Council of the European Union

Brussels, 14 July 2023
(OR. en)

11821/23
ADD 2

Interinstitutional File:
2023/0266(COD)

TRANS 312
CLIMA 355
CODEC 1370
IA 185

COVER NOTE

From:	Secretary-General of the European Commission, signed by Ms Martine DEPREZ, Director
date of receipt:	12 July 2023
To:	Ms Thérèse BLANCHET, Secretary-General of the Council of the European Union
No. Cion doc.:	SWD(2023) 441 final
Subject:	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND THE COUNCIL on the accounting of greenhouse gas emissions of transport services

Delegations will find attached document SWD(2023) 441 final.

Encl.: SWD(2023) 441 final

EUROPEAN
COMMISSION

Strasbourg, 11.7.2023
SWD(2023) 441 final

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND THE COUNCIL

on the accounting of greenhouse gas emissions of transport services

{COM(2023) 441 final} - {SEC(2023) 441 final} - {SWD(2023) 440 final} - {SWD(2023) 442 final}

Table of contents

Glossary

Term or acronym	Meaning or definition
boe	barrels of oil equivalent
CEN	European Committee for Standardisation
CH_4	Methane
CO_2	Carbondioxide
CO_2-eq.	Carbondioxide equivalents
DCS	Data Collection System
EASA	European Union Aviation Safety Agency
EPA	Environmental Protection Agency (US)
GCD	Great Circle Distance
GHG	Greenhouse Gas
GLEC	Global Logistics Emissions Council
IATA	International Air Transport Association
ICAO	International Civil Aviation Association
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organisation for Standardisation
kWh	Kilowatt-hour
LCA	Life cycle assessment
MJ	Mega Joule
MRV	Monitoring, Reporting and Verification
NABs	National Accreditation Bodies

N_2O	Nitrous oxide
NO_x	Nitrogen oxides
PEFCR	Product Environmental Footprint Category Rules
pkm	Passenger kilometre
SFD	Shortest feasible distance
SO_x	Sulphur oxides
tkm	Tonne kilometre
toe	Tons of oil equivalent
TTW	Tank-to-Wheel
WTT	Well-to-Tank
WTW	Well-to-Wheel

1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

1.1. Rationale

This Impact Assessment accompanies a new legislative proposal on the accounting of greenhouse gas (GHG) emissions of transport services[1], hereafter "**CountEmissions EU**".

Emissions accounting is a measure used in various economic sectors – including transport – to generate emissions data from specific activities of businesses and individuals. **Transparent information on emissions** empowers customers[2] for more efficient choices and influences business decisions of entities organising and offering different type of transport services[3] on the market. These data may therefore be considered an underlying requirement for stimulating **sustainability, innovation and behavioural change** towards low and zero emission transport. Benefits and value added of emissions accounting are evidenced by the outcomes of existing emissions monitoring and reporting schemes in the EU and beyond[4].

Unlocking the potential of emissions accounting requires however that the underlying calculations are comparable and accurate, addressing the characteristics and granularity of a transport service. Therefore, emissions should be quantified based on a scientifically sound, detailed and **harmonised methodological approach**. Currently, no such harmonised approach exists. Instead, various standards, methodologies and calculation tools entailing different approaches and diverging input data[5] are used throughout the market. This situation results in the provision of fragmented and incomparable emissions data that creates confusion among businesses and citizens and hampers informed transport choices and business decisions.

CountEmissions EU aims to provide **a single set of rules** for the quantification of GHG emissions and the harmonisation of the underlying data formats, thus enabling to generate and share reliable and comparable information on the environmental performance of a given service for all transport modes, segments and countries, across the EU.

1.2. Political context

Transport[6] accounted for 26% of all EU GHG emissions in 2020, with road transport alone representing around 20% of the total[7]. The initiative has therefore to be seen in the context of the **European Green Deal** (EGD)[8], and the **European Climate Law**[9] which set out the steps towards climate-neutrality by 2050. The **Sustainable and Smart Mobility Strategy** (SSMS)[10], published on 9 December 2020 lays the foundation on how the EU transport system can

---

[1] I.e. transporting freight or a passenger from an origin to a destination; a transport service can imply one or multiple transport chain elements requiring both transport operation(s) and/or hub operation(s).
[2] Transport service users, see more in Annex 3
[3] Transport service organisers and hub operators; see more in Annex 3
[4] In the freight sector for instance, the EU-based Lean and Green, the UK Logistics Emissions Reduction Scheme (LERS), and the US SmartWay programme.
[5] Especially default values; see more in section 2.2
[6] Including international aviation and maritime.
[7] Statistical pocketbook 2022 (europa.eu)
[8] COM(2019) 640 final
[9] Regulation (EU) 2021/1119
[10] COM(2020) 789 final

achieve this systemic change, including a 90% cut in transport GHG emissions by 2050, to be delivered by a smart, competitive, safe, accessible and affordable transport system. Apart from targeted actions to make individual transport modes more sustainable, the Strategy also refers to incentives for choosing the most sustainable transport options, within and across the modes. The incentives may be of both economic and non-economic nature, including the provision of better information for users and increased transparency of the GHG performance of transport services. This is why the Strategy announced plans[11] to "*establish a European framework for the harmonised measurement of transport and logistics greenhouse gas emissions, based on global standards, which could then be used to provide businesses and end-users with an estimate of the carbon footprint of their choices, and increase the demand from end-users and consumers for opting for more sustainable transport and mobility solutions, while avoiding greenwashing*"[12]. CountEmissions EU therefore represents a relevant policy response. 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.

Through its emissions reduction potential, CountEmissions EU will contribute towards the United Nations Sustainable Development Goal (SDG) 13 "Take urgent action to combat climate change and its impacts". In addition, it will indirectly support SDG 7 "Ensure access to affordable, reliable, sustainable and modern energy for all" and SDG 12 "Ensure sustainable consumption and production patterns".

1.3. EU and international context

Several standards and methodologies[13] (both referred also as 'methods') are currently available for the EU transport stakeholders to account GHG emissions from various transport activities. These have been developed by standardisation bodies, public authorities or private organisations.

At international level, the **GHG Protocol Corporate Accounting and Reporting Standard**[14] of 2001, was a pioneering initiative establishing a global standardised framework to measure and manage GHG emissions of private and public sector organisations. The GHG Protocol enables to account for indirect emissions from value chain activities as it is complemented by the Corporate Value Chain (Scope 3) Accounting and Reporting Standard and can therefore be used also for the quantification of emissions from transport and logistics[15].

[11] Action 33 of the Action Plan accompanying the SSMS
[12] Greenwashing is the practice of companies to give a false impression of their environmental impacts or benefits.
[13] There may be different meaning of a standard and a methodology. An emissions accounting standard can be commonly defined as the technical calculation and/or allocation rules used as a norm, or model in comparative evaluations. A methodology can be based on a standard, and in most cases it forms part of a broader policy or incentive programme. Source: Ecorys and CE Delft (2023), Impact assessment support study
[14] https://ghgprotocol.org/
[15] The Corporate Value Chain (Scope 3) Accounting and Reporting Standard is a supplement to GHG Protocol Corporate Accounting and Reporting Standard allowing all types of organisations to assess their entire value chain emissions impact, and identify where to focus reduction activities. Whereas Scope 1 and 2 refer to direct and indirect emissions from activities of an organisation, Scope 3 reflects emissions generated outside of the owned or controlled sources of this organisation, including from transport activities. Importantly, Scope 3 emissions for one organisation may represent Scope 1 for another one (such as a transport service provider). See more under Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf (ghgprotocol.org)

The first transport-service specific standard was introduced in 2012 by the European Committee for Standardisation (CEN)[16]. **CEN EN 16258** sets out a common methodology for the calculation and declaration of energy consumption and GHG emissions related to any transport service[17].

At national level, the **French Transport Code**[18] requires that all entities offering transport services on the market (freight and passenger, including all modes) calculate GHG emissions for each service departing from and/or ending in France, based on a specific methodology[19]. The French Transport Code also provides that the information on emissions should be reported to relevant parties[20], which is the only mandatory requirement of this type in the EU.

Specific methodologies for GHG emissions accounting exist also in the different segments of the transport sector, especially in freight. In many cases, they form part of broader green transport programs or other initiatives promoting efficient and low carbon transport activities. These include for instance the industry-led **Global Logistics Emissions Council (GLEC)** framework[21], the public-private US SmartWay program, and the Topsector Logistics[22] collaboration program between the Dutch government and businesses.

Furthermore, there are numerous mode specific emission accounting methods and requirements, which are either developed by the industries themselves, or launched by public authorities as parts of specific legislative frameworks. In maritime, for instance, there exists the **Clean Cargo Working Group**[23], a business-to-business initiative for containerised sea transport. Also, the International Maritime Organisation (IMO)[24] adopted a mandatory **Fuel Oil Data Collection System (DCS)** for international shipping, requiring vessels to collect and report relevant data into a common database[25]. Concerning aviation, the **Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)**[26] developed by the International Civil Aviation Organisation (ICAO)[27] provides a method to calculate CO_2[28] emissions at the flight level. ICAO and the International Air Transport Association (IATA)[29]

---

[16] https://www.cencenelec.eu/

[17] Despite its important contribution towards harmonising emissions accounting processes, EN 16258 is still considered not precise enough to deliver fully comparable and consistent emissions data for services performed across various transport segments. It is also a purely European standard that creates limitations for stakeholders operating globally. Until March 2023, when ISO 14083 was published, EN 16258 was the only transport specific and multi-modal (i.e. covering road, rail, IWT, maritime transport and aviation) standard available. Source: Ecorys and CE Delft (2023), Impact assessment support study

[18] Article L. 1431-3

[19] Established on the basis of CEN standard EN 16258

[20] Such as a person purchasing tickets for the transport of passengers, or a transport service user for the shipment of goods

[21] https://www.smartfreightcentre.org/en/how-to-implement-items/what-is-glec-framework/58/

[22] https://topsectorlogistiek.nl/

[23] https://www.bsr.org/en/blog/clean-cargo-working-group-transparency-and-transformation-in-ocean-transpor

[24] All EU Member States are IMO members

[25] https://www.imo.org/en/ourwork/environment/pages/data-collection-system.aspx.

[26] Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) (icao.int)

[27] All EU Member States are ICAO members

[28] For alternative fuels, the relative reduction should be based on CO2, CORSIA methodology calculates carbon dioxide equivalent (CO2e) emissions: of CO2, CH4 and N2O

[29] https://www.iata.org/

have also established standards for the aviation sector that prescribe in more detail how emissions need to be reported per passenger and per tonne of freight[30].

Given this fragmented methodological landscape, there have been various efforts by both the European Commission and industry towards a harmonised methodological framework. Between 2011 and 2019, two consecutive EU-funded projects, the FP7 - Carbon Footprint of Freight Transport (COFRET)[31] and H2020 – Logistics Emissions Accounting & Reduction Network (LEARN)[32], addressed the calculation, reporting and verification of GHG emissions from transport services, with the aim to develop a global method. These efforts led to the development of the GLEC framework (mentioned above) and initiated a coordinated action towards establishing a comprehensive and tailor-made standard at the level of International Organization for Standardization (ISO)[33]. This new standard, referred to as **ISO 14083**[34] was published in March 2023 and adopted by CEN in April as EN ISO 14083:2023[35]. It builds *inter alia* on the CEN EN 16258[36] and GHG Protocol.

1.4. Synergies with other EU policy instruments

As a cross-modal, horizontal initiative, CountEmissions EU accounts for synergies and complementarities with other regulatory EU actions regarding emissions reduction frameworks, fuel and emissions standards, enhanced transparency for users and stronger consumer rights. These relationships concern in principle the use of input data and emissions accounting methods, as well as the requirements related to the unambiguous communication on GHG emissions of transport services.

In this regard, there are important interlinkages with regulatory actions regarding the collection of information on emissions and environmental reporting. Under the **EU MRV** framework[37] maritime vessels above 5,000 GT sailing to and from EU ports have to monitor, verify and report annually their CO_2 emissions based on the fuel burned during the performance of their activities[38]. In aviation, the **Emissions Trading System of the European Union (EU ETS)**[39] requires airlines to calculate CO_2 emissions per flight in a comparable way as established by CORSIA, and to submit an emissions report for each year. While EU MRV and EU ETS serve different objectives and do not lead to accounting emissions of specific services[40], they may be

---

[30] https://www.iata.org/en/programs/environment/
[31] https://cordis.europa.eu/project/id/265879
[32] https://learnproject.net/
[33] https://www.iso.org/home.html
[34] A transport specific method on the quantification and reporting of greenhouse gas emissions arising from transport chain operations. https://www.iso.org/standard/78864.html
[35] Greenhouse gases - Quantification and reporting of greenhouse gas emissions arising from transport chain operations (ISO 14083:2023)
[36] EN ISO 14083 superseded CEN EN 16258 based on specific arrangements between CEN and ISO. EN ISO 14083 is the version of the standard that is referred in respective policy measures and options in the remaining of this document
[37] Regulation (EU) 2015/757
[38] The data monitored and reported for the EU MRV Regulation are intended to be used for other upcoming initiatives, like the possible inclusion of maritime shipping in the EU ETS or FuelEU Maritime.
[39] Directive 2003/87/EC
[40] For instance the differences relate to the methodological boundaries applied and the allocation of emissions to transport service level. Both terms in the context of emissions accounting are explained in Annex 8.

seen as complementary to CountEmissions EU, especially as regards the collection of the actual energy consumption data. The consistency of the input data for quantifying GHG emissions is also addressed in the context of the emerging EU initiatives on the uptake of renewable low carbon fuels. To this effect, CountEmissions EU includes a thorough reflection of the **Fit-for-55 package**[41], with particular reference to the Commission's proposals for the revised **Renewable Energy Directive (RED II)**[42], and the new initiatives **FuelEU Maritime**[43] and **ReFuelEU Aviation**[44], the latter consisting *inter alia* of provisions for **a dedicated environmental label for flights**[45]. The revised RED II and FuelEU Maritime specifically, will offer sets of default values[46] for emissions generated during the lifecycle of fuels ("Well-to-Wheel" emissions)[47]. All these aspects would be of high relevance for the uniform implementation of CountEmissions EU on the European market. This implementation will also take account of other legislative frameworks, such as **CO_2 performance standards for new heavy-duty vehicles**[48] **and light duty vehicles**[49], as well as a planned EU action on the **access to in-vehicle generated data**[50]. Possible synergies may be related for instance to the collection of actual fuel consumption data, and to default values on the CO_2 emissions per vehicle kilometre in road transport[51].

On the other hand, information on GHG emissions calculated and collected when applying CountEmissions EU, may be used for the purpose of corporate reporting, such as in the context of **Corporate Sustainability Reporting Directive (CSRD)**[52]. The CSRD and CountEmissions EU are consistent in their approach, both aiming at CO2 equivalent emissions of Scope 1 (direct emissions), Scope 2 (indirect emissions from the generation of purchased or acquired electricity, steam, heat, or cooling consumed by the undertaking), and Scope 3 (indirect emissions that occur in the value chain of the reporting company)[53]. While these frameworks differ in terms of the subject and level of precision (the CSRD refers to the emissions at the level of an entire company and CountEmissions EU covers emissions from door-to-door transport operations), information generated by CountEmissions EU may contribute to sustainability reports of companies thus facilitating the implementation of the CSRD. However, it should be noted that the vast majority of entities targeted by CountEmissions EU (i.e. SMEs and micro-companies) would not be affected by the CSRD requirements addressing

[41] https://ec.europa.eu/commission/presscorner/detail/en/IP_21_3541
[42] COM(2021) 557 final
[43] COM(2021) 562 final
[44] COM(2021) 561 final
[45] The development of an environmental label for aviation is based on Action 35 of the SSMS. The label may consist of different elements, including a flight emissions assessment.
[46] Derived by using pre-determined factors based on estimates.
[47] This makes the difference with the approach applied in the EU MRV, IMO DCS, CORSIA and EU ETS, which address solely activity based emissions ("Tank-To-Wheel"). The fuel/energy lifecycle covering both activity-based emissions and those generated at the production and distribution of fuels is referred to as "Well-To-Wheel".
[48] Regulation (EU) 2019/1242
[49] Regulation (EU) 2019/631
[50] https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13180-Access-to-vehicle-data-functions-and-resources_en
[51] It has to be noted however, that these initiatives address only activity-based emissions ("Tank-to-Wheel") and do not cover those generated upstream ("Well-to-Wheel").
[52] Directive 2014/95/EU
[53] Addressed in the GHG Protocol

rather large European companies, as well as companies listed on regulated markets, except listed micro-enterprises.

As regards the efficient information flow in logistics chains, **Regulation (EU) 2020/1056 on electronic freight transport information (eFTI)**[54] relates to the exchange of regulatory information on transport of goods by road, rail, air and inland waterways in the electronic form. It will allow operators to prove compliance to a wide range of both European and national reporting formalities applicable to the transport of goods. By establishing a fully decentralised but harmonised and trusted data sharing network, eFTI is expected to support sharing of GHG emissions data between various entities and individual users, thus supporting the implementation of this initiative.

CountEmissions EU also seeks complementarities with the **Circular Economy Action Plan (CEAP)**[55] and, under its umbrella, with specific initiatives aiming at the provision of adequate information to consumers. In particular, it interlinks with the **Product Environmental Footprint (PEF)**[56] as regards methodological requirements for quantifying emissions. PEF was originally developed in the context of **Single Market for Green Products Initiative**[57], and provides a horizontal and cross sectoral method for the measurement of the environmental performance of a good or service throughout its full life cycle (LCA). However, the general PEF framework does not specifically address transport services and its implementation for benchmarking purposes would still require the definition of specific Product Category Rules[58]. An analysis of PEF in the context of CountEmissions EU is presented in Annex 8.

Synergies were also identified with **Directive 2005/29/EC concerning unfair business-to-consumer commercial practices in the internal market** that applies to misleading environmental claims, and subsequently, the proposal for a **Directive on empowering consumers for the green transition** (amending Directive 2005/29/EC) that sets out a number of specific requirements on environmental claims and prohibits communicating generic environmental claims which are not based on recognised environmental performance relevant to the claim[59]. These synergies concern in principle the need for better and reliable information on sustainability aspects of services, including the protection of consumers against information that is not true or presented in a confusing or misleading way, in order to give the inaccurate impression that a service is more environmentally sound. CountEmissions EU would regulate specific aspects of environmental claims through the provision of a harmonised, commonly applicable framework, ensuring accurate and comparable emissions data to be made available to consumers by any relevant entity accounting emissions of transport services.

---

[54] Regulation (EU) 2020/1056 of the European Parliament and of the Council of 15 July 2020 on electronic freight transport information; OJ L 249

[55] COM(2020) 98 final

[56] Commission Recommendation (EU) 2021/2279. Full life cycle emissions "From cradle to grave", include the emissions of vehicle production, maintenance and disposal, and infrastructure as far as relevant. https://ec.europa.eu/environment/eussd/smgp/

[57] EUR-Lex - 52013DC0196 - EN - EUR-Lex (europa.eu)

[58] Currently, PEF Category Rules are not available for transport services. It should be noted that specific Category Rules would need to be still elaborated for a broad range of products and services across all the economic sectors of the EU.

[59] COM/2022/143

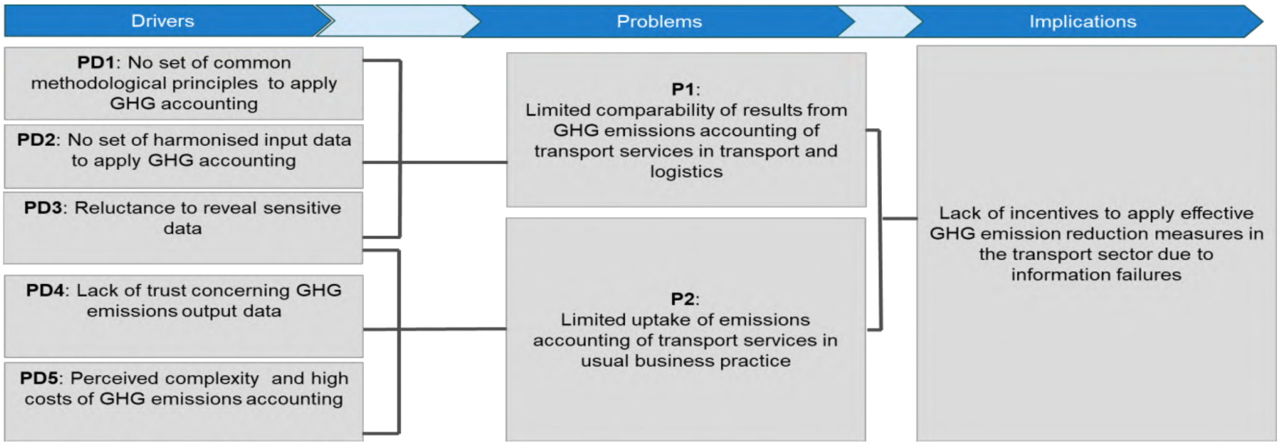
The Commission's proposal for **Directive on substantiation and communication of explicit environmental claims** (Green Claims Directive)[60] is conceived as lex specialis to Directive 2005/29/EC. Green Claims Directive addresses the lack of trust in the credibility of environmental claims and the proliferation of misleading commercial practices related to the environmental sustainability of products. This Regulation is complementary to the provisions related to explicit environmental claims, specifically where assessing and communicating GHG impacts of transport services.

Finally, interactions with the **Car Labelling Directive**[61] and **Tyre Labelling Regulation**[62], dealing with the provision of information to transport users regarding fuel economy, efficiency and emissions, were also investigated. However, these initiatives focus rather on data related to the type of a vehicle or tyre, and not on those associated with emissions of transport services, thus being less relevant for CountEmissions EU.

2. PROBLEM DEFINITION

The underlying problems, problem drivers and implications that are relevant for CountEmissions EU are presented in Figure 1: Problem tree**Error! Reference source not found.**.

Figure 1: Problem tree



1.1 What are the problems?

Problem 1 – Limited comparability of results from GHG emissions accounting of transport services in transport and logistics

Accurate and reliable figures are seen as a prerequisite to effectively manage emissions and to use emissions data for specific areas of application, such as setting and monitoring emissions targets, or benchmarking the environmental performance of services from different transport operators. However, as indicated above, currently no universally accepted framework for the

---

[60] COM/2023/166 final
[61] Directive 1999/94/EC
[62] Regulation (EU) 2020/740

GHG emissions accounting in transport exists. To quantify emissions, transport stakeholders can choose from a basket of different standards, methodologies, calculation tools and numerous emissions default values databases and datasets.

This situation leads in many cases to a very high variance of results that compromise the comparability of emission figures in the market[63]. It also bears the risk of selecting an emissions calculation method and default data based on what is more beneficial for an individual entity. This results in the provision of misleading information on the performance of a transport service, thus creating conditions for greenwashing and turning up in wrong incentives for a user. The problem may be further aggravated by the reluctance of companies to disclose detailed GHG emissions data quantified from their transport operations, as this driver may contribute to the existence of an incomplete and inconsistent transport emissions data environment.

As a consequence, environmental claims related to transport services cannot, in particular in a multimodal context, be compared in a fair and meaningful way by either businesses or consumers. GHG emissions figures that are not accurate, do not allow to make informed choices and may cause market distortions because of potential competitive advantages for those entities that do not use a proper calculation method, or formulate untruthful or unsubstantiated claims.

The issue is generally recognised and has materialised in several attempts by industry or national governments[64] to produce a standard framework. However, none of these efforts has led to the harmonisation of the GHG emissions accounting methods and uniform treatment of data at the entire EU level.

The lack of reliable and comparable information on GHG emissions of transport services is seen as a relevant problem also by the consulted stakeholders. It was in principle confirmed by the results of the Open Public Consultation (OPC), with 136 out of 169, or 80% respondents recognising the prevalence of this problem and considering it significant or very significant. Similar views were recorded while analysing the feedback to the Call for Evidence, the targeted stakeholders' survey ('targeted survey') as well as during the discussions at the stakeholders' workshop[65].

Problem 2 – Limited uptake of emissions accounting of transport services in usual business practice

Despite growing interest of transport stakeholders in GHG transport performance data[66], the overall uptake of GHG emissions accounting of transport services is still very limited. In most cases, transport service users do not obtain accurate information on the performance of

---

[63] Auvinen, H. et al., 2014. Calculating emissions along supply chains - Towards the global methodological harmonisation. Research in Transportation Business & Management. Binnenvaartemissielabel, 2022.

[64] Such as Article L. 1431-3 of the French Transport Code or GLEC framework mentioned in section 1.3

[65] Organised on 27 October 2022

[66] Desk research and targeted interviews highlighted that the main motivations were to raise environmental awareness and meet emissions reduction targets, as sales argument or as a decision-making support tool. Source: Ecorys and CE Delft (2023), Impact assessment support study

transport services, and transport service organisers do not calculate their emissions. What is more, most of transport service organisers that do so, make calculations rather at a company or vehicle level, and are not able to generate data on the emissions of transport services[67], while only the latter type of information is relevant to support and influence decisions of users. In this context, it is estimated that almost 600,000 entities in the EU transport ecosystem measure their emissions (2020), but only about 22,000 of these do it at such disaggregated level that enables to produce GHG emissions data of transport services. This represents only 1.2% of the overall population of the entities performing transport operations on their own (amounting to approximately 1.8 million)[68].

It should be also acknowledged that the capability of companies to calculate and report GHG emissions does not spread equally across the EU. According to a 2021 analysis undertaken for road freight carriers, this capability is significantly higher in countries implementing specific green freight programs, such as the Netherlands, France and Austria. France, applying Article L. 1431-3 of the French Transport Code[69], is a particularly good example showing that a targeted legislation may lead to considerable results, despite lax enforcement[70].

There are several drivers behind this problem, including the perceived complexity and high costs of GHG emissions accounting, the lack of trust regarding the emissions figures that are shared on the market, and the reluctance of transport service organisers to reveal sensitive operational data. This problem is particularly relevant for small and medium sized enterprises (SME)[71], offering transport services on the EU market[72]. Given that road freight transport represents the largest population of SME carriers[73], this segment is particularly affected[74].

The problem of the limited uptake of emissions accounting in usual business practice was also highlighted in the stakeholders' consultation. In the OPC 45 out of 56 organisations (80%); 61 out of 70 individuals (87%); and 60 out of 65 online customers (92%) stated they are not given enough information when planning/organising a journey, shipment or choosing the delivery of their package. In addition, 26 out of 31 (84%) respondents to the targeted survey estimated current levels of uptake as low or very low. Looking from the emissions accounting

---

[67] In order to generate accurate data on the GHG performance of a transport service (especially in the multimodal transport chain) it is necessary to account emissions of each individual transport chain element (leg). This level of calculation requires specific data and is more complex and costly from the perspective of an individual organisation. See more in Annex 8

[68] Ecorys and CE Delft (2023), Impact assessment support study

[69] See Annex 8 and Annex 11 for more detail

[70] Tölke, M. and McKinnon, A. (2021), Decarbonizing the operations of small and medium-sized road carriers in Europe. An analysis of their perspectives, motives, and challenges, Smart Freight Centre, Kühne Logistics University.

[71] Small and Medium Enterprises (SMEs) are companies with a staff headcount lower than 250 and turnover equal or lower than EUR 50 million (either a balance sheet total equal or lower than EUR 43 million), according to EU Recommendation 2003/361.

[72] Tölke, M. and McKinnon, A. (2021), Op.cit.

[73] Source: Eurostat (SBS_SC_1B_SE_R2)

[74] A 2021 survey among 811 carriers from 32 European countries, showed that only around 10% of carriers with fewer than 10 vehicles are able to calculate and report emissions at a customer level (compared to 25% carriers in total), Tölke, M. and McKinnon, A. (2021), Op. cit. Another survey among 252 road carriers demonstrated that only about 23% of respondents in total are able to calculate transport related emissions. Source: Transporeon (2022), Decarbonizing Freight 2022. Where shippers and carriers stand on the road to net zero.

perspective, the targeted survey showed that although 78% of the respondents (29 out of 37) already measure in some form their emissions, only 35% of those who measure (9 out of 26) do it at transport service level. However, this finding may not be fully representative for all entities concerned, and, as outlined above, the actual number of companies calculating transport services emissions appears to be significantly lower. Altogether, various consultation activities demonstrated that emissions accounting in transport and logistics is still very limited in uptake, completeness, frequency and precision. Feedback to another question of the same targeted survey revealed that most respondents (30 out of 31) would adopt a harmonised emissions measurement framework if established at the EU level.

1.2 What are the problem drivers?

Problem Driver 1: No set of common methodological principles to apply GHG emissions accounting

As already shown in section 1.3, there exists a highly fragmented environment of methods available for accounting emissions of transport activities. Some of them function as self-standing initiatives to be applied by any interested party, other form part of specific policies, reporting schemes and green incentive programmes that oblige or promote measurement and calculation of emissions among the respective stakeholders' groups. Also, several methods feature in the various calculation tools[75] that are offered to market players to facilitate and simplify emissions accounting. Table 1 provides an overview of methods identified as the most relevant for the transport sector.

Table 1: Overview of the main methods for GHG emissions accounting in the transport sector

Standard/methodology	Transport modes/segments	
GHG protocol	All modes	Passengers & freight
EN 16258	All modes	Passengers & freight
ISO 14083	All modes	Passengers & freight
PEF	All modes	Passengers & freight
French transport code (Article L. 1431-3)	All modes	Passengers & freight
Parcel Delivery Environmental Footprint[76]	All modes	Parcel
GLEC	All modes	Freight
SmartWay	All modes	Freight
Topsector	All modes	Freight
Clean Cargo Working Group	Maritime	Freight
EU MRV	Maritime	Freight
IMO DCS	Maritime	Freight
CORSIA	Aviation	Passengers & freight
ICAO/IATA RP1678	Aviation	Freight
IATA	Aviation	Passengers
EU ETS aviation	Aviation	Passengers & freight

Source: Ecorys and CE Delft (2023), Impact assessment support study

[75] Such as BigMile, Carbon Care, Carbon Visibility/Transporeon, EcoPassenger, EcoTransit, Eurocontrol small emitters tool, GHG Protocol Calculation tool for transport, GreenRouter, LogEC, NTM calc, Reff tool, Seaexplorer, Sncf, TK'Blue, TRACKS.

[76] https://single-market-economy.ec.europa.eu/sectors/postal-services_en

These methods have been, or are being developed, by various bodies, including standardisation organisations[77], public authorities[78] and industry associations[79], based on specific principles, objectives and perspectives, in many cases entailing very specific governance structures[80]. Some of these cover only individual segments or modes of transport; others enable to quantify emissions across the entire transport chain.

The methods differ in terms of principles and approaches. These differences concern a number of design elements, including the scope (such as type of emissions covered[81], activity boundaries[82], intended users[83], perspective[84]), the method of emissions calculation (granularity of output[85], metrics[86]) or allocation of emissions to transport services[87], thus resulting eventually in highly inconsistent and non-comparable GHG emissions data that is available on the market. A detailed analysis of these specific methodological principles and approaches in relation to the identified methods is provided in Annex 8.

The responses to the OPC acknowledged that the proliferation of standards and methodologies poses a serious challenge for the comparability of emissions data. 90% of respondents (157 of 174 respondents) indicated the problem with fragmented emissions calculation methods in the transport sector to be at least significant, and 69% (113 out of 163) stated that this situation affects their private or professional activities. This problem driver was reported as important also in the other consultation activities.

Problem Driver 2: No set of harmonised input data to apply emissions accounting

The lack of harmonised input data is another key driver contributing to the limited comparability of results from GHG emissions accounting in transport and logistics (problem 1). Depending on the method chosen[88], different types of input data are required or used to quantify emissions from transport activities. The types of data required or used are presented in Box 1.

---

[77] E.g. CEN EN 16258

[78] E.g. French Transport Code

[79] E.g. IATA RP1678

[80] E.g. Topsector

[81] E.g. CO_2 emissions, non-CO_2 emissions originating from combustion of fuel, non-CO_2 emissions originating from refrigeration, global warming effect of emission of non-CO_2 products at high altitudes, global warming effect of black carbon emissions, etc.

[82] Tank-to-Wheel, Well-to-Wheel, full lifecycle.

[83] Transport service providers, transport users.

[84] Ex post, ex ante.

[85] Total GHG emissions of a transport operator, GHG emissions of a transport service user or organiser, transport service level (passenger, freight type, mode), transport chain element/leg, single vehicle, individual trip, total GHG emissions of a hub operator, GHG emissions per activity at hub.

[86] E.g. emissions per tonne-km or passenger-km.

[87] Company level, transport leg level, transport chain element, trip level - journey specific.

[88] Some methods prescribe only activity based emissions (primary information and/or emission intensity factors), e.g. MRV, CORSIA; other cover the energy lifecycle emissions (activity based emissions and energy emission factors), e.g. ISO 14083, CEN 16258; and other reflect emissions generated during the full lifecycle of products, such as PEF.

Box 1. Type of data

Primary data (actual data) recorded at source by continuous monitoring and measuring actual fuel/energy consumption. This may also include transport performance data (e.g. origin, destination, number of persons / volume of freight transported).

Secondary data include default values from literature or modelled data.

The following default values are most relevant in the context of CountEmissions EU: (1) GHG emission intensity factors (default values for GHG emission intensity), used to derive estimates of GHG emissions related to fuel combustion based on transport performance data. These factors are often expressed in grams of GHG emissions per vehicle kilometre, grams of GHG emissions per tonne-kilometre or grams of GHG emissions per passenger-kilometre; (2) GHG energy emission factors (GHG emission factors), used to derive estimates of GHG emissions based on the amount of energy/fuel used. These factors are often expressed in grams of GHG emissions per litre/kWh or grams of GHG emissions per MJ; and (3) other emission factors applied by methods that incorporate emissions stemming from the production and scrapping of vehicles, or infrastructure use.

Modelled data are data established by use of a model that takes into account primary data and/or GHG emission-relevant parameters of a transport operation or hub operation. The model may be provided for instance through a commercial calculation tool offered on the market

The majority of methods listed in Table 1 and in Annex 8 prioritise the use of primary data reflecting the actual fuel/energy consumed while performing operations. Nonetheless, this type of information is not always available to businesses[89], and in this case default values need to be applied. On the other hand, using default values, or even modelled data, bears the risk that the calculation outcomes do not reflect all the relevant aspects of a transport service. To limit this risk, default values should be based on trustful, scientifically proven and accurate datasets, and the GHG emission-relevant parameters of modelled data should result in best possible representation of actual GHG emissions of a transport service.

Currently available databases of default values are scattered across the entire transport sector, and this concerns especially those covering the emission intensity factors[90]. The emission databases often have a national scope, reflecting emission intensity factors in gram per vehicle-kilometre, passenger-kilometre or tonne-kilometre. There are important differences between countries, for instance regarding the share of transport modes used (e.g. road, rail, aviation, waterborne), the composition of the vehicle fleet, energy mix, etc. What is more, a number of specific datasets are also embedded in specific calculation tools offered on the market as a support for emissions accounting, thus further contributing to the proliferation of the default values environment[91].

---

[89] For example, Stevens et al., 2018, Towards an adequate methodology for GHG emissions accounting in logistics, TU Delft, found that one of the main challenges of applying GHG emissions accounting for transport at Heineken is obtaining accurate (primary) data.
[90] For instance ADEME, DBEIS/DEFRA, GLEC, STREAM.
[91] It should be noted that approaches used by these tools differ widely. Some of them focus on calculating emissions based on default data, while other tools aim to support users in their GHG emissions accounting by automating calculations based on primary data and allocating the emissions to specific transport services.

As a result, transport service organisers (and other entities calculating emissions from transport services) face considerable challenges to access credible sources of input data for the quantification of their GHG emissions, in particular for cross-border transport activities. As the available datasets, especially in case of emission intensity factors, vary in terms of their specification level (also because of different models used to calculate the values), this leads to substantial divergences in the GHG emissions data, even when calculated using the same method[92].

This problem driver was signalled by several stakeholders during the targeted survey and especially the workshop as a key barrier hampering the comparability of the GHG emissions data in the transport chain. Also, 24 of the 31 (77%) respondents to the targeted survey considered it relevant or highly relevant (addressing it together with the driver related to the proliferation of methodological principles).

Problem Driver 3: Reluctance to reveal sensitive operational data

GHG emissions accounting may be perceived to imply sharing commercially sensitive data. Primary data in particular, may reveal the amount of fuel or energy consumed that is related to the assignments of specific customers, and therefore emissions can be reversely converted into the cost of operation. Especially in the freight transport sector, this is seen as a factor negatively affecting the negotiating power of transport operators vis-à-vis users, or creating competition issues amongst operators themselves.

As a result, transport operators very often are reluctant to share actual emissions data, even though the attempts to reverse-engineer costs are often complex and expensive. This situation occurs in particular when the data of competitors show better performance, or if the operator considers that competitors may use different (more beneficial from their viewpoint) methods to compute the data, or eventually when a user is able to estimate the actual cost of the service. The latter is mostly related to the issue of splitting incentives between transport operators and users, stemming from contractual agreements and reflecting for instance the division of responsibility for the fuel costs that has an impact on the final price of the service.

This reluctance is a driver behind the limited availability of the GHG emissions data, and overall low uptake of emissions accounting on the market. If operators refuse to share data on their actual emissions, transport users have to use modelling data or default values to complete their GHG emissions calculations. Consequently, these calculations reflect less accurately the actual emissions associated with the transport services, thus hindering the quality and comparability of these data.

In the OPC, this problem driver was generally regarded as more important by stakeholders operating in the freight and logistics segments, and especially by those working with complex supply chains. In the targeted survey, 19 out of 31 (61%) respondents indicated that this problem driver is either highly relevant or relevant. Although both large and small organisations are reported to be unwilling to share operational data, operators and users interviewed in the targeted consultation pointed out that particularly SMEs are hesitant in this

[92] Based on the experimentation in the EU LEARN project.

respect, since they have less market power and hence, they perceive disclosing information on their emissions as a higher risk.

Problem Driver 4: Lack of trust concerning GHG emissions output data

The trust in the relevance of GHG emissions output data is strongly correlated with their reliability and accuracy. This trust may be compromised if there is no confidence on how the emissions figures are calculated and what type of input data are used. The lack of trust therefore limits the demand for the emissions data from transport service users, and results in disincentives for transport service organisers (especially operators) to make the calculations.

