WIM and the potential for operators to deliberately avoid WIM an overall effectiveness of direct enforcement via certified WIM would be 40% effective, pre-selection WIM would be 20% effective and manual checks would be half as effective as pre-selection WIM (10%). These assumptions are used in PM7, PM6 and PMc6, respectively. On the other hand, PMc6 is also expected to lead to an increase in the vehicle-km performed by compliant HDVs, partially offsetting the benefits of the reduction in overloaded HDVs.

As a result, PMc6 will lead to EUR 478.4 million infrastructure costs savings over the period 2025-2050, expressed as present value relative to the baseline (in 2022 prices). The adjustment costs savings for public authorities related to infrastructure maintenance due to PMc6 are presented in Table 36.

Table 36: Impacts of PMc6 on public authorities relative to the baseline

	2025	2030	2040	2050	Present value (2025-2050)
Adjustment costs savings (EUR million)	23.2	24.4	27.0	29.9	478.4

Source: TML et al. (2023), impact assessment support study.

[237] See for example: Henny, & van Loo (2019), Remove Requirement for enforcement of overloaded vehicles in Europe, The Heavy Vehicle Transport Technology Forum; Honefanger, S. et al. (2007), Commercial Motor Vehicle Size and Weight enforcement in Europe, US DOT FHWA; Marchadour & Jacob (undated), Development and Implementation of a WIM network for enforcement in France, International Society for Weigh in Motion IS-WIM; Todts, W. (2014), Briefing: Weight sensors for lorries - effective, affordable reliable, Brussels: Transport & Environment; Oehry, H. & van Driel (2013), Study on heavy vehicle on-board weighing, Rapp Trans published by Transport & Environment; van Velzen (undated), The design of weight enforcement strategies for overloaded vehicles on complex road networks, The Netherlands: The Technical University of Delft.

[238] Winter, K., & Campbell, B. (2009). Technology helps us do things better: Virtual weigh stations, other new methods for enforcing the law prolong highway life and increase vehicle citations. Virginia Department of Transportation.

[239] Elvik, R., & Erke, A. (2006). Road Safety Measures: A catalogue of estimated effects. TOI report 851/2006.

[240] Regan, A., Park, M., Nandiraju, S., & Yang, C.-H. (2006). Strategies for successful implementation of virtual weigh and compliance systems in California. Institute of transportation studies University of California, Berkeley.

Adjustment costs for transport operators

The truck driver will have to stop for about one hour to perform the test. The economic cost associated to delaying the vehicle by that one hour is estimated at EUR 34.8[241].

According to the data on the number of checks undertaken by Member States and the number of infractions, 86.8% of the trucks stopped were not overloaded. It should be noted that other estimates have shown a lower proportion. For example, Wermskerken (2005)[236] reported that based on a questionnaire filled in by Member States manual stops were sufficiently targeted such that only 50% of those stopped were not overloaded. However, the number of Member States that replied and the precise details were not clear.

Taking into account the estimated increase in the number of weight tests required by PMc6, the adjustment costs for transport operators (compliant and non-compliant) for cooperating with the public authorities are provided in Table 37.

PMc6 is expected to reduce overloading practices. If operators that were previously operating overloaded trucks will now comply with the weight limits, then more vehicle-km will be required to transport the same quantity of goods. This will affect transport operators which were operating under infraction. By minimising the proportion of overloaded vehicles, compliant operators will benefit from a levelled playing field. This applies to both domestic and international transport. The adjustment costs due to reduced overloading practices are provide in Table 37.

Total adjustment costs for transport operators, expressed as present value over 2025-2050 relative to the baseline, are estimated at EUR 643 million.

Table 37: Impacts of PMc6 on transport operators relative to the baseline

	2025	2030	2040	2050	Cumulative/ present value (2025-2050)
Adjustment costs for cooperating with public authorities for performing the weight tests (EUR million)	8.2	9.5	10.6	11.8	184.7
Increase in transport activity due to reduced overloading practices (vkm million)	14.8	17.2	19.7	22.2	492.6
Adjustment costs due to reduced overloading practices (EUR million)	20.0	23.2	26.5	29.9	458.3
Total adjustment costs (EUR million)	28.2	32.7	37.1	41.7	643.0

Source: TML et al. (2023), impact assessment support study

PMc7: Set common principles for the voluntary implementation of intelligent access policies (IAP)

IAP primarily ensures matching the performance and characteristics of a road freight vehicle with the state and capability of specific section of an infrastructure network, i.e. it ensures that the correct vehicles runs on the correct road at the correct time. Access rules can refer to weight limits,

[241] Motor transport cost tables 2020, counting only fixed costs per operating hour that excluded distance related costs such as fuel, "https://motortransport.co.uk/annual-cost-tables-history"

dimensions limits, speed limit compliance, as well as day and/or time restrictions for categories of vehicles.

IAP is a nascent technology and could become a barrier to international traffic if Member States or even regions independently were to introduce their own systems without setting standards for information exchange.

PMc7 aims at facilitating a harmonised implementation of Intelligent Access Policies (IAP) in the EU based on common principles to be respected by Member States when they voluntary implement them, such as public accessibility to the information, non-discrimination. PMc7 would mean a common approach to ensure the interoperability of IAP's necessary hardware and software.

IAP aim to further facilitate efficient enforcement and to address the concerns of a risk of damage to infrastructure and of road safety by some types of HDVs. Assessing the overall impacts of a generalised introduction of IAP requires a thorough analysis and goes well beyond PMc7, which is limited to introducing common standards to facilitate IAP. Therefore, the assessment hereafter focuses only on the restricted aspect of standardisation.

Adjustment costs for the European Commission

The development of IAP standards will proceed in two steps. A study will be carried out to compile the required elements and propose several options for the establishment of the standards. In a second stage, an expert group will use the findings and assessment of the study to draft the standards.

The cost of the initial study is estimated at EUR 400,000. The average cost for a two-day workshop hosted by European Commission (EC), where participants are reimbursed by the EC is around EUR 30,000. Two of such in-person workshops may be required as well as two online meetings. Compensation for the experts contributing to the online meetings is estimated in EUR 5,000 for each meeting. Therefore, the one-off adjustment costs for the European Commission are estimated at EUR 0.47 million.

PM1: Allow for extra weight for HDV which are ZEV regardless of the weight of the ZE technology used

PM1 allows 4 extra tonnes for HDVs in national and international traffic which are ZEV (i.e. 2 extra tonnes as under the current Directive plus 2 additional tonnes) to 5/6-axle HGV only. In addition to PMc1, the extra weight is granted regardless of the weight of the ZE technology used. This also means that the effect of the measure will not fade out with technology progress, but the effect will continue over time. For instance, when technology will allow for a reduction in the weight of batteries, operators could use this to increase the payload capacity of ZEV and improve the business case of these vehicles.

PM1 will enable a maximum GVCW of 44 tonnes for zero-emission HGVs in road-only operations and of 46 tonnes or 48 tonnes (depending on the axle combination) for HDVs involved in intermodal operations[242].

[242] Currently the WD Directive allows a maximum GVCW of up to 46 tonnes for ZE HDV involved in intermodal transport operations.

Those Member States which already allow the circulation of HDV of up to 44 tonnes will be allowed to continue to do so during a transition period also in cross-border traffic, as enabled by PMc4. The transition period will finish in 2035 to allow sufficient adaptation time for operators to be able to renew their fleet.

Adjustment costs savings for transport operators

As indicated in the discussion on PMc1, given that diesel engines are heavier (and considering also a standard tank capacity of 1,000 litre), BEV with 5-6 tonne batteries are estimated to be 4 tonnes heavier than diesel vehicles. As indicated for PMc1, the increase of battery energy density due to technology progress is expected to lead to "weight parity" between diesel and BEV by 2030 (i.e. batteries of 3 tonnes and GVW of 42 tonnes as under the current directive). While longer term projections on energy density are scarce and divergent, the following assumptions were made: a 1000 kWh battery will weigh 2.2 tonnes in 2040 (energy density: 450 Wh/kg) and 1.7 tonnes by 2050 (energy density: 600 Wh/kg). This would bring a payload bonus of 2 tonnes by 2030, 3.8 tonnes by 2040 and 4.3 tonnes by 2050. With the maximum GVW maintained at 44t, these reductions in battery weigh over time will provide a bonus in loading capacity as shown in Table 38.

Table 38: Assumptions on technology evolution and its impact on payload capacity under PM1, tonnes

	2025	2030	2035	2040	2050
BEV battery weight in the baseline	6	4	3	2.2	1.7
BEV weight difference to ICE vehicles	4	2	1	0.2	-0.3
BEV payload bonus under PM1 with respect to BEV in the baseline	2	2	2	2	2
BEV payload bonus with respect to ICE vehicles under PM1	0	2	3	3.8	4.3
FCEV tank/fuel cell system weight in the baseline	0.8	0.6	0.4	0.3	0.2
FCEV weight difference to ICE vehicles	1.3	1.0	0.9	0.8	0.7
FCEV payload bonus under PM1 with respect to FCEV in the baseline	2.7	2.7	2.7	2.7	2.7
FCEV payload bonus with respect to ICE vehicles under PM1	2.7	3.0	3.1	3.2	3.3

Source: TML et al. (2023), impact assessment support study

The payload bonus for FCEV would be larger in the initial years than for BEV. According to Ballard (2022)[243], FCEV with a 150 kWh battery (weighing 820 kg at 180 Wh/kg) and 80kg of H2 storage are around 1.3 tonnes heavier than an equivalent diesel vehicle. With a 4 tonne general ZEV exemption, they would have a payload bonus of 2.7 tonnes in 2025, which would increase to 3.3 tonnes in 2050 (see Table 38). It is assumed that there is no evolution in the weight of the hydrogen tanks over time. As discussed for PMc1, only the weight constrained BEV and volume constrained FCEV will benefit from this measure. In addition, the lifetime of trucks is taken into account to obtain the actual effect of PM1 in terms of payload capacity over the fleet of vehicles as a whole.

PM1 would result in an increase in the transport activity (expressed in tonne-kilometres) performed by ZEV vehicles. The increase in the average payload is expected to lead to a decrease in the costs per tonne-kilometre for international transport as well as to a reduction in total transport activity in vehicle-kilometres and the number of trips. As a consequence, PM1 leads to adjustments costs savings for transport operators (Table 39) relative to the baseline estimated at EUR 3.9 billion, expressed as present value over 2025-2050.

[243] Ballard (2022), Fuel Cell Trucks / Weights & Dimensions Directive.

Table 39: Impacts of PM1 on transport operators relative to the baseline

	2030	2040	2050
Decrease in total transport activity in vkm (million)	18.7	172.3	336.1
Reduction in the number of trips (million)	91.3	845.2	1,639.1
Increase in ZEV transport activity (tkm million)	4,475.2	7,276.7	6,607.5
Adjustment costs savings (EUR million, 2022 prices)	78.8	294.7	485.6

Source: TML et al. (2023), impact assessment support study

Adjustment costs for public authorities

The heavier a truck the quicker the infrastructure is damaged and need maintenance. On the other hand, the fewer vehicles (i.e. trips) the lower the damage. Under PM1, the former effect is larger than the latter and the measure is thus expected to result in additional costs for the maintenance of road infrastructure. Overall, the adjustment costs for public authorities relative to the baseline in 2030, 2040 and 2050 are provided in Table 40. Expressed as present value over 2025-2050, they are estimated at EUR 4.2 billion relative to the baseline.

Table 40: Impacts of PM1 on public authorities relative to the baseline

	2030	2040	2050
Adjustment costs for public authorities (EUR million, 2022 prices)	67.8	333.1	543.8

Source: TML et al. (2023), impact assessment support study

PM2: Align the definition of intermodal transport with the Combined Transport Directive (to include all intermodal loading units)

The current directive granted an additional GVW of 2 or 4 tonnes for containerised transport involved in intermodal transport (depending on the axle configuration). PM2 extends this additional allowance to non-containerised intermodal transport[244]. When vehicles are alternatively-fuelled or zero-emission they also benefit from the extra weight allowance envisaged in the W&D (1 tonne and 2 tonnes, respectively). PM2 will thus result in a maximum GVW of these vehicle combinations of between 42 and 46 tonnes depending on the axle configuration and the type of fuel.

Adjustment costs savings for transport operators

About half of the Member States already allow 44t for semitrailers in national traffic, therefore this measures will only affect the 13 Member States that do not yet allow 44t HDVs: Austria, Bulgaria, Greece, Croatia, Germany, Latvia, Lithuania, Hungary, Poland, Romania, Slovenia, Slovakia, Estonia[245].

This measure is expected to affect palletised and pre-slung goods, which are the ones most suitable to be transported in trailer/semitrailers. PM2 is expected to work through two channels: on the one hand, transport of more than 300 km which could shift to intermodal and, on the other, transport of less than 150 km which corresponds to the road leg or last mile transport of current intermodal transport operations (as well as new "last mile" traffic induced from the shift to intermodal).

[244] This refers to transport where lorry, trailer, semi-trailer are the intermodal loading units.
[245] Cyprus and Malta are also in the group of Member States currently not allowing 44t for intermodal transport. However, given their insularity and size, this measure is not relevant for them.

According to Eurostat, about 1,700 million tonnes of palletised and pre-slung goods were transported by road in the concerned Member States in 2021, of which 850 million tonnes were transported on distances smaller than 150 km and 530 million tonnes on distances larger than 300 km (Table 41).

Table 41: Total transport vs. palletised and pre-slung goods transported on road in 2021 (million)

Member State	Total Transport			Palletised and pre-slung								
				Total			Up to 150 Km			More than 300 Km		
	Tonnes	vkm	tkm	Tonnes	vkm	tkm	Tonnes	vkm	tkm	Tonnes	vkm	tkm
Austria	403.5	2,112	26,296	67.0	884	9,583	45.6	266	2,030	9.4	376	5,098
Bulgaria	162.5	2,131	35,176	45.8	1,509	24,513	14.2	93	807	22.5	1,254	21,783
Croatia	86.5	897	13,632	24.0	539	7,702	10.4	78	522	8.6	378	6,079
Estonia	28.9	320	5,212	6.1	174	2,433	2.4	17	134	2.0	127	1,973
Germany	3,108.0	23,068	296,136	756.2	10,130	118,120	467.8	2,657	24,253	129.8	4,537	62,025
Greece	271.0	1,519	21,061	46.4	616	9,175	27.1	151	1,291	9.4	338	6,027
Hungary	242.2	2,576	36,887	77.5	1,504	19,561	40.0	218	2,084	21.2	1,012	14,198
Latvia	86.4	1,356	14,973	23.2	481	6,309	14.9	59	910	5.4	368	4,801
Lithuania	113.1	3,769	57,729	65.6	3,003	46,648	9.3	73	695	47.2	2,762	43,961
Poland	1,580.5	26,560	379,838	440.3	13,077	178,698	163.0	1,108	9,315	197.6	10,491	152,450
Romania	307.4	4,168	61,845	88.8	3,062	44,406	27.8	156	1,768	46.8	2,670	39,564
Slovakia	154.8	3,108	30,129	47.4	1,701	18,184	20.7	208	1,128	18.1	1,263	15,375
Slovenia	98.9	1,739	24,948	33.2	1,206	16,385	10.2	68	648	18.3	1,054	14,765
Total (13)	6,643.6	73,323	1,003,862	1,721.7	37,886	501,717	853.4	5,152	45,585	536.3	26,630	388,099
p.m. EU27	*12,547.3*	*134,254*	*1,758,184*	*3,482.3*	*72,602*	*880,019*	*1,815.3*	*11,573*	*95,309*	*998.5*	*47,926*	*653,660*

Source: Eurostat (road_go_ta_tcrg)

Table 42: Shares of palletised and pre-slung goods transported on road in total transport, in 2021

Member State	Total Transport			Palletised and pre-slung								
				Total			Up to 150 Km			More than 300 Km		
	Tonnes	vkm	tkm	Tonnes	vkm	tkm	Tonnes	vkm	tkm	Tonnes	vkm	tkm
Austria	404	2,112	26,296	16.6%	41.9%	36.4%	11.3%	12.6%	7.7%	2.3%	17.8%	19.4%
Bulgaria	162	2,131	35,176	28.2%	70.8%	69.7%	8.7%	4.4%	2.3%	13.8%	58.8%	61.9%
Croatia	86	897	13,632	27.8%	60.1%	56.5%	12.1%	8.7%	3.8%	10.0%	42.1%	44.6%
Estonia	29	320	5,212	21.2%	54.4%	46.7%	8.4%	5.3%	2.6%	6.9%	39.7%	37.9%
Germany	3,108	23,068	296,136	24.3%	43.9%	39.9%	15.1%	11.5%	8.2%	4.2%	19.7%	20.9%
Greece	271	1,519	21,061	17.1%	40.6%	43.6%	10.0%	9.9%	6.1%	3.5%	22.3%	28.6%
Hungary	242	2,576	36,887	32.0%	58.4%	53.0%	16.5%	8.5%	5.6%	8.7%	39.3%	38.5%
Latvia	86	1,356	14,973	26.9%	35.5%	42.1%	17.3%	4.4%	6.1%	6.2%	27.1%	32.1%
Lithuania	113	3,769	57,729	58.0%	79.7%	80.8%	8.2%	1.9%	1.2%	41.7%	73.3%	76.2%
Poland	1,581	26,560	379,838	27.9%	49.2%	47.0%	10.3%	4.2%	2.5%	12.5%	39.5%	40.1%
Romania	307	4,168	61,845	28.9%	73.5%	71.8%	9.0%	3.7%	2.9%	15.2%	64.1%	64.0%
Slovakia	155	3,108	30,129	30.6%	54.7%	60.4%	13.4%	6.7%	3.7%	11.7%	40.6%	51.0%
Slovenia	99	1,739	24,948	33.6%	69.4%	65.7%	10.3%	3.9%	2.6%	18.5%	60.6%	59.2%
Total (13)	6,644	73,323	1,003,862	25.9%	51.7%	50.0%	12.8%	7.0%	4.5%	8.1%	36.3%	38.7%
p.m. EU27	*12,547*	*134,254*	*1,758,184*	*27.8%*	*54.1%*	*50.1%*	*14.5%*	*8.6%*	*5.4%*	*8.0%*	*35.7%*	*37.2%*

Source: Eurostat (road_go_ta_tcrg)

Cargo transported on distances longer than 300 km. The extra allowance of 4 tonnes represents an increase by 16% in the load capacity with respect to the current levels[246]; after considering the increase in energy consumption, this translates into 11.6% decrease in operational costs per tonne. This measure would impact only weight restricted cargo, according to McKinnon, CNT and Panteia. Therefore, PM2 is expected to entail a shift of 2.2% of palletised and pre-slug transport on distances longer than 300 km from road-only to intermodal transport.

Cargo transported on distances below 150 km. The (semi)trailers currently involved in intermodal transport will also benefit from the operational costs savings.