There are several reasons behind this situation. Some of them are associated with the proliferation of GHG methods and the very fragmented landscape of default emissions values, discussed above. Others are linked to the fact that transport service providers make unconscious errors in their measurements and calculations of emissions, or intentionally underreport their GHG emissions to improve their own competitive position on the market[93]. For instance, the latter may take the form of "values shopping". If emissions accounted from primary data are higher than those resulting from the use of specific default values, there is a strong incentive on the part of the reporting organisation to use secondary data, at the expense of their accuracy and reliability. These causes are closely related to the issue of unsubstantiated environmental claims and greenwashing and are further exacerbated by the absence of a common data verification system that would guarantee the uniform application of accounting processes and the reliability of the GHG emission calculation across transport modes and segments. On the other hand however, additional costs and burden associated with the verification activities may further discourage certain stakeholders from accounting and sharing emissions data.

According to the stakeholders consulted, the lack of trust concerning GHG emissions output data is a reason for less demand for such output data and hence lower uptake of GHG emissions accounting. In particular, the lack of a credible and harmonised verification mechanism for the output shared or published has been raised as an issue by many stakeholders during the workshop. In the OPC, 145 out of 175 respondents acknowledged that the access to reliable and accurate GHG emissions data is very important or important.

Problem Driver 5: Perceived complexity and high costs of GHG emissions accounting

The uptake of GHG emissions accounting, especially by transport operators, is also hampered by the perceived complexity and high associated costs, especially related to the operation of specific computation processes, and sharing of GHG emissions output data in the transport networks.

The GHG emissions computation processes require the combination and matching of various data sets, which may be stored in different systems and parts of an organisation[94]. Particularly

---

[93] Dobers, K. et al. (2019), Challenges to standardizing emissions calculation of logistics hubs as basis for decarbonizing transport chains on a global scale, Transportation Research Record 2673, no. 9 (2019): 502-513.

[94] For instance, fuel use data, which are often stored by the financial administration of an operator (as it is what transport operators buy), need to be matched with transport activity data, which are stored elsewhere (as it is

in case of fragmented or incomplete data, the use of different sources, inside or outside of an organisation, proves to be challenging. This situation is further aggravated by the proliferation of methods and defaults values datasets, and by the limited availability of transport activity data that is required for quantifying emissions related to actual operations[95]. The perceived complexity and costs associated with the computation processes concern in particular small transport operators that very often are confused by the fragmented methodological environment, do not have the capacity and resources to collect primary data, to allocate it to specific operations/shipments/passengers and to perform the calculation of their emissions. Subsequently, a large number of SMEs, and especially microenterprises are reported as not being able to account their emissions, or not even having emission accounting capabilities[96]. SMEs also experience specific knowledge gaps[97], while for larger companies, data collection and data quality/completeness are the most challenging issues. In addition, as already shown above, a number of businesses that eventually decide to calculate emissions are unable to perform these activities at the service (leg) level.

Furthermore, there are also significant costs perceived with processing and sharing of GHG emissions output data between transport service organisers and transport service users. In freight transport, for instance, a large shipper may work with a wide range of carriers undertaking operations in specific parts of the supply chain, including cross-border. Collection of GHG output data therefore means dealing with different subcontractors that quantify emissions in different forms, based on different underlying methodologies, assumptions and default values[98]. Large carriers face a mirror problem, as they frequently need to report to an uncountable number of customers, who may have their own requirements for reporting. In addition, in the passenger transport segment, the collection of information on emissions output data from operators can be hampered by the fact that in many cases contracts with public authorities, or other responsible bodies, are long term and the requirements to provide information on emissions output data had not always been reflected in the past negotiations.

20 out of 31, or 64% of the stakeholders that replied to the targeted survey, consider this problem driver relevant or highly relevant. Respondents to the OPC also ranked this driver among the most relevant ones when asked about reasons of not measuring emissions by

---

related to customer orders) or they may be even in the possession of a shipper who has a better view on these data. Source: Dobers, K. et al. (2019), Challenges to standardizing emissions calculation of logistics hubs as basis for decarbonizing transport chains on a global scale, Transportation Research Record 2673, no. 9 (2019): 502-513.

[95] For instance, because the exact mass of a shipment is not recorded or available routing information is not detailed enough (e.g. missing data on the actual route followed by the vehicle). Ehrler, V.C. et al. (2018), Standardisation of transport chain emission calculation - status quo and what is needed next, Proceedings of 7th Transport Research Arena TRA 2018

[96] For instance, according to the survey of Smart Freight Centre and Kühne Logistics University, reported above, around 60% of the operators with fewer than 10 vehicles claim to have no emission measurement capabilities at all. Source: Tölke, M. and McKinnon, A. (2021), Op.cit.

[97] For instance, test cases carried out in the LEARN (Choumert & Smit, 2019) show that a common mistake made by small road carriers was in the computation of transport activity. All small road carriers that took part in the test cases computed transport activity by multiplying the sum of kilometres driven by the sum of weight of all shipments transported instead of summing up all shipments multiplied by the shipment-specific distances.

[98] Sources: Connekt (2021), Carbon Added Accounting - Background and principles of the CCA framework; Logistics Innovation (2021), Carbon accounting in freight transportation after the publication of EN 16258; Stevens, H. et al. (2018), Towards an adequate methodology for GHG emissions accounting in logistics - A case study at Heineken, TU DELFT

transport service providers. These findings were also broadly confirmed in the context of the targeted interviews and workshop.

1.3 Interlinkages between the problem drivers

Different characteristics and hierarchy of the problem drivers

The identified problem drivers may be categorised as either of a more technical (PD1 and PD2) or behavioural type (PD4 and PD5). This typology was reflected in the construction of the problem tree, where PD1 and PD2 represent main drivers behind the technical Problem 1, and PD4 and PD5 are linked to more behavioural Problem 2. PD3 is mainly associated with the behavioural Problem 2, however it may have some implications (i.e. the use of imprecise default values instead of primary data) on Problem 1 as well.

Based on the results of various stakeholders' consultation activities (summarised in Annex 2) PD1, PD2 and PD4 are considered as having the highest weight. These drivers were addressed with key policy measures structured around the methodological framework, input data and conformity (see Section 5.2 and Annex 7).

Synergies and trade-offs between the problem drivers

PD1 and PD2 featured very prominently in the debate with stakeholders. Because of the impact that the choice of the common reference method will have on other choices, i.e. the input data that needs to be used, PD1 and PD2 are inherently interlinked. For instance, a different set of default values would be necessary for using well-to-wheel (WTW) and full life cycle assessment (LCA) methodologies, respectively. Therefore, it is not possible to fully disentangle how to deal with input data from the choice of a method. The two drivers are therefore "feeding" each other while the quality of the output of the calculations will be substantially based on the quality of the input data, and the solidity and acceptability of the method. However, the relationship between PD1 and PD2 is rather nuanced and therefore these drivers were separated on clear request of the stakeholders. This is because the use of different methodologies and different sets of input data leads to higher variance of GHG emissions calculation results, but significant inconsistencies may also be observed when using the same methodology and different type of input data. PD1 and PD2 also show some trade-offs with PD4 and PD5, as presented below.

PD3 needs to be considered in conjunction with PD4 concerning the lack of trust, and PD5 related to the complexity and high costs of emissions calculation. Concerning its link with PD4, there is important trade-off between the two – the less operational data is used in the emissions calculation, the less reliable the results of the calculation would be available for the final data recipients.

As far as PD4 is concerned, apart from the synergies with PD3, interlinkages with PD1 and PD2 may also be observed, especially where the lack of trust in GHG emissions data is driven by the proliferation of GHG calculation methods and the very fragmented landscape of default emissions values. In addition, trade-offs with PD5 may be identified, especially related to the situation, where, from the one hand, a dedicated GHG data verification system would increase trust in the emissions figures shared on the market, but additional costs and burden associated with the verification activities may discourage transport organisers and operators from accounting and sharing emissions data, from the other.

Eventually, PD5 demonstrates synergies with PD1 and PD2, since the complexity and high costs of GHG emissions accounting may be associated with the proliferation of methods and default values datasets. It is also related to the limited availability of transport activity data, required for quantifying emissions from actual operations, which also establishes a relevant link to PD3.

1.4 Affected stakeholders

The problems and problem drivers discussed above affect various stakeholders operating in the transport sector, and the magnitude of the impact on each stakeholders' group depends on their role in the transport chain. The main stakeholders' groups identified in the context of the initiative are:

- Transport service organisers (or transport service providers) that include transport operators, transport intermediaries (e.g. travel agencies, freight forwarders) and operators of freight and passengers hubs (e.g. terminals, logistics platforms, ports, airports);
- Transport service users that include passengers, customers, public authorities, manufacturers/shippers, wholesalers, retailers, transport service intermediaries and data intermediaries[99].

The way how the problems affect these specific groups of stakeholders and their motivation to measure, report or base their decision on GHG emissions accounting, is presented in Table 2.

Table 2: Stakeholders affected by the identified problems

Problems	Stakeholders' groups affected
P1: limited comparability of results from GHG emissions accounting of transport services in transport and logistics	- Transport service organisers providing transport services (especially operators), as the lack of a common methodology and harmonised data (1) creates market distortions because of potential competitive advantages for those entities that do not use a proper calculation method, (2) results in uncertainty as regards the choice of a calculation method and datasets, that may also in certain cases translate in higher complexity (and hence costs) of calculating emissions data of their services. - Transport service users, as this problem does not allow for a fair comparison of GHG emission figures of different transport services, thus preventing users from making informed transport decisions. For large transport intermediaries (such as freight forwarders) and shippers that aggregate transport emissions data from various sources, the limited comparability of GHG emission figures from carriers heavily complicates the calculation of emissions from their activities. - Impacts related to the reluctance of sharing operational data differ widely between transport users (that require more transparency about transport

[99] A data intermediary may be perceived as a specific category of a user that collects information on a transport services from transport organisers and operators and discloses it further on the market.

	services) and transport organisers (that are reluctant to share operational data), thus being far less significant for the latter category.
P2: Limited uptake of emissions accounting of transport services in usual business practice	- Transport service users, as accurate emission figures per transport service are not available on a wide scale, preventing them from making informed transport decisions. Similarly as above, for large transport intermediaries (such as freight forwarders) and shippers that aggregate transport emissions data from various sources, the lack of GHG emission figures from carriers heavily complicates the calculation of emissions from their activities. - Transport service organisers (especially operators), as due to the lack of data (1) they cannot effectively benchmark their services against other similar ones, which may result in inadequate business decisions and additional costs, (2) they may find themselves in disadvantage when competing with enterprises being able to deliver accurate and reliable information on emissions to the users. - Similarly as in the case of Problem 1, transport operators may not be interested in disclosing operational data, therefore this issue affects mostly transport service users that are recipients of information on GHG emissions.

1.5 How likely is the problem to persist?

Problem 1: Limited comparability of results from GHG emissions accounting of transport services in transport and logistics

Despite recent harmonisation efforts towards a common GHG emissions accounting approach for transport services, the problem of limited comparability of GHG emissions output data is likely to persist without EU level action. As regards the method used, the ISO standard 14083 may represent a step towards establishing a common set of rules and emissions calculation principles. Full harmonisation between the various methods and calculation tools is however not possible, particularly because of the voluntary nature of this standard. This phenomenon can be evidenced through the experience with the existing CEN standard EN 16258, which eventually has not led itself to the harmonisation of the emissions accounting processes at EU level[100].

As explained in section 2.2, the issue of harmonised input data is equally important to ensure the comparability of the GHG emissions calculation outputs. According to the interviewed

[100] EN 16258 provided general principles, definitions, system boundaries, calculation methods and allocation rules to harmonise the quantification of energy consumption and GHG emissions of transport services. The standard was, however, affected by some shortcomings preventing from the uniform implementation of GHG emissions accounting on the market. In addition, other parallel methods stayed in use by transport sector stakeholders, preventing from the comparability of various GHG emissions data. Finally, the stakeholders' consultation showed that market players usually prefer a global approach instead of a European one, especially to be able to capture also emissions from the services performed beyond the EU network. See more details in Annex 8.

stakeholders, some increase in the use of primary data is expected over time. The primary data improves the accuracy of the calculations and therefore makes it possible to use the emissions data for operational optimisation purposes. However, this progress is expected to happen mainly within large companies, often having more resources and knowledge at their disposal. Smaller transport companies usually lack such capabilities, and in addition, are highly reluctant to share operational data. Therefore, their calculations are likely to continue to be mostly based on default emission intensity factors, the quality of which may also improve, for instance with respect to the development of specific metering and monitoring systems offered by third parties[101]. Nonetheless, in the absence of harmonised databases and datasets, differences in the quality of these intensity emission factors are likely to persist in the future.

Concerning the energy emission factors, specific initiatives such as the Commission's proposal for the revision of the Renewable Energy Directive and the proposed FuelEU Maritime Regulation, if adopted by co-legislators, may contribute to better reliability and accuracy of the available emissions input data. However, since the energy emission factors represent only one part of the calculation inputs, these are not likely to allow for a uniform approach for accounting emissions from the entire energy lifecycle perspective.

Finally, when speaking about the full lifecycle assessment approach, relevant emission factors may be only developed in case a dedicated LCA method is launched and widely used in the transport sector.

Problem 2: Limited uptake of emissions accounting of transport services in usual business practice

Without an EU level action, the uptake of GHG emissions accounting in the transport sector is likely to increase only at a limited extent. This process will be mostly driven by:

- the development and implementation of public policies that require data on GHG emissions from transport and logistics activities, like the Corporate Sustainable Reporting Directive, or the French Transport Code at the national level;
- growing environmental awareness, leading to higher demand and supply of sustainable products and services;
- the need to support decision-making or improve investor and consumer relations;
- the development of specific implementation guidelines, calculation tools, secure data sharing platforms, or sectorial standards (such as those existing in the chemical industry and emerging in the postal delivery sector).

Therefore, the factors identified above will not ensure the common application of emission accounting at the level of transport services and will not guarantee uniform procedures and processes across segments and modes, thus compromising the trust in quality of emissions output data generated by transport service providers. This situation will persist in the absence of a common verification system that otherwise would provide for the increased reliability of various GHG emissions outputs, and the correctness of the underlying quantification processes.

[101] These systems for instance may include telematics, data analytics, modelling and Artificial Intelligence (AI) to generate and transmit data to the back-office of fleet managers.

In addition, there will be no means to fully alleviate the problem driver related to the reluctance of operators to share operational information on their emissions. As explained in section 2.2, this issue affects in particular SMEs in business-to-business relations, and cannot be solved without ensuring the trust and security when sharing emissions data.

As regards the perceived complexity and costs related to quantification of emissions, this driver may be addressed to a certain extent by the emergence of specific calculation tools and implementation guidelines. However, in the absence of a common methodological framework, it is not expected to change significantly the situation on the market.

1.6 Foresight

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"[102] is relevant for both the problem related to the comparability of GHG emissions data and that related to the limited uptake of emissions accounting, especially as regards to the increasing need in the future for a harmonised approach to quantify transport services emissions. According to the 2022 Strategic Foresight Report[103], 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 and mobility sector. Another megatrend that is relevant for the evolution of the problems is "continuing urbanisation". Together with the growing demand for better connections to and between urban centres, this calls also for more sustainable modal choices. This has been duly taken into account in the analysis presented in the following sections.

3. WHY SHOULD THE EU ACT?

1.7 Legal basis

The legal basis giving the EU the right to act are Article 91(1) and Article 100(2) of the Treaty on the Functioning of the European Union (TFEU). In accordance with Article 4(2) of the Treaty, shared competence between the EU and the Member States applies in the area of transport.

1.8 Subsidiarity: Necessity of EU action

Under the principle of subsidiarity, in areas which do not fall within its exclusive competence, the Union shall act only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States. Since transport is not an exclusive Union competence pursuant to Article 4(g) TFEU, the subsidiarity principle applies. By providing harmonised rules for GHG emissions accounting at the transport service level, CountEmissions EU is particularly relevant for operations in the cross-border transport sector between EU

---

[102] https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en
[103] COM(2022) 289 final.

Member States. This level of harmonisation, related to the methodological choices and input data, cannot be effectively achieved across the EU by action of individual Member States[104].

1.9 Subsidiarity: Added value of EU action

Overall, the EU transport sector has a strong cross-border dimension, playing an important role for the free flow of people and goods on the EU internal market. Efficient transport services are key to meet the demand of transport users, support the growth of the EU economy and preserve lifestyle of the citizens. At the same time, attention should be drawn to challenges related to environmental impacts from transport, still growing mostly due to the increase of freight and passenger traffic on the European network[105].

CountEmissions EU is therefore conceived as an enabler for the transport community to facilitate green transition. The initiative will contribute to creating the level playing field for GHG emissions accounting between all segments and modes of transport, and across the national networks. By providing for better transparency on the performance of transport services, and supporting the use of GHG emissions data to make specific transport choices, it will lead to creating incentives for more sustainable solutions and innovation. Any national approaches would be highly counterproductive for achieving these objectives, bearing significant risk of conflicting requirements and inconsistent methodologies and data. These divergent national approaches would add costs and create unnecessary burden to businesses operating between different Member States.

4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

1.10 General objectives

In view of the problems described in section 2, the general objective of CountEmissions EU is **to incentivise behavioural change among businesses and customers to reduce GHG emissions from transport services through the uptake and use of comparable and reliable GHG emissions data**. To this end, the initiative will provide a harmonised regulatory framework for GHG emissions accounting, and specific rules stimulating its use across the entire transport chain.

In this context, and as already indicated above, CountEmissions EU will contribute towards SDG 13 ("Take urgent action to combat climate change and its impacts"), SDG 7 ("Ensure access to affordable, reliable, sustainable and modern energy for all") and SDG 12 ("Ensure sustainable consumption and production patterns").

---

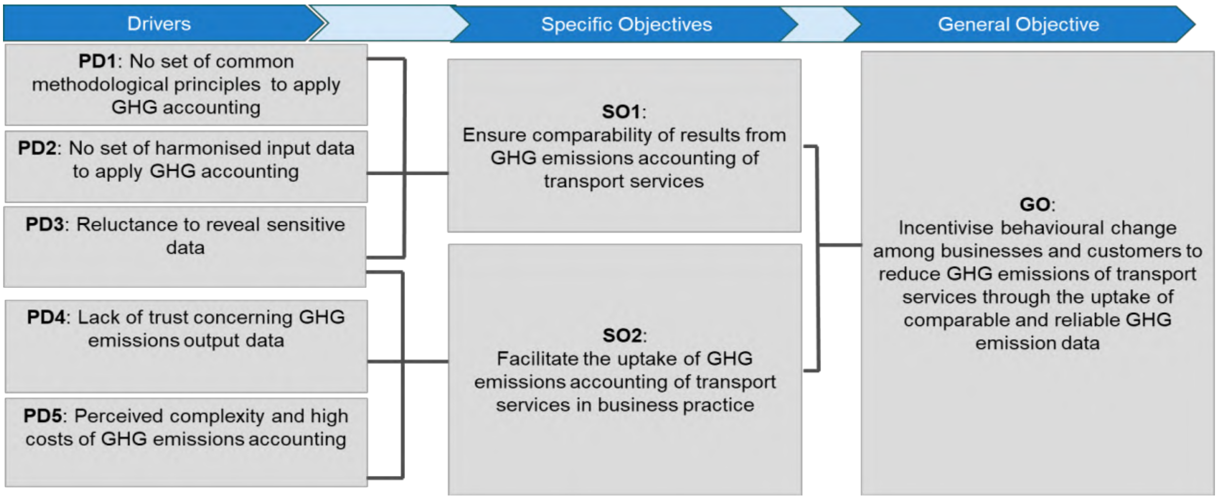
[104] So far only France has established a dedicated harmonised methodological framework, including measures to incentivise its uptake. No plans for other similar national initiatives have been identified. However, in case further Member States follow, this is expected to lead to very diverse calculations and/or reporting requirements for transport operators and users, with additional costs and administrative burden for industries operating across borders. Actions at national level may also lower the general effectiveness of emissions accounting, as GHG emissions output data from transport operations carried out in different countries would not be comparable, with a significant risk of creating confusion for users, and providing different, or even negative incentives for operators.

[105] Statistical pocketbook 2022 (europa.eu)

1.11 Specific objectives

This initiative is designed to effectively address the existing barriers hindering the harmonisation of the GHG emissions accounting and its uptake. The specific objectives (SOs) and their interlinkages with the problem drivers are presented in Figure 2.

Figure 2: Interlinkages between the specific objectives and the problem drivers



SO1: Ensure the comparability of results from GHG emissions accounting of transport services. This objective aims at the provision of a common reference methodology and a harmonised set of input data for accounting emissions from transport services, as well as addressing the issue of the sensitivity of emissions data.

SO2: Facilitate the uptake of GHG emissions accounting of transport services in business practice. This objectives aims to provide a harmonised approach for implementing the common reference methodology and supporting its use across all transport segments and modes. Together with SO1 it addresses the issue of the sensitivity of emissions data.

5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

1.12 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[106]. 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[107]. 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[108] and the initiatives of the RePowerEU package proposed by the Commission on 18 May 2022[109]. In terms of GHG

[106] EU Reference Scenario 2020 (europa.eu)
[107] https://energy.ec.europa.eu/data-and-analysis/energy-modelling/eu-reference-scenario-2020_en
[108] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en
[109] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131

emissions accounting, the Baseline scenario assumes no further EU level intervention beyond the current initiatives in place at national level and enterprise level. More details on the baseline are provided in Annex 4.

The baseline also incorporates foresight megatrends[110] and developments captured in the 2022 Strategic Foresight Report[111]. 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 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. 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). High speed rail activity, in particular, would grow by 68% by 2030 relative to 2015 (165% by 2050), missing however to deliver on the milestone of the SSMS of doubling its traffic by 2030 and tripling it by 2050. Freight rail traffic would increase by 42% by 2030 relative to 2015 (91% for 2015-2050) also not delivering on the milestone of the SSMS of increasing the traffic by 50% by 2030 and doubling it by 2050[112]. Well-to-wheel GHG emissions from transport including international aviation and maritime, are projected to be 26% lower by 2030 compared to 2015, and 89% lower by 2050. 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).

Regarding the uptake of GHG emissions accounting of transport services, due account was taken of the results of the stakeholders’ consultation and the experience derived from other initiatives aimed to harmonise the quantification and reporting of emissions in transport. As explained in section 2.5, in the absence of a regulatory framework, and despite the publication

---

110 https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en#explore

111 COM(2022) 289 final.

112 It should be noted that the scenarios underpinning the impact assessment accompanying the 2030 Climate Target Plan and the staff working document accompanying the Sustainable and Smart Mobility Strategy, as well as the impact assessments accompanying the ‘Fit for 55’ initiatives and the staff working document accompanying the REPowerEU package, took into account a broader range of policies (including this initiative as well as the initiatives on rail capacity, weights and dimensions for heavy duty vehicles and combined transport) 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. These initiatives (in particular the rail capacity initiative) are contributing towards the achievement of the milestones set in the context of the Sustainable and Smart Mobility Strategy. To define a meaningful baseline scenario for the initiatives part of the Greening transport package, these initiatives were not considered in the baseline scenario. This is the reason why the milestones of the Sustainable and Smart Mobility Strategy in terms of rail traffic growth are not assumed to be met in the baseline. If considering the milestones of the Sustainable and Smart Mobility Strategy in terms of rail traffic growth to be achieved in the baseline, the benefits of the policy options in terms of reduction in external costs of GHG emissions and air pollution emissions, as well as the avoided use of fuel, would be somewhat lower.

of ISO standard 14083, this uptake is likely to increase only at a limited extent since market forces alone will not be able to secure the uniform application of GHG accounting practices across the transport sector, and to guarantee the reliability, accuracy and comparability of GHG emissions data of different transport services shared by transport organisers. This assumption can be illustrated with the example of CEN EN 16258 standard, which has not led to the uniform GHG emissions accounting system for transport services.

The number of enterprises in the transport sector and other sectors performing transport on own account is estimated at 1.8 million in 2020 and is projected to remain stable over time. The large majority (99.7%) are micro, small and medium enterprises. The number of enterprises performing GHG emissions accounting at service level (i.e. for individual services delivered by an operator) is estimated at 21,660 in 2020, of which 21,342 SMEs. Their number is projected to increase over time to 39,380 by 2030 (38,693 SMEs and 687 large companies) and 69,599 by 2050 (68,279 SMEs and 1,320 large companies), driven by initiatives at national level and enterprise level. However, their share in the total number of enterprises in the transport sector and other sectors performing transport on own account is projected to remain limited by 2050 (2.2% in 2030 and 3.9% in 2050, relative to 1.2% in 2020). The number of large companies measuring GHG emissions at service level is projected to grow at higher pace relative to SMEs. The total costs incurred by the enterprises that measure GHG emissions from transport at service level are projected to increase from EUR 36.4 million in 2020 (EUR 34.1 million for SMEs and EUR 2.2 million for large companies) to EUR 61.4 million in 2030 (EUR 56.9 million for SMEs and EUR 4.6 million for large companies) and EUR 92.7 million in 2050 (EUR 85.1 million for SMEs and EUR 7.6 million for large companies). The largest share of the costs is associated to SMEs.

The baseline scenario reflects the projected higher energy prices driven by the Russian invasion of Ukraine[113]. 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, given large uncertainty with respect to its impacts, in particular for the medium to long term. However, the Russian invasion of Ukraine is not expected to have an impact on the number of companies performing GHG emissions accounting at service level, relevant for this initiative.

1.13 Description of the policy measures and policy options

As a first step, a comprehensive list of possible policy measures was established after extensive consultations with stakeholders (surveys, meetings, stakeholder workshop), independent research in the context of the impact assessment support study and the Commission's own analysis. This list was subsequently screened based on the likely effectiveness, efficiency and proportionality of the proposed measures in relation to the given objectives, as well as their legal, political and technical feasibility.

Discarded policy measures

A number of possible policy measures considered during the impact assessment process were discarded, either because the identified problem driver was not validated by the stakeholders,

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

the problem was not susceptible to a solution by means of EU intervention, or proposing an action to address the issue at EU level would not yield additional value. The full list of discarded policy measures and the reasons for discarding them is included in Annex 6.

Examples of policy measures discarded on the basis of stakeholders' contribution and desk research performed in the context of this impact assessment are:

- the development of a completely new reference methodology for accounting emissions – this measure was evaluated as neither realistic nor proportionate, given the very low stakeholders' support, and the time and resources to be invested in its development;
- the mandatory use of primary data as input for the GHG emissions calculations – it was found that such data is not yet widely available for certain types of transport operators (especially for SMEs and micro companies), and such requirement would thus impose disproportionate burden and costs on them;
- the certification of sectorial implementation guidelines – it was considered too complex, costly and bringing limited value added for achieving the objectives of the initiative, compared to other measures that were eventually retained.

Retained policy measures and policy options

The retained policy measures (see details in Annex 7) have been structured around the following areas of action:

- **Methodological framework** – to determine a common reference method ensuring that the quantification of emissions for transport services is performed in a standardised way across the entire transport sector. An additional assessment was performed to shortlist the methodologies that are the most relevant for the policy options (see Annex 7);
- **Input data and sources** – to provide a harmonised approach for the input data, by incentivising the use of primary information, increasing the reliability, accessibility and adequacy of default values, and mitigating variations between national, regional and sectorial datasets;
- **Applicability** – to determine the relevant type of policy instrument (ranging from mandatory to voluntary) to effectively apply CountEmissions EU on the EU market;
- **Harmonised emissions output data and transparency** – to determine appropriate formats and metrics for generating and sharing the GHG emissions data, as well as to provide for common rules on the communication and transparency of the emissions accounting results;
- **Sectorial implementation support** – to provide for harmonised implementation of CountEmissions EU in various transport segments;
- **Conformity** – to ensure a common, proportionate and reliable verification system for the GHG emissions data generated from specific transport services, and for the underlying calculation processes;
- **Complementary measures** – to cover aspects related to the development and use of technical support measures.

The impact assessment considers six policy options, combining retained policy measures based on the areas of action discussed above. Table 3 Table 3 presents the interlinkages between the retained policy measures, policy options, the specific policy objectives and problem drivers.

Table 3: Overview of specific objectives, problem drivers, measures and policy options

Specific objectiv e	Problem driver	Policy measure	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6

Specific objective	Problem driver	Policy measure	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
SO1	PD1	PM1: ISO 14083 is set as common reference methodology at EU level		√		√		√
		PM2: Product Environmental Footprint Category Rules for GHG emissions in transport, including rules for transport services, is set as common reference methodology at EU level					√	
		PM3: A common reference methodology is set at EU level, based on ISO 14083 but with additional elements and increased accuracy	√		√			
	PD2 PD3	PM4: The use of primary data is recognised and centralised databases for default values for GHG emission intensity and GHG energy emission factors are established at EU level (by European Environment Agency). Modelled data is used in conformity with the reference methodology.	√	√			√	
		PM5: The use of primary data is incentivised and centralised databases for default values for GHG emission intensity and GHG energy emission factors are established at EU level. Quality assurance of external databases operated by third parties is provided at EU level (by European Environment Agency). Modelled data is used in conformity with the reference methodology.			√	√		√
SO1, SO2	PD1 PD3 PD4	PM6: Minimum requirements for harmonised GHG output data metrics are provided at EU level, together with common rules on communication and transparency	√	√	√	√	√	√
	PD3 PD4 PD5	PM7: Horizontal guidelines for the harmonised implementation of CountEmissions EU in various sectors and segments of the transport market are provided at EU level	√	√	√	√	√	√
SO2	PD4	PM8: Mandatory process and data verification for all entities falling under the scope of CountEmissions EU is established at EU level	√					
		PM9: Mandatory process and data verification for entities above a certain size falling under the scope of CountEmissions EU is established at EU level			√	√	√	√
		PM10: Voluntary process and data verification for all entities are established at EU level		√				
	PD5	PM11: Emissions calculation tools are provided at EU level (by the European Commission)	√	√				
		PM12: Emissions calculation tools are provided by the market but they are certified at EU level			√	√	√	√
		PM13: Mandatory application of CountEmissions EU in the transport sector	√					√
		PM14: Binding opt-in application of CountEmissions EU in the transport sector			√	√	√	
		PM15: Voluntary opt-in application of CountEmissions EU in the transport sector with a label		√				

Policy option 1

Policy option 1 (PO1) envisages the highest level of centralisation and harmonisation for accounting GHG emissions from transport services and boosting its uptake on the market.

To address Specific Objective 1 (*Ensure comparability of results from GHG emissions accounting of transport services*), PO1 includes a comprehensive reference methodology based on ISO 14083 but with certain additional specifications and elements increasing accuracy and comparability of the results[114] (PM3), and also measures related to the input and output emissions data. As regards the input data, PO1 recommends the use of primary data and recognises entities that apply this type of information in their emissions accounting processes (PM4). In case this type of information is not available for an economic operator, PO1 allows the use of default values derived from a common database of the emission intensity factors established at the central EU level (by the European Environment Agency). This database is complemented by a separate database of the energy emission factors enabling to calculate GHG emissions in the energy lifecycle (Well-to-Wheel) perspective. Insofar the emissions output data is concerned, PO1 will mandate their formats and metrics, to ensure the alignment in the measurement units[115], and it will establish common rules on the communication and transparency for any environmental claims related to GHG emissions of transport services based on CountEmissions EU (PM6) - a measure that is included in all policy options.

As regards Specific Objective 2 (*Facilitate the uptake of the GHG emissions accounting of transport services for businesses and customers*), PO1 will mandate the verification of the adherence to CountEmissions EU, for GHG emissions data generated by transport service providers, and the accounting processes applied for the quantification of emissions (PM8), to address the lack of trust in GHG emissions outputs. Furthermore, a dedicated GHG emissions calculation tool will be provided at the central EU level (by the European Commission), to facilitate the use of the common methodology on the market (PM11). To ensure high uptake and harmonisation of GHG emissions accounting, PO1 will require the mandatory application by all entities organising and providing transport services, with CountEmissions EU as the only applicable framework. After a transition period ending in 2035, all companies involved in the organisation and provision of transport services should account GHG emissions (PM13).

Finally, PO1 includes the provision of horizontal guidelines for the implementation of the common accounting framework across various segments and sectors of the transport market (PM7) that addresses both Specific Objectives 1 and 2 - a measure that is included in all policy options.

Policy option 2

Policy option 2 (PO2) proposes an equally high level of centralisation as PO1, but with a methodology based on a global standard, less stringent conformity requirements and voluntary application by the transport service providers.

With respect to Specific Objective 1 (*Ensure comparability of results from GHG emissions accounting of transport services*), PO2 includes ISO standard 14083 as a common reference

[114] For details see Annex 8.
[115] For instance, to determine how the data shall be presented and communicated to any party in the transport chain.

methodology for quantifying GHG emissions from transport services (PM1). Regarding issues related to the harmonisation of input and output data, PO2 follows the same approach as in PO1 (including respectively PM4 and PM6).

For Specific Objective 2 (*Facilitate the uptake of the GHG emissions accounting of transport services for businesses and customers*), PO2, contrary to PO1, proposes a voluntary verification of the adherence to CountEmissions EU in terms of the emissions data and underlying calculation processes (PM10). Concerning GHG emissions calculation tools, similarly to PO1 they will be provided centrally at EU level by the European Commission (PM11). PO2 will leave the application of CountEmissions EU as a voluntary choice. The use of other frameworks is also possible, but the transport service providers choosing to adhere to the common framework are offered a CountEmissions EU label (PM15).

As in PO1, PO2 also includes the provision of horizontal guidelines for the implementation of the common accounting framework across various segments and sectors of the transport market (PM7) that addresses both Specific Objectives 1 and 2.

Policy option 3

Policy option 3 (PO3), includes measures with a lower level of centralisation and reduced requirements for harmonisation and applicability, but it is based on a comprehensive accounting methodology.

With regard to Specific Objective 1 (*Ensure comparability of results from GHG emissions accounting of transport services*) PO3 includes the same comprehensive methodology as proposed under PO1 (PM3), but with a less centralised approach for the treatment of emissions input data (PM5). Specifically, PM5 recommends the use of primary data and recognises those entities that apply it while quantifying emissions; it also proposes common EU databases for emission intensity factors and energy emissions factors. However, unlike PM4, this measure allows the use of additional national, regional or sectorial datasets, subject to a specific quality assurance process. This set of measures is complemented by PM6 that harmonises the GHG output data formats and metrics at EU level - also included in PO1 and PO2.

Regarding Specific Objective 2 (*Facilitate the uptake of the GHG emissions accounting of transport services for businesses and customers*), PO3 will mandate the verification of the adherence to CountEmissions EU, for both emissions data and underlying calculation processes, to entities above a certain size, i.e. large organisations (PM9). Unlike PO1 and PO2, PO3 will allow the use of external calculation tools developed both by industry and public authorities[116], under the condition that these are certified as conforming to CountEmissions EU (PM12). Eventually, PO3 envisages the application of CountEmissions EU as “binding opt-in”, imposing the requirement to use the common framework whenever entities providing and/or organising transport services choose or are mandated by other means[117] to share, publish, report or make claims on GHG emissions related to the performed transport services (PM14).

---

[116] Developed and offered for the use by wider public by enterprises, industrial associations, public authorities and other relevant bodies

[117] For instance, by other EU or national legislation or through contractual relations.

As in PO1 and PO2, PO3 also includes the provision of horizontal guidelines for the implementation of the common accounting framework across various segments and sectors of the transport market (PM7) that addresses both Specific Objectives 1 and 2.

Policy option 4

Policy option 4 (PO4), proposes a similar approach as envisaged under PO3, however with a methodology based exclusively on a global standard, offering the opportunity for the global outreach. Therefore, with respect to Specific Objective 1 (*Ensure comparability of results from GHG emissions accounting of transport services*), PO4 includes a direct reference to ISO standard 14083 as a common methodology for accounting emissions (PM1), instead of PM3 included in PO3. All other measures are the same as in PO3, including those addressing Specific Objective 2 (*Facilitate the uptake of the GHG emissions accounting of transport services for businesses and customers*).

Policy option 5

Policy option 5 (PO5), similarly to PO3 and PO4, envisages a balanced level of centralisation and harmonisation. The only differences concern Specific Objective 1 (*Ensure comparability of results from GHG emissions accounting of transport services*), where PO1 includes the Product Environmental Footprint Category Rules for GHG emissions in transport, as the common reference methodology (PM2), and establishes centralised databases of default values (PM4). All other policy measures, including those addressing Specific Objective 2 (*Facilitate the uptake of the GHG emissions accounting of transport services for businesses and customers*) replicate the approach taken in PO3 and PO4 (i.e. PM6, PM7, PM9, PM12 and PM14).

Policy option 6

Policy option 6 (PO6), is based on a similar set of policy measures as PO4, with one exception related to the applicability in the context of Specific Objective 2 (*Facilitate the uptake of the GHG emissions accounting of transport services for businesses and customers*). Consequently, instead of the binding opt-in approach envisaged under PM14, PO6 includes PM13, requiring the mandatory use of CountEmissions EU framework in the transport sector.

6. WHAT ARE THE IMPACTS OF THE POLICY OPTIONS?

This section summarises the main expected economic, social and environmental impacts of each policy option[118] (PO). The proposed measures are assumed to be implemented from 2025 onwards, so 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.

Further details on the methodological approach are provided in Annex 4.

[118] The analysis in this section is based on the Ecorys and CE Delft (2023), Impact assessment support study, and on the analysis of stakeholders' feedback.

1.14 Economic impacts

This section provides the economic impacts of the policy options on national public authorities, the European Environment Agency (EEA), the European Commission, and businesses and business associations involved in the accounting of GHG emissions from transport services. It also provides an assessment of impacts on SMEs, on consumers, on the functioning of the internal market and competition, and on competitiveness. The assessment of economic impacts draws on multiple data sources, including the targeted stakeholders' consultation (interviews and survey) and OPC, and findings from desk research in the context of the impact assessment support study.

6.1.1 Impacts on national public authorities

Adjustment costs for national public authorities. All six policy options entail adjustments costs for national statistical offices dealing with transport emissions statistics, driven by the minimum requirements for harmonised GHG output data formats and metrics at EU level (PM6). The workload needed for adapting to the harmonised GHG output data format is estimated at 120 hours per statistical office. The average cost per hour is estimated at EUR 40.9[119] in 2022 prices for ISCO 2 category (Professionals) and is assumed to remain constant over time in real prices. Thus, the total one-off adjustment costs at EU level in 2025 are estimated at EUR 132,504 relative to the baseline (in 2022 prices) for all policy options.