Taking into account all these elements, PM2 leads to adjustments costs savings for transport operators (Table 43) relative to the baseline estimated at EUR 21.9 billion, expressed as present value over 2025-2050.

[246] Maximum load capacity for 40t trailers and semitrailers is estimated in 25t on average.

Table 43: Impacts of PM2 on transport operators relative to the baseline

	2030	2040	2050
Shift from unimodal road to intermodal transport (billion tonne-kilometres)	9.4	10.5	11.8
Total decrease in road transport activity (million vehicle-kilometres)	535.9	595.3	667.5
Adjustment costs savings (EUR million)	1,160.2	1,233.9	1,303.6

Source: TML et al. (2023), impact assessment support study

Adjustment costs savings for public authorities

As PM2 will lead to a reduction in the total road transport activity in vkm, the maintenance costs for infrastructure are expected to decrease relative to the baseline. Overall, adjustment costs savings for public authorities relative to the baseline are estimated at EUR 312.9 million, expressed as present value over 2025-2050 (see also Table 44).

Table 44: Impacts of PM2 on public authorities relative to the baseline

	2030	2040	2050
Adjustment costs savings (EUR million)	16.0	17.6	19.5

Source: TML et al. (2023), impact assessment support study

PM3: Allow international (intra-EU) transport of EMS1 at least in the core and comprehensive TEN-T network conditioned to be ZEV or part of an intermodal transport operation

PM3 allows the circulation of EMS of up to 25.25m long and 60 tonnes of GVW in international traffic in all Members States within the TEN-T network. This is conditional on the EMS being either zero-emission vehicles or vehicles involved in an intermodal transport operation.

Adjustment cost savings for transport operators

The main benefits to transport operators from PM3 will come from the extra payload allowed through the use of 60t instead of the standard vehicles and the subsequent decrease in operating costs. The reduction in costs of using EMS is well established among transport operators[247] and corroborated by the literature[248]. PM3 will impact national and international transport activity of hauliers operating in Member States that currently do not allow EMS. However, hauliers operating in Member States that currently allow EMS ("allowing Member States"[249]) will also be affected as regards international traffic as described below.

The W&D Directive sets the maximum GVW for the heaviest category of vehicles (5- and 6-axle HGVs) at 40t (42t for ZE HDV and 44t for HDVs involved in intermodal transport). However, Estonia, France, Ireland and Italy allow higher weight limits as shown in Table 45. On the other hand, all Member States currently allowing the circulation of EMS allow them with a minimum GVW of 60t, with the only exception of Germany (40t) and the Czech Republic (48t) and, in many

[247] ACEA (2019) High Capacity Transport – Smarter Policies for Smart Transport.

[248] Among others, ITF (2019), "High Capacity Transport: Towards Efficient, Safe and Sustainable Road Freight", International Transport Forum Policy Papers, No. 69, OECD Publishing, Paris. The potential savings of EMS are based on the ratio of standard trucks that could be replaced by longer EMS. According to the *HCT DUO2-project* study, standard trucks can be replaced by HCVs at a ratio of 3:2 (for 25.25m EMS1), meaning that 2 EMS can move the same amount of goods as 3 standard trucks.

[249] Member States allowing the circulation of EMS are Finland, Sweden, Denmark, Germany, the Netherlands, Belgium, Czechia, Spain and Portugal.

cases in international traffic subject to bilateral agreements[250]. For the allowing Member States, with the exception of Germany and Czechia, PM3 will not change this allowance. Among the allowing Member States Finland and Sweden currently allow vehicles heavier than 60t in cross-border transport and therefore, under PM3, the maximum allowed GVW will decrease in international traffic between these two Member States following a transition period up to 2035. The national operations in the allowing Member States will not change. The change in payload per vehicle stemming from PM3 is summarised in Table 45[251]. Hauliers operating in allowing Member States will be able to extend their operations to international traffic without a limitation in the number of borders crossed and to any other Member State.

Table 45: Additional payload by vehicle when using EMS to replace standard trucks

Member State	Maximum GVW (t)		Increase in payload per vehicle
	Currently	EMS (under PM3)	
AT	40	60	50%
BE	60	60	0%
BG	40	60	50%
CZ	48	60	25%
DE	40	60	50%
DK	60	60	0%
EE	44	60	36%
EL	40	60	50%
ES	60	60	0%
FI	76	60	-21%*
FR	44	60	36%
HR	40	60	50%
HU	40	60	50%
IE	46	60	30%
IT	56	60	7%
LT	40	60	50%
LU	44	60	36%
LV	40	60	50%
NL	60	60	0%
PL	40	60	50%
PT	60	60	0%
RO	40	60	50%
SE	64	60	-6%*
SI	40	60	50%
SK	40	60	50%

*Notes: * A transition period till 2035 is foreseen for transport between FI and SE. The decrease in payload follows this transition period (post-2035). Within FI and SE the original maximum GVW will prevail. In Sweden, 74t are allowed in a trial. In Germany, the maximum allowed GVW goes up to 44t in intermodal transport and 46 tonnes in intermodal transport with ZEV. International road traffic for Cyprus and Malta is not considered possible and therefore excluded from the calculations.*
Source: TML et al. (2023), impact assessment support study

Operators from Member States already allowing the circulation of EMS will also benefit from PM3 beyond the savings stemming from PMc4. First, operators will be able to drive through all Member

[250] Cross-border traffic of EMS under bilateral agreements is currently allowed between Finland and Sweden, Sweden and Denmark, Germany and the Netherlands, and the Netherland and Belgium.
[251] The use of 25.25m EMS would significantly increase the volume compared to standard trucks; therefore, the additional payload could be even larger for volume constraint goods. However, for the purpose of calculating operating costs savings, a conservative increase in payload as presented in the table has been used.

States without the restriction of being an "allowing" Member State (as under PMc4) or having a bilateral agreement, as it is currently the case. This offers potential for the optimisations of routes and increases the geographical scope of operations. Secondly, they will be able to use 60t vehicles across the whole EU and will not be subject to the "minimum common denominator" anymore.

On the other hand, PM3 also entails some restrictions with respect to the current situation. International operations will be limited to EMS that are either ZEV or are involved in an intermodal transport operation. This is expected to result in a reduction in transport costs per tonne kilometre due to the increased payload. EMS that are not ZEV or involved in intermodal transport will not be allowed to operate cross-border. However, those Member States which already allow the circulation of EMS will be allowed to continue to do so during a transition period also in cross-border traffic, as enabled by PMc4. The transition period will finish in 2035 to allow sufficient adaptation time for operators to be able to renew their fleet.

The reduction of operating costs will generate a modal shift from rail and inland navigation to road transport. This is estimated using the price elasticity of demand presented in section 1 of Annex 4.

Taking into account all these elements, Table 46 and Table 47 summarise the effect of PM3 in terms of transport activity by type of truck.

Table 46: Decrease in transport activity due to PM3 relative to the baseline, in thousand vkm

Number of axles	2025	2030	2040	2050
4	0.0	0.0	0.0	0.0
5	6.2	41.1	86.0	144.7
6	181.5	231.5	464.4	749.1
Total	187.7	272.6	550.5	893.7

Source: TML et al. (2023), impact assessment support study

Table 47: Increase in transport activity due to PM3 relative to the baseline, in thousand tonnes

Number of axles	2025	2030	2040	2050
4	0.0	0.0	0.0	0.0
5	-2,642.4	-6,242.5	-11,369.3	-17,236.0
6	24,214.7	41,435.0	96,170.0	164,828.9
Total	21,572.3	35,192.5	84,800.7	147,592.9

Source: TML et al. (2023), impact assessment support study; Note: negative values represent a decrease.

Overall, PM3 is estimated to generate adjustments costs savings for transport operators (Table 48) relative to the baseline estimated at EUR 9.7 billion, expressed as present value over 2025-2050.

Table 48: Impacts of PM3 on transport operators relative to the baseline

	2030	2040	2050
Increase in total volume - number of tonnes (thousand)	35,193	84,801	147,593
Decrease in total transport activity in vkm (million)	272.6	550.5	893.7
Reduction in the number of trips (million)	1,316.9	2,524.1	3,927.6
Shift from unimodal road to intermodal transport (billion tonne-kilometres)	11.0	12.2	13.7
Adjustment costs savings (EUR million, 2022 prices)	265.8	648.6	1,196.2

Source: TML et al. (2023), impact assessment support study; Note: In terms of impact on the shift from unimodal road to intermodal transport the estimates provided here take into account the synergies between PM3 and PM2 (both included in PO-C).

Administrative costs for public authorities

Inspections will be needed to assess the suitability of the infrastructure to accommodate EMS. In case specific elements of the infrastructure are considered not suitable for EMS circulation, this will lead to the need of reinforcement (see below). The costs related to the inventory of infrastructure are included under PMc2. The inspection costs are estimated at EUR 0.5 million per Member State, for the Member States that currently do not allow EMS. The one-off administrative costs for public authorities due to PM3 are estimated at EUR 9 million relative to the baseline.

Adjustment costs savings for public authorities

In principle, PM3 would generate adjustment costs for public authorities related to the maintenance of infrastructure except in those Member States that are currently allowing 60t EMS or heavier. These are, in general, linked to the increase in the maximum total weight of vehicle combinations (and their length). However, in PM3 this increase in weight is outweighed by the decrease in the transport activity in vkm. Thus, PM3 leads to costs savings related to the maintenance of infrastructure.

Under current rules and considering PMc1, 46t HDV are already allowed to circulate across the EU territory in national and international transport. Therefore, the impact in terms of maintenance costs is already included in the estimates for PMc1. Under PM3, only the additional maintenance costs are calculated. The adjustment costs savings related to road maintenance relative to the baseline, are estimated at EUR 459.3 million, expressed as present value over 2025-2050 (in 2022 prices).

Table 49: Impacts of PM3 on adjustment costs savings for public administrations relative to the baseline

	2025	2030	2040	2050
Reduction in transport activity in vkm (million)	187.7	272.6	550.5	893.7
Adjustment costs savings (EUR million)	13.0	16.0	30.3	46.0

Source: TML et al. (2023), impact assessment support study

Adjustment costs for public authorities

Based on the experience of the MS currently allowing EMS, the main elements impacting the infrastructure relate to the extra length of EMS, namely manoeuvrability and visibility, particularly in parking areas and roundabouts. The increase in total weight may pose issues as regards old bridges as explained in PMc1. However, this usually affects secondary roads while PM3 is limited to the TEN-T network where bridges are designed and maintained to higher standards. The critical weight parameter affecting the infrastructure is the axle-weight, which will remain the same or decrease due to the addition of axles of EMS.

The need for adapting specific elements of the infrastructure will be the outcome of the inspections, discussed above. A number of Member States[252] have already undertaken such inspections. Based on this information, the adaptation costs per km of the road infrastructure to the dimensions of EMS (e.g. upgrading of roundabouts, adaptation of acceleration and deceleration lanes to enter and exit a motorway and provision of adequate parking spaces) was estimated at EUR 10,000 per km. By extrapolating to all the affected Member States[253], the one-off adjustment costs are estimated at

[252] Sweden, Denmark, Germany.

[253] The analysis for Germany was used as starting point. Lippold & Schemmel (2017), Parking at rest areas with vehicles and oversize vehicle combinations.

EUR 727 million. In addition, the one-off adjustment costs for the reinforcement of bridges are estimated at EUR 6.9 billion[254]. Thus, the total one-off adjustment costs for public authorities are estimated at EUR 7.6 billion for PM3.

PM4: Set minimum administrative and safety requirements for the transport of indivisible loads

The transport of an indivisible load[255] requiring longer HDVs and specific safety measures is subject to the issuance of special permit for each trip, which include elements such as vehicle escorts, allowed time frames, authorised speeds, etc. Different countries and regions have different rules and procedures in place for obtaining such permits.

PM4 aims at harmonising the requirements and procedures for issuing such national permits. PM4 envisages the implementation of some of the recommendations of the European Best Practice Guidelines (BPG) for abnormal road transport[256]. Namely, the one-stop-shop principle at national level for the submission of applications, the implementation of a harmonised abnormal road transport application form (where only the language of the application form vary between Member States), the mutual acceptance between Member States and the setting of a Special European Registration of Trucks and Trailers (SERT)[257]. The full digitalisation of the system will allow to interconnect national databases. For this, technical and operational standards for information exchange will need to be established.

Administrative cost saving for transport operators

Currently, 11 Member States already apply (fully or partially) the one-stop shop principle for granting permits for the transport of indivisible loads. In the rest of Member States, the principle has not been applied so far (7 Member States) or the actual situation has not been communicated (9 Member States). For the Member States where the actual situation has not been communicated, for the purpose of the calculations, it has been assumed that they partially apply the one-stop shop principle. In addition, SERT is currently only adopted in the Netherlands but accepted in five other Member States. See Table 50 for details.

For transport operators, PM4 will lead to time savings. The time needed to prepare the request, physically submit it (possibly at multiple locations) and to fetch the permit will be reduced. The introduction of the one-stop-shop principles entails the appointment of a single authority per Member State to handle the permit requests. The procedures would be then transparent to the applicants, which only have to deal with one authority, providing them with clarity and facilitating the administrative process. Based on the literature review and the consultation activities[258], the time currently needed is estimated at 4 hours for Member States with no one-stop shop in place, 3.5

[254] Effects of adapting the rules on weights and dimensions of heavy commercial vehicles as established within Directive 96/53/EC.

[255] Article 2 of Council Directive 96/53/EC defines an indivisible load as "*a load that cannot, for the purpose of carriage by road, be divided into two or more loads without undue expense or risk of damage and which owing to its dimensions or mass cannot be carried by a motor vehicle, trailer, road train or articulated vehicle complying with the W&D Directive in all respects*."

[256] European Best Practice Guidelines for abnormal road transport.

[257] The SERT provides national authorities, in a single document or database, the detailed technical information necessary to assess the compatibility of a vehicle with the specific requirements of the abnormal road transport that is not available on the registration certificate.

[258] COWI (2021), ESTA economic impact assessment 2013, interview with ESTA (European association abnormal road transport and mobile cranes).

hours for Member States with partial one-stop shops in place and 3 hours for Member States with physical one-stop shops in place. In the baseline scenario, due to digitalisation this is projected to go down to 3 hours from 2035 onwards for Member States with no one-stop shop in place, to 2.5 hours for Member States with partial one-stop shops in place and to 2 hours for Member States with one-stop shops in place. For Member States with no one-stop shop in place, the introduction of a digital one-stop shop is expected to reduce the time needed by transport operators for preparing and submitting the request by 2 hours until 2035 and by 1 hour from 2035 onwards. For Member States with a partial one-stop shop in place, the introduction of a digital one-stop shop is expected to reduce the time by 1.5 hours until 2035 and by 0.5 hours from 2035 onwards. For Member States with a physical one-stop shop in place, the introduction of a digital one-stop shop is expected to reduce the time by 1 hour by 2035. The introduction of SERT will further reduce the time needed for preparing and submitting the request to 1 hour. Depending on the initial system in place in each Member State, the time savings per permit for transport operators due to PM4 relative to the baseline are provided in Table 50.

Table 50: Time savings per permit for transport operators due to PM4 relative to the baseline

Member State	SERT		One-stop-shop in place	Time saved per permit (hours)	
	Adopted	Accepted		until 2035	from 2035 onwards
Austria		Yes	No	3.0	2.0
Belgium		Yes	Yes	2.0	1.0
Bulgaria			n.a.	2.5	1.5
Czechia			Yes	2.0	1.0
Denmark		Yes	Yes	2.0	1.0
Germany			Yes	2.0	1.0
Estonia			n.a.	2.5	1.5
Ireland			No	3.0	2.0
Greece			n.a.	2.5	1.5
Spain			Yes	2.0	1.0
France			No	3.0	2.0
Croatia			n.a.	2.5	1.5
Italy			No	3.0	2.0
Cyprus			n.a.	2.5	1.5
Latvia			n.a.	2.5	1.5
Lithuania			n.a.	2.5	1.5
Luxembourg			Yes	2.0	1.0
Hungary			Partially	2.5	1.5
Malta			n.a.	2.5	1.5
Netherlands	Yes	Yes	Yes	1.0	0.0
Poland			Yes	2.0	1.0
Portugal			Yes	2.0	1.0
Romania			No	3.0	2.0
Slovenia		Yes	Yes	2.0	1.0
Slovakia			n.a.	2.5	1.5
Finland			No	3.0	2.0
Sweden		Yes	No	3.0	2.0

Source: COWI & TRT (2021). Study on the Implementation of the Weights and Dimension Directive, Final report, *and TML et al. (2023), impact assessment support study.*

Following the consultation activities, seven Member States have communicated the number of permits they issued in 2021. Those amounted in total to 460 thousand permits or 24 permits for

every 100 trucks in their stock (see Table 51). This ratio was used to estimate the number of permits issued in the rest of Member States.

Table 51: Permits issued for the transport of indivisible loads in 2021

Member State	Permits
Germany	369,918
Spain	24,940
Hungary	2,700
Latvia	2,488
Poland	15,305
Finland	10,000
Sweden	34,651
Total	**460,002**

Source: TML et al. (2023), impact assessment support study

The number of permits has been assumed to grow over time in line with the vehicle stock in the baseline. To estimate the costs savings for transport operators due to PM4, the tariffs per hour from the Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs (i.e. ISCO 3 – Technicians and associate professionals) have been used (EUR 34 per hour in 2022 prices). Based on the estimated number of permits and the time saved for requesting the permits, the administrative costs savings for transport operators are provided in Table 52. Expressed as present value over 2025-2050, they are estimated at EUR 1.2 billion relative to the baseline.

Table 52: Impacts of PM4 on administrative cost savings for transport operators relative to the baseline

	2025	2030	2040	2050
Total number of permits	1,025,053	1,111,787	1,327,348	1,549,879
Administrative costs savings (EUR million)	75.8	81.5	55.0	64.1

Source: TML et al. (2023), impact assessment support study

For the purpose of the *application of the 'one in, one out' approach*, the annual average cost saving per permit over 2025-2035 has been estimated at EUR 64.1. Considering the average number of permits over 2025-2035, estimated at 1.12 million, the average annual cost savings are estimated at EUR 71.8 million.

The waiting time to obtain a permit will also be reduced. According BPG, in 2005 the waiting time went from two working days up to two months. While a waiting time of 5 up to 15 working days is considered to be acceptable, depending on how many road authorities need to intervene, even assuming some reduction in the waiting time since 2005 PM4 should further reduce the waiting time per permit application. This was however not possible to monetise.

Adjustment costs for public authorities

The introduction of the one-stop-shop concept will require national procedures to be adapted to handle permission requests across all authorities involved within each Member State. Each Member States shall appoint a single authority to handle the permission request. The single authority will also be in charge of internally involving other national or regional competent authorities. The application process should be digital by default, and therefore PM4 shall be based on an IT tool. The development of the IT tool and the implementation phase (e.g. staff training) will entail one-off costs. Recurrent annual maintenance costs are also to be expected. They are discussed below under administrative costs.

The one-off costs would be independent of the number of permits granted per year in a Member State, but will depend on the current system in place in each Member State. The one-off costs have been estimated using the assumptions based on COWI & TRT (2021) as follows:

- Full development of a one-stop shop system, including the introduction of SERT: EUR 1,000,000.
- Additional costs for a partially developed one-stop shop system: EUR 700,000.
- Introduction of SERT: EUR 400,000 for a one-stop shop system already in place.
- Adaptation of the system for the exchange of information with other MSs: EUR 200,000 for a one-stop shop system and SERT already in place.

Table 53: National implementation of the one-stop-shop principle

Member State	SERT		One-stop-shop in place	One-off costs
	Adopted	Accepted		EUR million
Austria		Yes	No	1.0
Belgium		Yes	Yes	0.4
Bulgaria			n.a.	0.7
Czechia			Yes	0.4
Denmark		Yes	Yes	0.4
Germany			Yes	0.4
Estonia			n.a.	0.7
Ireland			No	1.0
Greece			n.a.	0.7
Spain			Yes	0.4
France			No	1.0
Croatia			n.a.	0.7
Italy			No	1.0
Cyprus			n.a.	0.7
Latvia			n.a.	0.7
Lithuania			n.a.	0.7
Luxembourg			Yes	0.4
Hungary			Partially	0.7
Malta			n.a.	0.7
Netherlands	Yes	Yes	Yes	0.2
Poland			Yes	0.4
Portugal			Yes	0.4
Romania			No	1.0
Slovenia		Yes	Yes	0.4
Slovakia			n.a.	0.7
Finland			No	1.0
Sweden		Yes	No	1.0
Total EU27				**17.8**

Source: COWI & TRT (2021). Study on the Implementation of the Weights and Dimension Directive (Final report) and TML et al. (2023), impact assessment support study

Taking into account all these elements, the one-off costs related to the implementation of the new systems are estimated at EUR 17.8 million (in 2022 prices).

Administrative costs for public authorities

The recurrent annual costs related to the maintenance and management of the systems are estimated at 5% of development costs[259]. They are estimated at EUR 0.89 million per year from 2025 onwards. Expressed as present value over 2025-2050, the administrative costs for public authorities are estimated at EUR 16.4 million.

Administrative costs savings for public authorities

Based on the literature review and the consultation activities[260], the time currently needed for processing a permit request by public authorities[261] is estimated at 4 hours for Member States with no one-stop shop in place, 3.5 hours for Member States with partial one-stop shops in place and 3 hours for Member States with physical one-stop shops in place. In the baseline scenario, due to digitalisation this is projected to go down to 3 hours from 2035 onwards for Member States with no one-stop shop in place, to 2.5 hours for Member States with partial one-stop shops in place and to 2 hours for Member States with one-stop shops in place. For Member States with no one-stop shop in place, the introduction of a digital one-stop shop is expected to reduce the time needed for processing the request by 2 hours until 2035 and by 1 hour from 2035 onwards. For Member States with a partial one-stop shop in place, the introduction of a digital one-stop shop is expected to reduce the time by 1.5 hours until 2035 and by 0.5 hours from 2035 onwards. For Member States with a physical one-stop shop in place, the introduction of a digital one-stop shop is expected to reduce the time by 1 hour by 2035. The introduction of SERT will further reduce the processing time to 1 hour.

Based on the estimated number of permits and the time savings for processing the permits, it is estimated that public administrations will save a total of EUR 1.2 billion relative to the baseline, expressed as present value over the period 2025-2050 (in 2022 prices).

Table 54: Impacts of PM4 on administrative cost savings for public authorities relative to the baseline

	2025	2030	2040	2050
Total number of permits	1,025,053	1,111,787	1,327,348	1,549,879
Administrative costs savings (EUR million)	75.8	81.5	55.0	64.1

Source: TML et al. (2023), impact assessment support study

Adjustment costs savings for public administrations related to infrastructure

PM4 is not expected to have an impact on the traffic volumes or the chosen routes, so no significant impacts on infrastructure costs are expected. This being said, PM4 is likely to improve the availability of information about constraints on certain routes and, therefore, to reduce the risk of

[259] These refer to additional costs with respect to the baseline. The countries with (partial) systems in place were already incurring some maintenance costs. This is why the additional maintenance costs are proportional to the additional development costs.

[260] COWI (2021), ESTA economic impact assessment 2013, interview with ESTA (European association abnormal road transport and mobile cranes).

[261] Processing the permit entails verifying on a case-by-case basis that bridge structures, road tunnels and any other road infrastructure on the route can accommodate the transit of the vehicles used. This also includes the cooperation between various departments, preparing the approval document, signing and delivering the permit.

damage to infrastructure caused by incorrect route choices. Thus, some marginal savings on infrastructure maintenance are to be expected from PM4 although these could not be estimated.

Adjustment costs for the European Commission

Technical and operational standards for information exchange will need to be established for PM4. This will be done in two steps. A study will be carried out to compile the required elements and propose several options for the establishment of the standards. In a second stage, an expert group will use the findings and assessment of the study to draft the standards.

The cost of the initial study is estimated at EUR 400,000. The average cost for a two-day workshop hosted by European Commission (EC), where participants are reimbursed by the EC is estimated at around EUR 30,000. Two of such in-person workshops may be required as well as two on-line meetings. Therefore, the total one-off adjustment costs for the European Commission are estimated at EUR 0.46 million.

PM5: Set international transport corridors for indivisible loads

PM5 envisages the creation of corridors across the EU allowing passage rights to the transport by road of abnormal loads[262], provided that the corridors meet certain pre-defined criteria (e.g. minimum dimensions and height). This would implement the recommendations of the European Best Practice Guidelines (BPG) for abnormal road transport.

PM5 is in line with the current practice of granting long-term permits, for which Member States have identified and pre-classified routes for abnormal road transports. The information on the parts of the road network classified as adequate for the carriage of abnormal loads under certain thresholds should be kept up to date and be readily accessible to the stakeholders.

Administrative cost savings for transport operators

It is assumed that a permit will continue to be required for all trips as any trip will always begin or end outside the TEN-T network. The number of permits in the baseline is assumed to grow in line with the vehicle stock. The routes that are used will not change as restrictions on weights or dimensions of vehicles will not change. However, the effect of PM5 will be a reduction of the time needed for preparing and submitting the request for the permits. The reduction in the time required by operators to prepare the permit request is estimated at 10 minutes per permit. The projected number of permits and the administrative costs savings relative to the baseline are provided in Table 55. Expressed as present value over 2025-2050, administrative costs savings for transport operators are estimated at EUR 121.9 million (in 2022 prices).

Table 55: Impacts of PM5 on administrative costs for transport operators relative to the baseline

	2025	2030	2040	2050
Total number of permits (million)	1.03	1.11	1.33	1.55
Administrative costs savings (EUR million)	5.4	5.8	7.0	8.4

Source: TML et al. (2023), impact assessment support study

[262] "*Loads surpassing the allowed limits*" are called abnormal loads by experts. "*They include anything from a mobile house and mobile crane to exceptionally large and heavy indivisible loads such as electric transformers, chemical reactor vessels, airplane fuselage or wings*" (BPG).

For the purpose of the *application of the 'one in, one out' approach*, the annual average cost saving per permit over 2025-2035 has been estimated at EUR 5.3. Considering the average number of permits over 2025-2035, estimated at 1.12 million, the average annual cost savings are estimated at EUR 5.9 million.

Administrative cost savings for public administrations

PM5 is expected to also reduce the time public authorities need to process the permits. This is estimated at 10 minutes per permit. The projected number of permits and the administrative costs savings for public authorities relative to the baseline are provided in Table 56. Expressed as present value over 2025-2050, they are estimated at EUR 121.9 million (in 2022 prices).

Table 56: Impacts of PM5 on administrative costs for public authorities relative to the baseline

	2025	2030	2040	2050
Total number of permits (million)	1.03	1.11	1.33	1.55
Administrative costs savings (EUR million)	5.4	5.8	7.0	8.4

Source: TML et al. (2023), impact assessment support study

PM6: Require a minimum amount of Weigh-in-motion systems to be deployed in the TEN-T network

PM6 mandates the deployment of Weigh-in-Motion (WIM) systems every 300 km in the TEN-T network[263]. Under this policy measure the WIM systems do not need to be certified for direct enforcement. They will be used to better target manual controls. This policy measure will not remove the need for physical roadside controls in certified scales that will be necessary to determine the infractions and to set fines.

PM6 aims to further enhance the efficiency and effectiveness of controls, contributing to increase the level of compliance, by using WIM systems as a filter to pre-identify HDV that are likely to be overloaded. Only those pre-identified vehicles will be stopped and submitted to a roadside inspection with certified scales, optimising the public resources and reducing the unnecessary hassle to compliant road operators. The experience from Member States shows an average of 97% accuracy of non-certified WIM systems[264]. It is expected that the use of this automatic systems will decrease substantially the overall number of HDVs checked relative to the baseline.

This measure will require some Member States to install more WIM systems than initially envisaged by them, as well as an assessment of the most adequate locations within the TEN-T network. Currently, 258 WIM systems have been installed in 10 Member States as reflected in Table 57. The remaining Member States are estimated to have installed in their territories the EU average proportion of WIM systems per km of TEN-T with a minimum of 1 system per MS. Thus a total 296 WIM systems are estimated to have been installed in the TEN-T network in the EU.

[263] MS are currently obliged to deploy WIM systems in the infrastructure to, at least, detect HDV that could be overloaded. MS are free to decide where and how many WIM systems to deploy. They can be installed in any part of the network.

[264] Antofie et al. (2019), Approach of the Walloon legal Metrology (Belgium) for weigh in motion (WIM) free flow direct enforcement. Proceedings of the 8th international conference on weigh in motion.

Table 57: WIM systems deployed in the EU

Country	Installed WIM systems	Estimated WIM systems installed (EU average)	TEN-T network (km)	Number of WIM systems required by PM6	Additional WIM systems required by PM6
AT		1	1,814.3	7	6
BE		1	1,844.7	7	6
BG		1	2,580.2	9	8
CY		1	445.2	2	1
CZ	30		1,975.9	7	0
DE		7	11,348.4	38	31
DK	14		1,624.8	6	0
EE		1	1,354.7	5	4
EL		3	4,655.8	16	14
ES		7	12,030.0	41	34
FI	8		5,192.0	18	10
FR	29		14,611.9	49	20
HR		1	1,572.8	6	5
HU	107		2,544.9	9	0
IE	15		2,219.7	8	0
IT		6	10,706.8	36	30
LT		1	2,178.5	8	7
LU		1	90.5	1	0
LV		1	1,680.2	6	5
MT		1	117.39	1	0
NL	16		1,951.2	7	0
PL	3		7,751.1	26	23
PT		1	2,822.4	10	9
RO		3	4,837.9	17	14
SE	6		6,447.5	22	16
SI	30		643.2	3	0
SK		1	1,566.9	6	5
EU		**296**	**106,609.0**	**371**	**247**

Source: TML et al. (2023), impact assessment support study.

Adjustment costs for public administrations

It is estimated that 247 WIM systems will need to be additionally installed in the TEN-T network. PM6 only affects those MS that have not reached the minimum threshold of 1 WIM system every 300 km as shown in Table 57. The one-off costs per WIM[265] are estimated at EUR 0.3 million and

[265] The one-off costs per WIM take into account the civil engineering services for the installation of the systems and the capital expenditure for the acquisition of WIM systems.

the recurrent costs (calibration costs) at EUR 15,000 per WIM per year. Total one-off adjustment costs are estimated at EUR 74.4 million, while the recurrent adjustment costs at EUR 3.7 million. Expressed as present value over 2025-2050, PM6 is estimated to lead to adjustment costs for public authorities estimated at EUR 142.9 million, of which EUR 74.4 million one-off costs.

Table 58: Adjustment costs per Member State due to PM6 relative to the baseline

Country	One-off costs (in million EUR)	Maintenance costs (in million EUR)					
		2025	2030	2035	2040	2045	2050
AT	1.8	0.1	0.1	0.1	0.1	0.1	0.1
BE	1.8	0.1	0.1	0.1	0.1	0.1	0.1
BG	2.4	0.1	0.1	0.1	0.1	0.1	0.1
CY	0.3	0.0	0.0	0.0	0.0	0.0	0.0
CZ	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DE	9.3	0.5	0.5	0.5	0.5	0.5	0.5
DK	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EE	1.2	0.1	0.1	0.1	0.1	0.1	0.1
EL	4.2	0.2	0.2	0.2	0.2	0.2	0.2
ES	10.2	0.5	0.5	0.5	0.5	0.5	0.5
FI	3.0	0.2	0.2	0.2	0.2	0.2	0.2
FR	6.0	0.3	0.3	0.3	0.3	0.3	0.3
HR	1.5	0.1	0.1	0.1	0.1	0.1	0.1
HU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IT	9.0	0.5	0.5	0.5	0.5	0.5	0.5
LT	2.1	0.1	0.1	0.1	0.1	0.1	0.1
LU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LV	1.5	0.1	0.1	0.1	0.1	0.1	0.1
MT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NL	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PL	6.9	0.3	0.3	0.3	0.3	0.3	0.3
PT	2.7	0.1	0.1	0.1	0.1	0.1	0.1
RO	4.2	0.2	0.2	0.2	0.2	0.2	0.2
SE	4.8	0.2	0.2	0.2	0.2	0.2	0.2
SI	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SK	1.5	0.1	0.1	0.1	0.1	0.1	0.1
EU	**74.4**	**3.7**	**3.7**	**3.7**	**3.7**	**3.7**	**3.7**

Source: TML et al. (2023), impact assessment support study.

According to the information provided by public authorities during the consultation activities, only one Member State declared their intention of installing certified WIM systems for direct enforcement. While it is possible that some Member States decide to opt for the installation of certified WIM systems on a voluntary basis, due to their higher benefit to cost ratio, the assessment of impacts of PM6 does not take into account the extra cost incurred by those Member States.

Adjustment cost savings for public administrations

Adjustment cost savings for public administrations are related to the public expenditure on infrastructure maintenance. PM6 is expected to reduce the frequency and severity of overloading practices, mitigating the premature damage of the road infrastructure due to overloaded HDVs, which are estimated to account for 4.8% of all road maintenance costs[266]. The reduction in maintenance costs linked to overloaded HDVs will primarily benefit the TEN-T road infrastructure, that represents around 67%[267] of the total vkm in the EU[268], and where WIM systems under PM6 will be deployed. Outside the TEN-T network a positive effect is expected as the number of overloaded HDVs that partially use the TEN-T will decrease and a negative effect as part of overloaded HDVs will actively avoid the TEN-T network. Given that the second effect will be influenced by the choice of location of the WIM systems within the TEN-T network, as well as by the additional enforcement measures adopted at national level, overall it is estimated that the impact of PM6 on the part of the network outside the TEN-T network will be neutral.

As indicated in PMc6, the available literature, although limited, estimates that WIM systems for the pre-selection of overloaded HDVs have double the effectiveness (20%) of traditional manual controls (10%) in reducing the number of overloaded vehicles. Overall, the increased compliance is assumed to reduce the maintenance costs linked to overloaded vehicles in the TEN-T by the same proportion. PM6 is also expected to lead to an increase in the vehicle-km performed by compliant HDVs, partially offsetting the benefits of the reduction in overloaded HDVs.

The joint effects of PMc6 and PM6 (in PO-B) on the infrastructure maintenance costs relative to the baseline are provided in Table 59. Expressed as present value over 2025-2050, the adjustment costs savings are estimated at EUR 2.6 billion (in 2022 prices).

Table 59: Impacts of PM6 (jointly with PMc6) on adjustment costs for public authorities relative to the baseline

	2025	2030	2040	2050
Reduction in the overloaded vehicles (million vkm)	407	454	479	512
Adjustment cost savings (EUR million)	125.5	131.9	145.9	161.3

Source: TML et al. (2023), impact assessment support study

Administrative costs savings for public authorities

Non-certified WIM systems are used to pre-identify HDVs that are likely to be overloaded, but in order to determine the infraction a measurement with a certified scale is still foreseen. Thus, while PM6 considerably increases the effectiveness of controls, some manual/roadside checks still remain necessary. PM6 will allow Member States to increase the ratio of infractions detected relative to

[266] See PMc6 for an explanation of the source.

[267] Analysis accompanying the impact assessment for the revision of Regulation (EU) N° 1315/2013 on Union guidelines for the development of the trans-European transport network; the total amount of road freight tkm (table 18) for 2020, and the amount of activity on the TEN-T comprehensive network (table 21) to calculate the share.

[268] Report from the Commission to the European Parliament and the Council on the implementation in 2019-2020 of Regulation (EC) No 561/2006 on the harmonisation of certain social legislation relating to road transport and of Directive 2002/15/EC on the organisation of the working time of persons performing mobile road transport activities (31st report from the Commission on the implementation of the social legislation relating to road transport).

PMc6 while substantially decreasing the number of road-side checks, by 97% relative to the baseline.

The administrative costs savings for public authorities due to PM6 (in PO-B) are estimated at EUR 1.1 billion in 2030 and EUR 1.5 billion in 2050. Expressed as present value over 2025-2050 the administrative costs savings are estimated at EUR 21.6 billion.

Table 60: Impacts of PM6 (in PO-B) on administrative costs for public authorities relative to the baseline

	2025	2030	2040	2050	Cumulative/ present value (2025-2050)
Weight tests in the baseline (thousand)	6,683.5	8,022.4	8,943.7	10,703.7	227,351
Reduction in the number of weight tests relative to the baseline (thousand)	6,483.0	7,781.7	8,675.4	10,382.6	220,530
Administrative costs savings (EUR million)	920.6	1,105.0	1,231.9	1,474.3	21,592.8

Source: TML et al. (2023), impact assessment support study

Adjustment costs savings for road transport operators

Road transport operators will benefit from adjustment cost savings relative to the baseline, linked to the reduced time required for cooperating with the public authorities for the weight control. As indicated in PMc6 the average time per weight control is one hour and the economic cost associated to delaying the vehicle by that one hour is estimate at EUR 34.8. The accuracy of WIM systems in identifying overloaded control is 97%, as opposed to 13.3% of currently performed controls[269]. The adjustment costs savings due to PM6 and PMc6, jointly, are provided in Table 61. Expressed as present value over 2025-2050, they are estimated at EUR 5.2 billion.

Table 61: Impacts of PM6 on road transport operators (adjustment costs savings) relative to the baseline

	2025	2030	2040	2050
Adjustment costs savings (EUR million)	222.9	267.6	298.3	357.0

Source : TML et al. (2023), impact assessment support study

Adjustment costs for transport operators

PM6 jointly with PMc6 (in PO-B) is expected to reduce overloading practices. If operators that were previously operating overloaded trucks will now comply with the weight limits, then more vehicle-km will be required to transport the same quantity of goods. This will affect transport operators which were operating under infraction. By minimising the proportion of overloaded vehicles, compliant operators will benefit from a levelled playing field. This applies to both domestic and international transport.