Administrative costs for national public authorities. All six policy options entail administrative costs for accreditation of verifiers by National Accreditation Bodies (NABs), in view of performing data verification. The accreditation of verifiers by NABs is part of:

- PM8 (mandatory process and data verification for all entities falling under the scope of CountEmissions EU at EU level) included in PO1,
- PM9 (mandatory process and data verification for entities above a certain size falling under the scope of CountEmissions EU at EU level) included in PO3, PO4, PO5 and PO6, and
- PM10 (voluntary process and data verification for all entities at EU level) included in PO2.

The workload per NAB for the accreditation of verifiers is estimated at 120 hours in 2025 and is the same for all options. Thus, the total one-off administrative costs at EU level in 2025 are estimated at EUR 132,504 relative to the baseline (in 2022 prices) for all policy options.

6.1.2 Impacts on the European Environment Agency (EEA)

Adjustment costs for EEA. All policy options establish centralised databases for default input values (i.e. emissions intensity factors and energy/fuel emissions factors) at EU level (PM4 in PO1, PO2 and PO5, and PM5 in PO3, PO4 and PO6). The centralised EU databases will be developed and maintained by the European Environment Agency (EEA). In addition, PM5 (included in PO3, PO4 and PO6) allows for the use of data from databases operated by third parties, following quality assurance check by EEA.

---

[119] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour

For developing the databases (PM4 in PO1, PO2 and PO5), 1 full time equivalent (FTE) is estimated to be needed by EEA in 2025, 2026 and 2027, in addition to EUR 200,000 for infrastructure costs[120]. The one-off adjustment costs associated to the development of the databases are thus estimated at EUR 693,149. In addition, one FTE and operational costs for maintenance would be required for maintaining and updating the databases from 2026 onwards. The recurrent adjustment costs for EEA in PO1, PO2 and PO5 are estimated at EUR 186,000 per year from 2026 onwards relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs for PO1, PO2 and PO5 are estimated at EUR 3.5 million of which EUR 0.7 million one-off costs (in 2022 prices).

As explained above, PM5 (included in PO3, PO4 and PO6) covers the costs for developing the databases plus the quality assurance check by EEA. For the quality assurance check of external databases, the workload is estimated at 15 hours per database. The quality check is assumed to be performed for the first time in 2026 for 24 databases and would take place every two years. Thus, the recurrent adjustment costs for the quality assurance check are estimated at EUR 35,791 per year (occurring every two years from 2026 onwards). These are identified as operational costs for EEA.[121] The total adjustment costs for developing the databases plus the quality assurance check by EEA in PO3, PO4 and PO6 are estimated at EUR 693,149 one-off costs in 2025-2027 and EUR 221,791 recurrent costs in 2030 and 2050 relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs in PO3, PO4 and PO6 are estimated at EUR 3.9 million relative to the baseline of which EUR 0.7 million one-off costs (in 2022 prices).

6.1.3 Impacts on the European Commission

Adjustment costs for the European Commission. The definition of Category Rules (PEFCRs) for transport of the Product Environmental Footprint methodology (PM2) in PO5 will be done via a research project. The budget to be dedicated to develop the PEFCRs for transport is estimated at EUR 1.5 million per PEFCR. Based on previous work done in the context of ESPR[122] and aviation label, for covering all transport services, at least 4 PEFCRs are needed (road, maritime and inland waterways, aviation, rail). However, the work on aviation has already started and part of these costs (50%) are included in the baseline. Thus, the one-off adjustment costs for the European Commission in 2025 for PO5 are estimated at EUR 5.25 million relative to the baseline (in 2022 prices).

The development of the additional requirements for the methodology based on ISO 14083 but with additional elements and increased accuracy (PM3) in PO1 and PO3 will be also done via a research project. The budget to be dedicated to this work is estimated at EUR 2.4 million for 2025 (one-off costs) relative to the baseline (in 2022 prices).

Furthermore, PO1 and PO2 will lead to additional costs for the European Commission linked to the development of calculation tools following the common reference methodology (PM11). Based on the cost of THETIS-MRV[123] and experience with existing THETIS-EU modules, such IT-developments are estimated at EUR 300,000 (one-off costs in 2025).

---

[120] Source: EEA
[121] Source: EEA
[122] COM(2022) 142 final
[123] https://mrv.emsa.europa.eu/

Thus, the total one-off adjustment costs for the European Commission in 2025 are estimated at EUR 2.7 million in PO1, EUR 0.3 million in PO2, EUR 2.4 million in PO3 and EUR 5.25 million in PO5.

6.1.4 Impact on businesses and business associations involved in transport services

Adjustment costs for businesses and business associations. All policy options result in recurrent and one-off adjustment costs for businesses and business associations. While under PO2, PO3, PO4 and PO5 the application of CountEmissions EU in the transport sector is voluntary or quasi voluntary (i.e. voluntary opt-in with a label in PO2 and binding opt-in in PO3, PO4 and PO5), PO1 and PO6 foresee the mandatory application. Thus, the total (one-off and recurrent) adjustment costs in PO1 and PO6 are significantly higher than in all other policy options. For PO1, they are estimated at EUR 0.5 billion in 2025, EUR 3.9 billion in 2030 and EUR 6.4 billion in 2050 relative to the baseline, and for PO6 at EUR 0.3 billion in 2025, EUR 2 billion in 2030 and EUR 3.2 billion in 2050, relative to the baseline. At the same time, PO2 results in the lowest total adjustment costs among the options, estimated at EUR 54.8 million in 2025, EUR 101.3 million in 2030 and EUR 4.7 million in 2050 relative to the baseline, due to the voluntary opt-in foreseen by this option. Table 4 to Table 13 provide the recurrent and one-off adjustment costs by policy option and by policy measure for 2025, 2030 and 2050 relative to the baseline.

The highest share of the costs in all policy options is related to the setting of a common reference methodology at EU level (ISO 14083 in PO2, PO4 and PO6, ISO 14083 with additional elements and increased accuracy in PO1 and PO3 and PEFCR in PO5). Other important cost categories, discussed below, relate to the verification activities and the emissions calculation tools. More detailed explanations on the costs and the assumptions used to derive them, by policy measure and policy option, are provided in Annex 4.

The *setting of the new ISO 14083 methodology as the common reference methodology* (PM1) in PO2, PO4 and PO6 is expected to lead to additional labour costs relative to the baseline for the new businesses performing GHG emissions accounting at service level, but also for the businesses that are already quantifying GHG emissions in the baseline and would need to adjust their processes in line with the new ISO 14083 requirements. The costs of PM1 in PO2, PO4 and PO6 are different because of the voluntary opt-in application with a label of CountEmissions EU in PO2 (in conjunction with PM15), the binding opt-in application in PO4 (in conjunction with PM14) and the mandatory application in PO6 (in conjunction with PM13). For PO2, the one-off adjustment costs for businesses are estimated at EUR 31.8 million in 2025, EUR 56.4 million in 2030 and EUR 2.9 million in 2050 relative to the baseline, while the recurrent annual costs at EUR 15.9 million in 2025, EUR 31.3 million in 2030 and EUR 1.3 million in 2050 (see Table 4 and Table). Expressed as present value over 2025-2050, the total adjustment costs due to PM1 in PO2 are estimated at EUR 0.9 billion relative to the baseline, of which EUR 0.6 billion one-off adjustment costs. For PO4, the one-off adjustment costs for businesses are estimated at EUR 44.8 million in 2025, EUR 73.9 million in 2030 and EUR 16 million by 2050 relative to the baseline, while the recurrent annual costs at EUR 23.6 million in 2025, EUR 41.6 million in 2030 and EUR 9 million in 2050 (see Table 5 and Table 13). Expressed as present value over 2025-2050, the total adjustment costs due to PM1 in PO4 are estimated at EUR 1.4 billion relative to the baseline, of which EUR 0.9 billion one-off adjustment costs. For PO6, the one-off adjustment costs for businesses are estimated at EUR 0.2 billion in 2025, EUR 1.7 billion in 2030 and EUR 2.7 billion by 2050 relative to the baseline, while the recurrent annual costs at EUR 107.3 million in 2025, EUR 835.5 million in 2030 and EUR 1.4

billion in 2050 (see Table 5 and Table 13). Expressed as present value over 2025-2050, the total adjustment costs due to PM1 in PO6 are estimated at EUR 60.5 billion relative to the baseline, of which EUR 40.3 billion one-off adjustment costs. According to stakeholders' feedback, meetings with experts and desk research, the alignment with a global standard provided by ISO 14083 would allow for better comparability and usability by the businesses across the world.

The *setting of the Product Environmental Footprint (PEF) as common reference methodology* (PM2) in PO5 is expected to lead to additional labour costs for those businesses that are already quantifying GHG emissions in the baseline, as they will need to adjust their processes in line with the PEF requirements once the PEFCRs for transport have been developed, but also for the new businesses performing GHG emissions accounting. The one-off adjustment costs for businesses are estimated at EUR 63.1 million in 2025, EUR 94.6 million in 2030 and EUR 14.6 million by 2050 relative to the baseline, while the recurrent annual costs at EUR 29.9 million in 2025, EUR 50 million in 2030 and EUR 6.9 million in 2050 (see Table 5 and Table 13). Expressed as present value over 2025-2050, the total adjustment costs due to PM2 in PO5 are estimated at EUR 1.6 billion relative to the baseline, of which EUR 1.1 billion one-off adjustment costs (in 2022 prices). According to stakeholders' feedback, this measure may not ensure alignment at the global level, which may lead to difficulties for the aviation and the maritime transport sectors that are global in nature. Due to the fact that Category Rules are still to be developed, the costs reported are dependent on the future developments of the methodology.

The *setting of the new ISO 14083 with additional elements and increased accuracy as common reference methodology* (PM3) in PO1 and PO3, is expected to lead to additional labour costs relative to the baseline for the new businesses performing GHG emissions accounting, but also for the businesses that are already quantifying GHG emissions in the baseline and would need to adjust their processes in line with the new ISO 14083 requirements, once the additional elements have been developed. The costs of PM3 in PO1 and PO3 are different because of the mandatory application of CountEmissions EU in PO1 (in conjunction with PM13) and the binding opt-in application in PO3 (in conjunction with PM14). For PO1, the one-off adjustment costs for businesses are estimated at EUR 0.3 billion in 2025, EUR 2.3 billion in 2030 and EUR 3.7 billion in 2050 relative to the baseline, while the recurrent annual costs at EUR 0.1 billion in 2025, EUR 1 billion in 2030 and EUR 1.6 billion in 2050 (see Table 4 and Table). Expressed as present value over 2025-2050, the total adjustment costs due to PM3 in PO1 are estimated at EUR 80.3 billion relative to the baseline, of which EUR 56 billion one-off adjustment costs (in 2022 prices). For PO3, the one-off adjustment costs for businesses are estimated at EUR 43.6 million in 2025, EUR 76.3 million in 2030 and EUR 12 million in 2050 relative to the baseline, while the recurrent annual costs at EUR 18.1 million in 2025, EUR 33.8 million in 2030 and EUR 4.9 million in 2050 (see Table 4 and Table). Expressed as present value over 2025-2050, the total adjustment costs due to PM3 in PO3 are estimated at EUR 1.2 billion relative to the baseline, of which EUR 0.8 billion one-off adjustment costs. According to stakeholders' feedback, meetings with experts and desk research, the stricter requirements and additional elements relative to the global ISO 14083 standard are not likely to be followed at global level, which may lead to some challenges for the aviation and maritime transport sectors that are global in nature. The costs estimates above are also dependent on the additional elements that would still need to be developed.

All six policy options will require the provision of *horizontal guidelines for the harmonised implementation of CountEmissions EU in various sectors and segments of the transport market*

(PM7). The workload required by businesses sector associations to adapt sector processes in line with the guidelines set in the implementing act of CountEmissions EU is estimated at 90 hours per sector association. The average cost per hour is estimated at EUR 40.9[124] in 2022 prices for ISCO 2 category (Professionals). The number of sectors that will need to adapt processes is estimated to be 17, which represents an upper bound estimate (including all relevant NACE categories[125]). Thus, the one-off adjustment costs for business sector associations in 2025 are estimated at EUR 62,571 relative to the baseline (in 2022 prices).

All policy options foresee *process and data verification for businesses* (PM8, PM9 and PM10). The scope however varies between policy options: mandatory for all businesses (PM8) in PO1; mandatory for businesses above a certain size, excluding SMEs (PM9) in PO3, PO4, PO5 and PO6; and voluntary for all businesses (PM10) in PO2. The annual verification is performed by bodies that are accredited by NABs, following specific EU rules. A secondary act will define the accreditation rules and the verification rules for verification bodies. In PO1, the additional number of companies that would undergo verification activities (in conjunction with the mandatory application of CountEmissions EU, due to PM13) is estimated at 134,873 in 2025, 949,093 in 2030 and 1,758,729 in 2050, leading to recurrent adjustment costs of EUR 41.5 million in 2025, EUR 296.2 million in 2030 and EUR 481.9 million in 2050 relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs for PM8 in PO1 are estimated at EUR 7.2 billion relative to the baseline.

For PM9, the costs are different between policy options (between PO3, PO4, PO5 and PO6) because of the different unit cost per company for verification activities, linked to the method for GHG accounting applied (ISO 14083 with additional elements and increased accuracy in PO3, ISO 14083 in PO4 and PO6, and PEFCR in PO5). In PO3, PO4 and PO6, businesses that already perform verification activities in the baseline are expected to be faced with costs savings due to the fact that unit costs per company[126] for verification activities are expected to be lower relative to the baseline. On the other hand, the additional number of companies that perform verification activities (in conjunction with the binding opt-in application of CountEmissions EU, due to PM14 and the mandatory application due to PM13) leads to an overall increase in the recurrent adjustment costs in 2025 and 2030 relative to the baseline (for PO3 estimated at EUR 0.3 million in 2025 and EUR 1.1 million in 2030; for PO4 estimated at EUR 0.1 million in 2025 and EUR 0.9 million in 2030; for PO6 estimated at EUR 5 million in 2025 and EUR 47.6 million in 2030). In 2050, both PO3 and PO4 result in net costs savings relative to the baseline (EUR 1.3 million costs savings in PO3 and EUR 1.8 million in PO4) due to the lower unit cost of verification activities relative to the baseline, while PO6 results in additional adjustment costs for verification activities of EUR 77.4 million in 2050 due to the increased uptake. Expressed as present value over 2025-2050, PM9 results in total adjustment costs estimated at EUR 1 million in PO3, adjustment costs savings of EUR 3.6 million in PO4 and additional adjustment costs of EUR 1.2 billion relative to the baseline in PO6. In PO5, the recurrent

[124] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour

[125] NACE is a four-digit classification providing the framework for collecting and presenting a large range of statistical data according to economic activity in the fields of economic statistics (e.g. production, employment and national accounts) and in other statistical domains developed within the European statistical system (ESS).

[126] The provision of a single standardised set of rules will lead to time savings to support verification activities. The verification is conducted on annual basis on random samplings of quantifications. The verifiers will be provided with specific standardised rules to perform verifications. Source: Ecorys and CE Delft (2023), Impact assessment support study.

adjustment costs are estimated at EUR 7.4 million in 2025, EUR 11.6 million in 2030 and EUR 8.9 million in 2050 relative to the baseline. Expressed as present value over 2025-2050, PM9 results in adjustment costs estimated at EUR 180.3 million in PO5 relative to the baseline. For PM10 (included in PO2)[127], the recurrent adjustment costs are estimated at EUR 3 million in 2025, EUR 5.2 million in 2030 and EUR 2.1 million in 2050 relative to the baseline. Expressed as present value over 2025-2050, PM10 results in adjustment costs of EUR 68.1 million in PO2 relative to the baseline.

Finally, all policy options foresee the *use of calculation tools by businesses*. PM11 (included in PO1 and PO2) will provide businesses with calculation tools developed at EU level (by the European Commission), while PM12 (included in PO3, PO4, PO5 and PO6) foresees that calculation tools are developed by the market but certified according to EU rules that will be defined by a secondary act. The use of these calculation tools will require labour costs for incorporating them into the business practice, and time dedicated to use them. The recurrent adjustment costs relative to the baseline are driven by the unit costs for using the tools, which are dependent on the methodology applied, and the additional number of companies using the tools relative to the baseline. The highest recurrent adjustment costs related to the use of calculation tools are expected in PO1 (EUR 41.2 million in 2025, EUR 312.1 million in 2030 and EUR 505.3 million in 2050), and PO6 (EUR 32.5 million in 2025, EUR 257.7 million in 2030 and EUR 417.3 million in 2050) due to the mandatory application (in conjunction with PM13). The lowest recurrent adjustment costs are expected in PO2 (see Table 4) due to the voluntary opt-in application but also the lower unit costs for using the tools relative to the baseline. Expressed as present value over 2025-2025, the use of calculation tools is estimated to lead to recurrent adjustment costs of EUR 7.6 billion in PO1, EUR 74.5 million in PO2, EUR 167.6 million in PO3, EUR 138.6 million in PO4 (see Table 5) and EUR 470 million in PO5.

Table 4: Recurrent costs for business in the PO1, PO2 and PO3 relative to the baseline scenario (EU27), in million EUR (2022 prices) in 2025, 2030 and 2050

	Difference to the Baseline								
	PO1			PO2			PO3		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Adjustment costs	212.9	1,611.3	2,611.7	22.9	44.9	1.8	25.8	48.7	8.2
PM1 - ISO 14083 set as common reference methodology				15.9	31.3	1.3			
PM2 - PEFCR set as common reference methodology									
PM3 - ISO 14083 with additional elements and increased accuracy set as common reference methodology	130.2	1,003.0	1,624.5				18.1	33.8	4.9
PM8 - Mandatory process and data verification for all entities	41.5	296.2	481.9						
PM9 - Mandatory process and data verification for entities above certain size							0.3	1.1	-1.3

[127] The assumption behind the uptake of verification activities in PO2 is that 100% of the businesses that voluntarily opt-in to CountEmissions EU will perform verification. Verification in PO2 is the condition under which the CountEmissions EU label is awarded. Therefore, it is reasonable to assume that all businesses that invested in the quantification will decide to receive the label assessing their conformity to CountEmissions EU.

	Difference to the Baseline								
	PO1			PO2			PO3		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
PM10 - Voluntary process and data verification for all entities				3.0	5.2	2.1			
PM11 - Emissions calculation tools are provided at EU level	41.2	312.1	505.3	4.0	8.4	-1.6			
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level							7.5	13.7	4.5
Administrative costs	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.03
PM5 - Quality assurance of external databases operated by third parties is provided at the EU level							0.00	0.02	0.02
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level							0.02	0.02	0.02
Total net costs	212.9	1,611.3	2,611.7	22.9	44.9	1.8	25.9	48.7	8.2

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 5: Recurrent costs for business in the PO4, PO5 and PO6 relative to the baseline scenario (EU27), in million EUR (2022 prices) in 2025, 2030 and 2050

	Difference to the Baseline								
	PO4			PO5			PO6		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Adjustment costs	30.4	54.8	8.6	56.6	93.2	37.3	144.9	1,140.9	1,848.2
PM1 - ISO 14083 set as common reference methodology	23.6	41.6	9.0				107.3	835.5	1,353.5
PM2 - PEFCR set as common reference methodology				29.9	50.0	6.9			
PM3 - ISO 14083 with additional elements and increased accuracy set as common reference methodology									
PM8 - Mandatory process and data verification for all entities									
PM9 - Mandatory process and data verification for entities above certain size	0.1	0.9	-1.8	7.4	11.6	8.9	5.0	47.6	77.4
PM10 - Voluntary process and data verification for all entities									
PM11 - Emissions calculation tools are provided at EU level									
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level	6.7	12.3	1.4	19.3	31.6	21.5	32.5	257.7	417.3
Administrative costs	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.03	0.03
PM5 - Quality assurance of external databases operated by third parties is provided at the EU level	0.00	0.02	0.02				0.00	0.02	0.02
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

	Difference to the Baseline								
	PO4			PO5			PO6		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Total net costs	30.4	54.8	8.7	56.6	93.3	37.4	144.9	1,140.9	1,848.2

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 6: One-off costs for business in PO1, PO2 and PO3 relative to the baseline scenario (EU27), in million EUR (2022 prices)

One-off costs	Difference to the Baseline								
	PO1			PO2			PO3		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Adjustment costs									
PM1 - ISO 14083 set as common reference methodology				31.8	56.4	2.9			
PM2 - PEFCR set as common reference methodology									
PM3 - ISO 14083 with additional elements and increased accuracy set as common reference methodology	295.0	2,308.0	3,747.8				43.6	76.3	12.0
PM7 - Guidelines for harmonised implementation	0.06			0.06			0.06		
Total costs	295.1	2,308.0	3,747.8	31.8	56.4	2.9	43.7	76.3	12.0

Source : Ecorys and CE Delft (2023), Impact assessment support study

Table 7: One-off costs for business in PO4, PO5 and PO6 relative to the baseline scenario (EU27), in million EUR (2022 prices)

One-off costs	Difference to the Baseline								
	PO4			PO5			PO6		
	2025	2030	2050	2025	2030	2050			
Adjustment costs									
PM1 - ISO 14083 set as common reference methodology	44.8	73.9	16.0				210.5	1,660.2	2,698.2
PM2 - PEFCR set as common reference methodology				63.1	94.6	14.6			
PM3 - ISO 14083 with additional elements and increased accuracy set as common reference methodology									
PM7 - Guidelines for harmonised implementation	0.06			0.06			0.06		
Total costs	44.8	73.9	16.0	63.2	94.6	14.6	210.5	1,660.2	2,698.2

Source : Ecorys and CE Delft (2023), Impact assessment support study

Total (one-off and recurrent) adjustment costs for businesses, expressed as present value over 2025-2050, are estimated to be the highest in PO1 (EUR 95 billion), followed by PO6 (EUR 67.9 billion) and at large distance by PO5 (EUR 2.3 billion), PO4 (EUR 1.5 billion), PO3 (EUR 1.4 billion) and PO2 (EUR 1.1 billion). As already explained, while under PO2, PO3, PO4 and PO5 the application of CountEmissions EU in the transport sector is voluntary or quasi voluntary (i.e. voluntary opt-in with a label in PO2 and binding opt-in in PO3, PO4 and PO5), PO1 and PO6 foresee the mandatory application and thus lead to significantly higher costs. At the same time, PO2 results in the lowest total adjustment costs among the options, due to the voluntary opt-in foreseen by this option. The highest share of the adjustment costs for each policy option relates to the setting of a common reference methodology at EU level (91% of the total costs in PO4 and 89% in PO6 for ISO 14083, 88% in PO3 for ISO 14083 with additional elements and increased accuracy, 87% in PO2 for ISO 14083, 84% in PO1 for ISO 14083 with additional elements and increased accuracy and 72% in PO5 for PEFCR). The second category of costs in terms of share of the total costs relates to the use of the calculation tools (21% of the total costs in PO5, 12% in PO3, 9% in PO4 and PO6, 8% in PO1 and 7% in PO2). The verification activities account for less than 8% of the costs in all options.

Administrative costs for businesses. PM12 (included in PO3, PO4, PO5 and PO6) foresees that the development of calculation tools following a common reference methodology is left to the market but certified at EU level. A maximum of 34 tools are expected to be certified in addition to the baseline. The cost per tool for submitting for certification, per year, is estimated at EUR 531.65, assuming 13 hours of work per certification at an average cost per hour estimated at EUR 40.9[128] in 2022 prices for ISCO 2 category (Professionals). Thus, the recurrent administrative costs for businesses are estimated at EUR 18,076 from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, the total administrative costs are estimated at EUR 332,840 relative to the baseline.

In addition, in PO3, PO4 and PO6 the possibility of using data from sectorial specific datasets (PM5) recognised through the quality check performed by EEA will create additional administrative costs for the datasets developers willing to use this alternative. The recurrent administrative costs for datasets developers are estimated at EUR 16,686 in 2026 relative to baseline, and every two years up to 2050. Expressed as present value over 2025-2050, the total administrative costs are estimated at EUR 177,452. For the purpose of reporting on the application of the 'one in, one out' approach[129], the annual average number of hours per database for datasets developers to submit the databases has been estimated at 12 hours each year (instead of every two years). The cost per hour is estimated at EUR 40.9 and a number of 17 databases is assumed to be submitted. The cost per database for preparing the submission is thus estimated at EUR 490.76 per database. For the purpose of 'one in, one out' approach, the recurrent administrative costs for datasets developers are estimated at EUR 8,343 per year.

Expressed as present value over 2025-2050, total administrative costs for calculation tool developers are estimated at EUR 0.5 million in PO3, PO4 and PO6, and EUR 0.3 million in PO5.

Energy costs savings. All policy options are expected to incentivise behavioural change, leading to higher use of more sustainable transport options and optimised trips. This is expected to result in energy savings for transport service providers. The energy savings and the reduction in the energy costs for transport service providers for 2025, 2030 and 2050 relative to the baseline are provided in Table 8. In cumulative terms over 2025-2050, the energy savings are estimated to be the highest in PO1 and PO6 (8.9 Mtoe[130]), followed by PO4 (1.9 Mtoe), PO2 (1.2 Mtoe) and PO3 and PO5 (around 0.5 Mtoe). Total energy costs savings for the transport service providers, expressed as present value over 2025-2050 relative to the baseline, are estimated at EUR 10 billion in PO1 and PO6, EUR 2.3

---

[128] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour
[129] https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en
[130] Million of tonnes of oil equivalent.

billion in PO4, EUR 1.5 billion in PO2, EUR 0.7 billion in PO3 and EUR 0.6 billion in PO5[131]. It should however be noted that there is large uncertainty related to these estimates, that depend on behavioural change (for more details, see Annex 4).

Table 8: Energy savings and the reduction in energy costs for transport service providers in the policy options relative to the baseline scenario (EU27)

	2025	2030	2050
Energy savings for transport service providers (ktoe)			
PO1	32.6	259.4	385.7
PO2	46.8	93.9	3.5
PO3	23.6	56.0	1.2
PO4	70.6	123.8	24.0
PO5	21.3	51.5	1.1
PO6	32.6	259.4	385.7
Reduction in the energy costs for transport service providers (in million EUR)			
PO1	52.0	391.4	776.3
PO2	74.6	141.7	7.0
PO3	37.6	84.5	2.4
PO4	112.6	186.9	48.4
PO5	34.0	77.8	2.2
PO6	52.0	391.4	776.3

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: ktoe stands for kilo tonnes of oil equivalent.

Net costs/costs savings for businesses. PO1, PO3 and PO5 are expected to lead to net costs for businesses, estimated at EUR 85.1 billion in PO1, 57.9 billion in PO6, EUR 0.7 billion in PO3 and EUR 1.7 billion in PO5, expressed as present value over 2025-2050 relative to the baseline. On the other hand, PO2 and PO4 are projected to lead to net costs savings of EUR 0.4 billion and EUR 0.8 billion, respectively, relative to the baseline. The beneficiaries of the net savings are enterprises in the transport ecosystem, namely: (i) transport service organisers (TSO), (ii) transport service users (TSU) or hub operators (HO), as detailed in Annex 4.

6.1.5 Impacts on competitiveness

The impact on businesses involved in GHG emissions accounting of transport services is presented in section 6.1.4. This section focuses on the possible impacts on the competitiveness of a wider set of actors in the EU industry cluster, namely the transport sector, manufacturing companies, retailers and fuel suppliers as actors in the European supply chain. These impacts are driven by expected behavioural change, leading to higher use of more sustainable transport

[131] The energy use by policy option is derived based on the transport activity by transport mode corresponding to each option and the projected energy intensity per transport mode from the baseline scenario. The energy intensity is expressed in ton of oil equivalent (toe) per tonne-kilometre and takes into account all energy forms, including green electricity and hydrogen. The energy savings are computed by taking the difference between the energy use in the policy options and the baseline. Finally, projected average fuel costs in EUR per toe for each transport mode from the baseline scenario is used to monetise the energy savings. The average fuel costs takes into account all the energy forms used by transport mode, including green electricity and hydrogen. It needs to be clarified that the baseline scenario of this initiative includes significant reductions in the energy intensity of all modes over time. This is because it reflects the 'Fit for 55' and the REPowerEU packages. Yet, the rail transport shows significantly lower energy intensity per tonne-kilometres than other modes, as also the case today.

solutions and optimised trips. All policy options are expected to lead to indirect benefits for the EU industry cluster at large, resulting from energy costs savings due to increased efficiency of transport operations, helping companies de-risk future carbon prices. Sustainability is becoming an important issue also when influencing the decision of businesses when choosing with whom to work with. The assessment of impacts of the policy options on competitiveness is based on stakeholders' consultation.

Table 9: Impacts on competitiveness

Stakeholder group	PO1	PO2	PO3	PO4	PO5	PO6
Transport sector	Positive	Small positive	Small positive	Positive	Small positive	Positive
Manufacturing	Small positive	No change	No change	Positive	No change	Positive
Retail sector	Small positive	No change	No change	Small positive	No change	Small positive
Fuel suppliers	No change	No change	No change	Positive	Small positive	Positive

A small positive to positive improvement in the competitive position of the transport sector is expected in all policy options, while the impacts on other sectors largely depend on the uptake of GHG emissions accounting at transport service level. In addition, the policy options may also provide incentives for the uptake of zero-emission vehicles and of the renewable and low carbon fuels, strengthening the EU leadership position in sustainable mobility. Positive impacts on innovation (including process innovation) and faster technology uptake by transport service providers and hub operators may also be expected. The wider demand for collecting and sharing transport emissions data may also trigger further efforts by companies towards digital solutions. PO4 is expected to provide overall positive impacts on the competitiveness of the EU market, followed by PO6, PO1, PO5, PO2 and PO3.

6.1.6 Impacts on consumers

All policy options are expected to improve the comparability of GHG emissions data and allow consumers make informed decisions on their trips. This is expected to incentivise behavioural change, leading to higher use of more sustainable transport solutions. As a result, energy costs savings for consumers, expressed as present value over 2025-2050 relative to the baseline, are estimated to be the highest in PO1 and PO6 (EUR 405.3 million), followed by PO4 (EUR 108.1 million), PO2 (EUR 72.9 million), PO3 (EUR 34.6 million) and PO5 (EUR 30.6 million). It should however be noted that there is large uncertainty related to these estimates, that depends on the scale of behavioural change (for more details, see Annex 4).

6.1.7 Impacts on small and medium enterprises (SMEs)

SMEs play a very significant role in the supply chain of goods and passenger transport. Therefore, the initiative is considered relevant for the SMEs and the SME test has been performed. More detailed explanations on the SME test, including the four SME steps, are provided in Annex 10.

The share of SMEs in the sectors affected by the quantification of GHG emission for transport services is estimated at 99.7%, as shown in Annex 4. Therefore, the consultation activities were designed to identify the affected businesses and to further investigate the extent to which they would be affected.

PO2 and PO4 are estimated to result in net benefits for SMEs relative to the baseline. PO4 would lead to the highest net benefits estimated at EUR 43.7 million in 2025, EUR 70 million in 2030 and EUR 28.1 million in 2050 relative to the baseline, while PO2 at net benefits of EUR 23.1 million in 2025, EUR 46.7 million in 2030 and EUR 2.2 million in 2050. On the other hand, PO1, PO6, PO3 and PO5 are estimated to result in net costs (see Table 10 and Table 11). Annex 10 provides a detailed presentation of the total costs and benefits for SMEs, including a breakdown of the costs between adjustment and administrative costs[132] and by policy measure (see Table 10**Error! Reference source not found.** and in Annex 10). Expressed as present value over 2025-2050, the net benefits for PO2 and PO4 are estimated at EUR 0.5 billion and EUR 0.9 billion, respectively, while the net costs in PO1 at EUR 83.9 billion, in PO6 at EUR 66.6 billion, in PO5 at EUR 1.3 billion and in PO3 at EUR 0.4 billion relative to the baseline. As explained in section 6.1.4, the benefits are related to energy savings driven by behavioural change that leads to higher use of more sustainable transport options and optimised trips.

Table 10: Total costs and benefits for SMEs in PO1, PO2 and PO3 relative to the baseline scenario (EU27), in million EUR (2022 prices)

	Difference to the Baseline								
	PO1			PO2			PO3		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Recurrent and one-off costs	490.8	3,866.2	6,288.2	50.9	93.9	4.7	57.9	103.8	11.9
Adjustment costs	490.8	3,866.2	6,288.2	50.9	93.9	4.7	57.8	103.8	11.9
Administrative costs	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02
Benefits (energy costs savings)	51.7	390.7	775.1	74.0	140.6	6.9	37.2	83.6	2.4
Net costs/costs savings	**439.1**	**3,475.5**	**5,513.1**	**-23.1**	**-46.7**	**-2.2**	**20.7**	**20.2**	**9.5**

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 11: Total costs and benefits for SMEs in PO4, PO5 and PO6 relative to the baseline scenario (EU27), in million EUR (2022 prices)

	Difference to the Baseline								
	PO4			PO5			PO6		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Recurrent and one-off costs	68.0	115.4	19.9	101.2	156.4	37.4	344.7	2,767.6	4,501.4
Adjustment costs	68.0	115.4	19.9	101.2	156.4	37.3	344.7	2,767.5	4,501.4
Administrative costs	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Benefits (energy costs savings)	111.7	185.4	48.0	33.6	77.0	2.2	51.7	390.7	775.1
Net costs/costs savings	**-43.7**	**-70.0**	**-28.1**	**67.6**	**79.5**	**35.1**	**293.0**	**2,376.9**	**3,726.3**

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

6.1.8 Impact on the functioning of the internal market and competition

All policy options are expected to improve the comparability of GHG emissions data and have a positive impact on the functioning of the internal market. The companies providing services or working with subcontractors in different EU Member States will have a common methodology for measuring GHG emissions. In addition, according to stakeholders' feedback, the alignment

[132] In the assessment it has been assumed that the calculation tool developers are SME. Therefore, all the administrative costs presented in section 6.1.4 are assumed to belong to SMEs.

with a global standard provided by ISO 14083 (in PO2, PO4 and PO6) would allow for better comparability and usability of GHG emissions data by the businesses across the world. On the other hand, ISO 14083 with additional elements and increased accuracy (in PO1 and PO3) and the Product Environmental Footprint Category Rules (in PO5) will not ensure alignment to a global standard and may lead to challenges for the aviation and the maritime transport sectors, as well as large logistics and express companies, that are global in nature. The measures related to the verification of processes and data (PM8 included in PO1, PM9 included in PO3, PO4, PO5 and PO6, and PM10 included in PO2), are expected to have a positive impact on the fair competition between transport service providers. This is because the verification avoids distorting competition by "cherry picking" between the default values and primary data, to show lower emissions at transport service level.

6.1.9 Digital by default

All policy options are expected to have positive impacts on the application of the 'digital-by-default' principle, driven by the fact that the calculation and sharing of GHG emissions data in most cases will be associated with using digital tools and systems, and the wider demand for data in general. The demand may trigger further efforts by companies towards digital solutions, as reported in section 6.1.5 and Annex 5. Positive impacts on innovation (including process innovation) and faster technology uptake by transport service organisers and hub operators may also be expected.

The real magnitude of the impacts on the "digital-by-default" is however not directly quantifiable due to the current lack of a harmonised framework driving the progress in data access, data reuse and data interoperability at the level of the entire transport sector. This harmonisation process will largely depend on the successful implementation of the European Strategy for Data[133], including such initiatives as the European Mobility Data Space[134], Electronic Freight Transport Information Regulation[135], and activities of the Digital Transport and Logistics Forum[136].

These considerations were duly taken into account when addressing learning effects for the stakeholders affected by various policy options (see Annex 4 for more detail).

1.15 Social impacts

This section assesses the impacts of the policy options on public health, road safety and fundamental rights.

6.2.1 Impacts on public health

The availability of comparable data across transport services will facilitate customer choices towards higher use of more sustainable transport option for both passenger and freight, resulting in reduced air pollutant emissions and subsequent positive impacts on public health. The savings in the external

[133] https://digital-strategy.ec.europa.eu/en/policies/strategy-data
[134] https://transport.ec.europa.eu/news/share-your-views-common-european-mobility-data-space-2022-11-14_en
[135]https://eur-lex.europa.eu/EN/legal-content/summary/electronic-freight-transport-information.html#:~:text=Electronic%20freight%20transport%20information%20(eFTI)%20is%20a%20set%20of%20data,between%20operators%20and%20competent%20authorities.
[136] https://transport.ec.europa.eu/transport-themes/digital-transport-and-logistics-forum-dtlf_en

costs of air pollutants, expressed as present value over 2025-2050 relative to the baseline, are estimated to be the highest in PO1 and PO6 (EUR 600.6 million), followed by PO4 (EUR 163.5 million), PO2 (EUR 110.8 million), PO3 (EUR 53.1 million) and PO5 (EUR 47 million)[137]. The reason for the significantly higher savings in the external costs of air pollutants in PO1 and PO6 is due to the mandatory application of CountEmissions EU that will affect all businesses involved in transport services in EU27.

6.2.2 Impacts on road safety

The reduction in the road transport activity in all policy options, induced by better data available to customers to make more sustainable choices, is expected to result in a decrease in the number of fatalities and injuries relative to the baseline. Cumulatively over 2025-2050, PO1 and PO6 are estimated to lead to 510 lives saved and 2,732 serious injuries avoided, followed by PO4 (103 lives saved and 558 serious injuries avoided), PO2 (68 lives saved and 353 serious injuries avoided), PO3 (28 lives saved and 151 serious injuries avoided) and PO5 (23 lives saved and 133 serious injuries avoided). The reduction in the external costs of accidents is estimated to be the highest in PO1 and PO6 (EUR 2.8 billion), followed by PO4 (EUR 645.2 million), PO2 (EUR 424.4 million), PO3 (EUR 192.2 million) and PO5 (EUR 168.6 million), expressed as present value over 2025-2050 relative to the baseline[138].

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 for the assessment of the fundamental rights is the Charter of Fundamental Rights of the European Union[139]. All six 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.