[269] REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the implementation in 2019-2020 of Regulation (EC) No 561/2006 on the harmonisation of certain social legislation relating to road transport and of Directive 2002/15/EC on the organisation of the working time of persons performing mobile road transport activities (31st report from the Commission on the implementation of the social legislation relating to road transport).

Table 62: Impacts of PM6 and PM6c (in PO-B) on transport operators relative to the baseline

	2025	2030	2040	2050	Cumulative/ present value (2025-2050)
Increase in transport activity (vkm million)	68.2	79.7	90.9	104.0	2,293.5
Adjustment costs (EUR million)	91.8	107.3	122.4	140.1	2,132.6

Source : TML et al. (2023), impact assessment support study

PM7: Require a minimum amount of "certified" Weigh-in-Motion systems to be deployed in the TEN-T network for direct enforcement purposes

PM7 mandates the deployment of the same amount of WIM systems as in PM6, i.e. every 300 km in the TEN-T network. However, PM7 envisage the use of theses WIM systems for direct enforcement purposes. Under PM7 the WIM systems will require certification and regular calibration in order to serve as proof of the commission of an infraction. The certified WIM systems will significantly increase the effectiveness of controls as compared to PM6, with controls potentially be carried out 24h/7d, by reducing the need for additional resources (certified secondary scales and enforcement officers at the site) as they eliminate ad-hoc roadside controls.

On 1st March 2023 the Commission adopted a legislative proposal[270] to amend the Directive (EU) 2015/413[271] (the Cross-Border Enforcement Directive or CBE Directive). This proposal aims at further enhancing road safety by extending the scope of the CBE Directive to other road-safety-related traffic offences. The "use of an overloaded vehicle"[272] is one of them. As a consequence, the tools provided by the CBE Directive can be applied to identify the offender detected through WIM systems and facilitate its prosecution.

Adjustment costs for public administrations

This measure will require some Member States to install more WIM systems than initially envisaged by them, as required under PM6, and the upgrading of currently deployed WIM systems that should be certified (as reflected in Table 63). Thus, under PM7 a total 101 WIM systems that have been installed in the TEN-T network in the EU will be upgraded/certified and 247 additional certified WIM systems will be installed.

Table 63: WIM systems deployed in the EU

Country	WIM systems installed		Installed certified WIM systems	TEN-T network (km)	Certified WIM systems required by PM7	Non-certified WIM systems to be upgraded	Additional new certified WIM systems
	Installed	Estimated					
AT		1		1,814.3	7	1	6
BE		1	1	1,844.7	7	0	6

[270] COM(2023) 126 final.
[271] Directive (EU) 2015/413 of the European Parliament and of the Council of 11 March 2015 facilitating cross-border exchange of information on road safety related traffic offences (OJ L 68, 13.3.2015, p. 9–25).
[272] The 'use of an overloaded vehicle' is defined in the legislative proposal amending the CBE Directive as "*using a vehicle that does not comply with the requirements set for its maximum authorized weights, as laid down in the national laws, regulations or administrative provisions transposing Council Directive 96/53/EC, or in the law of the Member State of the offence for vehicles or operations for which there are no such requirements set in that Directive*".

BG		1		2,580.2	9	1	8
CY		1		445.2	2	1	1
CZ	30		5	1,975.9	7	2	0
DE		7		11,348.4	38	7	31
DK	14			1,624.8	6	6	0
EE		1		1,354.7	5	1	4
EL		3		4,655.8	16	3	13
ES		7		12,030.0	41	7	34
FI	8			5,192.0	18	8	10
FR	29			14,611.9	49	29	20
HR		1		1,572.8	6	1	5
HU	107		107	2,544.9	9	0	0
IE	15		15	2,219.7	8	0	0
IT		6		10,706.8	36	6	30
LT		1		2,178.5	8	1	7
LU		1		90.5	1	1	0
LV		1		1,680.2	6	1	5
MT		1		117.39	1	1	0
NL	16			1,951.2	7	7	0
PL	3			7,751.1	26	3	23
PT		1		2,822.4	10	1	9
RO		3		4,837.9	17	3	14
SE	6		6	6,447.5	22	6	16
SI	30			643.2	3	3	0
SK		1	1	1,566.9	6	1	5
EU	**296**		**128**	**106,609.0**	**371**	**101**	**247**

Source: TML et al. (2023), impact assessment support study.

The one-off costs per new WIM[273] installed are estimated at around EUR 0.4 million and upgrading of the existing ones at EUR 0.1 million per WIM. The recurrent costs (maintenance costs) are estimated at EUR 15,000 per WIM per year. Total one-off adjustment costs are estimated at EUR 108.9 million, while the recurrent adjustment costs at EUR 3.7 million. Expressed as present value over 2025-2050, PM6 is estimated to lead to adjustment costs for public authorities estimated at EUR 177.1 million, of which EUR 108.9 million one-off costs.

Adjustment cost savings for public administrations

Adjustment cost savings for public administrations are related to the public expenditure on infrastructure maintenance. Like in PM6, PM7 is expected to reduce the frequency and severity of overloading practices, mitigating the premature damage of the road infrastructure due to overloaded HDVs, which are estimated to account for 4.8% of all road maintenance costs. The reduction in maintenance costs linked to overloaded HDVs will primarily benefit the TEN-T road infrastructure,

[273] The one-off costs per WIM take into account the civil engineering services for the installation of the systems and the capital expenditure for the acquisition of WIM systems.

that holds 67% of the total vkm in the EU, and where WIM systems under PM7 will be deployed. Outside the TEN-T network it is expected a positive effect as the number of overloaded HDVs that partially use the TEN-T will decrease and a negative effect as part of overloaded HDVs will actively avoid the TEN-T network. Given that the second effect will be influenced by the choice of location of the WIM systems within the TEN-T network, as well as by the additional enforcement measures adopted at national level, overall it is estimated that the impact of PM7 on the part of the network outside the TEN-T network will be neutral.

As indicated in PMc6, the available literature, although limited, allows to make estimates that certified WIM systems for direct enforcement have double the effectiveness (40%) of pre-selection WIM systems (20%) and four times the effectiveness of traditional manual controls (10%) in reducing the number of overloaded vehicles. Overall the increased compliance will reduce the maintenance costs linked to overloaded vehicles in the TEN-T in the same proportion. PM7 is also expected to increase the amount of vehicle-km performed by compliant HDVs during the period 2025-2050 as compared to the baseline, partially offsetting the benefits of the reduction in overloaded HDVs. As a result, PM7 will lead to EUR 6.6 billion infrastructure costs savings over the period 2025-2050 expressed as present value (in 2022 prices).

Table 64: Impacts of PM7 on adjustment costs for public authorities relative to the baseline

	2025	2030	2040	2050
Adjustment cost savings (EUR million)	322.3	338.9	374.7	414.3

Source: TML et al. (2023), impact assessment support study

Administrative costs savings for public authorities

Certified WIM systems eliminate the need for road side controls with certified scales in the TEN-T network, where 67% of the circulation of HDVs occurs. PM7 will allow Member States to reach the minimum level of controls envisaged by PMc6 while increasing the ratio of infractions detected and will reduce the administrative costs for public authorities linked to roadside inspections.

Table 65: Impacts of PM7 on administrative costs for public authorities relative to the baseline

	2025	2030	2040	2050	Cumulative/ present value (2025-2050)
Reduction in the number of weight tests relative to the baseline (thousand)	6,683.5	8,022.4	8,943.7	10,703.7	227,351
Administrative cost savings (EUR million)	949.1	1,139.2	1,270.0	1,519.9	22,260.6

Source : TML et al. (2023), impact assessment support study

Adjustment cost savings for road transport operators

Road transport operators will benefit from adjustment cost savings relative to the baseline, linked to the reduced time required for cooperating with the public authorities for the weight control. As indicated in PMc6 and in PM6 the average time per weight control is one hour and the economic cost associated to delaying the vehicle by that one hour is estimate at EUR 34.8. The accuracy of WIM systems in identifying overloaded HDVs is 100%, as opposed to 13.25% for the currently

performed controls[274]. The adjustment costs savings linked to the elimination of unnecessary road side checks relative to the baseline are estimated at EUR 5.4 million expressed as present value over the period 2025-2050 (in 2022 prices). The economic impacts of PM6 for road operator for 2025, 2030, 2040 and 2050 are provided in Table 66.

Table 66: Impacts of PM7 on road transport operators (adjustment costs savings) relative to the baseline

	2025	2030	2040	2050	Cumulative/ present value (2025-2050)
Adjustment costs savings (EUR million)	229.8	275.9	307.5	368.0	5,390.4

Source: TML et al. (2023), impact assessment support study

Adjustment costs for transport operators

PM7 is expected to reduce overloading practices. If operators that were previously operating overloaded trucks will now comply with the weight limits, then more vehicle-km will be required to transport the same quantity of goods. This will affect transport operators which were operating under infraction. By minimising the proportion of overloaded vehicles, compliant operators will benefit from a levelled playing field. This applies to both domestic and international transport.

Table 67: Impacts of PM7 on transport operators relative to the baseline

	2025	2030	2040	2050	Cumulative/ present value (2025-2050)
Transport activity (vkm million)	168.8	196.7	225.3	257.5	5,671.6
Adjustment costs (EUR million)	227.4	265.0	303.4	346.9	5,273.4

Source : TML et al. (2023), impact assessment support study

PM8: Requirements for EMS and drivers: mandatory and harmonised

All Member States currently allowing the circulation of EMS also apply safety requirements to them beyond the minimum regulated standards of type approval for vehicles or driver licensing and the Certificate of Professional Competence for drivers.

Currently, those standards vary among Member States and risk becoming a barrier to the international traffic of EMS. Therefore, PM8 aims to make such requirements mandatory and harmonised.

Adjustment costs for transport operators

As indicated in PMc4, 9 Member States already allow the circulation of EMS in their national territory[275]. The additional standards for EMS refer to both drivers and equipment.

[274] REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL on the implementation in 2019-2020 of Regulation (EC) No 561/2006 on the harmonisation of certain social legislation relating to road transport and of Directive 2002/15/EC on the organisation of the working time of persons performing mobile road transport activities (31st report from the Commission on the implementation of the social legislation relating to road transport).

[275] Belgium, Czechia, Denmark, Germany, Finland, Netherlands, Portugal, Spain and Sweden.

PM8 will requires drivers to have five years of experience in driving HGV[276] and to have successfully completed a specific training. Currently, such trainings are already a requirement in Belgium, Germany and Netherlands. In the other six Member States with EMS there is not such a requirement.

The following data has been used for the estimation of the number of drivers that would be required to complete such a training in those six Member States:

- The active HGV driving licences and the projected number of licences until 2050, including the projected number of new HGV driving licences, drawing on the Impact Assessment for the revision of the Driving Licence Directive.
- The stock of EMS and its projected evolution in the baseline scenario.

A total of 1.08 million drivers are estimated to require completing a specific training in the six Member States, of which 604 thousand corresponding to existing drivers in 2025 and 481 thousand to new drivers that will join the profession throughout 2026-2050.

The cost for a three-day specific training is estimated in EUR 1,650. This is based on the current training taking place in Belgium, Germany and the Netherlands.

The number of trainings and the adjustment costs for transport operators relative to the baseline are provided in Table 68. Expressed as present value over 2025-2050, adjustment cost for transport operators are estimated at EUR 1.5 billion.

Table 68: Impacts of PM8 on transport operators relative to the baseline

	2025	2030	2040	2050
Number of trainings	603,920	18,220	19,167	21,193
Adjustment costs (EUR million)	996.5	30.1	31.6	35.0

Source : TML & Ramboll et al. (2023), impact assessment support study

In the Member States that currently do not allow the circulation of EMS, the requirement of such a training will be part of the conditions for the introduction of EMS and, therefore, is considered to be already included under the calculations for PM3.

Adjustment costs for the European Commission

On top of the special requirements for drivers, the Member States require reinforced safety features in the vehicles beyond the General Safety Regulation and Type Approval legal framework. These additional requirements include aspect such as lower minimum turning circle diameter to improve manoeuvrability, electronically controlled brake system (EBS) for faster brake response time over the longer distance between cab and rearmost axle, minimum power to weight ratio 5kw/tonne to reduce differential speeds between EMS and other traffic by ensuring certain minimum acceleration performance and minimum mass on the driven axle(s) to ensure a minimum standard of traction when moving away from rest or climbing a gradient in slippery conditions.

While different Member States require a different combination of the above mentioned features, safety level is considered to be equivalent across the allowing Member States. To avoid the risk that

[276] This will be accredited with the date of issuance of the licence.

different vehicle requirements could lead to restrictions to the international traffic of EMS, PM8 will harmonise the vehicle requirements for new vehicles while maintaining the same level of safety as it is currently the case. Therefore, no impact on the costs for transport operators is expected.

However, for establishing the exact requirements, an expert group will develop the standards based on a study which will compile the various existing requirements and propose several options for the establishment of the standards. The cost of the initial study is estimated in EUR 400,000. The average cost for a two-day workshop hosted by European Commission (EC), where participants are reimbursed by the EC is around EUR 30,000. Two of such in-person workshops may be required as well as two online meetings. Compensation for the experts contributing to the online meetings is estimated in EUR 5,000 for each meeting. Therefore, the one-off adjustment costs for the European Commission due to PM8 are estimated at EUR 0.47 million.

4. Methods for the assessment of the impacts on road safety

The impact on safety of the different policy measures has been measured in terms of expected reduction in fatalities. To monetise the external costs of fatalities, the unit costs at Member State level from the Handbook on external costs of transport[277] have been used. At EU level, the unit cost per fatality is estimated at EUR 3.9 million in 2022 prices.

The analysis was based, on the one hand, on literature focusing on engineering predictions, which studied the engineering effects of overloading vehicles both within and beyond their design limit[278] as well as the specific additional risks of EMS at 60 tonnes versus standard 44 tonne HGVs[279]. On the other hand, post-hoc statistical methods were also considered. These included a comparison of the fatality rates of different vehicles within existing length limits (16.5/18.75) by GVW and number of axles[280], which was updated and extended to smaller vehicles in the context of the support study; and a comparison of EMS with HGVs of up to 40 tonnes and 18.75m in Sweden[281], which found that the actual fatality rate in the EMS group was 21% lower than that for the 40 tonne vehicles.

Policy measures PMc1, PM1 and PMc3 envisage to a modest increase in mass for HDVs. For PMc1 and PM1, the increase in mass from 42 tonnes to 44 tonnes was considered to increase the risk by 0.5%. In PMc3, permitting 5 and 6-axle rigid vehicles was estimated to lead to a 1% risk increase. It should be noted that this factor represents an increase in risk per vehicle. Given that the measures lead to an overall decrease in the number of vehicle-kilometres, the overall effect is a decrease in the number of fatalities.

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[277] Essen, H. et al. (2020), Handbook on the external costs of transport: version 2019 – 1.1, Publications Office, available at:

[278] Breemersch, T. et al. (2021). Overweight vehicles' impacts on road infrastructure and safety. Transport and Mobility Leuven.

[279] Knight, I., et al. (2008). Longer and/or longer and heavier goods vehicles (LHVs) - a study of the likely effects if permitted in the UK. Crowthorne: TRL Published Project Report PPR 285.

[280] Ib.

[281] Balint, A. et al. (2014). Accident analysis for traffic safety aspects of High Capacity Transports. Chalmers University of Technology, Department of Vehicle Safety.

PMc4, PM3 and PM8 envisage larger capacity increases connected to EMS. Abstract engineering analysis predict a large increase in risk per km, associated with the larger weight gain and the addition of length related risks (e.g. poor manoeuvrability). However, statistical observations suggest a large reduction in risk per km associated with EMS compared with standard vehicles. This apparent contradiction is explained by the fact that EMS are implemented with additional safety features than standard HGVs and that they are used differently than standard HGVs such that their exposure to risk is different (e.g. more of their time is spent on safer parts of the road network), and that operators tend to use their best drivers on EMS. In addition, there is anecdotal evidence to suggest that drivers of EMS drive them more carefully than they would a standard HGV because of the perception of increased difficulty and risk that the additional length and articulation point brings. Moreover, EMS tend to be at the newer end of the range of vehicles and thus they are equipped with more modern safety features than the average HGV. Taking into account all these factors, a 5% reduction in risk has been estimated for PMc4 and PM3, which is further reduced to 6% with the introduction of PM8. Here again, besides the inherent risk per vehicle, the effect of the measures on the number of vehicle-kilometres has been taken into account to calculate the overall impact on road safety.

For PMc5 (i.e. vehicle carriers), it was considered that front and rear overhangs, that cause additional swept path that fall outside of turning circle limits, would be the main risk rather than load. Based on an analysis of collision data identifying typical manoeuvring related collisions, undertaken in the context of the support study, it was estimated that PMc5 would increase the fatality risk of each vehicle by 0.02%. As in previous cases, the effect of the measures on the number of vehicle-kilometres has been taken into account to calculate the overall impact on road safety.

PMc6, PM6, and PM7 reduce the number of overloaded vehicles. When the overloaded vehicles are within their design limit, the effect on safety risk per km is expected to be the same as for legally loaded vehicles. However, when overloads go above the design limit the safety risks substantially increase, likely exponentially. However, no scientific studies were identified that could quantify the scale of this increase. Based on expert opinion in the context of the support study, 2% higher risk per km was assumed for all overloaded vehicles compared to the legally loaded vehicles.

The impact of the policy options on road safety is presented in Table 69.

Table 69: Decrease in the number of fatalities (cumulative over 2025-2050) in the POs relative to the baseline scenario (EU27) and the reduction in the external costs expressed as present value over 2025-2050, in million EUR (2022 prices)

	Difference to the Baseline		
	PO-A	PO-B	PO-C
Decrease in the number of fatalities	237	411	642
Reduction in the external costs of fatalities (million EUR)	535.8	877.4	1,363.9

Source: TML et al. (2023), impact assessment support study

ANNEX 5: COMPETITIVENESS CHECK

1. OVERVIEW OF IMPACTS ON COMPETITIVENESS

Dimensions of Competitiveness	Impact of the initiative (++ / + / 0 / - / -- / n.a.)	References to sub-sections of the main report or annexes
Cost and price competitiveness	++	Section 6.1.3, 6.1.4. and 6.1.5. of the SWD and Annex 4
International competitiveness	+	Section 6.1.5 of SWD
Capacity to innovate	+	Section 6.1.5 and 6.1.7 of SWD
SME competitiveness	++	Section 6.1.6 of the SWD and Annex 11

2. SYNTHETIC ASSESSMENT

2.1. Cost and price competitiveness

The preferred policy option will bring significant improvements in the operational efficiency of road transport operations, including the efficiency of road-legs of intermodal operations. These efficiencies result mainly from the measures enabling to carry the same (or more) amount of cargo with less trips by road vehicles in cross-border operations (PMc2, PMc3, PMc4, PMc5, PM2), including intermodal operations, and from measures facilitating the transition to zero-emission transport (PMc1, PM1) while maintaining (or even gaining) a payload. Additionally, administrative cost savings come from measure streamlining the administrative procedures related to the use of high-cube containers in intermodal transport (PMc2) and for indivisible loads (PM4). As indicated in section 6.1.3, administrative costs savings are estimated at EUR 4.4 billion in PO-B, expressed as present value over 2025-2050, relative to the baseline. The initiative will improve, in particular, the competitiveness of road transport operators involved in cross-border operations, while ensuring stronger modal cooperation with other modes of transport, especially in long-distance operations, where other modes (rail, inland waterways, short-sea shipping) are more price-competitive than road-only transport. As explained in section 6.1.3, net costs savings for road transport operators are estimated at EUR 45.1 billion in PO-B, expressed as present value over 2025-2050 relative to the baseline (in 2022 prices).

2.2. International competitiveness

The initiative may improve the international competitiveness of the EU commercial road transport sector by making it greener and more efficient, including by encouraging

involvement in intermodal operations, thus reducing somewhat the demand for drivers[282] whose shortage is an acute and global challenge. In addition, it can be expected that compliance with the revised Directive will improve the safety and reliability of the HDVs, which can enhance the reputation of EU road transport companies on the international market.

2.3. Capacity to innovate

The initiative can positively affect the road transport sector's capacity to innovate, in several ways. By providing incentives to the deployment of zero-emission HDVs, it encourages the manufacturers to develop new solutions and technologies to make the ZE powertrains lighter and/or smaller, thanks to which road operators would gain extra payload, and manufacturers higher demand for such vehicles. As the initiative is zero-emission technology neutral, it may also trigger search for new technological solutions to address the issue of scarcity and price of raw material (e.g. lithium, cobalt, used broadly in electric battery powertrains). The revised Directive can also drive innovation in logistics and supply chain management, as companies seek to optimize their operations, including by improving load factors and searching for more cost-competitive and accessible intermodal combinations. The initiative will also stimulate the transition to digitalisation of documents (e.g. permits for abnormal transport) and transport data related to cargo, vehicle, route, etc. (e.g. on eFTI platforms).

2.4. SME competitiveness

Given that SMEs constitute the great majority of the road transport sector, the assessment of the overall cost and price competitiveness aspects is relevant for small and medium road transport companies. Hence, the initiative has a positive impact on competitiveness of SMEs, in particular those engaged in cross-border as well as intermodal operations, by improving their operational and energy efficiency and facilitating the transition to zero-emission operations.

[282] All policy options lead to a reduction in the vehicle-kilometres driven relative to the baseline, which translates into the reduction of drivers needed for performing transport operations.

ANNEX 6: DETAILED DESCRIPTION OF POLICY MEASURES

PMc1: Allow for extra weight and extra length to ZE heavy goods vehicles (HGVs) and 2-axle rigid buses

PMc1 provides for increasing the maximum gross vehicle combination weight (GVCW) up to a maximum of 2 tonnes[283], the maximum axle weight up to a maximum of 1 tonne on the drive axle or a bogie containing a drive axle[284] and the maximum length of the vehicle combination up to 90 cm.

The purpose of this measure is to compensate for the weight and the size of ZE powertrains (i.e. weight of electric batteries and space for hydrogen tanks) thus preventing the loss of payload in comparison with diesel vehicles. In other words, the extra weight and dimensions should be allocated to the powertrains and not to expand the payload. As a consequence, the effect of this measure is expected fade out over time with technology evolution as the weight of batteries is expected to decrease and, therefore, the ZE powertrains become of a similar weight and dimension with that of equivalent diesel powertrains.

For the heaviest vehicle combinations, i.e. those with 5 or more axles, this measure would enable a maximum GVCW of 44 tonnes for HDVs in road-only operations and of 46 or 48 tonnes (depending on the axle combination) for HDVs involved in intermodal operations[285]. The weight allowance for ZE HDVs would apply also to 2-axle rigid buses and to any vehicle of the combination equipped with zero emission technologies (i.e. motor vehicle, semi/trailers and dollies) to take account of technological developments such as electric trailers equipped with auxiliary motors and batteries which reduce the demand of energy from the motor vehicle and/or other power elements, such as cooling units of reefers. However, this measure offers no support for using an e-trailer to hybridize a non-zero-emission vehicle.

As regards the maximum length, HDVs will have to comply with the so-called "turning circle rule"[286] to ensure their manoeuvrability and no extended length will be granted to trailers or semitrailers, given that standard loading units are essential to ensure interoperability in and between transport modes.

PMc2: Allow for extra height to accommodate high-cube containers in intermodal transport

PMc2 provides for increasing the maximum height of HDV to 4.3m in order to accommodate high-cube containers using standards skeletal trailers. The W&D Directive

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[283] Currently the W&D Directive allows an additional GVW of 2 tonnes for certain ZE HDVs which under PMc1 would be increased by another 2 tonnes resulting in a potential increase of GVW by 4 tonnes. 2-axle rigid buses do not enjoy any derogation, thus their maximum GVW would only increase by 2 tonnes.

[284] Currently the W&D Directive allows a maximum authorised axle weight on the driving axle of 11.5 tonnes.

[285] Currently the W&D Directive allows a maximum GVCW of up to 46 tonnes for ZE HDV involved in intermodal transport operations.

[286] The turning circle rule is envisaged in point 1.5 of Annex I of the W&D Directive, according to which "*Any motor vehicle or vehicle combination which is in motion must be able to run within a swept circle having an outer radius of 12.50m and an inner radius of 5.30m*".

sets the maximum authorised height in international (intra-EU) transport at 4m, which requires road transport operators involved in the transport of high-cube containers to resort to special equipment (low skeletal trailers and gooseneck trailers) or to request special permits for indivisible loads (only possible in cases where the road infrastructure can accommodate 4.3m high HDV).

This measure aims at removing the "legal" limitation to the circulation of HDVs transporting high-cube containers (or swap bodies of equivalent height), without prejudice to the application of road traffic national provisions limiting the maximum height of HDV on certain roads of civil engineering structures.

PMc3: Harmonise the maximum permitted weight of 5- and 6-axle HDV (40t)

PMc3 sets the weight standard of 5- and 6-axle rigid vehicles in national and international transport to a maximum permitted weight of 40t. Rigid HDVs of 5 or 6 axles are currently not regulated in the W&D Directive. As a consequence, they are admitted in international transport with the same GVW of a 4-axle rigid trucks, i.e. 32t. The current Directive already establishes a maximum GVW of 40t for articulated vehicles of 5 and 6 axles. This measure extends the same maximum GVW to rigid vehicles.

PMc4: Allow cross-border transport of 44t-HDV and EMS between "allowing" MS

PMc4 allows the cross-border transport, on one hand, of 5- or 6-axle HDV with a maximum GVW of 44t and, on the other, of EMS between allowing Member States (i.e. Member States that allow such heavier and/or longer vehicles in national transport). This measure takes account of the national permissible weights (total and per axle) and length that are common to the respective MS ("minimum common denominator") and to the part of the network where these vehicles are allowed in national traffic, but it does not condition the cross-border transport to the compliance with additional requirements that could be imposed nationally to the vehicle or to the driver.

As a result, the cross-border transport of 44-t HDV can be limited to 6-axle vehicles or vehicle combinations (the number of axles refers to the type of vehicle to which the national derogation applies). The cross-border transport of EMS can be limited to EMS with a length of 25.25m and a GVW of 40t, depending on the national legal framework. Likewise, the cross-border transport of 34m and 70t EMS (or higher) could be authorised between Member States that permit those modular systems in their territories. The cross-border traffic of 44t-HDV and EMS is limited to the part of the network where these vehicles are allowed in national traffic. The number of border crossings is not limited.

On the other hand, the additional requirements for 44t-HDV or EMS, such as a specific drivers training or safety features to the vehicles (e.g. minimum power engine) that Member States may impose to their national hauliers cannot impede the acceptance of 44t-HDV or EMS registered in a different MS.

This measure does not pose any enforcement challenges, as it can be implemented under the same scheme currently used for 44t-HDV and EMS[287].

PMc5: Harmonise the loaded length of vehicle carriers

PMc5 introduces a standard for the maximum overhang of loads used in road trains specialised in the transport of vehicles (vehicle transporters or vehicle carriers) in national and international traffic. The maximum authorised length of these vehicles is the general 18.75m. However this length can be exceeded when they are loaded (through national derogations), via the use of front and/or rear cantilevers or overhangs, up to a maximum of 20.75m. This measure aims at removing the national divergences as regards the type and length of overhangs allowed in national transport.

PMc6: Reinforce MS obligation to conduct a minimum level of checks on HDV's weight

PMc6 will mandate Member States to carry out every year a minimum number of controls of the compliance of HDV with the rules on maximum total weight and maximum axle weight per million vehicle-kilometre (vkm) in each Member State. This measure does not preclude how the controls are performed, i.e. via physical inspection on the roadside or automatic systems allowing for direct enforcement without stopping the HDV controlled. The measure aims at ensuring a minimum level of enforcement in the EU which is expected to improve the competition and road safety.

PMc7: Set common principles for the voluntary implementation of intelligent access policies

IAP primarily ensures matching the performance and characteristics of a road freight vehicle with the state and capability of specific section of an infrastructure network, i.e. it ensures that the correct vehicles runs on the correct road at the correct time. Access rules can refer to weight limits, dimensions limits, speed limit compliance, as well as day and/or time restrictions for categories of vehicles.

IAP is a nascent technology and could become a barrier to international traffic if Member States or even regions independently were to introduce their own systems without setting standards for information exchange.

PMc7 aims at facilitating a harmonised implementation of Intelligent Access Policies (IAP) in the EU based on common principles to be respected by Member States when they voluntary implement them, such as public accessibility to the information, non-discrimination. PMc7 would mean a common approach to ensure the interoperability of IAP's necessary hardware and software.

IAP aim to further facilitate efficient enforcement and to address the concerns of a risk of damage to infrastructure and of road safety by some types of HDVs.

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[287] Some MS allow the circulation of EMS under a permit scheme of abnormal transport that allows the public authorities to assess that the type of modular system is acceptable, as well as to communicate to the operators the part of the network that it is available to them during a period of time (minimum 1 year).

PM1: Allow for extra weight for HDV which are ZEV regardless the weight of the ZE technology used

PM1 allows 4 extra tonnes for HDVs in national and international traffic which are ZEV (i.e. 2 extra tonnes as under the current Directive plus 2 additional tonnes) to 5/6-axle HGV only. In additon to PMc1, the extra weight is be granted regardless the weight of the ZE technology used. PM1 will incentivise the investment in the newest technologies that will become lighter/smaller, as well as the implementation of improved aerodynamics that will reduce the need for energy storage, allowing for gains in payload as compared to diesel trucks. This competitive advantage is expected to further incentivise the uptake of ZEV.

PM1 will enable a maximum GVCW of 44 tonnes for zero-emission HGVs in road-only operations and of 46 tonnes or 48 tonnes (depending on the axle combination) for HDVs involved in intermodal operations[288].

Those Member States which already allow the circulation of HDV of up to 44 tonnes will be allowed to continue to do so during a transition period also in cross-border traffic, as enabled by PMc4. The transition period should be aligned with the target dates set in the CO2 Standards Regulation to reinforce the effects of both initiatives, thus 2035.

PM2: Align the definition of intermodal transport with the Combined Transport Directive (to include all intermodal loading units)

PM2 aligns the definition of intermodal transport in the W&D Directive with the Combined Transport Directive. The current definition introduced in Article 2.a of the W&D Directive by Directive (EU) 2015/719 considers that intermodal transport operation shall mean "*the combined transport operations defined in Article 1 of Council Directive 92/106/ECC*[289] *engaged in the transport of one or more containers or swap bodies, up to a total maximum length of 45 feet*;". This reduces the scope of the combined transport operations that are supported by the W&D Directive to containerised transport and leaving out transport of goods where the lorry, trailer, semi-trailer, with or without tractor unit are the intermodal loading units that can be transhipped between modes of transport.

The aim of PM2 is to provide the same support to all intermodal/combined transport operations regardless the type of loading unit employed. Under the current W&D Directive, HDVs involved in intermodal transport 5/6-axle articulated vehicles and road trains are granted an additional GVW of 2 tonnes or 4 tonnes, reaching up to 42 tonnes or 44 tonnes, depending on the axle configuration. PM2 will allow the same extra weight also for intermodal (non-containerised) transport where lorry, trailer, semi-trailer are the

[288] Currently the WD Directive allows a maximum GVCW of up to 46 tonnes for ZE HDV involved in intermodal transport operations.

[289] Council Directive 92/106/EEC of 7 December 1992 on the establishment of common rules for certain types of combined transport of goods between Member States (OJ L 368, 17.12.1992, p. 38–42). Consolidated version available at EUR-Lex - 01992L0106-20130701 - EN - EUR-Lex (europa.eu)

intermodal loading units. As a consequence, this type of intermodal transport would benefit from almost 4 additional tonnes of payload as there is no weight of empty containers or swap bodies to be compensated, providing a competitive advantage as compared to only-road transport and compensating for the extra weight (which is estimated between 200Kg and 1 tonne) of craneable trailer/semitrailers.

When 5/6-axle articulated vehicles and road trains involved in intermodal transport are alternatively-fuelled or zero-emission they also benefit from the extra weight allowance envisaged in the W&D (1 tonne and 2 tonnes, respectively). PM2 will thus result in a maximum GVW of these vehicle combinations of 42 to 46 tonnes depending on the axle configuration and the type of fuel.

PM3: Allow international (intra-EU) transport of EMS1 at least in core and comprehensive TEN-T network conditioned to be ZEV or part of an intermodal transport operation

PM3 allows the circulation of EMS of up to 25.25m long and 60 tonnes of GVW in international traffic in all Members States within the TEN-T network, under the condition that they are, either zero-emission vehicles, or involved in an intermodal transport operation. As regards the geographical scope, the TEN-T network would ensure connectivity throughout the EU, but Member States can voluntary extend it to additional parts of their networks, as it is the case in those Member States that currently allow the circulation of EMS.

PM3 will affect Member States and their hauliers in a different way.

Hauliers operating in allowing Member States will be able to extend their operations to international traffic without a limitation in the number of borders crossed and to any other Member State. However, their international operations, which at the moment are possible between two neighbouring allowing Member States (based on bilateral agreements) will be limited to EMS that are either ZEV or are involved in an intermodal transport operation. Other EMS will not be allowed to operate cross-border; however, as a transition, in the "allowing MS", these later EMS will be able to continue operating in international traffic until 2035. The national operations in the allowing Member States will not change.

For those MS that already authorise the circulation of EMS in their territories ("allowing MS"[290]) there will be no impacts on the infrastructure. The two only exception are Germany and the Czechia, for which PM3 entails an increase in the maximum authorised weight limit for EMS, from 40t (44t in intermodal transport and 46 tonnes in intermodal transport with ZEV) to 60t in Germany and from 48t to 60t, in the Czechia.

On the other hand, this PM will affect the infrastructure needs of the Member States that do not currently allow EMS in their territories ("non-allowing MS"). They will need to inspect the road TEN-T network to assess whether it is adequate for the circulation of EMS, i.e. for a GVW of 60 tonnes instead of 46 tonnes[291] and a maximum length of

[290] Currently, the allowing Member States are Finland, Sweden, Denmark, Germany, the Netherlands, Belgium, Czech Republic, Spain and Portugal.

[291] Under the current W&D Directive 5/6-axle articulated vehicles and road trains can reach up to 46 tonnes if they are ZEV involved in intermodal transport operations.

25.25m instead of 18.75m, and upgrade the infrastructure where necessary. This will also be the case of Germany and the Czech Republic as regards the weight standards for EMS.

This measure will provide benefits to hauliers operating in the currently non-allowing MS in the form of an increase in the payload, both in volume and in weight. This will compensate for the capital investment necessary to electrify their fleets, as well as provide a competitive advantage to intermodal transport beyond that provided by PMc2 and PM2.

PM4: Set minimum administrative and safety requirements for the transport of indivisible loads

PM4 aims at harmonising the requirements and procedures for issuing national permits for performing transport of indivisible load[292] requiring longer HDVs and specific safety measures. PM4 envisages the implementation of some of the recommendations of the European Best Practice Guidelines (BPG) for abnormal road transport. Namely, the one-stop-shop principle at national level for the submission of applications, the implementation of a harmonised abnormal road transport application form and the setting of a Special European Registration of Trucks and Trailers.

The introduction of the one-stop-shop principles entails the appointment a single authority per Member State to handle the permission request, without prejudice of the internal involvement of other competent authorities at national or regional levels. The internal procedures would be then transparent to the applicants, which only had to deal with one authority, providing them with clarity and facilitating the administrative process.

A harmonised abnormal road transport application form was agreed between national experts and published in the BGP where only the language of the application form vary between Member States.

A Special European Registration of Trucks and Trailers (SERT) provides national authorities in a single document or database with the detailed technical information necessary to assess the compatibility of a vehicle with the specific requirements of the abnormal road transport that is not available on the registration certificate (and for which most countries have developed their own information documents).

PM5: Set international transport corridors for indivisible loads

PM5 envisages the implementation of one of the recommendations of the European Best Practice Guidelines (BPG) for abnormal road transport: the creation of abnormal road corridors across the EU allowing passage rights to the transport by road of abnormal

[292] Article 2 of Council Directive 96/53/EC defines indivisible load as "*a load that cannot, for the purpose of carriage by road, be divided into two or more loads without undue expense or risk of damage and which owing to its dimensions or mass cannot be carried by a motor vehicle, trailer, road train or articulated vehicle complying with the W&D Directive in all respects*."

loads[293] provided that the corridors meet certain pre-defined criteria (minimum dimensions and height as defined in the BPG).

PM5 is in line with the current practice of granting long-term permits, for which Member States have identified and pre-classified routes for abnormal road transports. The information on the parts of the road network classified as adequate for the carriage of abnormal loads under certain thresholds should be kept up to date and be readily accessible to the stakeholders.

PM6: Require a minimum amount of Weigh-in-motion systems to be deployed in the TEN-T network

PM6 mandates the deployment every 300 km in the TEN-T network. The WIM systems would be used at least for targeted controls[294], which means that they do not need to be certified for direct enforcement. This measure aims to further enhance the efficiency and effectiveness of controls and contribute to increasing the level of compliance, but will not remove the need for physical roadside controls in certified scales to determine the commission of infractions and to set fines.

This measure will require Member States to install more WIM systems than initially envisaged by them, as well as an assessment of the most adequate locations within the TEN-T network.