1.16 Environmental impacts

The analysis of environmental impacts covers well-to-wheel GHG emissions and air pollutant emissions.

It should be acknowledged that the empirical evidence on the relation between the GHG emissions accounting, changes in transport activity and the related reduction in the GHG emissions and air pollutant emissions is scarce. The relevant assumptions and projections used in estimating the impacts of the policy options are therefore based on the literature review, case studies/use cases[140] and the feedback from the stakeholders' consultation. In relation to this point, a sensitivity analysis was also performed to show the range of impacts. The sensitivity analysis presented in section 7.6 and detailed in Annex 4, section 5, assumes a lower share of passengers making

---

[137] The 2019 Handbook on the external costs of transport (Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1) has been used to monetise the costs.

[138] The 2019 Handbook on the external costs of transport (Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1) has been used to monetise the costs. According to the Handbook, the external cost of a fatality in 2022 prices is estimated at EUR 3.9 million and that of a serious injury at EUR 0.6 million.

[139] OJ C 326 of 26.10.2012 p.2

[140] See Annex 12

sustainable choices among the climate aware population(scenario A), and lower shares of activity shifted to more sustainable transport modes and optimisation of trips.

6.3.1 Impacts on well-to-wheel GHG emissions

The reduction in the well-to-wheel GHG emissions is mainly driven by the behavioural effects incentivising the higher use of more sustainable transport options and optimised trips. The highest reduction in the well-to-wheel GHG emissions from the transport sector relative to the baseline is projected for PO1 and PO6 (0.2% decrease in 2030 and 0.5% in 2050 or 904 thousand tonnes of emissions saved in 2030 and 438 thousand tonnes saved in 2050) and PO4 (0.1% decrease in 2030 and less than 0.1% decrease in 2050 or 432 thousand tonnes of GHG emissions saved in 2030 and 27 thousand tonnes saved in 2050). Cumulatively over 2025-2050, PO1 and PO6 result in 22.1 million of tonnes of GHG emissions saved relative to the baseline, PO4 in 5.6 million of tonnes of GHG emissions saved, PO2 in 3.7 million of tonnes of GHG emissions saved, PO3 in 1.7 million of tonnes of GHG emissions saved and PO5 in 1.5 million of tonnes of GHG emissions saved. The reduction in the external costs related to GHG emissions is estimated to be the highest in PO1 and PO6 (EUR 2.9 billion), followed by PO4 (EUR 0.7 billion), PO2 (EUR 0.4 billion), PO3 (EUR 0.2 billion) and PO5 (EUR 0.17 billion), expressed as present value over 2025-2050 relative to the baseline (in 2022 prices)[141]. Notwithstanding this result, indirect environmental benefits that PO5 would unlock from the assessment of emissions in the full lifecycle perspective should also be considered. They may bring along some accelerated greening of mobility, but due to lack of relevant data, these effects could not be quantified.

The improvements in the comparability of GHG emissions data is also expected to result in increased transparency, credibility, positive effects on reputation and public image of transport service providers and higher levels of trust in supply-chain partners.

6.3.2 Impacts on air pollutant emissions

Similarly to well-to-wheel GHG emissions, the reduction in air pollution emissions is mainly driven by the higher use of more sustainable transport options and optimised trips. Cumulatively over 2025-2050, NOx emissions are estimated to reduce by 53.2 thousand tonnes in PO1 and PO6 relative to the baseline, 12.7 thousand tonnes in PO4, 8.4 thousand tonnes in PO2, 3.9 thousand tonnes in PO3 and 3.4 thousand tonnes in PO5. The reduction in the particulate matter emissions would also be highest in PO1 (0.9 thousand tonnes), followed by PO4 (0.2 thousand tonnes saved) and PO2, PO3 and PO4 (0.1 thousand tonnes saved) relative to the baseline.

All policy options are consistent with the environmental objectives of the ***European Green Deal*** and the ***European Climate Law***[142]. 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.

---

[141] The 2019 Handbook on the external costs of transport (Source: https://op.europa.eu/en/publication-detail/-/publication/9781f65f-8448-11ea-bf12-01aa75ed71a1) has been used to monetise the costs.

[142] Regulation(EU) 2021/1119

7. HOW DO THE OPTIONS COMPARE?

1.17 Effectiveness

The assessment of effectiveness looks at the extent to which the general and specific objectives (SO) of the intervention are met. Table 12 provides the link between policy objectives and assessment criteria.

Table 12: Link between objectives and assessment criteria

General objective	Specific objective	Assessment criteria
Incentivise behavioural change among businesses and customers to reduce GHG emissions from transport services through the uptake and use of comparable and reliable GHG emissions data	**SO1** – Ensure the comparability of results from GHG emissions accounting of transport services	Expected improvement in the comparability of GHG emissions data shared in the transport chain (based on the relevant methodology, generated with accurate input data, and communicated from trusted sources in unambiguous and clear manner)
	SO2 - Facilitate the uptake of GHG emissions accounting of transport services in business practice	Expected increase in the use of the common methodological framework by economic operators and other relevant entities Expected decrease in the well-to-wheel GHG emissions of transport services

Concerning **SO1**, all policy options will result in improved comparability of the GHG emission results, although PO1, PO3, PO4, PO5 and PO6 are expected to be more effective than PO2.

PO1 and PO3 both rely on a comprehensive GHG emissions accounting methodology based on ISO 14083, but with additional elements[143] and increased accuracy (PM3). PO1 envisages the strongest regulatory intervention, including *inter alia* the development of centralised databases for default values (PM4) and emissions calculation tools at EU level, thus ensuring the comparability of the output data (PM11). In turn, PO3 enables, under specific conditions, the provision of emissions intensity factors databases (PM5) and emissions calculation tools (PM12) by the market. While these measures are expected to significantly contribute to improving comparability, they may be less effective than the databases and calculations tools established at the EU level. For both POs, ISO 14083 with additional elements and increased accuracy will ensure appropriate comparability and reliability of the GHG emissions outputs, but it will also require time and resources to develop the additional elements and to eventually offer the methodology for the use to stakeholders (it should be noted for instance, that at the moment there is no commonly accepted business practice to estimate emissions related to the production and end life of batteries in the context of transport services, and which is envisaged to form part of this methodology). Furthermore, given the inclusion of additional elements, this methodological choice may lead to inconsistencies in terms of harmonised accounting of emissions for international transport operations (mostly affecting maritime transport and aviation[144] that are global in nature). Given all the arguments above, PO1 is considered more effective than PO3.

PO4 includes the same policy measures as PO3, with the exception of the common reference methodology. While the plain ISO standard 14083 (included in PO4) does not ensure the same

[143] Such as emissions from the production of batteries; see details in Annex 8.
[144] Including with respect to existing and future requirements at IMO and ICAO level.

level of accuracy as the advanced methodology based on the ISO standard 14083 with additional elements (included in PO3 and PO1), it has certain advantages over the latter one. First, it has already been developed, based on a robust research process including public consultation. Secondly, it also offers the opportunity to align emissions accounting for international transport. Thus, PO4 is assessed to be equally effective as PO1, and more effective than PO3.

As far as SO1 is concerned, PO6 includes the same policy measures as envisaged under PO4, including the methodological choice (ISO 14083). Therefore, with respect to SO1, PO6 is considered to be equally effective as PO4.

The timescale and resources needed to develop the PEFCR (included in PO5), that addresses emissions accounting in the most comprehensive way, based on the full lifecycle (from cradle to grave), is expected to be even more substantial than for the methodology based on ISO standard 14083 with additional elements and increased accuracy. This is because the transport specific PEFCRs do not exist yet. In addition, the use of this methodology will likely result in even larger misalignment with emissions accounting approaches for transport services at the international level. Otherwise, PO5 also foresees centralised databases for default values to be established at the EU level (PM4). However, the accuracy, and thus reliability of the default values included in the databases envisaged under PO5 may not be as high as those included in the other policy options, given the significant degree of uncertainty related to the valuation of emission factors in the LCA perspective. Therefore, PO5 is assessed to be less effective than PO3 in achieving SO1.

PO2 includes the ISO standard 14083 (PM1) methodology and a centralised approach for the input data (PM4) that, once combined, may offer a high level of comparability of GHG emission figures on the market. However, PO2 envisages a voluntary application of the common methodological framework that leaves its use to the discretional decision of the concerned entities (PM15). The latter feature may eventually result in the co-existence of various approaches for accounting emissions, and lesser methodological alignment on the market in the short and medium term. Thus, PO2 is assessed to be the least effective in achieving SO1 among the policy options.

Based on this analysis, PO1, PO4 and PO6 are equally effective in achieving SO1, followed by PO3, PO5 and finally PO2.

Concerning **SO2**, the uptake of GHG emissions accounting in business practice, and the related reduction of WTW emissions from transport, will be mostly determined by the choice related to the application of the initiative on the market (PM13, PM14 and PM15). Especially for the policy options envisaging the voluntary or quasi voluntary application (PM14 and PM15) the uptake will also be driven by the choice of the methodology (PM1, PM2 and PM3), data and process verification system (PM8, PM9 and PM10), as well as other measures that will facilitate the implementation of the initiative on the market, including through the use of calculation tools (PM11, PM12).

PO1 and PO6 are assessed to be the most effective with respect to SO2 since they mandate the application of CountEmissions EU (PM13) to all entities involved in transport service activities. Both PO1 and PO6 are expected to result in 918,003 additional businesses performing GHG emissions accounting in 2030 and 1,703,841 additional businesses in 2050, relative to the baseline. In addition, they would result in 22.1 million tonnes of GHG emissions saved over the 2025-2050 period relative to the baseline.

PO3, PO4 and PO5 will mandate the use of the CountEmissions EU framework only for those companies that decide or are required by other means[145] to quantify and disclose GHG emissions data from their transport services (PM14), and therefore these policy options are assessed to be less effective than PO1 and PO6 in achieving SO2. The approach on the verification (only for large enterprises) and the provision of certified calculation tools is the same for PO3, PO4 and PO5, thus not affecting their ranking in terms of effectiveness. However, between these options, the use of the common methodological framework by economic operators will vary, subject to the complexity and costs related to its implementation. Therefore, PO4, offering a conducive methodology provided by the ISO standard 14083 (PM1), is assessed to be more effective than PO3 and PO5 that envisage additional methodological elements, associated with increased complexity of emissions accounting for users. PO4 would result in 39,358 additional businesses performing GHG emissions accounting in 2030 and 9,139 additional businesses in 2050, relative to the baseline, and 5.6 million tonnes of GHG emissions saved over the 2025-2050 period (relative to the baseline). PO3, implementing the ISO standard 14083 with additional elements and increased accuracy is expected to result in 26,745 additional businesses performing GHG emissions accounting in 2030 and 3,640 additional businesses in 2050, relative to the baseline. It would also result in 1.7 million tonnes of GHG emissions saved over the 2025-2050 period relative to the baseline. PO5 is assessed to be almost equally effective to PO3, with 25,102 additional businesses performing GHG emissions accounting in 2030 and 2,783 additional businesses in 2050, relative to the baseline, and 1.5 million tonnes of GHG emissions saved over the 2025-2050.

PO2 is expected to be more effective in achieving SO2 than PO3 and PO5 but less effective than PO4, given the lax application of CountEmissions EU on the EU market (PM15) and the fully voluntary verification system for processes and data (PM10). This assessment is based on the fact that PO2 includes a more conducive and user friendly methodology (PM1), recognises the use of CountEmissions EU through a label (PM15), and offers dedicated emissions calculation tools to be managed at the central EU level (PM11). These features may especially attract interest of SMEs that represent the majority of entities operating on this market. PO2 is expected to result in 30,219 additional businesses performing GHG emissions accounting in 2030 and 1,388 additional businesses in 2050, relative to the baseline, and 3.7 million tonnes of GHG emissions saved over the 2025-2050 period.

Therefore, with respect to SO2, PO1 and PO6 are assessed to be the most effective options, followed by PO4, PO2, PO3 and PO5.

1.18 Efficiency

Efficiency concerns the 'extent to which objectives can be achieved for a given cost (cost effectiveness)'. The estimates of costs and benefits are summarised in Table 13.

[145] For instance, based on a contractual relationship, or other legal requirements stemming from separate provisions.

Table 13: Summary of costs and benefits of policy options – present value for 2025-2050 compared to the baseline (in million EUR), in 2022 prices

	Difference to the Baseline					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
National public authorities (including NABs)						
Adjustment costs	0.1	0.1	0.1	0.1	0.1	0.1
Administrative costs	0.1	0.1	0.1	0.1	0.1	0.1
EEA						
Adjustment costs	3.6	3.6	3.9	3.9	3.6	3.9
European Commission						
Adjustment costs	2.7	0.3	2.4	0.0	5.3	0.0
Businesses						
Adjustment costs	95,010.8	1,084.6	1,374.4	1,542	2,283.7	67,927.7
Administrative costs	0.0	0.0	0.5	0.5	0.3	0.5
Benefits						
Avoided fuel used (operators and passengers)	10,362.9	1,585.5	718.3	2,415.9	630.5	10,362.9
Reduction in external costs of GHG emissions	2,878.9	445.4	200.0	674.1	174.9	2,878.9
Reduction in external costs of air pollution emissions	600.6	110.8	53.1	163.5	47.0	600.6
Reduction in external costs of accidents	2,760.5	424.4	192.2	645.2	168.6	2,760.5
Total costs	95,017	1,089	1,381	1,547	2,293	67,932
Total benefits	16,602.9	2,566.1	1,163.6	3,899	1,021.0	16,602.9
Net benefits	-78,414.4	1,477.3	-217.9	2,352.1	-1,272.1	-51,329.4
Benefits to costs ratio	0.2	2.4	0.8	2.5	0.4	0.2

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect net costs.

The major cost element of the policy options consists of adjustment costs for businesses for implementing the new emissions quantification methodologies. Other significant groups of costs, included in all POs, are adjustment costs related to the use of calculation tools and verification activities.

Total costs. PO1 and PO6 set the mandatory application of CountEmissions EU to all business performing transport on own account (around 1.8 million businesses) and are expected to result in the highest total costs, estimated respectively at EUR 95 billion and EUR 67.9 billion, expressed as present value over 2025-2050 relative to the baseline. The lower costs in PO6 compared to PO1 are mainly due to the lower unit costs associated to PM3 (ISO 14083) and the use of calculation tools. PO3, PO4 and PO5, that envisage a binding opt-in application, show significantly lower costs estimated at EUR 1.4 billion, EUR 1.5 billion and EUR 2.3 billion, respectively. The additional costs in PO5 compared to PO3 (EUR 912 million) and PO4 (EUR 747 million) are mainly associated to the additional complexity for implementing the PEFCR and also the use of calculation tools and verification activities. The additional costs in PO4 compared to PO3 (EUR 165 million) steam from the higher share of companies expected to implement GHG emissions accounting at service level. PO2, envisaging voluntary application, shows the lowest total costs, estimated at EUR 1.1 billion relative to the baseline, expressed as present value over 2025-2050.

The highest share of the total costs for each policy option relates to adjustment costs for businesses for the setting of a common reference methodology at EU level (91% and 89% of the total costs in

PO4 and PO6 respectively for ISO 14083, 88% in PO3 for ISO 14083 with additional elements and increased accuracy, 87% in PO2 for ISO 14083, 84% in PO1 for ISO 14083 with additional elements and increased accuracy and 72% in PO5 for PEFCR). The second category of costs in terms of share of the total costs relates to adjustment costs for businesses for the use of the calculation tools (21% of the total costs in PO5, 12% in PO3, 9% in PO4 and PO6, 8% in PO1 and 7% in PO2).

Total benefits. All policy options result in better transparency and improved harmonisation of GHG emissions data for transport services. This is expected to lead to higher use of more sustainable transport options and optimised trips, resulting in energy costs savings for transport operators and consumers, and a reduction in the external costs of transport. PO1 and PO6 show the highest total benefits estimated at EUR 16.6 billion, due to the mandatory application of the CountEmissions EU[146]. The other policy options show significantly lower benefits estimated at EUR 3.9 billion in PO4, followed by PO2 (EUR 2.6 billion), PO3 (EUR 1.2 billion) and PO5 (EUR 1 billion). It should however be noted that there is large uncertainty related to these estimates, that depend on behavioural change towards more sustainable solutions, as explained in Annex 4.

Overall, PO2 and PO4 are expected to result in **net benefits** relative to the baseline. PO4 shows the highest net benefits, estimated at EUR 2.4 billion expressed as present value over 2025-2050 (relative to the baseline), followed by PO2 (EUR 1.5 billion). On the other hand, PO1, PO6, PO3 and PO5 are expected to result in net costs (EUR 78.4 billion in PO1, EUR 51.3 billion in PO6, EUR 0.2 billion in PO3 and EUR 1.3 billion in PO5). PO4 also shows the highest benefit to cost ratio (2.5), followed by PO2 (2.4), PO3 (0.8), PO5 (0.4), PO6 and PO1 (0.2).

1.19 Coherence

Internal coherence assesses how various elements of the new legal act function together to achieve the objectives. It should be noted that this does not only concern the legal act itself, but also its accompanying secondary legislation and rules, as well as guidelines. Although all five policy options address the identified problems, they do so in different ways. PO1 proposes the strongest regulatory approach including the mandatory application of a comprehensive methodology, mandatory verification rules, as well as EU centralised default data databases and calculation tools. This approach ensures that all the entities involved in transport services activities account emissions, and they do so based on the same methodology and data. PO2, to the contrary, envisages a fully voluntary framework, both in terms of the applicability and verification, based on a conducive methodology, but supported with centralised databases and calculation tools. In this respect, PO2 aims to achieve the objectives with minimum burden and costs for the market. In turn, PO3, PO4 and PO5 offer a semi voluntary approach (binding-in) and lighter verification process, but they differ in terms of the use of centralised or decentralised databases, and the type of an accounting methodology referred to. PO6 proposes the mandatory application of the framework, but combined with a more conducive methodology, lighter verification process and some flexibility related to the use of input data and calculation of emissions, as already envisaged under PO4. Specific choices that are made for these options will determine the implementation modalities at different effectiveness and

[146] Feedbacks from stakeholder consultation and literature review does not provide further evidence for a modal shift in excess of 10% because of the harmonisation of GHG emissions methodology. Therefore, applying a conservative approach, the modal shift has been capped at 10%.

costs. Finally, there are common measures (implementation guidelines, harmonised rules for the output data) that aim to complement various policy components within the respective options. In this context, all options ensure internal coherence.

External coherence concentrates on the compliance of the initiative with other EU instruments, and also relevant international obligations. In this respect, all identified policy options were built in such a way to ensure complementarity to several existing and emerging EU and international initiatives dealing with emissions measurement and reporting and consumer protection, as presented in sections 1.3 and 1.4. However, the coherence of respective policy options vary, especially with respect to the choice of a reference GHG emissions accounting methodology, and the type of input data framework. In this context PO2, PO4 and PO6 show a high level of external coherence, being based on the existing (international) ISO standard 14083 and hence offering better opportunity for a global methodological alignment. However, PO4 and PO6 allowing external (international, national, sectorial) databases of default values (under certain conditions) are slightly more coherent than PO2, offering a single, centralised EU default values dataset. The coherence of PO1 and PO3 will be lower than PO4, PO2 and PO6, since both options are based on the ISO standard 14083 with additional elements (such as LCA[147] for batteries), that are not yet taken up in the international emissions accounting approaches. PO3 will nevertheless feature better than PO1, due to the decentralised system for default values, allowing the use of external databases (under certain conditions). PO5 scores the lowest, given the most complex and specific methodology provided through PEFCRs, that is not in use at the EU and international scale for quantifying emissions of transport services (this is especially valid for aviation and maritime that operate internationally). What is more, PO5 offers an EU centralised database of default values.

1.20 Subsidiarity and proportionality

None of the options goes beyond what is necessary to achieve the objectives or causes subsidiarity concerns. All policy options provide solutions towards a harmonised methodological approach, data access and treatment, as well as specific implementation aspects. These solutions constitute significant added value compared to the situation where this harmonisation process is left to the market or Member States alone.

In terms of proportionality, PO4 appears as the option providing the most balanced approach. Specifically, it envisages the use of the already existing and widely recognised standard ISO 14083, it allows (under specific conditions) for the decentralised approaches for input data and calculation tools, and sets rational requirements (excluding SMEs) for the verification. In addition, by including the binding opt-in application of the harmonised framework, PO4 enables a level playing field for emissions accounting across transport modes and segments, limiting the requirements only to those entities that decide or are mandated to quantify and share GHG emissions data. This aspect is important for stakeholders, in particular SMEs[148], which very often lack capacity and knowledge to effectively start accounting emissions in the short term, and therefore expect a more gradual implementation approach addressing their

---

[147] Feedback received from stakeholders and desk research showed that the LCA approach, while worth of gradually pursuing in the long term, was not deemed fully feasible in the short term, especially in the context of the current requirements and practice at international level.

[148] See section 4.2.4 of Annex 2

specific situation. PO2 ranks second mainly because of challenges associated with the achievement of the full harmonisation of emissions accounting on the market. The other four policy options (PO1, PO3, PO5 and PO6) are less proportionate, especially PO1 and PO6 with very burdensome and costly approaches related to the mandatory application of the framework.

1.21 Comparison of the options

Table 14 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).[149]

Table 14: Comparison of options in terms of effectiveness, efficiency, coherence, subsidiarity and proportionality relative to the baseline

Criteria	PO1	PO2	PO3	PO4	PO5	PO6
Effectiveness	+++++	+	++	+++	+	+++++
Efficiency	-----	++++	--	+++++	---	-----
Coherence	+	+++	+	+++++	+	+++++
Subsidiarity and proportionality	--	++	-/+	+++++	-/+	--

1.22 Sensitivity analysis

It should be noted that there is uncertainty regarding the estimates of the benefits identified in the previous sections. CountEmissions EU is expected to contribute to the reduction of GHG emissions from the transport and logistics sector in two ways: by providing more transparency with respect to the emissions of different transport services and by its use by other decarbonisation initiatives. While the first set of direct impacts can be estimated, those triggered by the development of new programs using CountEmissions EU as their tool cannot be quantified but are probably much larger than direct savings.

The empirical evidence on the effects between the GHG emissions accounting, changes in transport activity and the related reduction in the GHG emissions is scarce. For this reason, a sensitivity analysis has been performed, assuming a decrease by 40% in the share of passengers making sustainable choices among the climate aware population(scenario A), and a decrease by 30% in the shares of activity shifted to more sustainable transport modes and optimisation of trips (scenario B). Methodological details on the sensitivity analysis are provided in Annex 4, section 5. Table 15 shows that even with lower shares of passengers making sustainable choices because of increased transparency and data availability, the benefits from GHG emissions and air pollutants emissions reduction, fuel saved and accident reductions would realize, although the positive impacts would be limited. The same applies for the scenario assuming reduction of the shares of activity shifted to more

[149] This is a qualitative assessment and for presentational purpose, thus we decided to limit the number of + to provide a clear overview of the ranking of the options. For instance, the effectiveness of PO1 and PO6, due to their mandatory applicability, is 23 fold the number of companies estimated in PO4 in 2030. This is clarified in section 6 and Annex 4.

sustainable transport modes and trips optimisation. Therefore, the ranking of the policy options would not change.

Table 15: Results of the sensitivity analysis on the net benefits and benefit to costs ratio, expressed as present value over 2025-2050 (in million EUR) relative to the baseline

	Difference to the Baseline					
	PO1	PO2	PO3	PO4	PO5	PO6
Net Benefits (in million EUR)						
Share of passengers and activity - central case	-78,414.4	1,477.3	-217.9	2,352.1	-1,272.1	-51,329.4
Share of passengers (A) – 40% lower	-81,735.0	964.1	-450.6	1,572.4	-1,476.3	-54,650.0
Shares of activity (B) – 30% lower	-83,060.8	758.1	-544.1	1,259.7	-1,558.4	-55,975.7
Benefits to cost ratio						
Share of passengers and activity - central case	0.2	2.4	0.8	2.5	0.4	0.2
Share of passengers (A) – 40% lower	0.1	1.9	0.7	2.0	0.4	0.2
Shares of activity (B) – 30% lower	0.1	1.7	0.6	1.8	0.3	0.2

8. PREFERRED OPTION

1.23 Identification of the preferred policy option

Even though all policy options are in line with the general objective and include measures that address all specific objectives and problem drivers, they vary when assessed on different criteria. First, there is a clear difference in their *effectiveness*. As explained in section 7.1 and shown in Table 14, PO1 and PO6 are considered by far to be the most effective, followed by PO4, by contributing substantially to the harmonisation of GHG emissions data from transport services (SO1) and the uptake of GHG emissions accounting on the market (SO2). On the other hand, PO1 and PO6 score lowest on *efficiency*, given the very high costs (and very low benefit to cost ratio, 0.2) associated with the mandatory application and implementation of the harmonised framework by all entities involved in transport service activities. PO4 is assessed to be the most efficient, with the highest benefit to cost ratio (2.5).

In relation to internal *coherence* all policy options perform broadly the same. However, in relation to the external coherence with other instruments and policies, as shown in section 7.3 and in Table 14, PO4 and PO6 perform better than PO2, relative to the baseline, and much better than PO1, PO3 and PO5.

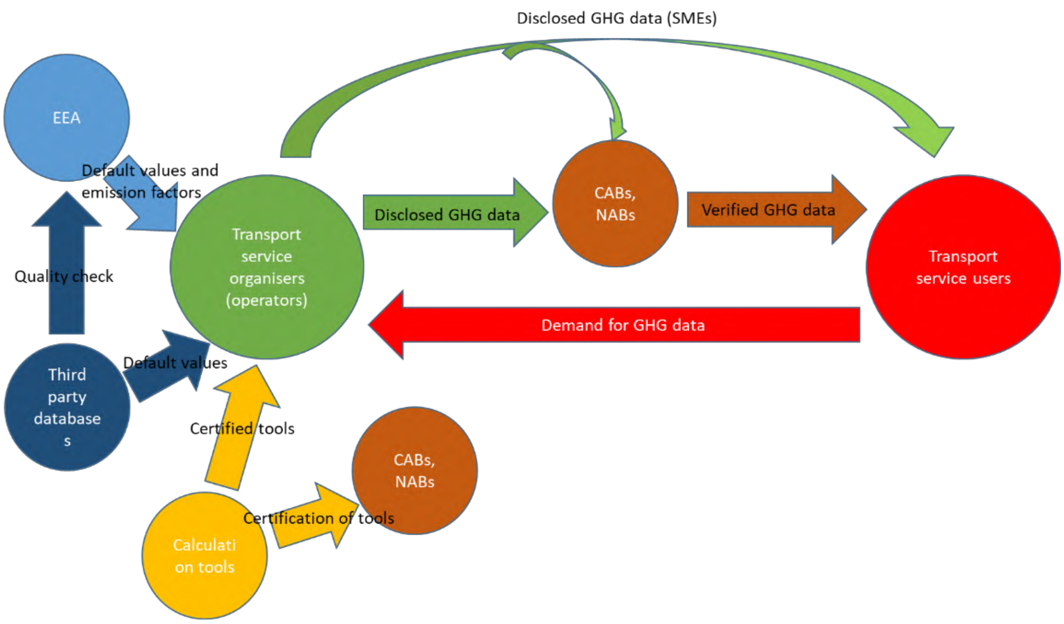
All policy options are in line with the principle of subsidiarity, addressing issues that cannot be solved by interventions at national level. In terms of proportionality, PO4 is deemed to be the most proportionate, as shown in section 7.4 and Table 14. PO2 ranks second mainly because of challenges associated with the achievement of the full harmonisation of emissions accounting on the market. The other four policy options (PO1, PO3, PO5 and PO6) are less proportionate, especially PO1 and PO6 with very burdensome and costly approaches related to the mandatory application of the framework.

In conclusion the analysis points at PO4 as the preferred policy option.

This option is supported by the stakeholders. As regards the methodological choice, one should note a strong support across all the consultation activities for an approach that considers already existing or emerging emissions accounting harmonisation efforts. In this respect, there was a clear preference in favour of the Well-to-Wheel, GHG perspective, with the new ISO standard 14083 as a relevant reference methodology[150]. When it comes to the input data, stakeholders strongly favoured the use of primary data for accounting emissions in the transport sector. However, they indicated that the use of primary data is not always possible in the business practice, and therefore default values should also be allowed, provided they are of a suitable quality. In terms of applicability, whereas most respondents advocated for certain mandatory components, SMEs preferred rather optional approaches, or possible derogations from a mandatory instrument. Similarly, regarding the verification of compliance of GHG emissions data and processes, stakeholders were in favour of such a system to be established, but called for specific exemptions in case it proves to be burdensome and costly. Finally, the majority of respondents believed specific implementation guidelines for market players to be necessary, however they were not fully clear on how these should be addressed in the context of CountEmissions EU. It should be noted therefore, that the set of policy measures included in the preferred policy option address these opinions in the most comprehensive way.

The transport services ecosystem and interactions between different types of stakeholders under PO4 is illustrated in Figure 3 below.

Figure 3: Transport service ecosystem and actors involved in a harmonised emissions accounting framework



1.24 Application of the 'one in, one out' approach

PO4 will result in a limited increase in the administrative costs for businesses (business sector associations and calculation tools developers), estimated at EUR 26,419 per year relative to the

[150] The LCA approach emerged as important in many stakeholders' responses too, especially in the context of the open public consultation.

baseline[151]. These costs are composed of annual labour costs for the submission by the business sector associations of the databases to be quality checked by EEA (PM5, EUR 8,343) and the certification of calculation tools by tools developer (PM12, EUR 18,076). Expressed as present value over 2025-2050, relative to the baseline, the total administrative costs for businesses are estimated at EUR 0.5 million.

In addition, total adjustment costs for businesses in PO4 are estimated at EUR 1.5 billion expressed as present value over 2025-2050, relative to the baseline. These will however be over compensated by energy costs savings for transport service providers, estimated at EUR 2.3 billion in PO4. Thus, the net benefits for businesses are estimated at EUR 0.8 billion expressed as present value over 2025-2050, relative to the baseline.

9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

The Commission services will monitor the implementation and effectiveness of this initiative through a number of actions and a set of core indicators that will measure progress towards achieving the objectives. Five years after the implementation date of the legislation, the Commission services should carry out an evaluation to verify to what extent the objectives of the initiative have been reached.

As regards Specific Objective 1 (Ensure the comparability of results from GHG emissions accounting of transport services) the main milestones to achieve this objective are the provision of a common GHG emissions calculation methodology, the central database of energy emission factors and the core database of emission intensity factors. The method will be established already in the basic act, and the databases will be provided in the implementation phase. Therefore, the main indicators that may be derived for the remaining aspects related to the comparability of GHG emissions data, would refer to the use of accurate default values offered by third party database developers and the level of correctness of the calculations undertaken by concerned entities, namely:

- number of external default values databases having undergone the quality check,
- number of entities having undergone the verification of the calculated GHG emissions data and related processes.

Monitoring of the achievement of Specific Objective 2 (Facilitate the uptake of GHG emissions accounting of transport services in business practice) is expected to be more straightforward. It may embrace in particular:

- number of companies accounting GHG emissions from transport services using CountEmissions EU,
- number of certified technical calculation tools,

[151] As explained in Annex 4, estimations about costs and cost savings for business associations and calculation tools developers are made on the basis of the assumption that 17 databases will be submitted to EEA for quality check, and 34 tools will be certified every year by the verification bodies. The costs for preparing the submission of databases and tools for submission is estimated at EUR 490.76 per database and EUR 531.65 per tool respectively.

- number of conformity assessment bodies being accredited under CountEmissions EU.

However, it would not be possible to directly derive information feeding the indicator that refers to the number of companies accounting GHG emissions of transport services using CountEmissions EU. The majority of interactions related to disclosing GHG emissions data will take place in a Business-to-Business or Business-to-Customer perspective, and this information will not be available to public authorities. Since imposing such reporting requirements on the businesses would create additional burden, the only solution to generate this type of information would be a dedicated survey, for instance in the context of the future evaluation of the initiative.

In this context, the following information needs to be collected:

- A conformity assessment body concerned should maintain an up-to-date list of the calculation tools that it has certified and for which it has withdrawn or suspended certification. It shall make that list publicly available on its website and shall communicate the address of that website to the Commission;
- A conformity assessment body concerned should draw up and maintain an up-to-date list of the entities that have undergone the verification and notify this list to the Commission on annual basis;
- A Member State should designate an authority maintaining an up-to-date list of the accredited conformity assessment bodies. The designated national authority should notify this list to the Commission on annual basis;
- Commission assisted by the European Environmental Agency (EEA) should monitor the status of the quality assessment activities performed with respect to the external default values databases.
- Upon request, horizontal analysis and technical assistance on specific implementation aspects should be provided by the EEA.

EEA will be instrumental in assisting the evaluation and monitoring of the initiative in the part related to the development and management of databases. The role of EEA is described in Table 16.

Table 16: Role of EEA

Role of EEA	Stakeholders involved
• Development and maintenance of core database of emission intensity factors	• EEA (developments and management of the database) • Entities calculating GHG emissions, mainly TSO and HU (as data users) • Emissions calculation tools providers (as data users)
• Establishment of a database of the	• EEA (management of the database)

Role of EEA	Stakeholders involved
energy emission factors	• Entities calculating GHG emissions, mainly TSO and HU (as data users) • Emissions calculation tools providers (as data users)
• Quality check of third party emission intensity factor databases	• EEA (performing quality check) • Entities – database developers (public, private) submitting databases for the quality check (as data users and providers)

ANNEX 1: PROCEDURAL INFORMATION

1. LEAD DG, DECIDE PLANNING/CWP REFERENCES

The lead DG is DG MOVE, Unit D1: Maritime Transport & Logistics.

DECIDE reference number: PLAN/2021/11499.

Item 2 in Annex I to Commission Work Programme 2022.

2. ORGANISATION AND TIMING

The impact assessment started in 2021, with the call for evidence published on 19 November 2021.

The impact assessment on CountEmissions EU was coordinated by an Inter-Service Steering Group (ISSG). The Commission Services participating in the ISSG were: Secretariat-General, Legal Service, DG Justice and Consumers, DG Climate Action, DG for Energy, DG Environment, DG for Financial Stability and Capital Markets, DG Industry, Entrepreneurship and SMEs, DG Research and Innovation. The Inter-Service Steering Group met 6 times: on 27 October 2021, 12 April 2022, 1 July 2022, 27 October 2022, 2 February 2023 and 23 February 2023. It was consulted throughout the different steps of the impact assessment process: notably on all the stakeholder consultation material, the deliverables from the external contractor, and on the draft Staff Working Document.

3. CONSULTATION OF THE RSB

The draft report was submitted to the RSB on 1 March 2023 and was discussed by the Board on 29 March 2023. RSB issued a positive opinion with reservations, that is attached to this report. Recommendations from the Board have been addressed in this final version of the Impact Assessment report as detailed in the table below.

Table 17: Modifications of the IA report in response to RSB recommendations

RSB recommendations	Modifications to the IA report
Main considerations	
(1) The report does not explain clearly how a harmonised methodological framework is coherent with existing reporting regimes and methodologies and will enable the reduction of GHG emissions of the transport sector.	Additional information on existing reporting regimes has been included and discussed in section 1.4 of the revised report. This information addresses coherence and complementarity of these regimes with the proposed harmonised framework. Further evidence supporting the assumptions related to the reduction of GHG emissions based on the literature review and stakeholders' consultations have been

	addressed in section 6 and Annex 4.
(2) The report does not provide a complete and realistic set of options.	A new policy option 6 (PO6), mandating the use of a conducive metholdogy (ISO 14083) but with a more decentralised approach, has been added to the assessment. This option is reflected in sections 6 and 7, and Annexes 4, 5, 9 and 10 of the revised report.
(3) The report does not sufficiently analyse the intended versus unintended consequences of the options, including as regards SMEs. It is not sufficiently clear to what extent the options will achieve behavioural changes among transport service providers and users.	The revised version of the Annex 4 includes: • new tables showing the relative (%) impacts on SMEs and larger companies, together with necessary explanations; • complementary information on benefits and costs impacting both SMEs and larger companies, broken down per specific qualifier (fuel saved, adjustment costs, administrative costs, etc.); • additional details on impacts stemming from the behavioural change to support the evidence underpinning the calculations.
(4) The report does not well explain the scoring methodology used when comparing the options.	A new section 7.5 (Comparison of the options) including clearer scoring methodology, together with necessary clarifications has been added to the revised report.
Adjustment requirements	
(1) The report should explain more clearly in its problem definition and intervention logic how a harmonised methodological framework will enable the reduction of the GHG emissions of the transport sector. The problem drivers behind a limited uptake of GHG emissions accounting in business practice are of a different nature than the problem drivers behind the limited comparability of GHG emissions accounting results. The report should make more use of evidence underpinning the assumed changes in the transport activity under each option. Given that rules on emissions reporting exist also elsewhere in EU law and exist through	Additional details clarifying interactions with other relevant regulatory regimes have been incorporated in section 1.4. New sections 2.3 (Interlinkages between the problem drivers) and 2.4 (Affected stakeholders) have been added to the revised report. Additional references regarding the limited uptake of the GHG emissions accounting of transport services have been included in section 2.5. Complementary clarification for the evidence underpinning the assumed changes in the transport activity has been included in sections 6, 8.1, and Annex 4.

other methodologies in areas such as Emission Trading System and corporate sustainability reporting, the report should better assess the coherence of the initiative (and later the options) with existing instruments.	
(2) The report should provide a complete and realistic set of options. While it presents an ambitious option which requires mandatory emissions counting for all entities, this option comes with additional requirements with less flexibility and raises short-term feasibility and coherence issues. To present a more credible and ambitious option, the report should consider presenting an option based on ISO 14083 while designing the other measures in a more SME friendly manner.	A new policy option 6 (PO6) has been added to the report. This option tests a fully mandatory application of the common GHG emissions accounting framework with a similar set of policy measures with respect to the preferred policy option (PO4). Based on the assessment performed, the choice of the preferred policy option has not changed.
(3) The report should analyse more deeply what the intended as well as unintended consequences would be of the options. Although the preferred option is quasi-voluntary, there seems to be a likelihood that transport actors will impose emissions accounting on their subcontractors, often SMEs, to meet the sustainability expectations of the transport demand side. Consequently, a quasi-voluntary approach for enterprises below a certain threshold might then become a de facto standard. The report should elaborate on the likelihood of this happening and on what the main implications for the key actors in terms of costs and benefits would be. The report should also clarify whether the adoption of the specific methodology and related reporting would be expected to influence other reporting regimes or become obligatory under current or future initiatives, and if so, what would be the consequences, in particular on SMEs, including for areas such as financing.	The consequences of various policy options have been clarified in revised sections 1.4, 6, and 8, and Annex 4. Additional implications of quasi-voluntary policy options (binding opt-in approaches) have been further explained in Annex 4.
(4) The report should better explain how the options will incentivise behavioural change, made both on the supply and demand sides of the transport market, towards their choice	Clarifications have been added to Section 6 and Annex 4 (including sensitivity analysis). The results of the sensitivity analysis on the net benefits and the benefits to costs ratio,

of transport services. It should provide evidence on the causality effect between the GHG emissions accounting, changes in transport activity and the related reduction in the GHG emissions. If empirical evidence is limited or unavailable, it should present use cases and case studies used to support the assumptions made in the modelling of changes to transport activity due to this initiative. The report should be clearer on how the different transport modes will be affected by the options. Given the high uncertainty related to the estimates, the report should undertake a sensitivity analysis on the key assumptions driving the results.	for each policy option, have been added in section 7.6. The impact on modal shift, underpinning the environmental impacts, has been further explained in Annex 4. A new annex (Annex 11) with illustrative case studies and use cases has been added to the report.
(5) The report should explain better the scoring methodology used when comparing the options. The scores attributed per criteria for the options should be consistent with the preceding analysis and adequately reflect the differences in observed impacts. If, for example, there are large differences in the effectiveness or coherence of options, this should be clearly explained and adequately reflected in the scoring. The report should clarify if factors outside the initiative'scope have been factored in or out in the effectiveness scoring, including acknowledging limits to the analytical work itself.	Section 7.5 has been added to the revised report. This section further details the effectiveness, efficiency, coherence, subsidiarity and proportionality of the policy options with a clearer scoring methodology embedded. Respective corrections and clarifications have also been included in Annex 9.
(6) The report should ensure analytical consistency throughout. Costs related to the One In, One Out approach should be presented in the aggregated format.	The analytical consistency has been checked across the report and its annexes. Costs related to the One In, One Out approach are now presented in the aggregated format in Annex 3.