PM7: Require a minimum amount of "certified" Weigh-in-Motion systems to be deployed in the TEN-T network for direct enforcement purposes

PM7 mandates the deployment every 300Km in the TEN-T network of certified WIM systems for direct enforcement purposes. The certified WIM systems will exponentially increase the effectivity of controls, with controls potentially be carried out 24h/7d, by reducing the need for additional resources (certified secondary scales and enforcement officers at the site) as they eliminate ad-hoc roadside controls. Under PM7 the WIM systems will require certification and regular calibration in order to serve as proof of the commission of an infraction.

On 1st March 2023 the Commission adopted a legislative proposal[295] to amend the Directive (EU) 2015/413[296] (the Cross-Border Enforcement Directive or CBE Directive). This proposal aims at further enhancing road safety by extending the scope of the CBE Directive to other road-safety-related traffic offences. The "use of an overloaded

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[293] "*Loads surpassing the allowed limits*" are called abnormal loads by experts. "*They include anything from a mobile house and mobile crane to exceptionally large and heavy indivisible loads such as electric transformers, chemical reactor vessels, airplane fuselage or wings*" (BPG).

[294] MS are currently obliged to deploy WIM systems in the infrastructure to, at least, detect HDV that could be overloaded. MS are free to decide where and how many WIM systems to deploy. They can be installed in any part of the network.

[295] COM(2023) 126 final.

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

vehicle"[297] is one of them. As a consequence, the tools provided by the CBE Directive can be applied to identify the offender detected through WIM systems and facilitate its prosecution.

PM8: Require EMS to comply with higher safety standards for HDV than those provided for in the General Safety Regulation and driver's minimum experience or training

All Member States allowing the circulation of EMS also apply additional safety requirements that go beyond the minimum regulated standards of type approval for vehicles or driver licensing and CPC for drivers. Those standards vary among Member States. Currently, those standards vary among Member States and risk becoming a barrier to the international traffic of EMS. Therefore, PM8 aims to make such requirements mandatory and harmonised.

PM8 proposes an initial nominal package based on the requirements that have been present for some time as a consequence of the General Safety Regulation or are commonly available in the market but not yet ubiquitous. They reflect the most common type of measures, either imposed by Member States or that have become the natural business practice. As long as the road safety objective is preserved the concrete list of requirements and safety systems can be the subject of technical negotiation.

PM8 proposes the following list of cumulative safety measures:

- Driver requirements:
    - To be in possession of a EC driving licence for a minimum of 5 years.
    - To have completed a specific training, following the Dutch example.
- Vehicle requirements covered the General Safety Regulation and the type approval legal framework, but which have not yet fully penetrated the fleet:
    - ABS: to better ensure stability under braking.
    - Electronic Stability controls: to reduce the chance of rollover.
    - Blind spot mirrors and/or blind spot camera monitor systems.
    - Front underrun protection: to ensure standards of protection in impacts with cars at the front.
- Vehicle requirements not covered by the General Safety Regulation and Type Approval legal framework:
    - Minimum turning circle based on the W&D Directive requirements but with an inner circle of 2m diameter instead of 5.3m to improve manoeuvrability.

[297] The 'use of an overloaded vehicle' is defined in the legislative proposal amending the CBE Directive as "*using a vehicle that does not comply with the requirements set for its maximum authorized weights, as laid down in the national laws, regulations or administrative provisions transposing Council Directive 96/53/EC, or in the law of the Member State of the offence for vehicles or operations for which there are no such requirements set in that Directive*".

- Mandatory electronically controlled brake system (EBS) for faster brake response time over the longer distance between cab and rearmost axle.
- Minimum power to weight ratio 5kw/tonne to reduce differential speeds between EMS and other traffic by ensuring certain minimum acceleration performance.
- Minimum mass on the driven axle(s) to ensure a minimum standard of traction when moving away from rest or climbing a gradient in slippery conditions.

ANNEX 7: RULES ON WEIGHTS AND DIMENSIONS OF HDVS

The Weights and Dimensions Directive (Council Directive 96/53/EC[298]) establishes the maximum authorised dimensions of heavy-duty vehicles (HDVs) in national and international traffic and the maximum authorised weights in international traffic. The primary objective was to ensure fair competition and eliminate the obstacles to cross-border traffic, while safeguarding the right balance with the need to protect road infrastructure and guarantee road safety.

Scope

The W&D Directive applies to:

1) the **dimensions** of motor vehicles in categories M2 and M3 and their trailers in category O and motor vehicles in categories N2 and N3 and their trailers in categories O3 and O4, as defined in the type approval legal framework.

Those categories of vehicles are currently defined in Article 4 of Regulation (EU) 2018/858[299] and correspond, in general terms, to:

- **buses and coaches**: motor vehicles designed and constructed primarily for the carriage of passengers and their luggage, with more than eight seating positions in addition to the driver's seating position (categories M2 and M3),
- **heavy goods vehicles**: motor vehicles designed and constructed primarily for the carriage of goods with a maximum mass exceeding 3,5 tonnes (categories N2 and N3)
- and their **trailers or semitrailers** (category O, O3 and O4).

Light duty vehicles and vans below 3.5 tonnes and passenger cars below eight seating positions for the passengers are outside the scope of the W&D Directive.
Buses comprising more than one articulated section are expressly excluded from the scope of the Directive (Article 1.3 of the W&D Directive).

2) the weights and certain other characteristics of the HDVs defined in point 1 above. All the values of weights, which are indicated in Annex I of the W&D Directive, are valid as circulation standards and thus refer to loading conditions, not to production standards.

General rules

The key limits regarding **maximum dimensions** as set in Annex I of the W&D Directive are the following:

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[298] Consolidated text: Council Directive 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic.
[299] Consolidated text: Regulation (EU) 2018/858 of the European Parliament and of the Council of 30 May 2018 on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, amending Regulations (EC) No 715/2007 and (EC) No 595/2009 and repealing Directive 2007/46/EC.

- maximum length: 16.5m for articulated vehicles (motor vehicle/semi-trailer combinations) and 18.75m for road trains (motor vehicle/trailer combinations);
- maximum height: 4 m; and
- maximum width: 2.55 – 2.60m.

The key limits regarding **maximum weights** as set in Annex I of the W&D Directive are the following:

- maximum weight or gross vehicle weight (GVW):
  - 18 tonnes for two-axle trucks;
  - 19,5 tonnes for two-axle buses;
  - 26 tonnes for three-axle motor vehicles;
  - 28 tonnes for three-axle articulated buses;
  - 32 tonnes for four-axle vehicles;
  - 36 tonnes for four-axle vehicle combinations;
  - 40 tonnes for five or six-axle vehicle combinations, which could be increased to 42/44 tonnes (depending on the number of the axles of the vehicle combination) for certain vehicles engaged in intermodal transport operations;
- Axle weight:
  - Maximum axle weight of a driving axle: 11.5 tonnes.
  - Maximum axle weight of a single axle: 10 tonnes.
  - Sum of the axle weights per tandem axle and per tri-axle of trailers and semitrailers may not exceed certain limits ranging from 11 tonnes to 24 tonnes depending on the distance between axles.
  - Minimum weight borne by the driving axle or driving axles of a vehicle or vehicle combination must not be less than 25 % of the total laden weight of the vehicle or vehicle combination, when used in international traffic.

One key **additional requirement** set in Annex I of the W&D Directive refers to the so called "Turning circle rule" which aims at ensuring the manoeuvrability of all HDV. According to this rule any motor vehicle or vehicle combination which is in motion must be able to turn within a swept circle having an outer radius of 12.50m and an inner radius of 5.30 m.

Vehicles complying with limits set in the W&D Directive are allowed to circulate on the territory of the EU without any restrictions.

National and international derogations

The W&D Directive allows for **national derogations**, so that Member States may authorise the circulation in their territories of HDV exceeding the maximum weights (with no limitations) and /or maximum dimensions set in the Directive. The national derogations for dimensions of vehicles are limited to specific use cases, namely:

(i) specialised vehicles, such as the ones used in the forestry industry; and

(ii) European Modular System (EMS)

(iii) trial schemes;

The W&D Directive does not explicitly allow heavier or longer vehicles in international transport. HDV used in international transport are bound by the limits set in the Directive even when they cross the territory of two neighbouring Member States that allow the same higher maximum authorised weights and/or dimensions on their territories. Here, the directive foresees certain exceptions.

Derogations to maximum dimensions in national transport

Articles 4(4) and (5) of the Directive allows for extra dimensions of HDVs in the following cases:

1) **local activities**: Member States may allow in their territory longer (and/or wider) specialised vehicles or vehicle combinations in circumstances in which they are not normally carried out by vehicles from other MS, e.g. operations linked to logging and forestry industry.

   These specialised longer vehicles have been in use, in particular in Sweden and Finland.

2) **modular concept**: Member States may allow longer and/or wider vehicles or vehicle combinations in national transport under the condition that they also allow the circulation of standard vehicles (motor vehicles, trailer and semitrailer) in such combinations as to reach the same loading length authorised in the given Member State. These combinations are known as modular concept or European modular systems (EMS).

   These derogations have its origin in the need to preserve the regime of the Scandinavian countries, which traditionally operated longer vehicles (up to 22 or 24 meters) in domestic transport. To avoid the distortion of competition Member States could operate larger vehicles and trailers with deviating dimensions on their territory as long as operators from a different Member States could compose competitive vehicle combinations with standard European equipment. It has resulted in the authorisation in the Scandinavian countries of EMS of up to 25.25m, the shortest possible combination with equivalent loaded length as their 22-24m long vehicles.

3) **trial periods**: Member States may conduct local transport operations for trial periods incorporating new technologies or new concepts, with vehicles or vehicle combinations exceeding maximum weights and/or dimensions.

   Member States have made use of this possibility to allow EMS too. The most common combinations of EMS under trial schemes are 25.25 m and 60 tonnes, although other variants exist.

Currently, the use of modular systems (EMS) of 25.25m long is allowed in Finland and Sweden, and is being trialled in Denmark, the Netherlands, Belgium, Spain, Portugal, Czech Republic and some German Länder. Additionally, Italy allows for longer semitrailers so as to allow for a maximum length of the vehicle combination of 18m.

Derogations to maximum weights in national transport

Member States are free to allow on their territories the circulation of heavier vehicles without any limitations.

As a result, there is a range of national weight limitations in the EU for vehicle combinations of five or more axles varying from 40t to 44t, 48t, 50t, 60t and up to 104t for nine and ten-axel vehicle combinations in different Member States.

All Member States allowing EMS (Finland and Sweden, and trials in Denmark, the Netherlands, Belgium, Spain, Portugal and Czech Republic) with the exception of Germany, allow for an extra weight (of up to 60 tonnes in most cases). Additionally, Belgium, Czech Republic, France, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Sweden, Denmark and Finland allow the circulation in national transport of five and/or six-axle vehicle combinations with a maximum weight of 44 tonnes[300].

Derogations to maximum weights in international transport

Apart from derogations from the maximum authorised weight for intermodal transport operations, alternatively fuelled vehicles, and the transport of indivisible loads, the directive does not foresee any derogations from weight limits applicable to international transport. This means that the Directive does not allow to cross borders by heavier vehicles (other than those eligible for derogation) between neighbouring countries even if both of them authorise 44 tonnes HDVs (or use heavier EMS) in their respective territories.

There is, however, a particular situation applicable to the Benelux countries. It originates in the Treaty Establishing the Benelux Economic Union[301], which was recognised by article 350 of the Treaty of the Functioning of the EU[302]. As a result, Belgium, Luxembourg and the Netherlands, are allowed to take advantage of the possibility foreseen in article 4(5) of the WDD[303], without the borders of the three countries being an impediment to conducting trials, in order to realise the Benelux internal market. The Benelux countries have made use of this possibility for cross-border transport by heavier vehicles up to 44t.

In addition to this diversity of regimes, the directive foresees the international transport of indivisible loads[304] which, owing to their dimensions or masses, cannot be transported in a vehicle or vehicle combination complying with the limits set in the Directive. The circulation of this particular type of transport is subject to a national special permit, which should be issued without discrimination (article 4(3) of the Directive). Other than

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[300] Czech Republic allows a maximum weight of up to 48t, the Netherlands of up to 50t and allows a maximum weight of up to 56t for the transport of excavation and mining materials.

[301] Consolidated version of the Treaty Establishing the Benelux Economic Union available in https://wetten.overheid.nl/BWBV0005047/2012-01-01

[302] Article 350 of the TFEU: "*The provisions of the Treaties shall not preclude the existence or completion of regional unions between Belgium and Luxembourg, or between Belgium, Luxembourg and the Netherlands, to the extent that the objectives of these regional unions are not attained by application of the Treaties*."

[303] Article 4.5 of the Weights and Dimensions Directive: "*Member States may allow vehicles or vehicles combinations incorporating new technologies or new concepts which cannot comply with one or more requirements of this Directive to carry out local transport operations for a trial period*".

304 Indivisible load is defined by Article 2 of Council Directive 96/53/EC as "*a load that cannot, for the purpose of carriage by road, be divided into two or more loads without undue expense or risk of damage and which owing to its dimensions or mass cannot be carried by a motor vehicle, trailer, road train or articulated vehicle complying with this Directive in all respects*".

that, Member States are free to authorise the transport of indivisible loads and to set the procedure and conditions for the issuing of the permits.

ANNEX 8: DISCARDED POLICY MEASURES

Mandating that semitrailers are craneable

This measure was proposed during the consultation activities (call for evidence, open public consultation, targeted consultation/interviews and/or position papers[305]) by stakeholders involved in rail transport as a measure that would promote intermodal road-rail transport. It appears, however, that it will have a negative impact on intermodal transport (road-rail and road-maritime) for reasons explained below.

Firstly, craneability is not necessary for most intermodal transport using semitrailers. On the one hand, the biggest share of intermodal transport in semitrailers takes place on ferries (64% of all intermodal transport operations[306]), where semitrailers and trucks enter the ferries by their own means. On the other hand, craneability is not strictly necessary for all rail-road intermodal transport, given that there are horizontal transhipment technologies available for non-craneable semitrailers and for the so-called "rolling highways" [307]. These horizontal transhipment technologies are used in approximately one-third of all semi-trailer intermodal road-rail operations in the EU.

Secondly, mandating the craneability of semitrailers would be against the principle of technological neutrality imposing *de facto* the resort to vertical transhipment technologies in detriment of the horizontal ones.

Finally, it would increase the cost and reduce the efficiency of intermodal transport, in particular for containerised transport (both in maritime and railway transport) as a consequence of the costs of the technology[308] and its maintenance. In addition, the weight of the technology would reduce the semitrailers loading capacity by approximately 1 tonne.

Overall, this measure would not effectively and efficiently promote the intermodal operations.

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[305] See position paper from the European railway operators and railway infrastructure companies association (CER) "Combined Transport AND road vehicle Weights & Dimensions, two sides of the same coin
10 GUIDING PRINCIPLES for the Revision of the Multimodal Regulatory Framework" from 19 September 2022.

[306] European Commission, Directorate-General for Mobility and Transport, *Comparative evaluation of transhipment technologies for intermodal transport and their cost: final report*, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2832/743839.

[307] The Rolling highway is a transport system for accompanied combined transport by rail or a special train in which complete trucks or semitrailers are transported by rail.

[308] The European Commission, Directorate-General for Mobility and Transport, *Comparative evaluation of transhipment technologies for intermodal transport and their cost: final report*, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2832/743839 estimates the costs of craneable semitrailers in an additional 1.000€ per unit cost and a slightly higher maintenance costs per year (+30€) as compared to non-craneable semitrailers.

Mandating the equipment of HDV with aerodynamic devices

To address the low uptake of aerodynamic devices, the Commission considered making the use of aerodynamic and other energy-saving technologies mandatory. The stakeholders consultations revealed a significant reluctance between respondents as regards the usefulness of this measure[309].

The evaluation of the W&D Directive confirmed that the low uptake of aerodynamic devices is mainly due to the fact that not enough time had passed since the adoption of the necessary type-approval legislation and secondary legislation in December 2019 and therefore more time should be allowed for the current rules to become effective. During the consultation process, several stakeholders expressed the views that the business case for the use of such devices is not so strong and common across the road haulage sector in order to create a high level of demand. Indeed, the benefits of the use of such devices (i.e. reducing the drag and improving fuel efficiency leading to lower operating costs and GHG emissions) can mainly be observed in long-haul trucking operations with high speeds over longer stretches of highways. The benefits are very limited in other types of operations, such as short-haul delivery trucks going at lower speeds and making frequent stops.

Some industry stakeholders (e.g. vehicle transporters) pointed out that due to the shape of their loads, there is little to be gained by using aerodynamic devices. They argued that more energy efficiency can be achieved by transporting a larger volume of goods at once, e.g. by increasing loaded length. An obligation to equip vehicles with aerodynamic devices could prove counterproductive if it is offset by a reduction in energy efficiency due to a lower loading capacity.

Furthermore, the stakeholders raised concerns about the technical feasibility and usefulness of such a measure in intermodal operations. Indeed, the aerodynamic devices that increase the height or width of the truck could affect compatibility with rail transport and other modes.

Nevertheless, as the use of aerodynamic devices, such as rear flaps, underbody panels, side cover extensions or gap reducers, promise benefits of greater energy efficiency, it can be expected that operators will be interested in installing them in the new zero-emission trucks (e.g. to optimize the use of the battery and reduce the frequency of breaks for charging). The increased interest will incentivise truck manufacturers to offer additional aerodynamic equipment at competitive prices.

In addition, the HDV CO_2 standards promote indirectly the adoption of such devices by setting fleet-wide CO_2 reduction targets (confirmed 15% by 2023 with respect to 2019 baseline and propose 45% by 2030) that can directly be translated into energy efficiency gains.

[309] According to the open public consultation out of 134 participants, 25% considered the measured useful, while 74% considered the measure detrimental or at least not particularly useful.

Given the above, and the fact that none of the stakeholders argued in favour of an obligation to equip HDV with aerodynamic devices, there is no strong justification for an additional regulatory intervention in this area.

Mandating the equipment of HDV exceeding the maximum weights with on-board weighing (OBW) devices.

To step up enforcement, all Member States opted for the installation of Weigh-in-motion (WIM) systems in the road infrastructure instead of imposing the use of On-Board Weighing (OBW) equipment for vehicles, ensuring that all HDVs can be checked as regards their compliance with the maximum authorised weight throughout the whole EU territory. However, as shown in the evaluation report there is a general lack of information on the number of WIM systems installed, in-service, operated, or on the number of measurements gathered.

In order to choose between the two options some Member States conducted cost-benefit analysis of the different options showing a clear recommendation for systems installed in the road infrastructure over OBW[310] for reasons of societal costs, transport efficiency, fair competition and technology uncertainties. This is also confirmed by truck manufacturers, which resort to alternative systems of mass estimation for HDV equipped with automatic gear shifting to facilitate information to the transport operators at a much lower cost.

The Commission considered a measure of mandatory equipping the HDV, exceeding the maximum weights set in the Directive, with OBW devices in order to address the market segments posing a higher risk to the protection of the infrastructure and to road safety (namely, EMS and indivisible loads). Mandating OBW would limit the scope of the measure to those relatively small market segments and would duplicate the detection systems, adding disproportionate costs to public authorities[311], to manufacturers and to road transport operators[312]. The same result could be achieved more efficiently via the installation of a minimum number of WIM systems and performing a minimum level of controls.

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[310] As a way of example, the cost-benefit analysis carried out by the Swedish Transport Agency in 2020 ("Scales in the infrastructure or in the vehicles?") concluded that mandating OBW systems have greater costs than the expected benefits (societal economic cost of SEK 7.8 billion).

[311] Costs for public authorities include, among others the set-up of the system to receive and process the information, including the equipment of the network with road-side units and/or smart devices for control officers.

[312] According to the same analysis carried out by the Swedish Transport Agency in 2020 ("Scales in the infrastructure or in the vehicles?"), the average installation cost is estimated for around 10.500 € per vehicle.

ANNEX 9: CONCLUSIONS OF THE EVALUATION

The links between the conclusions of the ex-post evaluation and the impact assessment are summarised in the table below.

Table 70: Links between conclusions of the ex-post evaluation and the impact assessment

Main ex-post evaluation conclusions	Impact Assessment
Conclusions on effectiveness	
The Directive was only partially successful in achieving its objectives. The Directive removed technical barriers to carrying out cabotage operations and facilitated cross-border transport operations by standard HDVs. However, due to various national derogations and ambiguities of certain provisions of the Directive, a patchwork of diverging national rules, technical and administrative requirements for the use of longer/heavier vehicles as well as bilateral arrangements emerged, leading to the fragmentation of certain segments of the internal market.	Policy measures are designed to clarify the provisions and further harmonise technical and administrative requirements for the use of longer and/or heavier vehicles in cross-border operations.
The Directive had limited impact on sustainability. It has facilitated the containerised intermodal transport by allowing extra weight to compensate the weight of empty container. However by allowing for higher weight limits in national road-only operations, the intermodal operations have been put in a disadvantaged position. The provisions to incentivise the uptake of alternatively fuelled powertrains and aerodynamic devices were insufficient and not reflecting the operational and zero-emission technology requirements.	The impact assessment assesses measures to boost the uptake of zero-emission technologies and to further promote intermodal transport by allowing extra weights/length for zero-emission HDVs and extra height for intermodal operations. It also supports the increase in operational and energy performance of conventional vehicle combinations in cross-border traffic.
The Directive has been effective in improving road safety and preventing wear and tear of infrastructure as it sets maximum safe limits for weights and sizes of HDVs which however can be adapted in national territories to the MS infrastructure standards and operational conditions.	The impact assessment takes into account the vehicle safety and road safety requirements as well as the capacity of the road infrastructure to handle possibly increased weights and dimensions of HDVs.
Conclusions on efficiency	
The Directive reduced administrative burden by providing that all vehicles must comply, in principle, with the same standards in cross-border traffic. On the other hand, by enabling higher national standards on weight/dimension of HDVs and national requirements for the circulation of longer vehicles on their territories, the Directive rendered certain operations more costly and procedures more time-consuming. The Directive has not enabled efficient enforcement.	Policy measures are defined to remove unnecessary regulatory barriers and administrative burdens with regard to cross-border traffic of longer/heavier vehicles. The measures also support targeting roadside controls to render enforcement more efficient.
Conclusions on coherence	

The Directive is coherent with the relevant EU road transport and transport decarbonisation policies and initiatives. Inconsistencies have been found between the Directive and the Combined Transport Directive with regard to the definition of intermodal/combined transport. The internal incoherence of the certain provisions of the Directive also hampered more effective promotion on intermodal operations.	The impact assessment supports the alignment of the Directive's provisions with those in the Combined Transport Directive. Policy measures are defined to create synergies with other relevant initiatives such as TEN-T Regulation, rail capacity initiative, and CO_2 standards for HDVs.
Conclusions on EU added value	
The Directive's EU added value lies in facilitating cross-border trade in the EU Single Market by harmonizing the (standard) HDV technical requirements across Member States.	Policy measures will support harmonisation of requirements for the use in cross-border operations of non-standard HDVs (such as car transporters, abnormal transport, etc.) to strengthen the internal market.
Conclusions on relevance	
The Directive remains relevant, as it continues to address key challenges in the transport sector, such as road safety, environmental protection, and fair competition. However, its provisions need to be updated to effectively and efficiently realize the Directive's objectives.	Policy measures are defined to update and adapt certain provisions of the Directive to the technological developments such as zero-emission technologies, multimodality and digitalisation.

ANNEX 10: EFFECTIVENESS OF THE DIFFERENT POLICY OPTIONS

This annex provides more detailed explanations on the assessment of effectiveness of the policy options, complementing the analysis in section 7.1.

Key impacts expected						
××	×	O	✓	✓✓	✓✓✓	
Strongly negative	Negative	No or negligible impact	Positive	Moderately positive	Strongly positive	Unclear

	PO-A	PO-B	PO-C
Specific policy objective 1: Remove barriers for the uptake of ZEV and energy-saving devices and incentivise intermodal transport			
Expected increase of transport activity performed by ZE HDVs	Positive impact on increasing the activity performed by ZE HDVs. Compensating the losses in weight and length capacity of HDVs linked to the weight and space taken by zero-emission technologies (PMc1) will ensure a level playing field for ZEV as compared to diesel HDVs, including the extra weight born by trailers and semitrailers equipped with auxiliary zero-emission powertrains. The incentive for BEV is however limited as it is expected that from 2035 onwards the decrease in the weight of batteries will make this policy measure redundant. The incentive will remain for FCEV and other potential emerging	Moderately positive impact on increasing the activity performed by ZE HDVs. The maximum compensation necessary for the extra weight of the zero-emission technologies envisaged under PO-A will be maintain over the period 2025-2050 in PO-B regardless of the weight of the technology (PM1). This will provide additional payload to FCEV instantly and to BEV progressively as batteries become lighter. PO-B will thus provide greater incentives to operators to invest in ZEV and to HDVs manufacturers to develop lighter technologies and improve the aerodynamics that will increase the range of ZEV and reduce the consumption	Strong positive impact on increasing the activity performed by ZE HDVs. PO-C will integrate the benefits of PO-A and, by allowing the use of zero-emission EMS in national and international transport (PM3), it will bring additional incentives for ZEV stemming from the increased payload and the reduction in transport costs. As a result, cumulatively over 2025-2050, PO-C is estimated to increase the activity of road freight transport performed by ZEV by 430.6 billion tonne-kilometres relative to the baseline.

	technologies. As a result, cumulatively over 2025-2050, PO-A is estimated to increase the activity of road freight transport performed by ZEV by 62.3 billion tonne-kilometres relative to the baseline.	from the main powertrain in refrigerated units. PO-B will also ensure that as of 2035 44t HDV will be able to circulate in international traffic, only if they are ZEV, allowing operators that currently use 44t HDV in international transport to progressively renew their fleets. As a result, cumulatively over 2025-2050, PO-B is estimated to increase the activity of road freight transport performed by ZEV by 176.4 billion tonne-kilometres relative to the baseline.	
Expected increase in intermodal transport operations	Positive impact on increasing intermodal transport operations The transport of high-cube containers with non-dedicated equipment will be facilitated through the elimination of national permits (PMc2), reducing the administrative burden and costs linked to obtaining such permits. However, the effectiveness of this measure is limited by the fact that part of the road infrastructure is not accessible to vehicles with height of 4.3m. PO-A will not incentivise the uptake of non-containerised intermodal transport. In PO-A, the shift from road-only to intermodal transport is estimated at around 12 billion tonne-kilometres in 2030 and 14 billion tonne-kilometres in 2050, relative to the baseline.	Strong positive impact on increasing intermodal transport operations In addition to the support provided by PO-A, PO-B significantly improves the attractiveness of intermodal transport by extending the allowance of extra 4 tonnes (currently used to compensate the weight of empty container or swap body in intermodal operations) also to non-containerised intermodal operations (PM2). In practice, it means that operators using conventional HDVs may benefit from additional payload when using their trucks, trailers and semitrailers in intermodal operations. Consequently, the alignment of the W&D Directive with the CTD under PO-B would bring along synergy effects in promoting growth of intermodal transport. The shift from road-only to intermodal transport in PO-B is estimated at around 21 billion tonne-kilometres in 2030 and 26 billion tonne-	Strong positive impact on increasing intermodal transport operations PO-C will integrate the benefits of PO-A and PO-B. In addition, allowing in international traffic EMS involved in intermodal transport (PM3) will provide further incentives to intermodal transport stemming from the increased payload and the reduction in transport costs, above those provided by PO-B operations. The shift from road-only to intermodal transport in PO-C is estimated at around 23 billion tonne-kilometres in 2030 and 28 billion tonne-kilometres in 2050, relative to the baseline.

		kilometres in 2050, relative to the baseline.	
Expected reduction in CO_2 emissions	Positive impact on reducing CO2 emissions from freight transport In PO-A the reduction in the CO_2 emissions is driven by the increase in the share of zero-emission vehicles in the HDVs fleet (due to PMc1), the increase in the intermodal transport (due to PMc2) and the improved efficiency of transport operations (PMc3, PMc4 and PMc5). Cumulatively over 2025-2050, PO-A is estimated to reduce CO_2 emissions by 10.7 million tonnes relative to the baseline (0.5% of the CO_2 emissions from freight transport).	Strong positive impact on reducing barriers to cross-border transport In PO-B the reduction in the CO_2 emissions is driven by the increase in the share of zero-emission vehicles in the HDVs fleet (due to PMc1 and PM1), the increase in the intermodal transport (due to PMc2 and PM2) and the improved efficiency of transport operations (PMc3, PMc4 and PMc5 in all policy options). Cumulatively over 2025-2050, PO-B is estimated to reduce CO_2 emissions by 27.8 million tonnes relative to the baseline (1.2% of the CO2 emissions from freight transport).	Strong positive impact on reducing barriers to cross-border transport In PO-C the reduction in the CO_2 emissions is driven by the increase in the share of zero-emission vehicles in the HDVs fleet (due to PMc1 and PM3), the increase in the intermodal transport (due to PMc2, PM2 and PM3) and the improved efficiency of transport operations (PMc3, PMc4 and PMc5 in all policy options). Cumulatively over 2025-2050, PO-C is estimated to reduce CO_2 emissions by 29.8 million tonnes relative to the baseline (1.3% of the CO2 emissions from freight transport).
Specific policy objective 2: Harmonise the rules on maximum weights and dimensions of HDV in cross-border operations			
Expected reduction of the number of barriers to cross-border transport, including the need for special permits	Moderately positive impact on reducing barriers to cross-border transport PO-A fully eliminates the regulatory barriers at EU level for cross-border transport of 5- and 6-axle rigid trucks, harmonising their maximum weights with that of vehicles combinations of the same number of axles (PMc3). PO-A also eliminates the regulatory barriers to the cross-border transport of vehicle transporters, regulating the extended length of these vehicles via the use of overhangs (PMc5), currently	Strong positive impact on reducing barriers to cross-border transport PO-B further reduces regulatory barriers relative to PO-A, by harmonising the weight standards for ZEV HDVs in national and international transport (PM1). It also aligns the definition of intermodal transport with the Combined Transport Directive, bringing into scope all types of intermodal transport (currently limited to containerised transport) (PM2).	Strong positive impact on reducing barriers to cross-border transport In addition to the common measures included in all options and the alignment of the definition of intermodal transport with the Combined Transport Directive (included in PO-B), PO-C also harmonises the use of EMS in international traffic within the EU by allowing their circulation on the TEN-T network under certain conditions: (i) maximum 25.25m long and weigh maximum 60t of maximum weight; (ii) ZEV or engaged in

	subject to national rules. PO-A removes the barriers to cross-border transport operations by heavier HDVs (44t) and by longer and/or heavier vehicle combinations (EMS), however the harmonisation effects are limited to the operations between Member States that allow such vehicles in national transport in their territories (PMc4). Moreover, EMS remain subject to the national limits in terms of length, weight and axel weight, in order to adapt to the national circumstances and to limit the investments in infrastructure. PO-A will also eliminate the administrative barrier related to the need for special permits linked to the transport of high-cube containers (PMc2).		intermodal operation. The positive effects of this harmonisation are however partially offset by the fact that these conditions for circulation pose new barriers in Member States which currently use EMS in cross-border operations without restrictions. Setting abnormal road transport corridors (PM5) will further simplify the procedures for special permits for the transport of indivisible loads falling within certain thresholds as regards the maximum weights and dimensions. However, those thresholds remain subject to national rules and, therefore, the continuity of the corridors in international transport is not guaranteed.
Simplification of authorisation procedures for issuing permits for abnormal transport	No impact on the simplification of procedures for issuing permits for abnormal transport.	Strong positive impact on the simplification of procedures for issuing permits for abnormal transport. PO-B will reduce administrative barriers linked to the issuance of national permits for abnormal transport (PM4). It will harmonise and streamline the procedures for obtaining such permits by introducing a one-stop-shop approach, the harmonised abnormal road transport application form as well as the mutual acceptance between Member States and the setting of a Special European Registration of Trucks and Trailers, enabling the full	Strong positive impact on the simplification of procedures for issuing permits for abnormal transport. PO-C will reduce administrative barriers linked to the issuance of national permits for abnormal transport (PM4). It will harmonise and streamline the procedures for obtaining such permits by introducing a one-stop-shop approach, the harmonised abnormal road transport application form as well as the mutual acceptance between Member States and the setting of a Special European Registration of Trucks and Trailers, enabling the full digitalisation of the system.

		digitalisation of the system.	
Specific policy objective 3: Improve the enforcement of cross-border rules, including for road safety purposes			
Infringement detection ratio (number of infractions detected per number of HDVs controlled)	No impact on better detecting infringements. PO-A maintains random roadside checks which are not an efficient way of detecting infringements.	Strong positive impact on better detecting infringements. The wide deployment of WIM systems on the TEN-T network, where most commercial transport operations are performed, will significantly improve the ratio of detection of overloaded vehicles (from 13.25% to 97%).	Strong positive impact on better detecting infringements. The wide deployment of WIM systems for direct enforcement on the TEN-T network will slightly improve the detection ratio of overloaded vehicles as compared to PO-B (from 97% to a 100%).
Level of controls on maximum weights of HDVs	Positive impact on ensuring a minimum level of controls on maximum weights of HDVs. By imposing a ratio of controls on the maximum weight and axle weight of HDV per vehicle-km (6 controls per million vehicle-km) in all Member States the average level of controls performed in the EU is ensured as a minimum. Nevertheless, substantial differences remain due to the limitations in human resources and the equipment dedicated at national level.	Strong positive impact on ensuring a minimum level of controls on maximum weights of HDVs. The wide deployment of WIM systems (PM6) will substantially increase the number of controls performed on HDVs´ weight with equal or lower level of resources dedicated to weights roadside checks than in the baseline. Resources could then be dedicated more intensively to secondary roads. The establishment of common minimum principles to the voluntary implementation of intelligent access policies (PM8) could contribute to the broader deployment of these schemes, which bring additional possibilities for the control of compliance of all HDVs in given territory. However, its voluntary nature may result in a limited outreach thus lower	Strong positive impact on ensuring a minimum level of controls on maximum weights of HDVs. The wide deployment of certified WIM systems (PM7) for direct enforcement will substantially increase the number of controls performed on HDVs´ weight with lower level of resources dedicated to weights roadside checks than in the baseline. Resources could then be dedicated more intensively to secondary roads. The establishment of common minimum principles to the voluntary implementation of intelligent access policies (PM8) could contribute to the broader deployment of these schemes, which bring additional possibilities for the control of compliance of all HDVs in given territory. However, its voluntary nature may result in a

		effectiveness.	limited outreach thus lower effectiveness.
Duration of controls on maximum weights of HDVs	No impact on reducing the duration of controls as PO-A maintains random roadside checks.	Strong positive impact on reducing the duration of controls. Directly linked to the higher effectiveness of WIM systems in detecting overloaded HDVs (PM6), the number of roadside checks on maximum weights of HDVs carried out on the TEN-T network will decrease substantially relative to the baseline, although some physical checks at the roadside will still be necessary. Roadside checks performed on other parts of the network will not be affected by PO-B.	Strong positive impact on better detecting infringements. The wide deployment of certified WIM systems for direct enforcement (PM7) will eliminate the need for roadside checks on maximum weights of HDVs on the TEN-T network However, a minimum level of police surveillance will be necessary to interrupt the most serious infringements that can compromise the infrastructure and pose a risk to road safety. Roadside checks performed on other parts of the network will not be affected by PO-C.

ANNEX 11: SME TEST

Step (1) of SME test (identification of affected businesses). In the road transport sector 99% of companies are SMEs (enterprises employing up to 250 people and with a turnover of less than EUR 50 million[313,314]). Intermodal transport involves by definition many different economic agents. While many operators in rail transport and shipping are medium and some even large companies, operators in inland waterways and many intermodal organisers are often SMEs. Therefore, the initiative is considered relevant for the SMEs and the SME test has been performed (see Annex 11).

Step (2) of SME test (consultation of SME stakeholders). SMEs constitute a significant share of the stakeholders involved in the consultation activities: 80 out of 128 companies that responded to the open public consultation were SMEs and, among them, 32 were microbusiness (below 10 employees). 13 were associations of transport operators and forwarders representing the interest of SMEs submitted their responses to the online survey-questionnaire in the targeted stakeholder consultation, where a total of 24 transport operators and forwarders participated. The specific needs and challenges for SMEs were duly taken into account throughout the impact assessment. Key issues are mentioned below.

Step (3) of SME test (assessment of the impacts on SMEs). SMEs stressed the need to increase the efficiency of transport operations by removing barriers to cross-border transport between Member States where the same weight and dimension standards apply (prohibition of 44t HDV in cross-border transport was the main identified barrier), as well as the reduction of administrative burden and simplification of procedures for the issuing of national permits.

As explained in section 6.1.3, all policy options are expected to result in administrative and adjustment costs savings for road transport operators as well as to an increase in the adjustment costs. Overall, net costs savings for road transport operators are estimated at EUR 46.8 billion in PO-C, followed by PO-B with net costs savings estimated at EUR 45.1 billion and PO-A with net costs savings of EUR 14.7 billion, expressed as present value over 2025-2050 relative to the baseline (in 2022 prices).

Considering the very large share of SMEs in the road transport sector, most of these net costs savings are expected to be attributed to them although the available data did not allow a split of these costs savings between the two groups of operators (i.e. SME and others). In addition, the increase in intermodal transport in all policy options will have a positive economic impact on the SMEs involved, which the highest benefits expected in PO-C and PO-B.