4. EVIDENCE, SOURCES AND QUALITY

The impact assessment is based on several sources, using both quantitative and qualitative data. These include:

- Stakeholder consultation activities (see Annex 2);
- External support study carried out by an independent consortium (led by Ecorys Nederland B.V);

- Commission experience in standardisation activities and quantification of emissions in transport.

ANNEX 2: STAKEHOLDER CONSULTATION (SYNOPSIS REPORT)

This annex provides a summary of the outcomes of the stakeholders' consultation activities carried out for the CountEmissions EU initiative, including in the context of the technical support study. It illustrates the main consultation activities, depicts the range of stakeholders consulted, and presents a succinct analysis of their views and the main issues raised. The full analysis of the consultation results is presented in the stakeholder consultation report annexed to the technical support study.

The objectives of the consultation activities were the following:

- to collect information and opinions of stakeholders on the key problems and associated drivers, the definition of relevant policy objectives linked to those problems, and the identification and screening of policy measures that could be considered in this Impact Assessment;
- to gather information and opinions on likely impacts of the policy measures and options.

OVERVIEW OF CONSULTATION ACTIVITIES

The consultation strategy was developed from the start of the project and included as key stakeholders the following groups: citizens, companies, business associations, public authorities, NGOs, consumer organisations, academia, trade unions, environmental organisations. The consultation tools were placed in sequence to ensure appropriate feedback during the development of the respective stages of the Impact Assessment.

Consultation activities took place in 2021 and 2022, and specifically included:

Feedback on the Call for Evidence

As part of the initial feedback mechanism, interested parties had the possibility to provide feedback on the Call for Evidence published on the "Have your say" webpage[152] on 19 November 2021 and open until 17 December 2021. In principle, the Call for Evidence collected feedback regarding the Commission's plans concerning the CountEmissions EU initiative, and general opinions on the issues related to accounting emissions in the transport sector.

Open Public Consultation

The Open Public Consultation (OPC) questionnaire was accessible on "Have Your Say" webpage from 25 July to 20 October 2022. The OPC specifically inquired about the current situation and motivations for emissions accounting in transport, related problems and problem drivers, and measures to address these on the EU market.

[152] Count your transport emissions – 'CountEmissions EU' (europa.eu)

Targeted consultation

Two rounds of interviews were held:

- Exploratory interviews during the technical support study inception phase, aimed at tackling general issues from different user perspectives and targeting subsequent engagement with a broader group of stakeholders (Q2 2022).
- In-depth interviews to plug information gaps and assess the expected impacts of policy measures (Q2, Q3 and Q4 2022).

Two rounds of surveys were carried out:

- A survey questionnaire to substantiate the problem analysis and to assess the impacts of policy measures (Q3 and Q4 2022).
- A short follow-up survey questionnaire targeting selected Member States (Q4 2022);

One expert workshop was held, focusing on the problem tree and proposed measures (on 27 October 2022).

STAKEHOLDER GROUPS CONSULTED

This section provides a short overview of the main types of stakeholders identified and targeted as part of the stakeholders' consultation.

Overall, the consultation activities attracted interest from various types of stakeholders, which resulted in a good participation level and numerous contributions received. The participation in all consultation activities is shown in the table below.

Table 18: Overview of stakeholder consultation results

Consultation activity	Number of stakeholders invited	Number of responses	Number of documents provided[153]
'*Have your say*' Call for Evidence	Not applicable	64	60 [154]
Open Public Consultation	Not applicable	After analysing the data, 188 non-duplicates, of which 184[155] contain answers to the questionnaire and not just a document (position paper) attached. SMEs are 100 of the responses.	27[156]
Exploratory interviews	4	4	0

[153] Position papers or other contributions in addition to the responses to the questions

[154] The total number of written contributions was 64, but taking into account duplications, the number of unique written contributions that have been reviewed is equal to 60.

[155] It is possible that 6 out of the 184 answers to the Open Public Consultation questionnaire are part of a coordinated campaign.

[156] A total of 31 submissions were obtained, of which 4 were duplicate entries and were removed. From the remaining 27, 22 contain information related to the scope of this initiative, 3 contain information about related topics, and 2 do not contain information related to the scope of this initiative.

Targeted survey	70	After analysing and filtering the data, 38 questionnaires, of which 26 were fully completed. SMEs are 8 of the responses.	22[157]
Targeted interviews	44	32	0[158]
Short survey questionnaire	4	1	3[159]
Stakeholder workshop	43[160]	33[161]	0[162]

Source: Ecorys and CE Delft (2023), Impact assessment support study

It should be noted that given the concurrent engagement mechanisms, most stakeholders have chosen not to participate in all opportunities that were made available to them. For example, some stakeholders had contributed to the OPC or had undertaken targeted interviews and therefore did not feel the need to participate in the targeted survey.

Call for Evidence

60 unique contributions were received, with a large majority of respondents belonging to categories described as company/business organisations and business associations (25 and 24 out of 60, or 42% and 40%, respectively). With respect to the place of origin of the participating respondents, 24 out of 60 (or 40%) of the responses came from Belgium, where business associations usually establish head offices and act as umbrella organisations on behalf of associated national or industrial members. Other opinions derive mostly from western and northern EU Member States. Two contributions were also submitted from non-EU countries (the UK and the US).

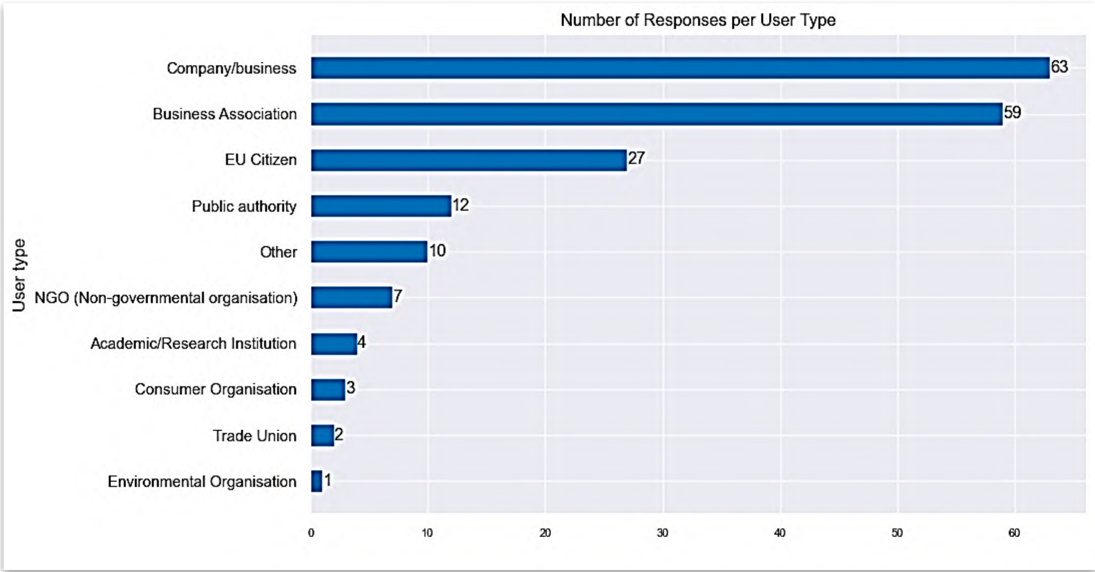
Open Public Consultation

The OPC was open to the general public, with 184 stakeholders participating. The responses to the OPC were mostly populated by respondents representing company/business organisations and business associations, followed by individual citizens (34%, 32% and 15%, respectively).

---

[157] A total of 27 written contributions from 14 different stakeholders were received as part of this process in addition to the responses to the questionnaire, of which 4 are duplicates, and 1 more was already submitted as a contribution to the Open Public Consultation.
[158] A number of written contributions were received from a limited number of stakeholders, but they are duplicates of other submissions that have been received in other stakeholder engagement tools.
[159] The only Member State to respond provided 2 links to websites and 1 link to an online-hosted document.
[160] A total of 60 individual representatives were invited, representing 43 different stakeholder organisations.
[161] In total there were 43 representatives attending the workshop, representing 33 different stakeholders.
[162] One stakeholder sent a position paper as follow-up to the workshop, however it is a duplicate of documents received as attachments to the Open Public Consultation.

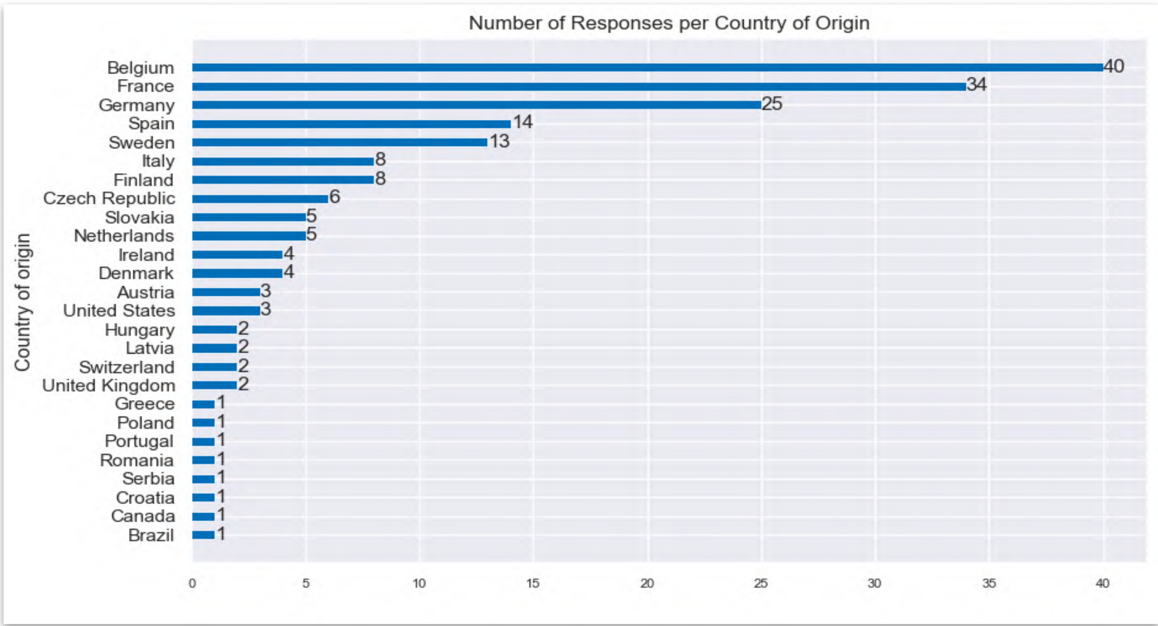
Figure 4: Number of Open Public Consultation respondents by type of respondent



Source: Ecorys and CE Delft (2023), Impact assessment support study

In terms of the geographical representation, the respondents originated from across the EU, mostly from the western and northern Member States, and in particular from Belgium. A number of responses were also submitted from non-EU countries, namely the US, Switzerland, the UK, Serbia, Canada and Brazil.

Figure 5: Participating stakeholders: countries of origin



Source: Ecorys and CE Delft (2023), Impact assessment support study

Targeted consultation

Exploratory interviews

4 stakeholders were interviewed in exploratory interviews The represented specifically: a passenger transport association, a shippers' association, a non-profit environmentally oriented organisation and a green transport programme.

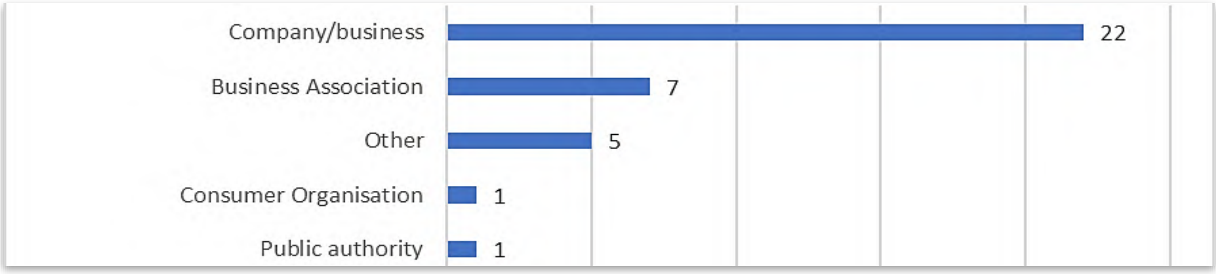
Targeted interviews

32 stakeholders responded positively to the invitation to participate in targeted interviews, representing 12 individual companies, 9 transport associations, 4 public authorities, 2 consumer and passenger associations, 1 academia/research institution and 4 other types of stakeholders.

Targeted survey

Questionnaires were sent to 70 addressees across the identified groups. Eventually 38 responses were collected from stakeholders, 26 of which had completed the survey in full.

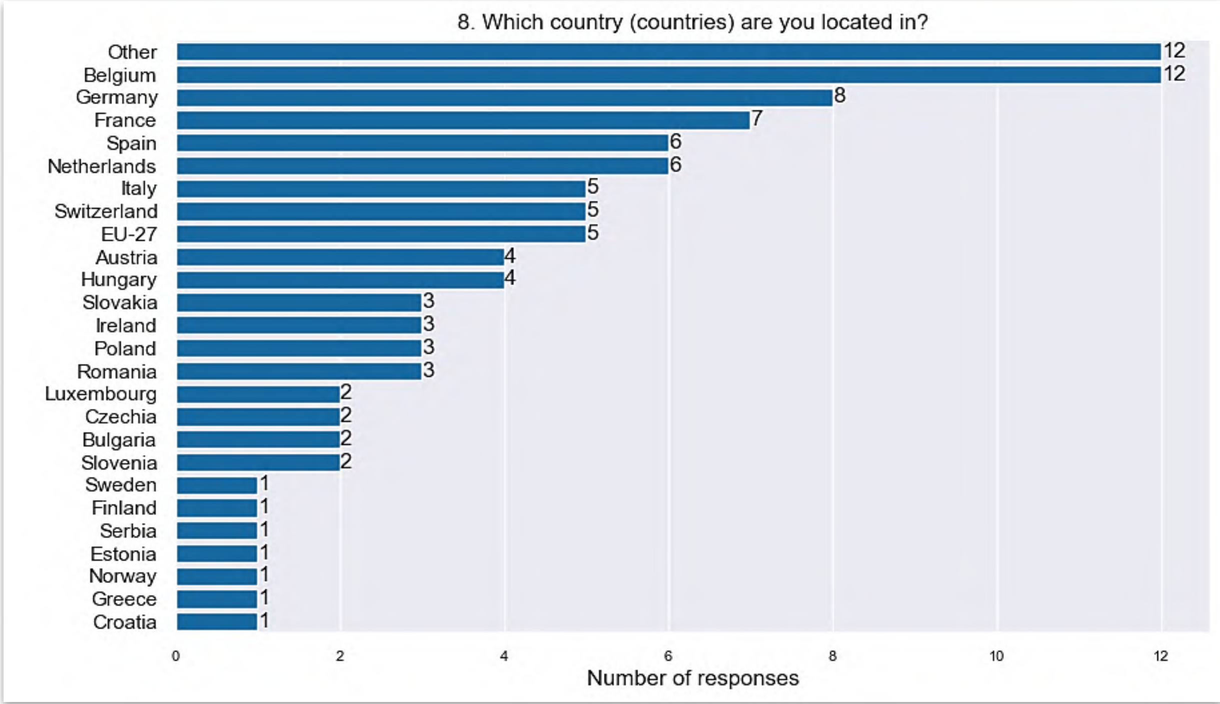
Figure 6: Number of targeted survey respondents by type of respondent



Source: Ecorys and CE Delft (2023), Impact assessment support study

As shown in Figure 7, the majority of the respondents operate in EU-27 countries.

Figure 7: Participating stakeholders: countries of origin or respondents



Source: Ecorys and CE Delft (2023), Impact assessment support study

Workshop

A workshop was organised on 27 October 2022 upon direct invitation, with 43 participants representing 33 different stakeholders participating online: Airbus, Alliance for Logistics Innovation through Colaboration in Europe (ALICE), Aerospace, Security, and Defense Industries Association of Europe (ASD), Federation of German Industries (BDI), European Chemical Industry Council (CEFIC), Community of European Railway and Infrastructure Companies (CER), CLECAT (European Association for Forwarding, Transport, Logistics and Customs Services), Deutsche Bahn (DB), Deutsche Post DHL Group (DPDHL), Danish Transport and Logistics Association (DTL), European Union Aviation Safety Agency (EASA), European Environment Agency (EEA), Erste Group Services, European Freight and Logistics Leaders' Forum, European Shippers' Council, Federation of European Private Port Operators (FEPORT), Global Business Travel Association (GBTA), HAROPA Port, International Air Transport Association (IATA), International Road Transport Union (IRU), ISO workgroup, Kaufland, Lidl/Schwarz group, Lufthansa, Nordic Logistics Association, Norwegian Truck Owners Association, Swedish Association of Road Transport Companies - Sveriges Akeriforetag, Topsector Logistiek, Transporeon, International Union of Wagon Keepers (UIP), Vendelbo Spedition, World Shipping Council, ZF group.

Short survey questionnaire

Short written questionnaires were sent to selected Member States to complement the stakeholders' consultation analysis. Only one Member State (France) provided a response to the questionnaire.

LIMITATIONS OF THE STAKEHOLDER CONSULTATION

Some consultation activities (especially targeted) spread over the European summer period. This resulted in partial review of the original list of stakeholders. The stakeholders that were not available for the interview were in almost all cases replaced with similar organisations. The exception was the e-commerce sector, where despite repeated invites there was limited feedback, resulting in little direct representation in the interview process.

In addition, due to time constraints and limitations in the availability of the Member States stakeholders to participate in the interviews, these were substituted with short written questionnaires sent to Denmark, Estonia, France, and Italy. Only one Member State (France) provided a response to the questionnaire. However, other input from public authorities, including Member States, was also collected though the general consultation tools.

Time constraints during the stakeholder workshop meant that not all policy measures were individually discussed with the same rigour. Stakeholders had a lot to say on the debate around input and output data, which led to the situation where other policy measures were only briefly discussed, sometimes as a group of measures only, instead of individual ones. While this reflects the issues that stakeholders consider the most important, it limited the quality of the input on the other aspects, not related to the data.

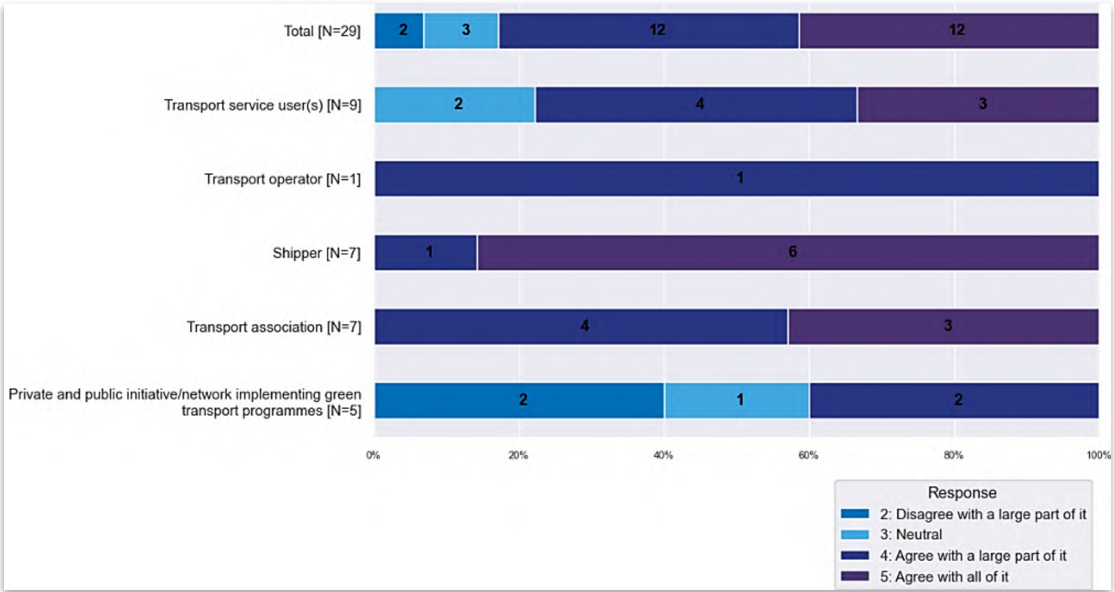
ANALYSIS OF THE KEY RESULTS OF THE STAKEHOLDER CONSULTATION

The remainder of this annex presents key findings from the analysis of stakeholder contributions to the consultation process.

Feedback received on the problem definition

This section provides an overall view of the stakeholders' inputs on the proposed definition of the problem and its underlying drivers.

Figure 8: Extent to which the stakeholders agree with the overall problem diagram



Source: Ecorys and CE Delft (2023), Impact assessment support study

It should be acknowledged however, that the public consultation also revealed a clear need for shifting some elements in the initial problem definition, especially to recognise particular importance of input data while accounting emissions. Consequently, the problem tree was reshaped and updated, and its final version is shown in section 2 of this report.

Current situation and motivations

The initiative received an overwhelming support from almost all stakeholders in the Call for Evidence (57 out of 60, or 95%) and the targeted survey (28 out of 31, or 90%). While the OPC did not explicitly include this type of question, the received responses indirectly point to a similar conclusion. This view was also notably expressed in the targeted interviews and was confirmed during the stakeholders' workshop.

Figure 9: Summary of the overall support of stakeholders for the initiative, expressed in the Call for Evidence

Source: Ecorys and CE Delft (2023), Impact assessment support study

Stakeholders generally recognised that a harmonised measurement and calculation framework is needed as emissions accounting becomes increasingly embedded in the broader policy ecosystem and the decision-making processes of transport services users. Better measurement of emissions is also considered by many as a way to establish and monitor specific sustainability targets.

In the Call for Evidence, targeted survey and interviews, stakeholders pointed to the on-going harmonisation efforts concerning emissions accounting in transport (such as ISO 14083, GLEC, Green Freight Europe, COFRET, CEN EN 16258), although they also admitted the lack of the necessary implementation regimes. This finding was also confirmed during the stakeholders' workshop.

The consultation also showed that emissions measurement and calculation is more mature and harmonised in the freight transport segment. However, as evidenced during the targeted interviews, passenger transport operators do acknowledge that emissions data is a factor that is increasingly looked into, especially during transport procurement processes.

When asked about their motivation to measure emissions, the respondents to the targeted survey indicated without exception their environmental awareness and willingness to contribute to meeting emissions reduction targets (22 out of 22 consider it important or very important). Targeted interviews further suggested that emissions accounting is also perceived as an element of risk management for private sector organisations. They are aware that emissions data would be increasingly important for preserving their competitiveness (or investor relations) and are therefore investing in systems to both measure or calculate emissions and communicate them effectively.

All consultation activities, however, consistently revealed that information on emissions is not yet a primary factor in decision-making for acquiring products and services. From the targeted survey, it is clear that price, time and reliability (quality) remain the primary motivators, with environmental aspects amongst the secondary considerations (12 out of 32, or 38%). SMEs are even less likely to consider the environmental dimension in their business practice than large companies (only 1 out of 7 SMEs, or 14%). On the other hand, the targeted interviews and the workshop showed that currently it is difficult to consider these aspects during the decision-making process, since information on emissions is hardly available at a point of sale, either for freight or passenger transport.

Views on problems

- *Problem 1: Limited comparability of results of GHG emissions accounting in transport and logistics*

The vast majority of the consulted stakeholders see the lack of reliable and comparable information on GHG emissions data as a relevant issue. These findings were in principle confirmed by the results of the OPC, with 136 out of 169, or 80% respondents reiterating the prevalence of this problem and considering it significant or very significant. What is more, 103 out of 157 (66%) indicate it as a real concern for their professional or private activities.

In addition, the respondents to the Call for Evidence point to substantial divergences in emission data calculation results and to the lack of comparability, which ultimately diminishes the usefulness of GHG measurement and calculation, when it comes to taking informed travel and transport decisions. The respondents also emphasised that the status quo does not allow providing the end users with clear price signals and acknowledged that this situation hinders the effectiveness of GHG measurement and calculation as a policy measure to incentivise environmentally friendly transport and mobility choices.

Also, the stakeholders joining the workshop acknowledged large differences between emissions data calculated for transport services and shared in the transport chain, recognising the proliferation of methodological choices, and large variability in the input data.

Finally, 22 out of 31 respondents to the targeted survey pointed to better comparison of GHG emissions data as a key feature describing the added value of CountEmissions EU.

- *Problem 2: Limited uptake of emission accounting in usual business practice*

Respondents of the OPC agree that while obtaining information on GHG emissions of transport services is important or very important (145 out of 175, or 83%), and they are not given enough information when planning a journey or transport of goods (45 out of 56 organisations, or 80%; 61 out of 70 individuals, or 87%; and 60 out of 65 online customers, or 92%), which seems to confirm this problem. Respondents to the targeted survey also estimated the current uptake of emissions accounting as low or very low (26 out of 31, or 84%) and interviewees agreed, adding that while companies are starting to take up emissions accounting, this is not yet a commonplace, a notion that was also mentioned by the stakeholders that participated in the workshop.

On the other hand, the outcomes of various consultation activities show that many stakeholders already perform some form of emissions measurement and calculation. The results of the targeted survey suggest that 29 out of 37, or 78% measure emissions, but in most cases this is done only for certain activities, and not necessarily frequently. It is also not a common practice to measure, calculate or communicate transport emissions at the service or trip level (only by 9 out of 26, or 35% of the respondents who declared to measure their transport emissions), which is necessary to influence transport choices of operators and users.

These factors together confirm that emissions accounting in business practice is very limited at least in uptake, completeness, frequency, and precision. The targeted survey showed that the majority of respondents (30 out of 31) would adopt a harmonised emissions measurement framework if established at EU level.

Feedback received on problem drivers

– *No set of common methodological principles to apply GHG emissions accounting*

The lack of a harmonised method appeared as a major problem driver across various consultation activities.

The respondents to the Call for Evidence recognised it as an important factor hampering the ability to accurately measure and compare the environmental impact of various transport activities. In this context, a number of contributions pointed to the harmonisation efforts being undertaken at various levels, however without having significantly improved the situation on the market.

In the OPC, 90% (157 out of 174) of the respondents replied that the existence of various GHG accounting methods and calculations leading to the provision of incomparable GHG emissions data poses a significant or very significant problem. When asked if this problem was affecting their private or professional activities, 69% (113 out of 163) replied affirmatively, while 20% (33 out of 163) considered this phenomenon to affect them only to a limited extent.

– *No set of harmonised input data to apply GHG emissions accounting*

In the initial problem definition presented to the stakeholders, this driver was integrated with another one addressing the lack of common methodological principles. However, based on the feedback from the stakeholders suggesting that the issues associated with input data (i.e. primary data and default values) need a more prominent place in the problem definition, '*No set of harmonised input data to apply GHG emissions accounting*' was included in the problem tree as a separate problem driver.

In this context, looking at the results of the targeted survey, the vast majority of the respondents replied that the issue of various methodological principles and input data together, is either relevant or highly relevant (77%, 24 out of 31).

The Call for Evidence, the targeted interviews and especially the stakeholders' workshop clearly demonstrated that there is large variance in the accounting results depending on the input data used, even when using some already established methodologies. Especially debates at the workshop focused on the importance of this problem driver and suggested an EU action may be needed, for instance to incentivise the use of primary data.

– *Reluctance to share (sensitive) data*

The reluctance to share data that is necessary for emissions accounting and decision-making processes was strongly discussed during interviews, mainly with transport service providers and their associations. Reasons given included the need to preserve sensitive information on costs and operations, especially among SMEs. The contributions in the stakeholders' workshop, as well as the replies to the survey questionnaire (19 out of 31 respondents, or 61%

rank it as relevant or highly relevant) and the questionnaire sent to Member States further reiterated the importance of this driver in the problem definition. Specifically, France clearly indicated that CountEmissions EU should provide rules addressing the exchange of information on GHG emissions with an appropriate level of security and privacy.

– *Lack of trust concerning GHG emissions output data*

This driver was not initially provided in the first set of targeted interviews, targeted survey and the OPC, but it was included in the workshop discussion, because feedback obtained from stakeholders at previous stages of the consultation process pointed to the consistent lack of trust concerning GHG emissions output data as an important issue to be tackled. For instance, OPC respondents (145 out of 175, or 84%) acknowledged that access to reliable and accurate GHG emissions data is important or very important.

During the workshop, a number of stakeholders contributing to the discussion mentioned the need for more reliable emissions accounting results as a relevant factor. The lack of trust in reliability and comparability of the GHG emissions figures was commonly considered a reason for lower demand for such figures and hence lower uptake of GHG emissions accounting. In this context, the need for a credible and harmonised verification mechanism for the output shared or published has been constantly raised as an issue by many stakeholders.

– *Complexity and high costs of GHG emissions accounting*

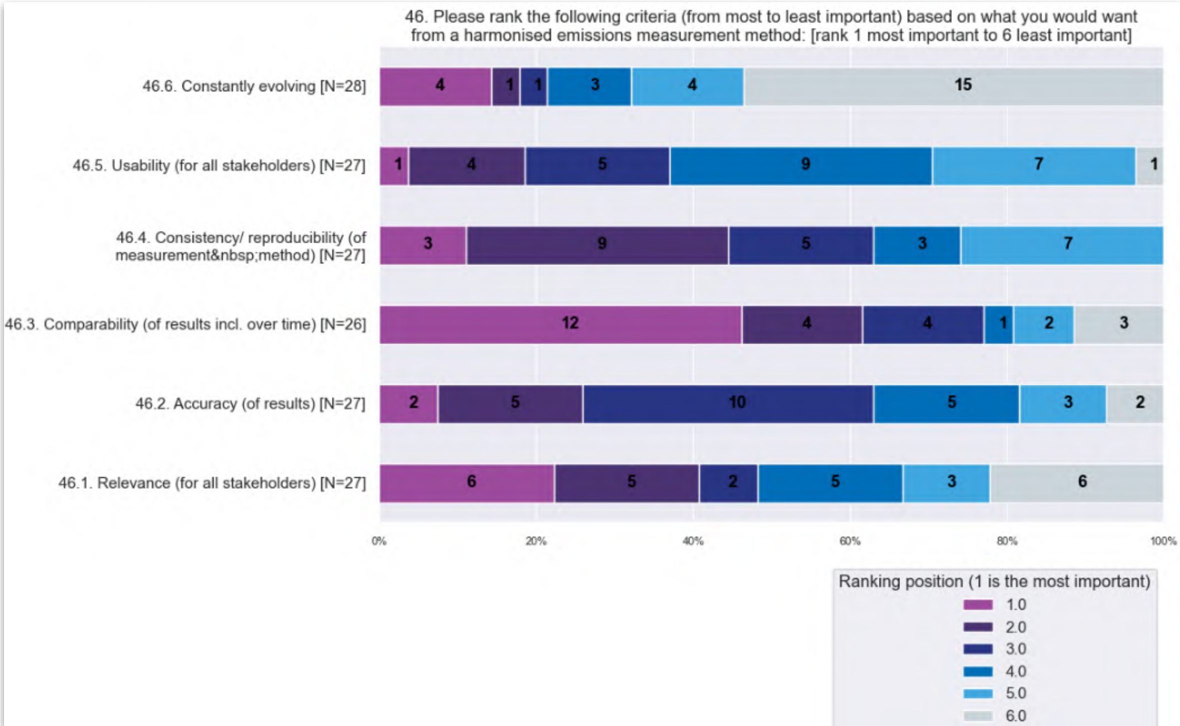
In general, stakeholders regarded complexity and high costs of GHG emissions accounting as strongly associated with calculation processes, and sharing of GHG emissions figures in the transport networks. The majority of the respondents (20 out of 31, or 64%) that replied to the targeted survey, consider this problem driver relevant or highly relevant. Respondents to the OPC also ranked this as the third most relevant driver, only after the limited availability of data within organisations and along the supply chain. These findings were also broadly confirmed by the stakeholders participating in the targeted interviews.

Feedback received on possible solutions

General expectations from a harmonised emissions measurement framework

When asked to rank specific criteria relevant for the harmonised GHG emissions measurement method (from 1 - most important to 5 - least important), respondents to the targeted survey pointed to the comparability of results over time as their first or second choice (16 out of 26, or 61%). This aspect was followed by the choices related to the consistency/reproducibility of the measurement method (12 out of 27, or 44%) and its relevance (11 out of 27, or 41%).

Figure 10: Summary of the views of stakeholders in regards to their ranking of importance of different criteria for a harmonised emissions measurement method.



Source: Ecorys and CE Delft (2023), Impact assessment support study

The need for a consistent approach to measuring GHG emissions was also raised by the respondents to the OPC (167 out of 178, or 94%).

Interaction of the common emissions accounting method with currently existing methods

Regarding the design of the initiative, there is strong support across all the consultation activities for an approach that considers already existing or emerging emissions accounting harmonisation efforts. In this regard, the response obtained from the Member State questionnaire suggests that the success of the measure can be highly dependent on being based on well-established and robust methodologies, especially those with global scope, as otherwise it could open the way for a dispute.

According to the Call for Evidence, interviews, and workshop, it was highlighted that it is also important that organisations are not subjected to diverging requirements, either across countries or regions, as that would greatly increase complexity of emissions accounting and the associated costs.

Inclusion of sector specificities in the common emissions accounting method

The targeted survey (23 out of 28, or 82%), interviews and workshop revealed that the majority of stakeholders believe sector specific guidelines based on common rules are necessary, with a possible role for each sector in collaboratively developing and implementing them in its respective networks. However, the interviews and workshop did show that some stakeholders also see these decentralised developments as a risk leading to uncontrolled divergences between the quantification processes in various sectors and resulting in producing inconsistent emissions output data. According to discussions with stakeholders, this phenomenon may be mitigated by specific measures, such as a centralised approval of sectorial guidelines, or harmonised implementation rules applicable across the board. Moreover, during the workshop some parties mentioned that the uptake of primary input data could minimise the need for these guidelines in general.

Mandating the use of the common emissions accounting method

According to the results obtained across the various consultation tools, there is a significant preference of stakeholders for an instrument including certain mandatory components. This may be especially demonstrated by the results of the targeted survey, where 26 out of 28 respondents (93%) indicated this preference, with the majority of them (17 out of 28, or 61%) suggesting mandatory calculation and reporting of emissions for at least some classes of organisations in the transport system. The survey also shows that the participating SMEs have a bigger propensity to prefer optional approaches, or, alternatively, derogations in the mandatory instrument (4 out of 7, or 57%, compared to 9 out of 28 or 32% overall). This could be due to disproportionate impact of the mandatory instrument on SMEs, a comment that appeared during interviews and workshops. Some transport associations that participated in the interviews in particular suggested large businesses should take on more of the early costs associated with CountEmissions EU, and then gradually involve the SMEs in their ecosystems to facilitate the knowledge and process transfer.

Unsurprisingly, the survey also revealed that stakeholders believe that the initiative will be more impactful if a mandatory instrument is used. Respondents felt that in this case positive effects for the transport system would substantially increase (respondents were asked to rank the magnitude of a number of potential impacts and the large majority foresaw an increase in positive impacts). However, they did not expect large emissions reductions from the accounting emissions alone (only 10 out of 23, or 43% foresaw emissions reductions), since CountEmissions EU should be seen rather as an enabler for more efficient transport options, and not a measure that can make the change directly. The insights from the interviews and the workshop broadly confirmed this finding.

Scoping and boundaries of the common emissions accounting method

The stakeholders' consultation provided useful input to the analysis of various design alternatives when discussing methodological choices for CountEmissions EU[163].

In principle, the Call for Evidence, survey and interviews clearly demonstrated that GHG (CO2 equivalents) are the preferred emissions scope for the common method. The interviews and the survey (16 out of 28, or 57%) also showed that the transport service level accounting is the one most favoured by the stakeholders (which is also the case for the Member State questionnaire response), followed by the product-level approach. In all consultation activities, as already mentioned above, there was a strong preference for a methodology that would have a global scope, facilitating emissions accounting in the international transport chains.

In terms of the activity boundaries, the Well-to-Wheel (WTW) approach was the most preferred by stakeholders across various consultation activities. However, the full lifecycle assessment (LCA) was equally strongly supported in the OPC (i.e. 75 out of 164 respondents or 46% each), especially among citizens. In this context, there appears a division among beneficiaries of transport services (individuals and businesses not directly participating in

[163] See Annex 8 for more technical details.

transport activities) more inclined towards the LCA approach, and stakeholders that are a more integral part of the transport system expressing their favour towards the WTW. From the regulatory side, a response from France, benefitting from long experience in emissions accounting in transport, revealed a preference for the WTW boundaries as well.

Verification of the emissions data

A dedicated system for verification of the emissions data and calculation processes featured prominently across all the consultation activities. In the targeted survey, for instance, out of 28 responses received, there was no opinion against the verification system to be implemented. This finding can be confirmed by the results of the OPC with 158 out of 178 (89%) respondents suggesting this measure should be tackled by CountEmissions EU. Also the participants of the stakeholders' workshop suggested a system where the emissions calculation methods and GHG data can be verified, expressing at the same time their strong preference towards using primary information.

On the other hand, the consulted stakeholders were not clear on how this verification system should be designed and which functionalities it should bear. In the OPC, an important share of answers (43 out of 178, or 24%) indicated that specific exemptions to the verification could be possible if it would prove to be too burdensome and costly.

Provision of the technical support tools and data sharing

Stakeholders see the provision of technical support tools (such as calculators and specific software) as useful enablers to facilitate the uptake of the common emissions accounting methodology. Based on the targeted survey, 18 out of 28, or 64% of the respondents would likely or very likely use these tools in their business practice, a result that should be corroborated with the outcome of the OPC (123 out of 175, or 70% of the respondents pointed to the need for additional support tools under CountEmissions EU). This OPC finding is particularly strong among business associations (46 out of 57, or 81%) and NGOs (5 out of 6, or 83%). Comments in this regard highlighted that these tools could be most beneficial to lighten the administrative burden of SMEs.

On the other hand, there was no consensus on where these technical support tools should be developed or provided from. In particular, the respondents to the OPC and targeted survey were not clear on the potential role of the public and private sectors in developing and providing these tools to organisations that need/want to calculate their GHG emissions from transport services. Otherwise, stakeholders participating in the interviews and the workshop suggested that the private sector is better positioned to provide specific tools for businesses, while these should undergo some form of a public sector verification. The latter finding broadly aligns with the views expressed in the targeted survey (by 23 out of 28, or 82% of the respondents), that the technical support tools, regardless where they come from, should be certified by an independent entity.

In addition, during various consultation activities, stakeholders also raised the topic of sharing emissions data between various entities in the transport chain. According to these stakeholders, some actions would be necessary to ensure an appropriate level of security and confidentiality of these data (for instance by appointing neutral third parties or establishing/allowing for dedicated emissions data sharing platforms). During the workshop, an idea was also brought up for the EU to define clear rules on handling these data by businesses in a proper manner.

ANNEX 3: WHO IS AFFECTED AND HOW?

1. PRACTICAL IMPLICATIONS OF THE INITIATIVE

Summary of the implementation of the preferred policy option

The focus of the initiative is to provide a harmonised framework for accounting GHG emissions of transport services, and to incentivise its uptake on the transport market.

The framework is conceived to stimulate the behavioural change among businesses and customers to effectively lower GHG emissions of transport. The preferred policy option (PO4) establishes the binding opt-in application of CountEmissions EU, accompanied by a set of provisions ensuring a high level of harmonisation of the GHG emissions data, and facilitating the use of the framework for various groups of stakeholders. According to the analysis performed in the Impact Assessment, PO4 provides a structure for the efficient implementation of the framework without creating a disproportionate burden and costs for the stakeholders concerned.

Specifically, the impacts of the measures included in the preferred policy option are expected to fall on different stakeholder groups:

- <u>Stakeholders involved in transport services activities;</u>
    - transport service organisers and hub operators;
    - transport service users;
    - other entities involved in accounting of GHG emissions of transport services;
- <u>National public authorities responsible for transport statistics;</u>
- <u>National Accreditation Bodies (NABs);</u>
- <u>Society as a whole</u>.

Stakeholders involved in transport services activities

Transport service organisers and hub operators[164], including transport operators, transport intermediaries[165] (e.g. travel agencies, freight forwarders, logistics service providers) and operators of freight and passengers hubs (e.g. terminals, logistics platforms, ports, airports) will bear the major share of the costs estimated for the preferred policy option. The costs will in particular be associated with the implementation of the methodological requirements based on the new ISO standard 14083 (adjustment costs). However, given that these requirements will apply only to entities that decide to quantify and share their GHG emissions data, this cost category is estimated to remain at a relatively moderate level. Other costs for transport service organisers and hub operators will mostly relate to the verification of the GHG emissions data generated under CountEmissions EU and the processes used for their quantification.

[164] To simplify the reading they are referred throughout the document as transport service organisers

[165] Transport intermediaries might take the role of transport service users, depending on the type of activity performed in the transport chain. For instance, a freight forwarding company may serve as a transport service organiser in relation to a manufacturer/shipper and as a transport service user for a transport operator.

Nonetheless, these costs will be borne mainly by large enterprises, since the SMEs are exempted from this provision, unless they decide to undergo this verification voluntarily.

On the other hand, transport service organisers will benefit from a unique and harmonised framework for emissions accounting, including clear instructions and specific provisions facilitating its implementation in business practice (such as certified emissions calculation tools, recognised databases of emission factors, implementation guidelines and harmonised rules for GHG emissions output data). The comparability and reproducibility of GHG emissions figures accounted by using CountEmissions EU will allow for better transparency as regards the performance of various transport services, and will lead to more informed business decisions, reduced fuel/energy consumption, lower operational costs and intangible reputational benefits vis a vis transport service users and society in general. Overall, it is estimated that for this category of stakeholders the initiative will lead to net benefits, as demonstrated in Annex 4 below.

Transport service users, be them passengers, customers, public authorities, manufacturers/shippers, wholesalers, retailers, transport service intermediaries[166] or data intermediaries[167] will mostly benefit from the clear, comparable and correct information on GHG emissions offered by the harmonised emissions accounting framework. This transparency will allow users for making informed choices as regards specific transport options, thus incentivising the behavioural change towards sustainable transport options and emissions reduction. However, the impact of these benefits, potentially large, cannot be directly quantified.

On the other hand, additional costs may arise for some users, especially those accounting emissions from their transport chains (e.g. shippers, logistic service providers, freight forwarders, travel agencies etc.). However, these costs are expected to be offset by the clear accounting rules, harmonised data and implementation support.**Other entities involved in accounting of GHG emissions of transport services,** include notably the providers of GHG emission calculators and other tools facilitating emissions accounting, such as business sector associations. This group of stakeholders will be mostly concerned by the requirements and costs related to the certification of tools they offer on the market and the quality check of sectorial/national default values databases. However, these additional costs will be outweighed by the benefits from the increased demand for these tools and databases.

[166] Certain categories of users, like manufacturers/shippers, wholesalers, retailers may to some extent execute transport services with using their internal resources. This has been accounted in the assessment

[167] A data intermediary may be considered as a specific category of a user that collects information on a transport services from transport organisers and operators and discloses it further on the market.

National public authorities responsible for transport statistics are not expected to change their reporting and enforcement modalities, but the necessary adjustments to the GHG emissions data output formats, and efforts related to the acknowledgment of the new emissions accounting rules will result in additional costs of a limited scale.

National Accreditation Bodies (NABs), would incur some minor costs for getting familiar with relevant provisions of CountEmissions EU, as well as for additional efforts related to the accreditation of bodies that will perform the verification and certification activities foreseen under CountEmissions EU.

Implications for society as a whole will include the improved transparency of information on the performance of transport services, implying the behavioural changes towards more sustainable transport choices and the related reduction of the GHG emissions, associated with positive impact on human's health.

SUMMARY OF COSTS AND BENEFITS

I. Overview of Benefits (total for all provisions) – Preferred Option ***(Policy option 4)***		
Description	***Amount***	***Comments***
	Direct benefits	
Benefits for passengers from avoided fuel used, expressed as present value over 2025-2050 relative to the baseline	EUR 108.1 million	Benefits to passengers due to more sustainable transport choices leading to energy costs savings, estimated at EUR 108.1 million, expressed as present value over 2025-2050 relative to the baseline. This is mostly due to the improved comparability of the data on which passengers can make informed decisions.
Benefits for transport service providers from avoided fuel used, expressed as present value over 2025-2050 relative to the baseline	EUR 2.3 billion	Benefits to transport service providers due to more sustainable transport choices leading to energy costs savings, estimated at EUR 2.3 billion, expressed as present value over 2025-2050 relative to the baseline. This is mostly due to the improved comparability of the data on which passengers can make informed decisions.
	Indirect benefits	
Reduction in external costs of GHG emissions, expressed as present value over 2025 2050, relative to the baseline	EUR 674.1 million	Indirect benefit to society at large, due to the tonnes of GHG emissions saved, enabled by more sustainable transport choices by passengers and transport service providers. The reduction in the external costs of GHG emissions is estimated at EUR 674.1 million, 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 163.5 million	Indirect benefit to society at large, due to the tonnes of air pollutant emissions saved, enabled by more sustainable transport choices by passengers and transport service providers. The reduction in the external costs of GHG emissions is estimated at EUR 163.5 million, expressed as present value over the 2025-2050 horizon relative to the baseline.

Reduction in external costs of road accidents (fatalities and injuries), expressed as present value over 2025 2050, relative to the baseline	EUR 645.2 million	Indirect benefit to society at large, due to the lives saved and injuries avoided, enabled by more sustainable transport choices by passengers and transport service providers and thus a reduction in the road transport activity relative to the baseline. The reduction in the external costs of road accidents is estimated at EUR 645.2 million, expressed as present value over the 2025-2050 horizon relative to the baseline.
Administrative cost savings related to the 'one in, one out' approach*		
-	-	-

II. Overview of costs – Preferred option *(Policy option 4)*						
	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 transport service organisers (TSO), transport service users (TSU) and hub operators (HO): EUR 0.9 billion For other entities involved in accounting of GHG emissions of transport services (business sector associations): EUR 0.1 million	For transport service organisers (TSO), transport service users (TSU) and hub operators (HO): EUR 0.6 billion	For national public authorities: EUR 0.1 million For EEA: EUR 0.7 million	For EEA: EUR 3.2 million
Direct administrative costs, expressed as present value over 2025-2050, relative to the baseline	-	-	-	For other entities involved in accounting of GHG emissions of transport services (business sector associations): EUR 0.2 million For other	For National Accreditati on Bodies (NABs): EUR 0.1 million	-

II. Overview of costs – Preferred option *(Policy option 4)*							
		Citizens/Consumers		Businesses		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
					entities involved in accounting of GHG emissions of transport services (calculation tool developers): EUR 0.3 million		
Indirect costs		-	-	-	-	-	-
Costs related to the 'one in, one out' approach							
Total	Direct adjustment costs, expressed as present value over 2025-2050, relative to the baseline	-	-	For transport service organisers (TSO), transport service users (TSU) and hub operators (HO): EUR 0.9 billion For other entities involved in accounting of GHG emissions of transport services (business sector associations): EUR 0.1 million	For transport service organisers (TSO), transport service users (TSU) and hub operators (HO): EUR 0.6 billion		
	Indirect adjustment costs	-	-	-	-		
	Administrative costs (for offsetting), **average per year relative to**	-	-	-	For business sector associations and calculation tools developers:		

II. Overview of costs – Preferred option *(Policy option 4)*							
		Citizens/Consumers		**Businesses**		**Administrations**	
		One-off	**Recurrent**	**One-off**	**Recurrent**	**One-off**	**Recurrent**
	the baseline				EUR 26,419 per year on average, relative to the baseline		

RELEVANT SUSTAINABLE DEVELOPMENT GOALS

III. Overview of relevant Sustainable Development Goals – Preferred Option *(Policy option 4)*		
Relevant SDG	**Expected progress towards the Goal**	**Comments**
SDG No 13 - Take urgent action to combat climate change and its impacts	431.5. thousand tonnes of GHG saved in 2030 and 27.3 thousand tonnes of GHG saved in 2050	The reduction in the GHG emissions is mainly driven by the behavioural changes towards higher use of more sustainable transport options. In cumulative terms, over 2025-2050, the preferred policy option is expected to result in 5.6 million tonnes of GHG emissions saved.
SDG No 7 - Ensure access to affordable, reliable, sustainable and modern energy for all	Better and comparable data will provide the base for a more informed decisions making in passengers choices and freight transport.	The WTW GHG emission will consider the production, distribution and use of energy/fuels for transport services, making different energy sources comparable, even if used for the same type of transport.
SDG No 12 - Ensure sustainable consumption and production patterns	EUR 2.4 billion of fuel saved by 2050, of which EUR 2.3 billion for operators and EUR 108 million for consumers.	The availability of better quality and comparable data will induce saving behaviours towards greener mobility and transport choices.

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[168], the impact assessments accompanying the 2030 Climate Target Plan[169] and the Staff Working Document accompanying the Sustainable and Smart Mobility Strategy[170], the Commission's proposal for a Long Term Strategy[171] as well as for the 2020 and 2030 EU's climate and energy policy framework. Building on the PRIMES-TREMOVE model results, the baseline projections for the number of users of GHG quantification tools has been developed by CE Delft et al. in the context of the impact assessment support study[172].

For the assessment of the impacts of the policy options, an Excel-based tool has been developed by CE Delft et al. in the context of the impact assessment suport study. The proposed measures 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 2022-2050 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 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.

---

[168] Delivering the European Green Deal | European Commission (europa.eu)
[169] SWD(2020)176 final.
[170] EUR-Lex - 52020SC0331 - EN - EUR-Lex (europa.eu)
[171] Source: 2050 long-term strategy (europa.eu)
[172] Ecorys and CE Delft (2023), Impact assessment support study.

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 and New Mobility Pattern projects) 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 CountEmissions EU

An excel-based tool has been developed for projecting the numbers of businesses that are quantifying the GHG emissions at transport service level and quantifying the costs based on the Standard Cost Model.

[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

The main data source, for the levels of business activity in the transport sector[176], is Eurostat business statistics by employment size class between 2015 and 2020. This provides data for each of the EU27 Member States and at EU27 level, per year, per company size, and per economic activity. The sources for the number of persons employed in the passenger and freight transport are the EUROSTAT database and the Statistical Pocketbook "EU transport in figures"[177]. Other data comes from UNECE, World Tourism Organisation, national databases and some national/social representatives' reports. The company size is defined based on the number of employees. Data on turnover draws on the same data sources. The economic activities for which the data was extracted represent the transport sector (those under NACE code H), manufacturing (NACE code C), trade (NACE code G), and the tourism industry (Eurostat aggregate under code TI).

On the basis of this information, the NACE-code classification has been further elaborated to link the transport-related activities with the type of enterprises in the transport ecosystem, namely: (i) transport service organiser (TSO) (e.g. transport operators, travel agencies, logistics service providers, freight forwarders), (ii) transport service user (TSU) (e.g. shippers) or hub operator (HO)[178].

Table 19 shows the average number of companies involved in the transport ecosystem for 2015-2020 by NACE-code, by type of activity and by size. It should be noted that the vast majority of companies (i.e. 99.7%) falls under the definition of small and medium-sized enterprises (SMEs). When it comes to the type of activity, the majority of enterprises in the manufacturing, wholesale and retail, and tourism sectors are users of transport services[179].

Table 19: Number of companies involved in the transport ecosystem by NACE-code, by type of activity and by size (average value for 2015-2020)

Transport mode	Eurostat NACE-code	Type of activity	Number of companies			Share	
			SMEs	> 250	Total	SMEs	> 250
Passenger	Interurban rail	TSO	150	35	185	81.1%	18.9%
	Other transport over land	TSO	339,572	549	340,121	99.8%	0.2%
	Maritime	TSO	5,745	38	5,783	99.3%	0.7%
	Inland navigation	TSO	3,892	2	3,894	99.9%	0.1%
	Air	TSO	3,748	70	3,818	98.2%	1.8%
Freight	Road	TSO	543,186	641	543,827	99.9%	0.1%
	Rail	TSO	561	37	598	93.8%	6.2%
	Inland navigation	TSO	5,550	2	5,552	100.0%	0.0%
	Maritime	TSO	3,835	51	3,886	98.7%	1.3%
	Air and space	TSO	503	9	512	98.2%	1.8%
	Postal activities	TSO	88,545	314	88,859	99.6%	0.4%
Hub operators	Warehousing and storage	HO	13,860	195	14,055	98.6%	1.4%
	Support activities for transportation	HO	121,038	1,032	122,070	99.2%	0.8%
Other	Manufacturing	TSU	31,998	1,529	33,527	95.4%	4.6%

176 Services by employment size class (NACE Rev. 2, H-N, S95) [SBS_SC_1B_SE_R2__custom_3944403]
177 https://transport.ec.europa.eu/media-corner/publications_en
178 A transport hub operator is defined as an enterprise that organises transport services converging at nodes, like warehouses or logistic centres, where cargos are exchanged between vehicles or transport modes.
179 Only those that are estimated to perform transport on own account are reported in this table and relevant for this initiative.

	Wholesale and retail	TSU	578,130	702	578,832	99.9%	0.1%
	Tourism	TSU	27,389	532	27,921	98.1%	1.9%
Total			**1,767,702**	**5,738**	**1,773,440**	**99.7%**	**0.3%**

Source : Ecorys and CE Delft (2023), Impact assessment support study

The number of entreprises currently measuring transport GHG emissions was estimated based on inputs from stakeholders. Two dimensions were considered. The first was at the entreprise level (for example, the level of detail commonly associated with the annual reporting for publicly listed companies) and the second was at the service level (for example, for individual services delivered by an operator). The evidence collected suggests that while quite a high proportion of entreprises already consider their transport emissions at aggregate level, there are very few who consider emissions at the service level.

Considerations for the uptake of GHG emissions accounting on the market

Uptake of GHG emissions accounting of transport services is an essential element to identify the impacts. In this context specific considerations were given to voluntary, or semi voluntary (binding opt-in) approaches (which cover PO2 to PO5), where the decision on whether to calculate emissions is not specifically required by law. In the case of a voluntary policy instrument (with no requirement to use the harmonised framework) it was assumed that some businesses would choose to use the harmonised framework, while others would continue with other available methods, in particular those they were already familiar with. In the binding opt-in cases, it was assumed that any business that chose to measure or calculate emissions at the service level would do so using the harmonised framework. In the cases where transport emissions measurement and calculation is binding opt-in, the assumption was made that no additional business entities above the baseline in 2050 would be incentivised to take up emissions accounting at the service level. It means in practice that the 2050 baseline uptake acts as an upper bound of 'climate aware' business entities, but regulators can incentivise those climate aware entities to engage in emissions measurement and calculation earlier than they would have otherwise. This may be a conservative assumption since it is entirely possible that European support of the existing methodology would encourage new businesses to measure and calculate emissions that would not have considered doing so otherwise. It was, however, thought to be unlikely that the existence of a harmonised transport emissions measurement and calculation methodology in itself could incentivise business entities to become 'climate aware'. The transition to 'climate aware' status would rather occur as a result of external pressure from investors/ clients or separate legislative measures, for instance requiring to calculate or/and report emissions based on CountEmissions EU framework. While there is no specific evidence to estimate the maximum magnitude of this additional factor on the binding opt-in approach, especially in the theoretical situation where it leads to establishing a de facto standard on the market, the mandatory policy options 1 and 6 show the impact of the use of CEEU on all concerned businesses in the baseline.

Overall, the reason for building this level of assumptions lies in the fact that a harmonised approach such as CountEmissions EU does not exist yet. To further assess and recognise the limitations, a two-scenario sensitivity analysis has been performed to support the assessment of impacts.

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" (REF2020)[180]. The same assumptions have been used in the policy scenarios underpinning the impact assessments accompanying the "Fit for 55" package[181].

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[182] 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[183] by the Directorate General for Economic and Financial Affairs, which are based on the same population growth assumptions.

Table 20: 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%

[180] EU Reference Scenario 2020 (europa.eu)
[181] Policy scenarios for delivering the European Green Deal (europa.eu)
[182] EUROPOP2019 population projections: Eurostat - Data Explorer (europa.eu)
[183] 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
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%
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[184].

Table 21: 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

[184] SWD(2022)230 final.

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[185]. The same assumptions have been used in the context of this impact assessment.

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[186] and the initiatives of the RePowerEU package proposed by the Commission on 18 May 2022[187]. In terms of GHG emissions accounting, the Baseline scenario assumes no further EU level intervention beyond the current initiatives in place at national level and enterprise level.

The baseline also incorporates foresight megatrends[188] and developments captured in the 2022 Strategic Foresight Report[189]. 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*[190] by the Directorate General for Economic and Financial Affairs.

Baseline scenario results

Transport activity. 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. 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). High speed rail activity, in particular, would grow by 68% by 2030 relative to 2015 (165% by 2050), missing however to deliver on the milestone of the SSMS of doubling its traffic by 2030 and tripling it by 2050. Freight rail traffic would increase by 42% by 2030 relative to 2015 (91% for 2015-2050) also not delivering on the milestone of the SSMS of increasing the traffic by 50% by 2030 and doubling it by 2050.

GHG emissions and air pollutant emissions. Well-to-wheel GHG emissions from transport including international aviation and maritime, are projected to be 26% lower by 2030 compared to 2015, and 89% lower by 2050. NOx emissions are projected to go down by 56%

---

[185] EU Reference Scenario 2020 (europa.eu)
[186] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/delivering-european-green-deal_en
[187] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_3131
[188] https://knowledge4policy.ec.europa.eu/foresight/tool/megatrends-hub_en#explore
[189] COM(2022) 289 final of 29 June 2022.
[190] The 2021 Ageing Report : Underlying assumptions and projection methodologies The 2021 Ageing Report: Underlying Assumptions and Projection Methodologies | European Commission (europa.eu)

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).

Number of businesses in the transport sector and other sectors performing transport on own account. The number of enterprises in the transport sector and other sectors performing transport on own account is estimated at 1.8 million in 2020 and is projected to remain stable over time.

Evolution of number of businesses performing GHG emissions accounting at service level. The evidence collected suggests that while quite a high proportion of enterprises already considers their transport emissions at aggregate (i.e. enterprise) level and their share will continue to increase over time, there are very few who consider emissions at the service level. In addition, the growth in the number of business entities who measure transport emissions at the service level is expected to be low in the baseline but also to differ between large enterprises and SMEs. The shares of large enterprises performing GHG emissions accounting at service level in the total number of large enterprises in the baseline scenario for 2020-2050 are provided in Table 22, while the total number of large enterprises performing GHG emissions accounting at service level is provided in Table 23Table .

Table 22: Shares of large entreprises performing GHG emissions accounting at service level in the baseline scenario

Transport mode	Eurostat NACE-code	2020	2025	2030	2040	2050
Passenger	Interurban rail	8.6%	14.3%	17.1%	25.7%	34.3%
	Other transport over land	0.7%	0.7%	0.7%	0.7%	0.7%
	Maritime	13.2%	18.4%	23.7%	28.9%	36.8%
	Inland navigation	0.0%	0.0%	0.0%	0.0%	0.0%
	Air	22.9%	25.7%	30.0%	37.1%	44.3%
Freight	Road	13.7%	18.3%	22.6%	30.4%	37.6%
	Rail	8.1%	13.5%	18.9%	27.0%	35.1%
	Inland navigation	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	13.7%	17.6%	21.6%	29.4%	37.3%
	Air and space	22.2%	22.2%	33.3%	44.4%	44.4%
	Postal activities	8.6%	13.7%	18.2%	26.4%	34.1%
Hub operators	Warehousing and storage	2.1%	3.1%	4.1%	5.6%	7.7%
	Support activities for transportation	1.0%	2.0%	3.0%	4.9%	6.8%
Other	Manufacturing	6.3%	11.2%	15.8%	24.4%	32.2%
	Wholesale and retail	6.3%	11.2%	15.8%	24.4%	32.2%
	Tourism	1.7%	3.9%	6.0%	10.0%	13.5%

Source : Ecorys and CE Delft (2023), Impact assessment support study

Table 23: Number of large entreprises performing GHG emissions accounting at service level in the baseline scenario

Transport mode	Eurostat NACE-code	2020	2025	2030	2040	2050
Passenger	Interurban rail	3	5	6	9	12
	Other transport over land	4	4	4	4	4

Transport mode	Eurostat NACE-code	2020	2025	2030	2040	2050
	Maritime	5	7	9	11	14
	Inland navigation	0	0	0	0	0
	Air	16	18	21	26	31
Freight	Road	88	117	145	195	241
	Rail	3	5	7	10	13
	Inland navigation	0	0	0	0	0
	Maritime	7	9	11	15	19
	Air and space	2	2	3	4	4
	Postal activities	27	43	57	83	107
Hub operators	Warehousing and storage	4	6	8	11	15
	Support activities for transportation	10	21	31	51	70
Other	Manufacturing	96	171	242	374	492
	Wholesale and retail	44	78	111	172	226
	Tourism	9	21	32	53	72
Total		318	507	687	1,018	1,320

Source: Ecorys and CE Delft (2023), Impact assessment support study

The shares of SMEs performing GHG emissions accounting at service level in the total number of SMEs in the baseline scenario for 2020-2050 are provided in Table 24 while the total number of SMEs performing GHG emissions accounting at service level is provided in Table 25.

Table 24: Shares of SMEs performing GHG emissions accounting at service level in the baseline scenario

Transport mode	Eurostat NACE-code	2020	2025	2030	2040	2050
Passenger	Interurban rail	0.0%	0.0%	0.0%	0.0%	0.7%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	3.4%	4.6%	5.6%	7.6%	9.4%
	Inland navigation	0.2%	0.4%	0.5%	0.8%	1.1%
	Air	1.1%	1.3%	1.5%	1.9%	2.2%
Freight	Road	2.8%	3.7%	4.5%	6.1%	7.5%
	Rail	0.0%	0.2%	0.2%	0.2%	0.4%
	Inland navigation	0.3%	0.7%	1.0%	1.6%	2.2%
	Maritime	3.4%	4.6%	5.6%	7.6%	9.4%
	Air and space	5.6%	6.6%	7.6%	9.3%	10.9%
	Postal activities	4.4%	6.8%	9.0%	13.2%	17.0%
Hub operators	Warehousing and storage	0.0%	0.0%	0.0%	0.1%	0.1%
	Support activities for transportation	0.0%	0.0%	0.0%	0.0%	0.1%
Other	Manufacturing	0.3%	0.6%	0.8%	1.2%	1.6%
	Wholesale and retail	0.3%	0.6%	0.8%	1.2%	1.6%
	Tourism	0.6%	1.3%	2.1%	3.4%	4.6%

Source : Ecorys and CE Delft (2023), Impact assessment support study

Table 25: Number of SMEs performing GHG emissions accounting at service level in the baseline scenario

Transport mode	Eurostat NACE-code	2020	2025	2030	2040	2050
Passenger	Interurban rail	0	0	0	0	1
	Other transport over land	25	25	25	25	25

Transport mode	Eurostat NACE-code	2020	2025	2030	2040	2050
	Maritime	197	263	324	438	540
	Inland navigation	9	15	20	31	42
Freight	Air	42	50	57	70	82
	Road	14,938	19,857	24,518	33,118	40,840
	Rail	0	1	1	1	2
	Inland navigation	19	37	55	90	123
	Maritime	132	175	216	292	360
	Air and space	28	33	38	47	55
	Postal activities	3,874	5,995	8,004	11,713	15,042
	Warehousing and storage	3	4	5	8	11
Other	Support activities for transportation	12	24	36	59	82
	Manufacturing	100	179	253	391	515
	Wholesale and retail	1,807	3,229	4,577	7,065	9,298
	Tourism	156	366	564	931	1,261
Total		21,342	30,253	38,693	54,279	68,279

Source : Ecorys and CE Delft (2023), Impact assessment support study

Costs for enterprises performing GHG emissions accounting. Table 26 provides a breakdown of the unit costs per transport service for performing GHG emissions accounting, by cost category and type of cost (i.e. one-off and recurrent costs). The unit costs are differentiated between transport service organisers (TSO), transport service users (TSU) and hub operators (HO), and also between SMEs and large companies. Labour costs are derived based on the tariff rates from the Eurostat's structure of earnings survey and labour force survey, considering the category ISCO 2 (professionals)[191]. The number of hours worked and thus the unit costs per transport service are assumed to go down over time, by 15% by 2050 relative to 2020, due to the learning effects[192].

Table 26: Unit costs per transport service associated with GHG emissions accounting, by type of activity in 2020 (in EUR, 2022 prices)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
1) One-off costs for implementing a new GHG emission accounting method	1,748	2,033	1,748	4,802	6,625	4,802
2) Recurrent annual costs with no verification	1,139	570	1,139	3,190	2,734	3,190
3) Recurrent costs for verification of calculation processes (use of certified tool)	399	570	399	638	1,048	638
4) Recurrent costs for the use of calculation tools	257	514	514	1,799	3,597	3,597

[191] The tariff rate for ISCO 2 is EUR 40.9 per hour in 2022 prices. Source: Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour Costs.
[192] Taking into account possible savings resulting from the facilitation of corporate reporting required under other legislation (such as CSRD).

Source: Ecorys and CE Delft (2023), Impact assessment support study

Total costs are calculated by multiplying the number of services for which the enterprises count GHG emissions with the unit values presented in costs per transport service and are reported in Table 27Table . In the baseline scenario, they are projected to increase from EUR 36.4 million in 2020 to EUR 61.4 million in 2030 and EUR 92.7 million in 2050. The largest share of the costs is associated to SMEs.

	2021	2030	2040	2050
All enterprises	106.5	200.4	294.4	378.8
SME	93.3	171.7	250.1	320.6
Large enterprises	13.3	28.7	44.2	58.2

Source: Ecorys and CE Delft (2023), Impact assessment support study

Further details on the costs associated with GHG emissions accounting for SMEs and large enterprises are provided in Table 27.

Table 27: Total costs for SMEs and large enterprises associated with GHG emissions accounting at service level in the baseline (in million EUR, 2022 prices)

	2020	2025	2030	2040	2050
1a) One-off costs for implementing a new GHG emission accounting method	3.4	3.4	3.1	2.7	2.2
SME	3.2	3.2	2.9	2.5	2.1
Large companies	0.2	0.2	0.2	0.2	0.1
1b) One-off costs for switching to a new GHG emission accounting method	0.0	0.0	0.0	0.0	0.0
SME	0.0	0.0	0.0	0.0	0.0
Large companies	0.0	0.0	0.0	0.0	0.0
2) Recurrent annual costs with no verification	24.1	33.8	41.7	54.6	64.0
SME	23.1	32.3	39.8	51.9	60.8
Large companies	0.9	1.5	2.0	2.7	3.3
3) Annual costs for verification activities	2.0	2.9	3.6	4.9	5.7
SME	1.8	2.5	3.2	4.2	4.9
Large companies	0.2	0.3	0.5	0.7	0.8
4) Annual costs for tools use	6.9	10.2	12.9	17.4	20.7
SME	6.0	8.8	11.0	14.7	17.4
Large companies	0.9	1.4	1.9	2.7	3.4
Total costs	36.4	50.3	61.4	79.6	92.7
SME	34.1	46.8	56.9	73.3	85.1
Large companies	2.2	3.5	4.6	6.3	7.6

Source: Ecorys and CE Delft (2023), Impact assessment support study

3. Costs of individual policy measures

This section explains the inputs used and provides the assessment of costs of the policy measures included in the policy options. The estimation of the costs draws on the impact assessment support study[193], including input collected through desk research and stakeholder interviews during the impact assessment process. It should be however noted that these costs and costs savings should only be regarded as an estimation of the order of magnitude, drawing mainly on stakeholder interviews.

193 *Ecorys and CE Delft (2023), Impact assessment support study*.

The presentation distinguishes between different stakeholders' groups (national public authorities including NABs, businesses and business associations, European Commission and EEA) and between one-off and recurrent (annual) costs, and provides the present value for 2025-2050 assuming a discount rate of 3%.

In order to calculate the total costs of the policy options, different levels of uptake of GHG emissions accounting at transport service level have been assumed on the basis of:

- The policy measures related to the methodology (ISO 14083 – PM1, PEFCR – PM2 or ISO 14083 with additional elements and increased accuracy – PM3);
- The policy measures for the applicability (mandatory – PM13, binding opt-in – PM14, voluntary opt-in – PM15).

Drawing on desk research and interviews with operators and experts[194] in the context of the impact assessment support study, Table 28 to Table 37 summarise the increase in the share of enterprises performing GHG emissions accounting at service level for each NACE category, separated between large enterprises and SMEs, for each policy option relative to the baseline.

Table 28: Increase in the share of enterprises performing GHG emissions accounting at service level in PO1 and PO6 relative to the baseline (percentage points increase relative to the baseline)

		2025	2030	2035	2040	2045	2050
SME							
Passenger	Interurban rail	5%	53%	100%	100%	100%	99%
	Other transport over land	5%	52%	100%	100%	100%	100%
	Maritime	8%	51%	93%	92%	91%	91%
	Inland navigation	8%	53%	99%	99%	99%	99%
	Air	6%	52%	98%	98%	98%	98%
Freight	Road	7%	51%	95%	94%	93%	92%
	Rail	5%	52%	100%	100%	100%	100%
	Inland navigation	6%	52%	99%	98%	98%	98%
	Maritime	8%	51%	93%	92%	91%	91%
	Air and space	8%	50%	91%	91%	90%	89%
	Postal activities	10%	50%	89%	87%	85%	83%
Hub operators	Warehousing and storage	5%	53%	100%	100%	100%	100%
	Support activities for transportation	5%	53%	100%	100%	100%	100%
Other	Manufacturing	6%	52%	99%	99%	99%	98%
	Wholesale and retail	6%	52%	99%	99%	99%	98%
	Tourism	7%	52%	97%	97%	96%	95%
Large companies (250 or more)							
Passenger	Interurban rail	14%	47%	77%	74%	69%	66%
	Other transport over land	5%	52%	99%	99%	99%	99%
	Maritime	16%	43%	74%	71%	66%	63%
	Inland navigation	5%	53%	100%	100%	100%	100%

[194] *Ecorys and CE Delft (2023), Impact assessment support study*.