Step (4) of SME test (minimizing negative impacts on SMEs). As indicated in section 6.1.3, all policy options are expected to result in a reduction of administrative costs for road transport operators, in particular as a consequence of the policy measures aimed at simplifying the procedures for the issuing of national permits for abnormal transport (PMc2 in all policy

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[313]European Commission, Impact Assessment accompanying the document Proposal for a Regulation amending the Regulation (EC) No 1071/2009 and Regulation (EC) No 1072/2009, SWD(2017) 194 final. https://eur-lex.europa.eu/resource.html?uri=cellar:9d5c61bf-4629-11e7-aea8-01aa75ed71a1.0001.02/DOC_1&format=PDF

[314] Eurostat: Services by employment size class. "https://ec.europa.eu/eurostat/databrowser/view/SBS_SC_1B_SE_R2__custom_3493320/default/table"

options, PM4 in PO-B and PO-C and PM5 in PO-C), which affects the transport of indivisible loads, the transport of high-cube containers and the authorisation of EMS in cross-border transport. Administrative costs savings are estimated to be the highest in PO-C (EUR 4.5 billion), followed by PO-B (EUR 4.4 billion) and PO-A (EUR 3.2 billion), expressed as present value over 2025-2050, relative to the baseline.

All policy options will eliminate the inefficiencies of road transport resulting from the divergence between national and international (intra-EU) rules via the adoption of harmonisation measures (PMc4, PMc5). In addition, it is expected that a reduction of transport costs will facilitate the uptake of ZEV and/or the resort to intermodal transport (PMc1, PM1, PM2 and PM3) for SMEs.

Alternative options. None.

ANNEX 12: LETTER FROM FORMER VICE-PRESIDENT SIIM KALLAS, 13 JUNE 2012

SIIM KALLAS
VICE-PRESIDENT OF THE EUROPEAN COMMISSION

Brussels, 13. 06. 2012
KJF/bk D(2012)

Mr Brian SIMPSON
Chairman of the Transport and Tourism Committee
Office: ASP13G306
60, rue Wiertz
BE-1047 Brussels

Dear Mr. Simpson,

As was discussed in the meeting of the TRAN Committee of 26 March, I have been carefully considering the reading of certain points of Directive 96/53/EC[1] and I would like to inform you of my conclusions, in the light of the advice I have received. Although you are aware that the definitive interpretation of EU law remains with the Court of Justice of the European Union, I believe that it is important to first describe our understanding of the role of the Directive in the structure of European transport policy in order to explain our interpretation and its practical implications.

The first Directive on weights and dimensions of road vehicles, Council Directive 85/3/EEC, represented a first step in harmonising the diverging rules in this field in Member States. By laying down maximum standards, the Directive broke new ground, allowing hauliers who had up until then been held up at borders due to diverging sets of legislation to circulate throughout the Community, if their vehicles complied with the weights and dimensions limits in the Directive. In this sense this Directive is truly a cornerstone piece of legislation, key to ensuring free circulation and the setting up of the internal market for road transport.

Under the Directive, Member States could choose to exceed these standards if the infrastructure and market conditions on their territory allowed this. Several Member States chose to do so, without the Directive stipulating the geographical scope of such deviations. The Directive thus prevented Member States from rejecting vehicles in international transport, as long as they complied with the (maximum) standards. The Directive did not, however, prevent Member States from accepting vehicles which exceed these standards on their territory. This is still reflected in Art 3 which has remained in the today's Directive and which does not prevent Member States from accepting the modular concept on their territory.

With the opening up of internal borders in 1993 and the possibility for hauliers to carry out domestic transport operations in other Member States, the Directive was replaced and its key provisions were maintained and supplemented. Not only should the legislation ensure that hauliers could circulate freely from one country to another, it should also guarantee that when carrying out national transport operations abroad, they are operating

[1] COUNCIL DIRECTIVE 96/53/EC of 25 July 1996 laying down for certain road vehicles circulating within the Community the maximum authorized dimensions in national and international traffic and the maximum authorized weights in international traffic (OJ L 235, 17.9.1996, p.59), as amended by Directive 2002/7/EC of the European Parliament and of the Council of 18 February 2002 (OJ L 67, 9.3.2002, p. 47)

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on equal footing with local operators benefitting from the higher limits referred to above. The legislator therefore decided to forbid deviation from the standards for national transport in order to preserve fair competition, in particular in the newly opened cabotage market. The Commission's proposal was specifically amended by the legislator to ensure that the standards in the Directive were impartially applied in national transport. Derogations were however agreed for longer vehicles in cases which did not affect fair competition and provided that they were applied without discrimination.

The derogation related to the modular concept was a result of the accession to the European Union of Finland and Sweden, where these vehicles were already in use. With the concept applicable to any type of vehicle, irrespective of the country of registration the legislator considered that the modular concept does not significantly affect international competition. The driving principle behind this derogation, once again, is fair competition in a free market.

The notion of "national transport operation" was introduced in the derogation foreseen for the modular concept to mirror the requirement to comply with these standards in national transport. This does not rule out a situation where hauliers could benefit from similar derogations in two bordering countries, nor does it create a legally binding situation as regards international transport.

It therefore appears that the aim of the Directive is not to prevent the derogations laid out in Art 4(3), 4(4) and 4(5) from applying to cross-border traffic, as long as the Member States involved apply these derogations on their own territories and do so without discrimination to all hauliers. It must also be clear that these derogations should not distort international competition in the transport market, which is the key principle behind this piece of legislation. Finally these derogations should be applied reasonably so that their use does not lead to an exceptional practice becoming the norm, thus contravening the driving principles of the Directive.

Thus under Art 4(3), inter-member state journeys with indivisible loads or vehicles intended to carry an indivisible load are permitted, subject to the grant of a special permit delivered without discrimination by each Member State concerned. These permits should be mutually compatible and should remain in line with the principles underlying the Directive, including the principles of non-discrimination and fair competition. It implies notably that the conditions imposed are sufficiently transparent for all users, including those from other Member States.

As described above, Art 4(4) is an exception to Art 4(1) which prescribes only which vehicles may be allowed for national transport. A key element is to ensure fair competition between national operators and operators of other Member States when carrying out national transport operations. National transport operations are to be understood as operations from one point to another in a Member State's territory. They may therefore cover transport from a point in the territory of a Member State to the border. Neither this paragraph, nor Article 3, nor any other provisions of the Directive addresses the issue of the border crossing. However, a transport authorised from one point to the border within the territory of a Member State may be followed by a transport also authorised from the same border point to another point within the territory of another Member State. It follows from the economic and internal market objectives that such a transport operation across the border should not be prohibited between the two Member States concerned. It remains that conditions must be respected to ensure the compatibility of such an operation with all the objectives of the Directive and in particular the

condition that the derogation of Art 4(4) must not significantly affect international competition. These conditions could reasonably be regarded as satisfied if a cross border use remained within two member states where the existing infrastructure and safety requirements allow it. A last important condition is that these authorisations should be granted to hauliers without discrimination.

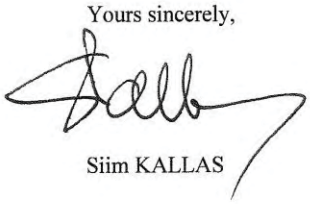
Similarly, trials under Art 4(5) could involve more than one member state, and include journeys between those Member States, provided the trial is still "local" – concerning for example a cross border region.

This is, in my view, the interpretation which is the most consistent with the text of the Directive and the initial ambition of the legislator. A more restrictive reading would lead to hauliers uncoupling their vehicles at a border to reattach them a few meters later. Such an interpretation would amount to reinstating artificial obstacles at borders in contradiction with both past and current policy aims. The interpretation set out above preserves the intention of the legislator whilst avoiding manifest absurdity in the application of the Directive.

I hope that this letter clarifies the uncertainties which may have existed regarding the application of the Directive and the approach that I intend to follow with regard to its implementation .

I consider this approach to be both legally sound (though I accept the Directive is not completely unambiguous), and also reasonable in policy terms. It achieves an appropriate balance between on the one hand the right of Member States under subsidiarity to determine transport solutions appropriate to their local circumstances and on the other the need for such national policies not to distort the internal market. I am though fully aware that this is a controversial and emotive issue. However the revision of Directive 96/53 which I expect the Commission to propose in late 2012 (addressing a number of more technical points such as aerodynamic adaptations) will provide an opportunity for the legislator to review the issue of cross border use of longer trucks.

Yours sincerely,



Siim KALLAS

ANNEX 13: MONITORING

To measure the progress and the actual effects of the initiative, a list of operational objectives and indicators for assessing the progress towards them have been identified and are detailed in Table 71.

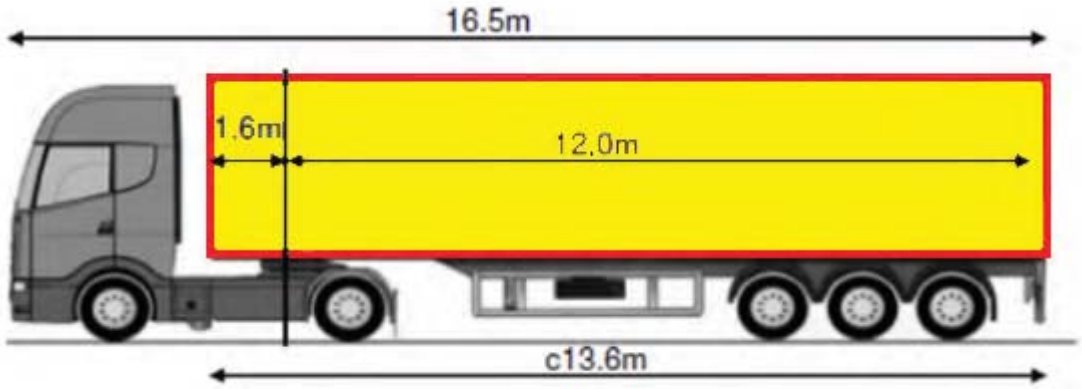
Table 71: Operational objectives and indicators for the monitoring of impacts

Operational objectives	Indicators
Increase the uptake of zero-emission HDVs and aerodynamic devices	Number of newly registered ZE HDVs per year Share of ZE HDVs in total fleet Share of HDV with aerodynamic devices
Increase the intermodal freight transport	Share of HDVs involved in intermodal operations The use of 45' containers transported as part of intermodal transport
Improve operational efficiency of cross-border road transport operations	The use of EMS in cross border traffic
Increase effectiveness of controls for compliance	Number of vehicles controlled per year Number and gravity of infringements (level of excess of weight) detected Number and type of Weigh-in-Motion systems installed Changes in infringement detection ratio

The data for assessing these operational objectives will draw on the from regular monitoring activities described in section 9 as well as *ad hoc* data collection actions, including by exploiting the existing databases and data exchange systems, such as CARE database or European Register of Road Transport Undertaking (ERRU).

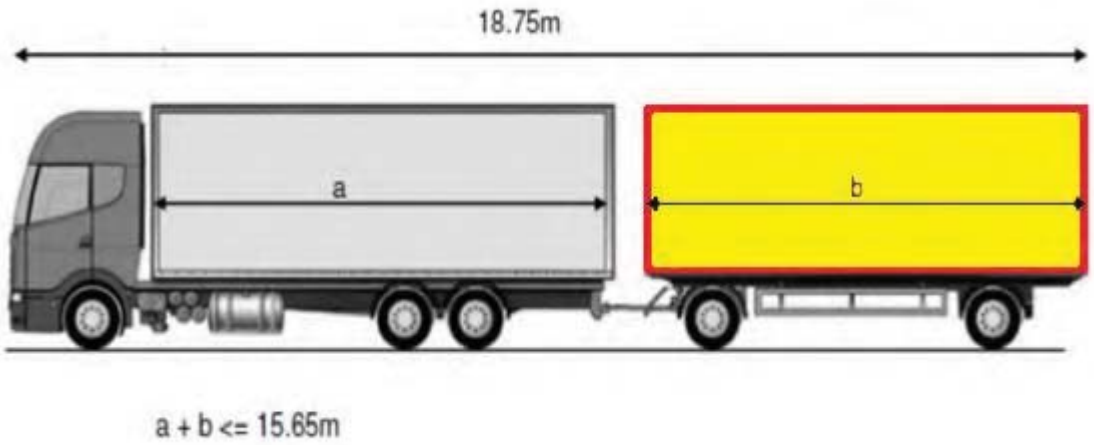
ANNEX 14: VISUALS FOR CONCEPT UNDERSTANDING

Figure 11: Articulated vehicle consisting of truck and semitrailer, semitrailer highlighted



Source: Longer Semi-trailer Trial (publishing.service.gov.uk)

Figure 12: Classic trailer (for comparison) attached to rigid truck, trailer highlighted.



Source: Longer Semi-trailer Trial (publishing.service.gov.uk)

Figure 13: Swap body

Source: Schmitz Cargobull

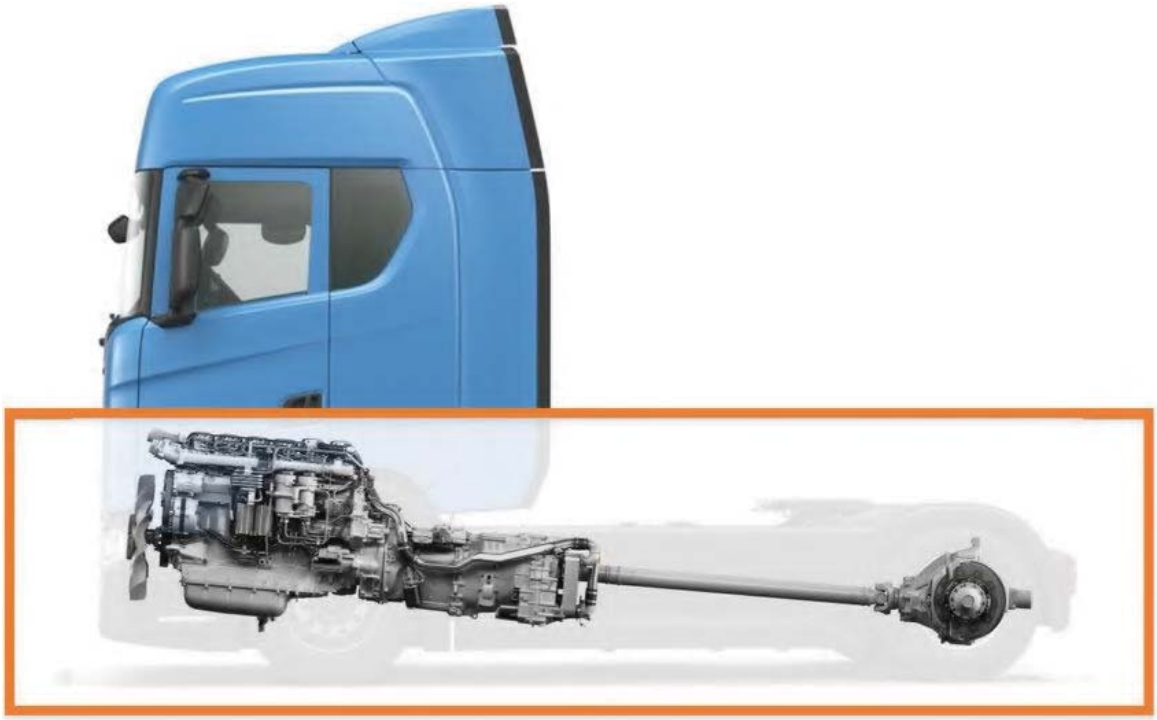
Figure 14: Swap body trailer (empty)

Source: Schmitz Cargobull

Figure 15: Swap body trailer (loading process)

Source: Schmitz Cargobull

Figure 16: Truck powertrain

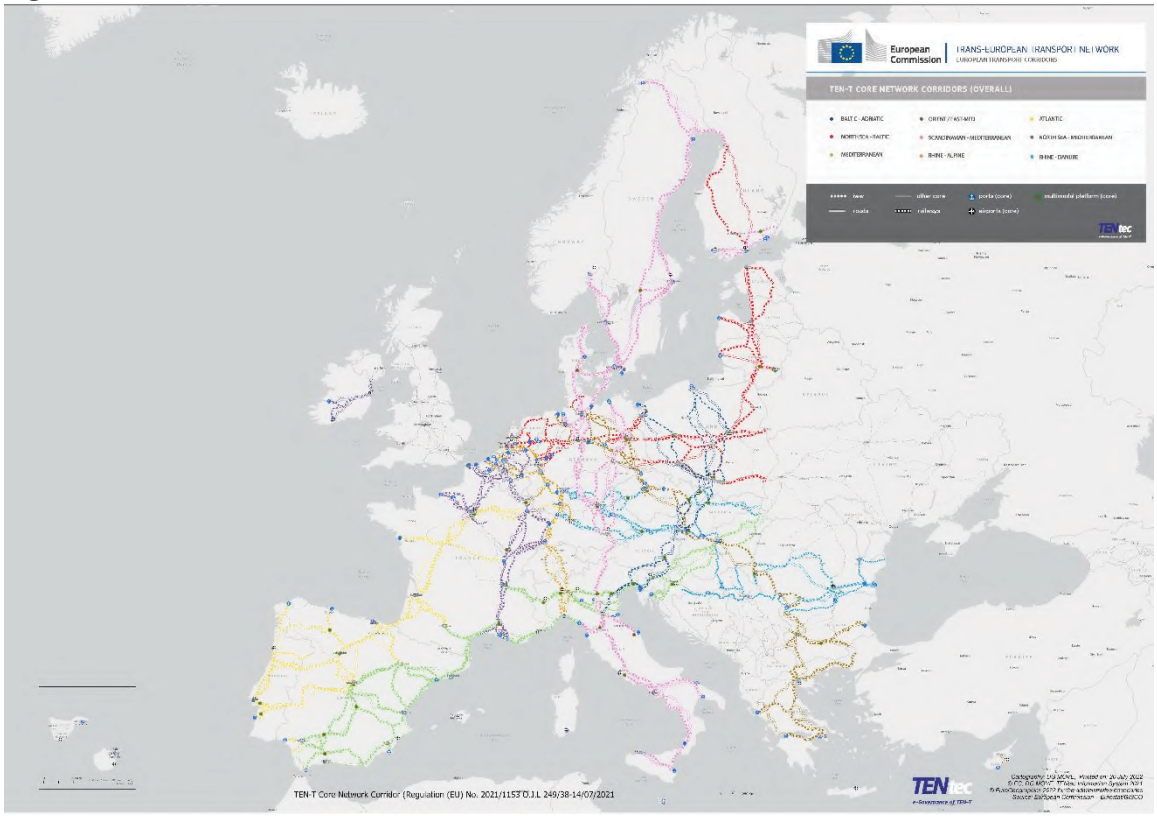


Source: Williamson, D. et al. (2018): The hunt for proper relation weights in product architecture clustering, Nord Design Conference, 2018

Figure 17: Rear aerodynamic flaps on a semitrailer

Source: ZF

Figure 18: TEN-T network



ANNEX 15: EVALUATION REPORT (SEPARATE DOCUMENT)

Separate document: Evaluation SWD and specific annexes.