		2025	2030	2035	2040	2045	2050
	Air	16%	41%	66%	63%	60%	56%
Freight	Road	16%	44%	73%	70%	66%	62%
	Rail	16%	46%	78%	73%	70%	65%
	Inland navigation	5%	53%	100%	100%	100%	100%
	Maritime	17%	46%	73%	71%	67%	63%
	Air and space	27%	41%	67%	56%	56%	56%
	Postal activities	15%	46%	78%	74%	70%	66%
Hub operators	Warehousing and storage	22%	59%	95%	94%	93%	92%
	Support activities for transportation	22%	59%	96%	95%	94%	93%
Other	Manufacturing	15%	47%	80%	76%	72%	68%
	Wholesale and retail	15%	47%	80%	76%	72%	68%
	Tourism	9%	51%	92%	90%	88%	87%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 29: Type and size of impacted enterprises in PO1 and PO6 as a percentage of all enterprises targeted by CountEmissions EU

		2025	2030	2040	2050
SME					
Passenger	Interurban rail	5%	53%	100%	100%
	Other transport over land	5%	53%	100%	100%
	Maritime	12%	56%	100%	100%
	Inland navigation	8%	54%	100%	100%
	Air	7%	53%	100%	100%
Freight	Road	11%	55%	100%	100%
	Rail	5%	53%	100%	100%
	Inland navigation	6%	53%	100%	100%
	Maritime	12%	56%	100%	100%
	Air and space	15%	57%	100%	100%
	Postal activities	17%	59%	100%	100%
Hub operators	Warehousing and storage	5%	53%	100%	100%
	Support activities for transportation	5%	53%	100%	100%
Other	Manufacturing	6%	53%	100%	100%
	Wholesale and retail	6%	53%	100%	100%
	Tourism	8%	54%	100%	100%
Total SMEs		8%	54%	100%	100%
Large (250 or more)					
Passenger	Interurban rail	29%	63%	100%	100%
	Other transport over land	6%	53%	100%	100%
	Maritime	34%	66%	100%	100%
	Inland navigation	0%	50%	100%	100%
	Air	43%	71%	100%	100%
Freight	Road	34%	67%	100%	100%
	Rail	30%	65%	100%	100%
	Inland navigation	0%	50%	100%	100%
	Maritime	35%	67%	100%	100%
	Air and space	44%	78%	100%	100%
	Postal activities	29%	64%	100%	100%
Hub operators	Warehousing and storage	26%	63%	100%	100%

	Support activities for transportation	25%	62%	100%	100%
Other	Manufacturing	26%	63%	100%	100%
	Wholesale and retail	26%	63%	100%	100%
	Tourism	13%	57%	100%	100%
Total large companies (250 or more)		24%	62%	100%	100%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 30: Increase in the share of enterprises performing GHG emissions accounting at service level in PO2 relative to the baseline (percentage points increase relative to the baseline)

		2025	2030	2035	2040	2045	2050
SME							
Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%	0.7%	0.1%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	1.8%	3.8%	2.7%	1.8%	0.9%	0.2%
	Inland navigation	0.3%	0.6%	0.4%	0.3%	0.1%	0.0%
	Air	0.3%	0.7%	0.5%	0.3%	0.2%	0.0%
Freight	Road	1.5%	3.0%	2.2%	1.4%	0.7%	0.1%
	Rail	0.0%	0.2%	0.2%	0.2%	0.0%	0.0%
	Inland navigation	0.6%	1.2%	0.9%	0.6%	0.3%	0.1%
	Maritime	1.9%	3.8%	2.7%	1.8%	0.9%	0.2%
	Air and space	1.8%	3.4%	2.4%	1.6%	0.8%	0.2%
	Postal activities	3.9%	7.9%	5.8%	3.8%	1.8%	0.4%
Hub operators	Warehousing and storage	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Support activities for transportation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other	Manufacturing	0.4%	0.8%	0.6%	0.4%	0.2%	0.0%
	Wholesale and retail	0.4%	0.8%	0.6%	0.4%	0.2%	0.0%
	Tourism	1.3%	2.5%	1.9%	1.2%	0.6%	0.1%
Large companies (250 or more)							
Passenger	Interurban rail	8.6%	17.1%	11.4%	8.6%	2.9%	0.6%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	7.9%	13.2%	10.5%	7.9%	2.6%	0.5%
	Inland navigation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Air	7.1%	14.3%	10.0%	7.1%	4.3%	0.9%
Freight	Road	7.3%	15.0%	10.9%	7.2%	3.4%	0.7%
	Rail	8.1%	16.2%	13.5%	8.1%	5.4%	1.1%
	Inland navigation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	7.8%	15.7%	9.8%	7.8%	3.9%	0.8%
	Air and space	11.1%	11.1%	11.1%	0.0%	0.0%	0.0%
	Postal activities	7.6%	15.9%	11.8%	7.6%	3.8%	0.8%
Hub operators	Warehousing and storage	1.5%	3.6%	2.6%	2.1%	1.0%	0.2%
	Support activities for transportation	1.8%	3.8%	2.8%	1.8%	1.0%	0.2%
Other	Manufacturing	8.0%	16.3%	11.9%	7.7%	3.8%	0.8%
	Wholesale and retail	8.0%	16.3%	11.9%	7.7%	3.8%	0.8%
	Tourism	3.7%	7.4%	5.4%	3.5%	1.7%	0.3%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 31: Type and size of impacted enterprises in PO2 as a percentage of all enterprises targeted by CountEmissions EU

		2025	2030	2040	2050
SME					

Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%
	Other transport over land	0.0%	0.0%	0.0%	0.0%
	Maritime	6.4%	9.4%	9.4%	9.6%
	Inland navigation	0.7%	1.1%	1.1%	1.1%
	Air	1.7%	2.2%	2.2%	2.2%
Freight	Road	5.1%	7.5%	7.5%	7.7%
	Rail	0.2%	0.4%	0.4%	0.4%
	Inland navigation	1.3%	2.2%	2.2%	2.3%
	Maritime	6.4%	9.4%	9.4%	9.6%
	Air and space	8.3%	10.9%	10.9%	11.1%
	Postal activities	10.7%	17.0%	17.0%	17.4%
Hub operators	Warehousing and storage	0.1%	0.1%	0.1%	0.1%
	Support activities for transportation	0.0%	0.1%	0.1%	0.1%
Other	Manufacturing	1.0%	1.6%	1.6%	1.6%
	Wholesale and retail	1.0%	1.6%	1.6%	1.6%
	Tourism	2.6%	4.6%	4.6%	4.7%
Total SMEs		2.5%	3.9%	3.9%	3.9%
Large (250 or more)					
Passenger	Interurban rail	22.9%	34.3%	34.3%	34.3%
	Other transport over land	0.7%	0.7%	0.7%	0.7%
	Maritime	26.3%	36.8%	36.8%	36.8%
	Inland navigation	0.0%	0.0%	0.0%	0.0%
	Air	32.9%	44.3%	44.3%	45.7%
Freight	Road	25.6%	37.6%	37.6%	38.2%
	Rail	21.6%	35.1%	35.1%	35.1%
	Inland navigation	0.0%	0.0%	0.0%	0.0%
	Maritime	25.5%	37.3%	37.3%	37.3%
	Air and space	33.3%	44.4%	44.4%	44.4%
	Postal activities	21.3%	34.1%	34.1%	34.7%
Hub operators	Warehousing and storage	4.6%	7.7%	7.7%	7.7%
	Support activities for transportation	3.9%	6.8%	6.8%	7.0%
Other	Manufacturing	19.2%	32.2%	32.2%	32.9%
	Wholesale and retail	19.2%	32.2%	32.2%	32.9%
	Tourism	7.5%	13.5%	13.5%	13.9%
Total large companies (250 or more)		14.3%	23.0%	23.0%	23.5%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 32: Increase in the share of enterprises performing GHG emissions accounting at service level in PO3 relative to the baseline (percentage points increase relative to the baseline)

		2025	2030	2035	2040	2045	2050
SME							
Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%	0.7%	0.0%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	1.2%	2.7%	1.6%	0.7%	0.0%	0.0%
	Inland navigation	2.6%	5.2%	5.1%	5.0%	4.8%	4.7%
	Air	0.6%	0.9%	0.7%	0.6%	0.4%	0.3%
Freight	Road	0.7%	1.7%	0.9%	0.1%	0.0%	0.0%
	Rail	0.0%	0.2%	0.2%	0.2%	0.0%	0.0%
	Inland navigation	0.6%	1.2%	0.9%	0.6%	0.3%	0.0%
	Maritime	2.7%	4.7%	3.7%	2.8%	1.9%	1.0%

		2025	2030	2035	2040	2045	2050
	Air and space	3.0%	4.6%	3.6%	2.8%	2.0%	1.2%
	Postal activities	5.2%	9.6%	7.4%	5.4%	3.5%	1.6%
Hub operators	Warehousing and storage	0.2%	0.4%	0.3%	0.3%	0.3%	0.3%
	Support activities for transportation	0.2%	0.4%	0.3%	0.3%	0.3%	0.3%
Other	Manufacturing	0.5%	1.0%	0.7%	0.5%	0.3%	0.2%
	Wholesale and retail	0.5%	1.0%	0.7%	0.5%	0.3%	0.1%
	Tourism	1.5%	3.0%	2.3%	1.6%	1.0%	0.4%
Large companies (250 or more)							
Passenger	Interurban rail	8.6%	20.0%	14.3%	11.4%	5.7%	2.9%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	10.5%	18.4%	15.8%	13.2%	7.9%	5.3%
	Inland navigation	0.0%	50.0%	50.0%	50.0%	50.0%	50.0%
	Air	11.4%	18.6%	14.3%	11.4%	8.6%	4.3%
Freight	Road	10.8%	18.9%	14.8%	11.1%	7.3%	3.9%
	Rail	10.8%	18.9%	16.2%	10.8%	8.1%	2.7%
	Inland navigation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	11.8%	19.6%	13.7%	11.8%	7.8%	3.9%
	Air and space	22.2%	22.2%	22.2%	11.1%	11.1%	11.1%
	Postal activities	10.2%	19.1%	15.0%	10.8%	7.0%	3.2%
Hub operators	Warehousing and storage	17.4%	34.4%	33.3%	32.8%	31.8%	30.8%
	Support activities for transportation	17.4%	35.0%	34.0%	33.0%	32.2%	31.2%
Other	Manufacturing	10.2%	19.3%	14.9%	10.7%	6.8%	3.0%
	Wholesale and retail	10.2%	19.3%	14.9%	10.7%	6.8%	3.0%
	Tourism	4.4%	8.6%	6.6%	4.7%	2.9%	1.2%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 33: Type and size of impacted enterprises in PO3 as a percentage of all enterprises targeted by CountEmissions EU

		2025	2030	2040	2050
SME					
Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%
	Other transport over land	0.0%	0.0%	0.0%	0.0%
	Maritime	5.8%	8.3%	8.3%	9.4%
	Inland navigation	3.0%	5.8%	5.8%	5.8%
	Air	1.9%	2.5%	2.5%	2.5%
Freight	Road	4.3%	6.2%	6.2%	7.5%
	Rail	0.2%	0.4%	0.4%	0.4%
	Inland navigation	1.3%	2.2%	2.2%	2.2%
	Maritime	7.2%	10.4%	10.4%	10.4%
	Air and space	9.5%	12.1%	12.1%	12.1%
	Postal activities	11.9%	18.6%	18.6%	18.6%
Hub operators	Warehousing and storage	0.2%	0.4%	0.4%	0.4%
	Support activities for transportation	0.2%	0.4%	0.4%	0.4%
Other	Manufacturing	1.1%	1.8%	1.8%	1.8%
	Wholesale and retail	1.1%	1.8%	1.8%	1.8%
	Tourism	2.8%	5.0%	5.0%	5.0%

Total SMEs		2.4%	3.6%	3.6%	4.0%
Large (250 or more)					
Passenger	Interurban rail	22.9%	37.1%	37.1%	37.1%
	Other transport over land	0.7%	0.7%	0.7%	0.7%
	Maritime	28.9%	42.1%	42.1%	42.1%
	Inland navigation	0.0%	50.0%	50.0%	50.0%
	Air	37.1%	48.6%	48.6%	48.6%
Freight	Road	29.0%	41.5%	41.5%	41.5%
	Rail	24.3%	37.8%	37.8%	37.8%
	Inland navigation	0.0%	0.0%	0.0%	0.0%
	Maritime	29.4%	41.2%	41.2%	41.2%
	Air and space	44.4%	55.6%	55.6%	55.6%
	Postal activities	23.9%	37.3%	37.3%	37.3%
Hub operators	Warehousing and storage	20.5%	38.5%	38.5%	38.5%
	Support activities for transportation	19.5%	38.0%	38.0%	38.0%
Other	Manufacturing	21.3%	35.2%	35.2%	35.2%
	Wholesale and retail	21.4%	35.2%	35.2%	35.2%
	Tourism	8.3%	14.7%	14.7%	14.7%
Total large companies (250 or more)		19.2%	31.7%	31.7%	31.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 34: Increase in the share of enterprises performing GHG emissions accounting at service level in PO4 relative to the baseline (percentage points increase relative to the baseline)

		2025	2030	2035	2040	2045	2050
SME							
Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%	0.7%	0.0%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	2.8%	5.0%	3.9%	3.0%	2.1%	1.2%
	Inland navigation	0.3%	0.6%	0.4%	0.3%	0.1%	0.0%
	Air	0.6%	1.0%	0.8%	0.6%	0.5%	0.3%
Freight	Road	2.2%	4.0%	3.2%	2.4%	1.7%	1.0%
	Rail	0.0%	0.2%	0.2%	0.2%	0.0%	0.0%
	Inland navigation	0.7%	1.4%	1.1%	0.8%	0.5%	0.2%
	Maritime	2.8%	5.0%	3.9%	3.0%	2.1%	1.2%
	Air and space	3.0%	4.8%	3.8%	3.0%	2.2%	1.4%
	Postal activities	5.4%	10.1%	7.9%	5.9%	4.0%	2.1%
Hub operators	Warehousing and storage	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Support activities for transportation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other	Manufacturing	0.5%	1.0%	0.8%	0.6%	0.4%	0.2%
	Wholesale and retail	0.5%	1.0%	0.8%	0.6%	0.4%	0.2%
	Tourism	1.6%	3.1%	2.4%	1.8%	1.2%	0.6%
Large companies (250 or more)							
Passenger	Interurban rail	8.6%	20.0%	14.3%	11.4%	5.7%	2.9%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	10.5%	18.4%	15.8%	13.2%	7.9%	5.3%
	Inland navigation	0.0%	50.0%	50.0%	50.0%	50.0%	50.0%
	Air	11.4%	18.6%	14.3%	11.4%	8.6%	4.3%
Freight	Road	10.8%	18.9%	14.8%	11.1%	7.3%	3.9%
	Rail	10.8%	18.9%	16.2%	10.8%	8.1%	2.7%

		2025	2030	2035	2040	2045	2050
	Inland navigation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	11.8%	19.6%	13.7%	11.8%	7.8%	3.9%
	Air and space	22.2%	22.2%	22.2%	11.1%	11.1%	11.1%
	Postal activities	10.2%	19.1%	15.0%	10.8%	7.0%	3.2%
Hub operators	Warehousing and storage	17.4%	34.4%	33.3%	32.8%	31.8%	30.8%
	Support activities for transportation	17.4%	35.0%	34.0%	33.0%	32.2%	31.2%
Other	Manufacturing	10.2%	19.3%	14.9%	10.7%	6.8%	3.0%
	Wholesale and retail	10.2%	19.3%	14.9%	10.7%	6.8%	3.0%
	Tourism	4.4%	8.6%	6.6%	4.7%	2.9%	1.2%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 35: Type and size of impacted enterprises in PO4 as a percentage of all enterprises targeted by CountEmissions EU

		2025	2030	2040	2050
SME					
Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%
	Other transport over land	0.0%	0.0%	0.0%	0.0%
	Maritime	7.4%	10.6%	10.6%	10.6%
	Inland navigation	0.7%	1.1%	1.1%	1.1%
	Air	1.9%	2.5%	2.5%	2.5%
Freight	Road	5.9%	8.5%	8.5%	8.5%
	Rail	0.2%	0.4%	0.4%	0.4%
	Inland navigation	1.4%	2.4%	2.4%	2.4%
	Maritime	7.4%	10.6%	10.6%	10.6%
	Air and space	9.5%	12.3%	12.3%	12.3%
	Postal activities	12.2%	19.1%	19.1%	19.1%
Hub operators	Warehousing and storage	0.1%	0.1%	0.1%	0.1%
	Support activities for transportation	0.0%	0.1%	0.1%	0.1%
Other	Manufacturing	1.1%	1.8%	1.8%	1.8%
	Wholesale and retail	1.1%	1.8%	1.8%	1.8%
	Tourism	2.9%	5.2%	5.2%	5.2%
Total SMEs		2.9%	4.4%	4.4%	4.4%
Large (250 or more)					
Passenger	Interurban rail	22.9%	37.1%	37.1%	37.1%
	Other transport over land	0.7%	0.7%	0.7%	0.7%
	Maritime	28.9%	42.1%	42.1%	42.1%
	Inland navigation	0.0%	50.0%	50.0%	50.0%
	Air	37.1%	48.6%	48.6%	48.6%
Freight	Road	29.0%	41.5%	41.5%	41.5%
	Rail	24.3%	37.8%	37.8%	37.8%
	Inland navigation	0.0%	0.0%	0.0%	0.0%
	Maritime	29.4%	41.2%	41.2%	41.2%
	Air and space	44.4%	55.6%	55.6%	55.6%
	Postal activities	23.9%	37.3%	37.3%	37.3%
Hub operators	Warehousing and storage	20.5%	38.5%	38.5%	38.5%
	Support activities for transportation	19.5%	38.0%	38.0%	38.0%
Other	Manufacturing	21.3%	35.2%	35.2%	35.2%
	Wholesale and retail	21.4%	35.2%	35.2%	35.2%
	Tourism	8.3%	14.7%	14.7%	14.7%

Total large companies (250 or more)		19.2%	31.7%	31.7%	31.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 36: Increase in the share of enterprises performing GHG emissions accounting at service level in PO5 relative to the baseline (percentage points increase relative to the baseline)

		2025	2030	2035	2040	2045	2050
SME							
Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%	0.7%	0.0%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	1.1%	2.5%	1.4%	0.5%	0.0%	0.0%
	Inland navigation	2.6%	5.2%	5.1%	5.0%	4.8%	4.7%
	Air	0.5%	0.9%	0.7%	0.5%	0.4%	0.2%
Freight	Road	0.6%	1.6%	0.8%	0.0%	0.0%	0.0%
	Rail	0.0%	0.2%	0.2%	0.2%	0.0%	0.0%
	Inland navigation	0.5%	1.0%	0.7%	0.4%	0.1%	0.0%
	Maritime	2.6%	4.5%	3.5%	2.5%	1.6%	0.8%
	Air and space	2.8%	4.4%	3.4%	2.6%	1.8%	1.0%
	Postal activities	4.9%	9.1%	6.9%	4.9%	3.0%	1.1%
Hub operators	Warehousing and storage	0.2%	0.4%	0.3%	0.3%	0.3%	0.3%
	Support activities for transportation	0.2%	0.4%	0.3%	0.3%	0.3%	0.3%
Other	Manufacturing	0.5%	0.9%	0.7%	0.5%	0.3%	0.1%
	Wholesale and retail	0.5%	0.9%	0.7%	0.5%	0.3%	0.1%
	Tourism	1.4%	2.8%	2.1%	1.4%	0.8%	0.2%
Large companies (250 or more)							
Passenger	Interurban rail	8.6%	20.0%	14.3%	11.4%	5.7%	2.9%
	Other transport over land	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	10.5%	15.8%	13.2%	10.5%	5.3%	2.6%
	Inland navigation	0.0%	50.0%	50.0%	50.0%	50.0%	50.0%
	Air	11.4%	17.1%	12.9%	10.0%	7.1%	2.9%
Freight	Road	10.3%	17.9%	13.9%	10.1%	6.4%	3.0%
	Rail	10.8%	16.2%	13.5%	8.1%	5.4%	0.0%
	Inland navigation	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Maritime	9.8%	19.6%	13.7%	11.8%	7.8%	3.9%
	Air and space	22.2%	11.1%	11.1%	0.0%	0.0%	0.0%
	Postal activities	9.6%	18.2%	14.0%	9.9%	6.1%	2.2%
Hub operators	Warehousing and storage	17.4%	34.4%	33.3%	32.8%	31.8%	30.8%
	Support activities for transportation	17.4%	35.0%	34.0%	33.0%	32.2%	31.2%
Other	Manufacturing	9.6%	18.3%	13.9%	9.7%	5.7%	2.0%
	Wholesale and retail	9.6%	18.3%	13.9%	9.7%	5.7%	2.0%
	Tourism	4.2%	8.2%	6.1%	4.2%	2.4%	0.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 37: Type and size of impacted enterprises in PO5 as a percentage of all enterprises targeted by CountEmissions EU

		2025	2030	2040	2050
SME					
Passenger	Interurban rail	0.0%	0.7%	0.7%	0.7%
	Other transport over land	0.0%	0.0%	0.0%	0.0%
	Maritime	5.7%	8.1%	8.1%	9.4%
	Inland navigation	3.0%	5.8%	5.8%	5.8%

	Air	1.9%	2.4%	2.4%	2.4%
Freight	Road	4.3%	6.1%	6.1%	7.5%
	Rail	0.2%	0.4%	0.4%	0.4%
	Inland navigation	1.2%	2.0%	2.0%	2.2%
	Maritime	7.1%	10.1%	10.1%	10.1%
	Air and space	9.3%	11.9%	11.9%	11.9%
	Postal activities	11.7%	18.1%	18.1%	18.1%
Hub operators	Warehousing and storage	0.2%	0.4%	0.4%	0.4%
	Support activities for transportation	0.2%	0.4%	0.4%	0.4%
Other	Manufacturing	1.0%	1.7%	1.7%	1.7%
	Wholesale and retail	1.0%	1.7%	1.7%	1.7%
	Tourism	2.8%	4.8%	4.8%	4.8%
Total SMEs		2.4%	3.5%	3.6%	4.0%
Large (250 or more)					
Passenger	Interurban rail	22.9%	37.1%	37.1%	37.1%
	Other transport over land	0.7%	0.7%	0.7%	0.7%
	Maritime	28.9%	39.5%	39.5%	39.5%
	Inland navigation	0.0%	50.0%	50.0%	50.0%
	Air	37.1%	47.1%	47.1%	47.1%
Freight	Road	28.5%	40.6%	40.6%	40.6%
	Rail	24.3%	35.1%	35.1%	35.1%
	Inland navigation	0.0%	0.0%	0.0%	0.0%
	Maritime	27.5%	41.2%	41.2%	41.2%
	Air and space	44.4%	44.4%	44.4%	44.4%
	Postal activities	23.2%	36.3%	36.3%	36.3%
Hub operators	Warehousing and storage	20.5%	38.5%	38.5%	38.5%
	Support activities for transportation	19.5%	38.0%	38.0%	38.0%
Other	Manufacturing	20.8%	34.1%	34.1%	34.1%
	Wholesale and retail	20.8%	34.2%	34.2%	34.2%
	Tourism	8.1%	14.3%	14.3%	14.3%
Total large companies (250 or more)		18.8%	31.1%	31.1%	31.1%

Source: Ecorys and CE Delft (2023), Impact assessment support study

PM1: ISO 14083 is set as common reference methodology at EU level

In PM1 (included in PO2, PO4 and PO6), the ISO 14083 methodology is set as common reference methodology for quantifying GHG emissions at EU level. It covers Well-to-Wheel GHG emissions related to transport operations, including emissions from the production of fuels. ISO provides a detailed methodology addressing the segmentation of the transport services and shows high acceptability by stakeholders. It also provides for alignment to a global standard.

Adjustment costs for businesses

The setting of the ISO 14083 methodology as the common reference methodology to quantify GHG emissions from transport services is expected to lead to additional costs relative to the baseline for the new businesses performing GHG emissions accounting but also for the businesses that are already quantifying GHG emissions and would need to switch to ISO

14083. Businesses already quantifying GHG emissions in the baseline will need to adjust their processes to be in line with the new ISO 14083 requirements, resulting in one-off adjustment costs that are different per type and size of business[195]. The recurrent adjustment costs[196] are expected to be the same as in the baseline. New businesses performing GHG emissions accounting are expected to be faced with both one-off adjustment costs for implementing the processes and annual recurrent costs. Table 38 shows the different unit costs per type of business for adopting ISO 14083 as common reference methodology, based on stakeholder's feedbacks and desk research[197]. These costs cover labour costs and costs for obtaining the necessary documentation.

Table 38: Unit adjustment costs per type of business due to PM1 in PO2, PO4 and PO6 (in EUR, 2022 prices)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
One-off costs for starting implementing the GHG emission accounting (i.e. ISO 14083)	1,748	2,033	1,748	4,802	6,625	4,802
One-off costs for switching to the ISO 14083 GHG emission accounting method	589	589	589	1,262	1,262	1,262
Annual recurrent costs	1,139	570	1,139	3,190	2,734	3,190

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: 'Large' stands for large businesses; Annual recurrent costs for ISO 14083 are the same as for other methods used in the baseline.

The total adjustment costs for PM1 in PO2 (in conjunction with the voluntary application of CountEmissions EU, due to PM15) are different from those in PO4 (in conjunction with the binding opt-in application of CountEmissions EU, due to PM14) and in PO6 (in conjunction with the mandatory application of CountEmissions EU, due to PM13). The one-off and recurrent adjustment costs for businesses due to PM1 in PO2 for 2025, 2030, 2040 and 2050 relative to the baseline are provided in Table 39, together with the number of companies that switch from other methods to ISO 14083 and the additional number of companies that implement ISO 14083 relative to the baseline. The costs are also provided by company size (large and SME). Expressed as present value over 2025-2050, the total adjustment costs due to PM1 are estimated at EUR 0.9 billion in PO2 relative to the baseline, of which EUR 0.6 billion one-off adjustment costs.

Table 39: One-off and recurrent adjustment costs for business due to PM1 in PO2 (in million EUR, 2022 prices), relative to the baseline

	2025	2030	2040	2050
Number companies that switch from other methods to ISO 14083	6,152	1,720	1,546	1,389
SMEs	6,051	1,686	1,515	1,361
Large companies	101	34	31	28
Additional number of companies that implement ISO 14083 relative to the baseline	14,868	30,219	14,302	1,388

[195] The adjustment is assumed to be gradual over time, i.e. 20% of the companies that are quantifying GHG emissions at service level in the baseline are assumed to switch to the new methodology each year between 2025 and 2030. Post-2030, only the additional number of companies that are quantifying GHG emissions at service level in the baseline relative to the previous year are assumed to switch to the new methodology.
[196] The cost of ISO certification, ISOUpdate.com, 8 July 2020.
[197] The number of hours worked and thus the unit costs per transport service are assumed to go down over time, by 15% by 2050 relative to 2020, due to the learning effects.

	2025	2030	2040	2050
SMEs	14,557	29,586	14,000	1,361
Large companies	311	633	302	27
One-off adjustment costs (in million EUR)	31.8	56.4	25.4	2.9
SMEs	29.8	52.7	23.8	2.8
Large companies	2.0	3.7	1.7	0.2
Recurrent adjustment costs (in million EUR)	15.9	31.3	13.9	1.3
SMEs	15.0	29.6	13.1	1.2
Large companies	0.9	1.8	0.8	0.1
Total adjustment costs (in million EUR)	47.7	87.7	39.4	4.2
SMEs	44.8	82.2	36.9	4.0
Large companies	2.9	5.5	2.5	0.2

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 40: type and size of impacted enterprises due to PM1 in PO2 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies switching or implementing ISO 14083	2.6%	3.9%	3.9%	4.0%
SMEs	2.5%	3.9%	3.9%	3.9%
Large companies	14.3%	23.0%	23.0%	23.5%

Source: Ecorys and CE Delft (2023), Impact assessment support study

The one-off and recurrent adjustment costs for businesses due to PM1 in PO4 (in conjunction with the binding opt-in application of CountEmissions EU, due to PM14) for 2025, 2030, 2040 and 2050 relative to the baseline are provided in Table 41, together with the number of companies that switch from other methods to ISO 14083 and the additional number of companies that implement ISO 14083 relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs due to PM1 are estimated at EUR 1.4 billion in PO4 relative to the baseline, of which EUR 0.9 billion one-off adjustment costs.

Table 41: One-off and recurrent adjustment costs for business due to PM1 in PO4 (in million EUR, 2022 prices), relative to the baseline

	2025	2030	2040	2050
Number companies that switch from other methods to ISO 14083	6,152	1,720	1,546	1,389
SMEs	6,051	1,686	1,515	1,361
Large companies	101	34	31	28
Additional number of companies that implement ISO 14083 relative to the baseline	21,595	39,358	23,441	9,139
SMEs	21,003	38,224	22,638	8,638
Large companies	592	1,134	803	501
One-off adjustment costs (in million EUR)	44.8	73.9	41.9	16.0
SMEs	41.3	67.7	37.9	13.8
Large companies	3.4	6.2	4.0	2.2
Recurrent adjustment costs (in million EUR)	23.6	41.6	23.6	9.0
SMEs	21.8	38.3	21.4	7.7
Large companies	1.8	3.3	2.2	1.3
Total adjustment costs (in million EUR)	68.4	115.5	65.4	25.1
SMEs	63.2	106.1	59.2	21.5
Large companies	5.2	9.5	6.2	3.5

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 42: type and size of impacted enterprises due to PM1 in PO4 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies switching or implementing ISO 14083	3.0%	4.4%	4.4%	4.4%
SMEs	2.9%	4.4%	4.4%	4.4%
Large companies	19.2%	31.7%	31.7%	31.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study

The one-off and recurrent adjustment costs for businesses due to PM1 in PO6 (in conjunction with the mandatory application of CountEmissions EU, due to PM13) for 2025, 2030, 2040 and 2050 relative to the baseline are provided in Table 43, together with the number of companies that switch from other methods to ISO 14083 and the additional number of companies that implement ISO 14083 relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs due to PM1 are estimated at EUR 60.5 billion in PO6 relative to the baseline, of which EUR 40.3 billion one-off adjustment costs.

Table 43: One-off and recurrent adjustment costs for business due to PM1 in PO6 (in million EUR, 2022 prices), relative to the baseline

	2025	2030	2040	2050
Number companies that switch from other methods to ISO 14083	6,152	1,720	1,546	1,389
SMEs	6,051	1,686	1,515	1,361
Large companies	101	34	31	28
Additional number of companies that implement ISO 14083 relative to the baseline	110,570	918,003	1,718,143	1,703,841
SMEs	109,689	915,130	1,713,423	1,699,423
Large companies	881	2,873	4,720	4,418
One-off adjustment costs (in million EUR)	210.5	1,660.2	2,913.4	2,698.2
SMEs	205.4	1,644.5	2,889.1	2,677.1
Large companies	5.1	15.8	24.3	21.1
Recurrent adjustment costs (in million EUR)	107.3	835.5	1,463.0	1,353.5
SMEs	104.7	827.2	1,450.2	1,342.3
Large companies	2.6	8.3	12.8	11.2
Total adjustment costs (in million EUR)	317.8	2,495.8	4,376.3	4,051.7
SMEs	310.1	2,471.7	4,339.3	4,019.4
Large companies	7.7	24.1	37.1	32.3

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 44: type and size of impacted enterprises due to PM1 in PO4 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies switching or implementing ISO 14083	8.0%	54.0%	100.0%	100.0%
SMEs	7.9%	54.0%	100.0%	100.0%
Large companies	24.2%	62.0%	100.0%	100.0%

Source: Ecorys and CE Delft (2023), Impact assessment support study

According to stakeholders' feedback, meetings with experts and desk research, the alignment with a global standard provided by ISO 14083 would allow for better comparability and usability by the businesses across the world.

PM2: Product Environmental Footprint Category Rules (PEFCR) for GHG emissions in transport, including rules for transport services, is set as common reference methodology at EU level

In PM2 (included in PO5), the PEFCR methodology is set as common reference methodology for quantifying GHG emissions at EU level. It covers Life Cycle GHG emissions related to transport operations, including emissions from the production of fuels, vehicles and equipment. PEFCR is taken as the basis to develop Product Environmental Footprint Category Rules for the transport sector, with a focus on GHG emissions.

Adjustment costs for European Commission

The Category Rules for transport of the Product Environmental Footprint methodology have not been yet developed. The budget to be dedicated to studies to develop the Category Rules for transport is estimated at EUR 1.5 million per Category Rule.

Based on previous work done in the context of ESPR[198] and aviation label, for covering all transport services 4 Category Rules are needed (road, maritime and IWW, aviation, rail). However, the work on aviation has already started and part of these costs (50%) are included in the baseline. Thus, the one-off adjustment costs for the European Commission in 2025 are estimated at EUR 5.25 million relative to the baseline (in 2022 prices).

Adjustment costs for businesses

The setting of the Product Environmental Footprint (PEF) Category Rules as common reference methodology for CountEmissions EU to quantify GHG emissions from transport services, driven by PM2 (in PO5), is expected to lead to additional costs relative to the baseline for the new businesses performing GHG emissions accounting but also for the businesses that are already quantifying GHG emissions and would need to switch to PEFCR.

Businesses already quantifying GHG emissions in the baseline will need to adjust their processes to be in line with the PEF requirements, once the Category Rules for transport are developed, resulting in one-off adjustment costs that are different per type and size of business[199]. The recurrent adjustment costs are also expected to be higher than in the baseline. New businesses performing GHG emissions accounting are also expected to be faced with one-off adjustment costs for implementing the processes and annual recurrent costs. Table 45 shows the different unit costs per type of business for adopting PEFCR as common reference methodology, based on stakeholder's feedbacks and desk research[200]. These costs cover labour costs. The documentation for PEFCR is assumed to be free of charge.

---

198 COM(2022) 142 final

199 The adjustment is assumed to be gradual over time, i.e. 20% of the companies that are quantifying GHG emissions at service level in the baseline are assumed to switch to the new methodology each year between 2025 and 2030. Post-2030, only the additional number of companies that are quantifying GHG emissions at service level in the baseline relative to the previous year are assumed to switch to the new methodology.

200 The number of hours worked and thus the unit costs per transport service are assumed to go down over time, by 15% by 2050 relative to 2020, due to the learning effects.

Table 45: Unit adjustment costs per type of business due to PM2 in PO5 (in EUR, 2022 prices)

Costs associated with calculation (in EUR), in 2022 prices	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
One-off costs for starting implementing the GHG emission accounting (i.e. PEFCR)	3,092	3,619	3,092	11,502	16,560	11,502
One-off costs for switching to the PEFCR GHG emission accounting method	2,671	3,066	2,671	9,447	13,241	9,447
Annual recurrent costs	2,108	1,054	2,108	5,901	5,058	5,901

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: 'Large' stands for large businesses

The total one-off and recurrent adjustment costs for businesses due to PM2 in PO5 (in conjunction with the binding opt-in application of CountEmissions EU, due to PM14) for 2025, 2030, 2040 and 2050 relative to the baseline are provided in Table 46, together with the number of companies that switch from other methods to PEFCR and the additional number of companies that implement PEFCR relative to the baseline. The costs are also provided by company size (large and SME). Expressed as present value over 2025-2050, the total adjustment costs due to PM2 are estimated at EUR 1.6 billion in PO5 relative to the baseline, of which EUR 1.1 billion one-off adjustment costs.

Table 46: One-off and recurrent adjustment costs for business due to PM2 in PO5 (in million EUR, 2022 prices), relative to the baseline

	2025	2030	2040	2050
Number companies that switch from other methods to PEFCR	6,152	1,720	1,546	1,389
SMEs	6,051	1,686	1,515	1,361
Large companies	101	34	31	28
Additional number of companies that implement PEFCR relative to the baseline	12,202	25,102	9,278	2,783
SMEs	11,629	24,006	8,513	2,320
Large companies	573	1,096	765	463
One-off adjustment costs (in million EUR)	63.1	94.6	38.8	14.6
SMEs	54.2	79.7	29.3	9.6
Large companies	8.9	14.8	9.4	5.0
Recurrent adjustment costs (in million EUR)	29.9	50.0	18.3	6.9
SMEs	26.5	44.0	14.3	4.6
Large companies	3.4	6.0	4.0	2.3
Total adjustment costs (in million EUR)	93.0	144.6	57.1	21.5
SMEs	80.7	123.8	43.7	14.1
Large companies	12.4	20.8	13.4	7.4

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 47: type and size of impacted enterprises due to PM2 in PO5 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies switching or implementing PEF CR	2.4%	3.6%	3.6%	4.1%
SMEs	2.4%	3.5%	3.6%	4.0%
Large companies	18.8%	31.1%	31.1%	31.1%

Source: Ecorys and CE Delft (2023), Impact assessment support study

According to stakeholders' feedback, meetings with experts and desk research, this measure will not ensure alignment to a global standard, which may lead to difficulties for the aviation and the maritime transport sectors that are global in nature. Due to the fact that Category Rules are still to be developed, the costs reported are highly dependent on the future developments of the methodology.

PM3: A common reference methodology is set at EU level, based on ISO 14083 but with additional elements and increased accuracy

In PM3 (included in PO1 and PO3), a methodology based on ISO 14083 but with additional granularity and coverage, i.e. LCA for battery vehicles, is developed and set as common reference methodology for quantifying GHG emissions at EU level.

Adjustment costs for European Commission

As for PM2, the additional specifications needed to increase the accuracy and stringency of the new methodology building on ISO 14083, will require as explained in Annex 8 additional investments in research and development. The budget to be dedicated to such study is included in PM3 and is estimated at EUR 2.4 million. Thus, the one-off adjustment costs for the European Commission in 2025 are estimated at EUR 2.4 million relative to the baseline (in 2022 prices).

Adjustment costs for businesses

The setting of the new methodology based on ISO 14083, but with additional elements and increased accuracy, as common reference methodology for CountEmissions EU to quantify GHG emissions from transport services, driven by PM3 (in PO1 and PO3), is expected to lead to additional costs relative to the baseline for the new businesses performing GHG emissions accounting but also for the businesses that are already quantifying GHG emissions and would need to switch to the new methodology.

Businesses already quantifying GHG emissions in the baseline will need to adjust their processes to be in line with the new methodology, once the additional requirements to increase accuracy of data are developed, resulting in one-off adjustment costs that are different per type and size of business[201]. The recurrent adjustment costs are also expected to be higher than in the baseline. New businesses performing GHG emissions accounting are also expected to be faced with one-off adjustment costs for implementing the processes and with annual recurrent costs. Table 48 shows the different unit costs per type of business for adopting the modified ISO 14083 as common reference methodology, based on stakeholder's feedbacks and desk research[202]. These costs cover labour costs and the costs for obtaining the necessary documentation.

---

[201] The adjustment is assumed to be gradual over time, i.e. 20% of the companies that are quantifying GHG emissions at service level in the baseline are assumed to switch to the new methodology each year between 2025 and 2030. Post-2030, only the additional number of companies that are quantifying GHG emissions at service level in the baseline relative to the previous year are assumed to switch to the new methodology.

[202] The number of hours worked and thus the unit costs per transport service are assumed to go down over time, by 15% by 2050 relative to 2020, due to the learning effects.

Table 48: Unit adjustment costs per type of business due to PM3 in PO1 and PO3 (in EUR, 2022 prices)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
One-off costs for starting implementing the GHG emission accounting (i.e. ISO 14083 with additional elements and increased accuracy)	2,439	2,781	2,439	9,044	13,418	9,044
One-off costs for switching to the ISO 14083 with additional elements and increased accuracy GHG emission accounting method	912	912	912	1,514	1,514	1,514
Annual recurrent costs	1,367	684	1,367	3,828	3,281	3,828

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: 'Large' stands for large businesses.

The total adjustment costs for PM3 in PO1 (in conjunction with the mandatory application of CountEmissions EU, due to PM13) are different from those in PO3 (in conjunction with the binding opt-in application of CountEmissions EU, due to PM14). The one-off and recurrent adjustment costs for businesses due to PM3 in PO1 for 2025, 2030, 2040 and 2050 relative to the baseline are provided in Table 49, together with the number of companies that switch from other methods to ISO 14083 with additional elements and increased accuracy, and the additional number of companies that implement ISO 14083 with additional elements and increased accuracy relative to the baseline. The costs are also provided by company size (large and SME). Expressed as present value over 2025-2050, the total adjustment costs due to PM3 are estimated at EUR 80.3 billion in PO1 relative to the baseline, of which EUR 56 billion one-off adjustment costs.

Table 49: One-off and recurrent adjustment costs for business due to PM3 in PO1 (in million EUR, 2022 prices), relative to the baseline

	2025	2030	2040	2050
Number companies that switch from other methods to ISO 14083 with additional elements and increased accuracy	6,152	1,720	1,546	1,389
SMEs	6,051	1,686	1,515	1,361
Large companies	101	34	31	28
Additional number of companies that implement ISO 14083 with additional elements and increased accuracy, relative to the baseline	110,570	918,003	1,718,143	1,703,841
SMEs	109,689	915,130	1,713,423	1,699,423
Large companies	881	2,873	4,720	4,418
One-off adjustment costs (in million EUR)	295.0	2,308.0	4,047.6	3,747.8
SMEs	285.2	2,277.1	4,000.1	3,706.4
Large companies	9.8	30.9	47.5	41.3
Recurrent adjustment costs (in million EUR)	130.2	1,003.0	1,755.9	1,624.5
SMEs	126.9	993.0	1,740.5	1,611.0
Large companies	3.2	10.0	15.4	13.5
Total adjustment costs (in million EUR)	425.2	3,311.0	5,803.5	5,372.2
SMEs	412.2	3,270.1	5,740.6	5,317.4
Large companies	13.0	40.9	62.9	54.8

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 50: type and size of impacted enterprises due to PM3 in PO1 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies switching or implementing to ISO 14083 with additional elements and increased accuracy	8.0%	54.0%	100.0%	100.0%
SMEs	7.9%	54.0%	100.0%	100.0%
Large companies	24.2%	62.0%	100.0%	100.0%

Source: Ecorys and CE Delft (2023), Impact assessment support study

The one-off and recurrent adjustment costs for businesses due to PM3 in PO3 (in conjunction with the binding opt-in application of CountEmissions EU, due to PM14) for 2025, 2030, 2040 and 2050 relative to the baseline are provided in Table 51, together with the number of companies that switch from other methods to ISO 14083 with additional elements and increased accuracy, and the additional number of companies that implement ISO 14083 with additional elements and increased accuracy relative to the baseline. Expressed as present value over 2025-2050, the total adjustment costs due to PM3 are estimated at EUR 1.2 billion in PO3 relative to the baseline, of which EUR 0.8 billion one-off adjustment costs.

Table 51: One-off and recurrent adjustment costs for business due to PM3 in PO3 (in million EUR, 2022 prices), relative to the baseline

	2025	2030	2040	2050
Number companies that switch from other methods to ISO 14083 with additional elements and increased accuracy	6,152	1,720	1,546	1,389
SMEs	6,051	1,686	1,515	1,361
Large companies	101	34	31	28
Additional number of companies that implement ISO 14083 with additional elements and increased accuracy, relative to the baseline	13,023	26,745	10,828	3,640
SMEs	12,431	25,611	10,025	3,139
Large companies	592	1,134	803	501
One-off adjustment costs (in million EUR)	43.6	76.3	32.4	12.0
SMEs	37.0	64.3	24.7	7.9
Large companies	6.6	12.0	7.7	4.2
Recurrent adjustment costs (in million EUR)	18.1	33.8	13.1	4.9
SMEs	15.9	29.9	10.4	3.3
Large companies	2.2	4.0	2.7	1.6
Total adjustment costs (in million EUR)	61.7	110.2	45.5	16.9
SMEs	52.9	94.2	35.1	11.2
Large companies	8.8	16.0	10.4	5.8

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 52: type and size of impacted enterprises due to PM3 in PO3 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies switching or implementing to ISO 14083 with additional elements and increased accuracy	2.5%	3.7%	3.7%	4.1%
SMEs	2.4%	3.6%	3.6%	4.0%
Large companies	19.2%	31.7%	31.7%	31.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study

According to stakeholders' feedback, meetings with experts and desk research, the stricter requirements relative to the global standard are not likely to be followed at global level, which may lead to challenges for the aviation and maritime transport sectors that are global in nature. The costs estimates above are dependent on the additional requirements that are still to be developed.

PM4: The use of primary data is incentivised and centralised databases for default values and energy emission factors are established at EU level (by European Environmental Agency)

Adjustment costs for European Environmental Agency

In PM4 (included in PO1,PO2 and PO5) primary data on transport operations shall be used with priority. In case this is not possible, the use of emission intensity factors from a centralised EU database created and maintained by European Environmental Agency (EEA) is allowed. The energy/fuel emission factors database will also be maintained at EU level, by EEA.

For developing the databases, 1 full time equivalent (FTEs) is estimated to be needed by EEA in 2025, 2026 and 2027, in addition to EUR 200,000 in infrastructure costs[203]. The one-off costs associated to the development of the databases are thus estimated at EUR 693,149. In addition, one FTE and operational costs for maintenance would be required for maintaining and updating the databases from 2026 onwards. The recurrent adjustment costs for EEA are estimated at EUR 186,000 per year from 2026 onwards relative to the baseline.

As explained above, PM4 is included in PO1, PO2 and PO5. The total adjustment costs for EEA due to PM4 relative to the baseline, expressed as present value over 2025-2050, are estimated at EUR 3.6 million of which EUR 0.7 million one-off costs.

PM5: The use of primary data is incentivised and centralised databases for default values are established at EU level. Quality assurance of external databases operated by third parties is provided at EU level (by European Environmental Agency).

Adjustment costs for European Environmental Agency

Similarly to PM4, primary data for transport operations shall be used with priority in PM5 (included in PO3, PO4 and PO6). In case this is not possible, the use of emission intensity factors from a centralised EU database created and maintained by EEA is allowed. Use of data from sectorial specific dataset, recognised according to a quality check made by EEA is allowed as well. The energy/fuel emission factors database will also be maintained at EU level, by EEA.

As for PM4, for developing the databases 1 full time equivalent (FTEs) is estimated to be needed by EEA in 2025, 2026 and 2027, in addition to EUR 200,000 in infrastructure costs[204]. The one-off costs associated to the development of the databases are thus estimated at EUR 693,149. In addition, one FTE and operational costs would be required for maintaining and

[203] Source: EEA
[204] Source: EEA

updating the databases from 2026 onwards. The recurrent adjustment costs for EEA are estimated at EUR 186,000 per year from 2026 onwards relative to the baseline.

In addition, quality assurance of external databases operated by third parties will be provided at EU level by European Environmental Agency. For each dataset, 15 hours are assumed to be needed for performing the quality check. The quality check is assumed to be performed for the first time in 2026, for 24 datasets (more than one for each sector involved in the quantification). The quality check of each dataset is estimated to occur every two years. Thus, operational costs are estimated to be needed every two years, equivalent to EUR 35,791 every two years[205].

The total one-off adjustment costs for the EEA are estimated at EUR 693,149 in the period 2025-2027, while the recurrent annual costs at EUR 221,791 in 2030 and in 2050. Expressed as present value over 2025-2050, the total adjustment costs are estimated at EUR 3.2 million.

Administrative costs for business sector associations

The possibility of using data from sectorial specific datasets recognised through the quality check performed by EEA will create additional administrative costs for the businesses willing to use this alternative. According to the feedback received during the stakeholders' consultation, this option will not be used at single business level, but rather by sector associations that will collect the data from their associates and submit them to the EEA for the quality check.

Estimates of costs were based on similar initiatives such as FuelEU Maritime[206] and EMSWe[207], and feedback from stakeholders. The time needed for businesses to submit the databases is estimated at 24 hours per database, and the cost per hour is estimated at EUR 40.9[208] in 2022 prices for ISCO 2 category (Professionals), and it is assumed to remain constant over time in real prices. A number of 17 databases is assumed to be submitted, in line with the number of involved sectors. Databases are expected to be submitted every two years.

The recurrent administrative costs for business sector associations are estimated at EUR 16,686 in 2026 relative to baseline, and every two years up to 2050. Expressed as present value over 2025-2050, the total administrative costs are estimated at EUR 177,452.

For the purpose of reporting on the application of the 'one in, one out' approach[209], the annual average number of hours per database for businesses to submit the databases has been estimated at 12 hours each year (instead of every two years). The cost per hour is estimated at EUR 40.9 and a number of 17 databases is assumed to be submitted. The cost per database for preparing the submission is estimated at EUR 490.76 per database. Thus, for the purpose of 'one in, one out' approach, the recurrent administrative costs for business sector associations are estimated at EUR 8,343 per year.

---

[205] Source: EEA
[206] COM(2021)562
[207] Regulation (EU) 2019/1239 establishing a European Maritime Single Window environment
[208] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour
[209] https://ec.europa.eu/info/law/law-making-process/planning-and-proposing-law/better-regulation-why-and-how_en

PM6: Harmonised GHG output data formats and metrics are provided at EU level, together with common rules on the communication and transparency

In PM6, minimum requirements for harmonised formats (unit of measures) are mandated. This will facilitate the sharing of comparable data between entities along the supply chain, which may be particularly beneficial as companies have to request/provide data to a large number of other companies, all using their own data output formats. The reference to the source of the data output (CountEmissions EU) and its scope (GHG emissions from transport services) will be mandated. This will enhance transparent communication. Specific requirements for the communication and transparency related to any GHG claims on the performance of transport services are included. This measure is common to all policy measures.

Adjustment costs for national public authorities

The time required for the national statistical offices that are collecting and storing data on transport GHG emissions to implement the new rules, switching to a unique format for the data resulting from the calculations, is estimated at 120 hours per statistical office. The average cost per hour is estimated at EUR 40.9[210] in 2022 prices for ISCO 2 category (Professionals) and it is assumed to remain constant over time in real prices. Thus, the one-off adjustment costs for the national public authorities in 2025 are estimated at EUR 132,504 relative to the baseline (in 2022 prices). This should be regarded as an upper-bound estimate, as it is very likely that familiarising with the new rules would take place in the context of the regular activities performed by the statistical offices.

PM7: Horizontal guidelines for the harmonised implementation of CountEmissions EU in various sectors and segments of the transport market are provided at EU level

In PM7 guidance is provided at EU level on how to calculate emissions using CountEmissions EU, how to apply primary data and default values, how to develop sectorial guidelines, how to go through the verification process, and how to safely share emissions data, preserving privacy and confidentiality (e.g. SCF & CEFIC (2021) for the chemical sector)[211]. This measure is common to all policy options.

Adjustment costs for business sector associations

The workload required by businesses sector associations to adapt sector processes in line with the guidelines set in the implementing act of CountEmissions EU is estimated at 90 hours per sector association. The average cost per hour is estimated at EUR 40.9[212] in 2022 prices for ISCO 2 category (Professionals). The number of sectors that will need to adapt processes is estimated to be 17, which represents an upper bound estimation (including all NACE categories). Thus, the one-off adjustment costs for business sector associations in 2025 are estimated at EUR 62,571 relative to the baseline (in 2022 prices).

PM8: A mandatory process and data verification for all entities is established at EU level

---

[210] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour
[211] TFS, The Product Carbon Footprint Guideline for the Chemical Industry, 2021
[212] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour

In PM8, the data and calculation processes of GHG emissions from entities must be verified annually by bodies accredited at EU level. These bodies are bound by non disclosure. The verification is done by bodies that are accredited by MS accreditation bodies, following specific EU rules. These bodies follow the verification rules provided at the EU level, both for data (with the support of EEA) and processes. Verification for data will be done in conformity with the requirements for the input data and methodology.

Administrative costs for National Accreditation Bodies – NABs[213]

PM8 mandates for all businesses to be verified by a verifier accredited in line with Regulation 2016/2072[214], which can be extended to the whole transport sector with very small modifications. Verification is performed by bodies that are accredited by NABs, dealing with accreditation following specific EU rules.

As regards accreditation, the workload associated to PM8 (included in PO1) for national public authorities is estimated at 120 hours per Member State. The average cost per hour is estimated at EUR 40.9[215] in 2022 prices for ISCO 2 category (Professionals). Thus, the one-off administrative costs for NABs in 2025 at EU level are estimated at EUR 132,504 relative to the baseline.

Adjustment costs for businesses

As regards verification, in the baseline scenario 80% of large companies and 20% of the SMEs that perform GHG emissions accounting undergo verification. PM8 mandates the verification of GHG emissions output data for all businesses. Verification is performed by bodies that are accredited by MS accreditation bodies, following specific EU rules. A secondary act will define the accreditation rules and the verification rules for verification bodies. Verification will be performed on annual basis.

The costs for PM8 (included in PO1) build on estimates from the impact assessments accompanying the Fuel EU Maritime initiative and the MRV Regulation, and inputs from the stakeholder consultation activities. The unit costs by size of business are provided in Table 53[216].

Table 53: Unit costs for verification activities per business type, due to PM8 in PO1 (in EUR)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
Baseline	399	570	399	638	1,048	638
PO1	273	410	273	465	684	465

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: 'Large' stands for large businesses.

213 A National Accreditation Body (NAB) is an institution which attests to the competence and impartiality of conformity assessment bodies (testing and calibration laboratories, certification and inspection bodies), according to international standards such as ISO/IEC. https://ec.europa.eu/growth/tools-databases/nando/index.cfm?fuseaction=ab.main

214 Commission Delegated Regulation (EU) 2016/2072 of 22 September 2016 on the verification activities and accreditation of verifiers pursuant to Regulation (EU) 2015/757 of the European Parliament and of the Council on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R2072

215 Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour

216 The number of hours worked and thus the unit costs are assumed to go down over time, by 15% by 2050 relative to 2020, due to the learning effects.

Businesses that already perform verification activities in the baseline are expected to be faced with costs savings due to the fact that the unit costs per company[217] for verification activities are expected to be lower in PM8 relative to the baseline. On the other hand, the additional number of companies that perform verification activities (in conjunction with the mandatory application of CountEmissions EU, due to PM13) lead to an overall increase in adjustment costs for PM8 (see Table 54). Expressed as present value over 2025-2050, the total adjustment costs for PM8 in PO1 are estimated at EUR 7.2 billion relative to the baseline.

Table 54: Recurrent adjustment costs for business due to PM8 in PO1 (in EUR)

	2025	2030	2040	2050
Number of companies that perform verification activities in the baseline	6,457	8,290	11,670	14,711
SMEs	6,051	7,739	10,856	13,654
Large companies	406	551	814	1,057
Costs for companies switching to ISO+ verification (in million EUR) relative to the baseline	-0.9	-1.1	-1.5	-1.8
SMEs	-0.8	-1.0	-1.3	-1.5
Large companies	-0.1	-0.1	-0.2	-0.3
Additional number of companies that perform verification in PM8	134,873	949,093	1,761,770	1,758,729
SMEs	133,891	946,084	1,756,846	1,754,048
Large companies	982	3,009	4,924	4,681
Costs for additional companies that perform verification (in million EUR) relative to the baseline	42.4	297.3	518.7	483.7
SMEs	41.9	295.6	516.2	481.5
Large companies	0.6	1.7	2.5	2.2
Total additional costs relative to the baseline (in million EUR) relative to the baseline	41.5	296.2	517.2	481.9
SMEs	41.1	294.7	514.9	479.9
Large companies	0.4	1.5	2.3	2.0

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 55: type and size of impacted enterprises due to PM8 in PO1 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies performing verification	8.0%	54.0%	100.0%	100.0%
SMEs	7.9%	54.0%	100.0%	100.0%
Large companies	24.2%	62.0%	100.0%	100.0%

Source: Ecorys and CE Delft (2023), Impact assessment support study

PM9: A mandatory process and data verification for entities above certain size are established at EU level

---

[217] The provision of a single standardised set of rules will lead to savings in time to support verification activities. The verification is conducted on annual basis on random samplings of quantifications. The verifiers will be provided with specific standardised rules to perform verifications. Source: CE Delft et al. (2023), Impact assessment support study

Administrative costs for National Accreditation Bodies – NABs[218]

PM9 (included in PO3, PO4, PO5 and PO6) mandates for businesses above certain size alone to be verified by a verifier accredited via Regulation 2016/2072[219]. Verification is performed by bodies that are accredited by NABs dealing with accreditation following specific EU rules. A secondary act will define the accreditation rules and the verification rules for verification bodies.

As regards accreditation, the workload associated to PM9 (included in PO3, PO4, PO5 and PO6) for national public authorities is estimated at 120 hours per Member State. The average cost per hour is estimated at EUR 40.9[220] in 2022 prices for ISCO 2 category (Professionals). Thus, the one-off administrative costs for NABs in 2025 at EU level are estimated at EUR 132,504 relative to the baseline.

Adjustment costs for businesses

PM9 sets the verification of GHG emissions as mandatory only for companies above a certain size, i.e. non SMEs. As for PM8, the verification is performed by bodies that are accredited by Member States accreditation bodies, following specific EU rules. Verification is performed on annual basis. Notwithstanding its voluntary nature for SMEs, due to their involvement in the supply chain, it is assumed that 20% of those performing GHG emissions accounting will undergo verification. All large companies will undergo verification.

The total adjustment costs due to PM9 are different between policy options (in PO3, PO4, PO5 and PO6) due to the different unit costs per company for verification activities in each option, linked to the method for GHG accounting applied (ISO 14083 with additional elements and increased accuracy in PO3 due to PM3, ISO 14083 in PO4 and PO6 due to PM1 and PEFCR in PO5 due to PM2). The unit costs by size of business and by policy option are provided in Table 56[221].

Table 56: Unit costs for verification activities per business type, due to PM9 in PO3, PO4, PO5 and PO6 (in EUR)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
Baseline	399	570	399	638	1,048	638
PO3	273	410	273	465	684	465
PO4	228	342	228	387	570	387
PO5	948	1,265	948	1,391	2,150	1,391
PO6	228	342	228	387	570	387

Source: Ecorys and CE Delft (2023), Impact assessment support study

[218] A National Accreditation Body (NAB) is an institution which attests to the competence and impartiality of confor- mity assessment bodies (testing and calibration laboratories, certification and inspection bodies), according to interna- tional standards such as ISO/IEC. https://ec.europa.eu/growth/tools-databases/nando/index.cfm?fuseaction=ab.main

[219] Commission Delegated Regulation (EU) 2016/2072 of 22 September 2016 on the verification activities and accreditation of verifiers pursuant to Regulation (EU) 2015/757 of the European Parliament and of the Council on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R2072

[220] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour

[221] The number of hours worked and thus the unit costs are assumed to go down over time, by 15% by 2050 relative to 2020, due to the learning effects.

In PO3, businesses that already perform verification activities in the baseline are expected to be faced with costs savings due to the fact that unit costs per company[222] for verification activities are expected to be lower in PM9 relative to the baseline. On the other hand, the additional number of companies that perform verification activities (in conjunction with the binding opt-in application of CountEmissions EU, due to PM14) leads to an increase in the adjustment costs for PM9 (see Table 57). Expressed as present value over 2025-2050, PM9 results in total adjustment costs estimated at EUR 1 million in PO3 relative to the baseline.

Table 57: Recurrent adjustment costs for business due to PM9 in PO3 (in EUR)

	2025	2030	2040	2050
Number of companies that perform verification activities in the baseline	6,457	8,290	11,670	14,711
SMEs	6,051	7,739	10,856	13,654
Large companies	406	551	814	1,057
Costs for companies switching to ISO+ verification (in million EUR) relative to the baseline	-0.9	-1.1	-1.5	-1.8
SMEs	-0.8	-1.0	-1.3	-1.5
Large companies	-0.1	-0.1	-0.2	-0.3
Additional number of companies that perform verification in PM9	3,179	6,393	3,013	1,395
SMEs	2,486	5,123	2,006	631
Large companies	693	1,270	1,007	764
Costs for additional companies that perform verification (in million EUR) relative to the baseline	1.2	2.2	1.1	0.5
SMEs	0.8	1.5	0.6	0.2
Large companies	0.4	0.7	0.5	0.3
Total additional costs relative to the baseline (in million EUR) relative to the baseline	0.3	1.1	-0.4	-1.3
SMEs	0.0	0.6	-0.7	-1.3
Large companies	0.3	0.5	0.3	0.1

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 58: type and size of impacted enterprises due to PM9 in PO3 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies performing verification	0.5%	0.8%	0.8%	0.9%
SMEs	0.5%	0.7%	0.7%	0.8%
Large companies	19.2%	31.7%	31.7%	31.7%

[222] The provision of a single standardised set of rules will lead to savings in time to support verification activities. The verification is conducted on annual basis on random samplings of quantifications. The verifiers will be provided with specific standardised rules to perform verifications. Source: Ecorys and CE Delft (2023), Impact assessment support study.

Source: Ecorys and CE Delft (2023), Impact assessment support study

The recurrent adjustment costs/costs savings for business due to PM9 in PO4 are provided in *Table 59*. Expressed as present value over 2025-2050, PM9 results in adjustment costs savings estimated at EUR 3.6 million in PO4 relative to the baseline.

Table 59: Recurrent adjustment costs/costs savings for business due to PM9 in PO4 (in EUR)

	2025	2030	2040	2050
Number of companies that perform verification activities in the baseline	6,457	8,290	11,670	14,711
SMEs	6,051	7,739	10,856	13,654
Large companies	406	551	814	1,057
Costs for companies switching to ISO verification (in million EUR) relative to the baseline	-1.2	-1.5	-2.1	-2.4
SMEs	-1.1	-1.3	-1.8	-2.1
Large companies	-0.2	-0.2	-0.3	-0.3
Additional number of companies that perform verification in PM9	4,892	8,913	5,533	2,492
SMEs	4,199	7,643	4,526	1,728
Large companies	693	1,270	1,007	764
Costs for additional companies that perform verification (in million EUR) relative to the baseline	1.4	2.4	1.4	0.6
SMEs	1.0	1.8	1.0	0.4
Large companies	0.3	0.6	0.4	0.3
Total additional costs relative to the baseline (in million EUR) relative to the baseline	0.1	0.9	-0.6	-1.8
SMEs	0.0	0.5	-0.8	-1.7
Large companies	0.2	0.4	0.1	-0.1

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 60: type and size of impacted enterprises due to PM9 in PO4 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies performing verification	0.6%	1.0%	1.0%	1.0%
SMEs	0.6%	0.9%	0.9%	0.9%
Large companies	19.2%	31.7%	31.7%	31.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study

The recurrent adjustment costs for business due to PM9 in PO5 are provided in *Table 61*. Expressed as present value over 2025-2050, PM9 results in adjustment costs estimated at EUR 180.3 million in PO5 relative to the baseline.

Table 61: Recurrent adjustment costs for business due to PM9 in PO5 (in EUR)

	2025	2030	2040	2050
Number of companies that perform verification activities in the baseline	6,457	8,290	11,670	14,711
SMEs	6,051	7,739	10,856	13,654
Large companies	406	551	814	1,057
Costs for companies switching to PEF verification (in million EUR) relative to the	3.8	4.8	6.4	7.5

	2025	2030	2040	2050
baseline				
SMEs	3.4	4.3	5.7	6.7
Large companies	0.4	0.5	0.7	0.9
Additional number of companies that perform verification in PM9	3,000	6,033	2,672	1,193
SMEs	2,326	4,801	1,703	467
Large companies	674	1,232	969	726
Costs for additional companies that perform verification (in million EUR) relative to the baseline	3.6	6.9	3.1	1.4
SMEs	2.4	4.8	1.7	0.4
Large companies	1.2	2.1	1.5	1.0
Total additional costs relative to the baseline (in million EUR) relative to the baseline	7.4	11.6	9.5	8.9
SMEs	5.9	9.1	7.3	7.1
Large companies	1.5	2.6	2.2	1.9

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 62: type and size of impacted enterprises due to PM9 in PO5 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies performing verification	0.6%	0.8%	0.8%	0.9%
SMEs	0.5%	0.8%	0.8%	0.8%
Large companies	14.3%	23.0%	23.0%	23.5%

Source: Ecorys and CE Delft (2023), Impact assessment support study

The recurrent adjustment costs for business due to PM9 in PO6 are provided in *Table 61*. Expressed as present value over 2025-2050, PM9 results in adjustment costs estimated at EUR 1.2 billion in PO6 relative to the baseline.

Table 63: Recurrent adjustment costs for business due to PM9 in PO6 (in EUR)

	2025	2030	2040	2050
Number of companies that perform verification activities in the baseline	6,457	8,290	11,670	14,711
SMEs	6,051	7,739	10,856	13,654
Large companies	406	551	814	1,057
Costs for companies switching to ISO verification (in million EUR) relative to the baseline	-1.2	-1.5	-2.1	-2.4
SMEs	-1.1	-1.3	-1.8	-2.1
Large companies	-0.2	-0.2	-0.3	-0.3
Additional number of companies that perform verification in PM9	22,921	186,037	347,609	344,568
SMEs	21,939	183,028	342,685	339,887
Large companies	982	3,009	4,924	4,681
Costs for additional companies that perform verification (in million EUR) relative to the baseline	6.3	49.2	86.2	79.8
SMEs	5.8	47.8	84.1	78.0
Large companies	0.5	1.4	2.1	1.9

Total additional costs relative to the baseline (in million EUR) relative to the baseline	5.0	47.6	84.1	77.4
SMEs	4.7	46.5	82.3	75.9
Large companies	0.3	1.2	1.8	1.5

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 64: type and size of impacted enterprises due to PM9 in PO6 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies performing verification	1.7%	11.0%	20.3%	20.3%
SMEs	1.6%	10.8%	20.0%	20.0%
Large companies	24.2%	62.0%	100.0%	100.0%

Source: Ecorys and CE Delft (2023), Impact assessment support study

PM10: A voluntary process and data verification for all entities is established at EU level

Administrative costs for National Accreditation Bodies – NABs[223]

PM10 does not mandate for any businesses to be verified by a verifier accredited via Regulation 2016/2072[224]. However, the same accreditation-verification mechanism is foreseen. Verification is performed by bodies that are accredited by NABs dealing with accreditation following specific EU rules. A secondary act will define the accreditation rules and the verification rules for verification bodies.

As regards accreditation, the workload associated to PM10 (included in PO2) for national public authorities is estimated at 120 hours per Member State. The average cost per hour is estimated at EUR 40.9[225] in 2022 prices for ISCO 2 category (Professionals). Thus, the one-off administrative costs for NABs in 2025 at EU level are estimated at EUR 132,504 relative to the baseline.

Adjustment costs for businesses

PM10, included in PO2, keeps the verification of GHG emissions output data voluntary. As for PM8 and PM9, verification is performed by bodies that are accredited by MS accreditation bodies following specific EU rules. A secondary act will define the accreditation rules and the verification rules for verification bodies. Verification will be performed on annual basis.

The costs for PM10 (included in PO2) build on estimates from the impact assessments accompanying the Fuel EU Maritime initiative and the MRV Regulation, and inputs from the stakeholder consultation activities. The unit costs for verification activities by size of business are provided in *Table 65*.

---

[223] A National Accreditation Body (NAB) is an institution which attests to the competence and impartiality of confor- mity assessment bodies (testing and calibration laboratories, certification and inspection bodies), according to interna- tional standards such as ISO/IEC. https://ec.europa.eu/growth/tools-databases/nando/index.cfm?fuseaction=ab.main

[224] Commission Delegated Regulation (EU) 2016/2072 of 22 September 2016 on the verification activities and accreditation of verifiers pursuant to Regulation (EU) 2015/757 of the European Parliament and of the Council on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R2072

[225] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour

Table 65: Unit costs for verification activities per business type, due to PM10 in PO2 (in EUR)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
PO2	228	342	228	387	570	387

Source: Ecorys and CE Delft (2023), Impact assessment support study

The recurrent adjustment costs/costs savings for business due to PM10 in PO2 are provided in *Table 66*. Expressed as present value over 2025-2050, PM10 results in adjustment costs estimated at EUR 68.1 million in PO2 relative to the baseline.

Table 66: Recurrent adjustment costs for business due to PM10 in PO2 (in EUR)

	2025	2030	2040	2050
Number of companies that perform verification activities in the baseline	6,457	8,290	11,670	14,711
SMEs	6,051	7,739	10,856	13,654
Large companies	406	551	814	1,057
Costs for companies switching to ISO verification (in million EUR) relative to the baseline	-1.2	-1.5	-2.1	-2.4
SMEs	-1.1	-1.3	-1.8	-2.1
Large companies	-0.2	-0.2	-0.3	-0.3
Additional number of companies that perform verification in PM10	16,770	27,173	23,793	21,461
SMEs	16,358	26,404	23,287	21,171
Large companies	412	769	506	290
Costs for additional companies that perform verification (in million EUR) relative to the baseline	4.2	6.7	5.5	4.6
SMEs	4.0	6.3	5.2	4.4
Large companies	0.2	0.4	0.2	0.1
Total additional costs relative to the baseline (in million EUR) relative to the baseline	3.0	5.2	3.4	2.1
SMEs	2.9	5.0	3.5	2.3
Large companies	0.1	0.2	-0.1	-0.2

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 67: type and size of impacted enterprises due to PM10 in PO5 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies performing verification	0.6%	0.8%	0.8%	0.9%
SMEs	0.5%	0.8%	0.8%	0.8%
Large companies	14.3%	23.0%	23.0%	23.5%

Source: Ecorys and CE Delft (2023), Impact assessment support study

PM11: Emissions calculation tools are provided at EU level (by European Commission)

Adjustment costs for European Commission

PM11 (included in PO1 and PO2) foresees that calculation tools following the common reference methodology are developed and provided at the EU level, while the data sharing is done through recognised tools such as ISO/IEC 27001 and related standards on information security management.

The development of these calculation tools is expected to be done in the context of a research project procured by the European Commission. As explained in Annex 8, this will require additional investments in research and development. Based on the cost of THETIS-MRV and experience with existing THETIS-EU modules that support various pieces of EU legislation, such IT-developments are estimated at EUR 300,000 (one-off costs in 2025).

Adjustment costs for businesses

PM11 will provide businesses with calculation tools developed following strict rules by the European Commission. The use of these calculation tools will require labour costs for incorporating them into the business practices, and time dedicated to use them. The costs for the use of calculation tools by type and size of company are provided in Table 68*Table 68*.

Table 68: Costs for the use of calculation tools by business type, due to PM11 in PO1 and PO2 (in EUR)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
Baseline	257	514	514	1,799	3,597	3,597
PO1	308	377	377	2,158	4,317	4,317
PO2	257	314	314	1,753	3,506	3,506

Source: Ecorys and CE Delft (2023), Impact assessment support study

The total recurrent adjustment costs for calculation tools due to PM11, included in PO1, are provided in *Table 69* and those for PO2 in

	2025	2030	2040	2050
Number companies using calculation tools	8.0%	54.0%	100.0%	100.0%
SMEs	7.9%	54.0%	100.0%	100.0%
Large companies	24.2%	62.0%	100.0%	100.0%

Source: Ecorys and CE Delft (2023), Impact assessment support study.

Table 71. Expressed as present value over 2025-2050, PM11 results in adjustment costs estimated at EUR 7.6 billion in PO1 and EUR 74.6 million in PO2 relative to the baseline.

Table 69: Recurrent adjustment costs for business due to PM11 in PO1 (in million EUR)

	2025	2030	2040	2050
Number of companies that use calculation tools in the baseline	30,760	39,380	55,297	69,599
SMEs	30,253	38,693	54,279	68,279
Large companies	507	687	1,018	1,320
Additional number of companies that need calculation tools in PM11	110,570	918,003	1,718,143	1,703,841
SMEs	109,689	915,130	1,713,423	1,699,423
Large companies	881	2,873	4,720	4,418
Total costs relative to the baseline (in million EUR)	41.2	312.1	545.8	505.3
SMEs	37.6	301.4	529.4	490.8
Large companies	3.6	10.7	16.4	14.5

Source: Ecorys and CE Delft (2023), Impact assessment support study.

Table 70: type and size of impacted enterprises due to PM11 in PO1 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies using calculation tools	8.0%	54.0%	100.0%	100.0%

SMEs	7.9%	54.0%	100.0%	100.0%
Large companies	24.2%	62.0%	100.0%	100.0%

Source: Ecorys and CE Delft (2023), Impact assessment support study.

Table 71: Recurrent adjustment costs for business due to PM11 in PO2 (in million EUR)

	2025	2030	2040	2050
Number of companies that use calculation tools in the baseline	30,760	39,380	55,297	69,599
SMEs	30,253	38,693	54,279	68,279
Large companies	507	687	1,018	1,320
Additional number of companies that need calculation tools in PM11	14,868	30,219	14,302	1,388
SMEs	14,557	29,586	14,000	1,361
Large companies	311	633	302	27
Total costs relative to the baseline (in million EUR)	4.0	8.4	2.6	-1.6
SMEs	3.1	6.6	1.9	-1.6
Large companies	0.9	1.8	0.8	0.0

Source: Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant; Note: negative values reflect costs savings, where relevant.

Table 72: type and size of impacted enterprises due to PM11 in PO1 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies using calculation tools	2.6%	3.9%	3.9%	4.0%
SMEs	2.5%	3.9%	3.9%	3.9%
Large companies	14.3%	23.0%	23.0%	23.5%

Source: Ecorys and CE Delft (2023), Impact assessment support study.

PM12: The provision of the emissions calculation tools is left to the market but they are certified at EU level

Adjustment costs for businesses

PM12 (included in PO3, PO4, PO5 and PO6) foresees that the development of calculation tools following the common reference methodology is left to the market but certified at EU level. Data sharing is done through recognised tools such as ISO ISO/IEC 27011. As explained in Annex 8, there are already a number of tools available on the market and, according to desk research and feedback in the context of stakeholders' consultation, the changes needed to adapt to ISO 14083 and the ISO 14083 with additional elements and increased accuracy would not require significant effort. The only exception represents the calculation tool for PEFCR, for which data on potential costs is very much dependent on the Category Rules that will be developed in the future.

The costs for the use of calculation tools by type and size of company are provided in Table 73*Table 73* and they are different depending on the policy option.

Table 73: Costs for the use of calculation tools by business type due to PM12 (in EUR)

	TSO (SME)	TSU (SME)	HO (SME)	TSO (Large)	TSU (Large)	HO (Large)
Baseline	257	514	514	1,799	3,597	3,597
PO3	308	377	377	2,158	4,317	4,317
PO4	257	314	314	1,753	3,506	3,506
PO5	475	951	951	3,328	6,655	6,655
PO6	257	314	314	1,753	3,506	3,506

Source: Ecorys and CE Delft (2023), Impact assessment support study

The total recurrent adjustment costs for calculation tools due to PM12, included in PO3, are provided in Table 74*Table 74*, for PO4 in Table 75 and for PO5 in Table 76. Expressed as present value over 2025-2050, PM12 results in total recurrent adjustment costs estimated at EUR 167.6 million in PO3, EUR 138.6 million in PO4, EUR 470 million in PO5 and EUR 6.2 billion in PO6 relative to the baseline.

Table 74: Recurrent adjustment costs for business due to PM12 in PO3 (in million EUR)

	2025	2030	2040	2050
Number of companies that use calculation tools in the baseline	30,760	39,380	55,297	69,599
SMEs	30,253	38,693	54,279	68,279
Large companies	507	687	1,018	1,320
Additional number of companies that need calculation tools in PM12	13,023	26,745	10,828	3,640
SMEs	12,431	25,611	10,025	3,139
Large companies	592	1,134	803	501
Total costs relative to the baseline (in million EUR)	7.5	13.7	7.6	4.5
SMEs	4.9	9.1	4.2	2.1
Large companies	2.6	4.7	3.4	2.4

Source: Ecorys and CE Delft (2023), Impact assessment support study.

Table 75: type and size of impacted enterprises due to PM12 in PO3 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies using calculation tools	2.5%	3.7%	3.7%	4.1%
SMEs	2.4%	3.6%	3.6%	4.0%
Large companies	19.2%	31.7%	31.7%	31.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study.

Table 76: Recurrent adjustment costs for business due to PM12 in PO4 (in million EUR)

	2025	2030	2040	2050
Number of companies that use calculation tools in the baseline	30,760	39,380	55,297	69,599
SMEs	30,253	38,693	54,279	68,279
Large companies	507	687	1,018	1,320
Additional number of companies that need calculation tools in PM12	21,595	39,358	23,441	9,139
SMEs	21,003	38,224	22,638	8,638
Large companies	592	1,134	803	501
Total costs relative to the baseline (in million EUR)	6.7	12.3	6.2	1.4
SMEs	4.8	8.9	4.0	0.1
Large companies	1.8	3.4	2.3	1.3

Source: Ecorys and CE Delft (2023), Impact assessment support study.

Table 77: type and size of impacted enterprises due to PM12 in PO4 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies using calculation tools	3.0%	4.4%	4.4%	4.4%
SMEs	2.9%	4.4%	4.4%	4.4%
Large companies	19.2%	31.7%	31.7%	31.7%

Source: Ecorys and CE Delft (2023), Impact assessment support study.

Table 78: Recurrent adjustment costs for business due to PM12 in PO5 (in million EUR)

	2025	2030	2040	2050
Number of companies that use calculation tools in the baseline	30,760	39,380	55,297	69,599
SMEs	30,253	38,693	54,279	68,279
Large companies	507	687	1,018	1,320
Additional number of companies that need calculation tools in PM12	12,202	25,102	9,278	2,783
SMEs	11,629	24,006	8,513	2,320
Large companies	573	1,096	765	463
Total costs relative to the baseline (in million EUR)	19.3	31.6	24.4	21.5
SMEs	14.7	23.6	17.8	16.1
Large companies	4.6	8.0	6.6	5.4

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 79: type and size of impacted enterprises due to PM12 in PO5 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies using calculation tools	2.4%	3.6%	3.6%	4.1%
SMEs	2.4%	3.5%	3.6%	4.0%
Large companies	18.8%	31.1%	31.1%	31.1%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 80: Recurrent adjustment costs for business due to PM12 in PO6 (in million EUR)

	2025	2030	2040	2050
Number of companies that use calculation tools in the baseline	30,760	39,380	55,297	69,599
SMEs	30,253	38,693	54,279	68,279
Large companies	507	687	1,018	1,320
Additional number of companies that need calculation tools in PM12	110,570	918,003	1,718,143	1,703,841
SMEs	109,689	915,130	1,713,423	1,699,423
Large companies	881	2,873	4,720	4,418
Total costs relative to the baseline (in million EUR)	32.5	257.7	451.5	417.3
SMEs	29.8	249.4	438.7	406.1
Large companies	2.7	8.3	12.8	11.1

Source: Ecorys and CE Delft (2023), Impact assessment support study

Table 81: type and size of impacted enterprises due to PM12 in PO6 of all enterprises targeted with CountEmissions EU

	2025	2030	2040	2050
Number companies using calculation tools	8.0%	54.0%	100.0%	100.0%

SMEs	7.9%	54.0%	100.0%	100.0%
Large companies	24.2%	62.0%	100.0%	100.0%

Source: Ecorys and CE Delft (2023), Impact assessment support study

Administrative costs for businesses (calculation tool developers)

As explained, PM12 (included in PO3, PO4, PO5 and PO6) foresees that the development of calculation tools following the common reference methodology is left to the market but certified at EU level. A maximum of 34 tools are expected to be certified in addition to the baseline. The cost per tool for certification, per year, is estimated at EUR 531.65, assuming 13 hours of work per certification at an average cost per hour estimated at EUR 40.9[226] in 2022 prices for ISCO 2 category (Professionals).

Thus, the recurrent administrative costs for businesses are estimated at EUR 18,076 from 2025 onwards relative to the baseline. Expressed as present value over 2025-2050, the total administrative costs are estimated at EUR 332,840 relative to the baseline.

PM13: Mandatory application of CountEmissions EU in the transport sector

PM13 (included in PO1 and PO6) mandates the GHG emissions accounting for transport services to all businesses in EU27, following a transition period until 2035. The accounting is done through CountEmissions EU. This measure does not have a direct impact on costs but its indirect impact on total costs, through the higher number of business that will perform GHG emissions accounting relative to the baseline, is accounted in the costs of other measures.

PM14: Binding opt-in application of CountEmissions EU in the transport sector

PM14 (included in PO3, PO4 and PO5) leaves the GHG emissions accounting for transport services voluntary, but it mandates the use of CountEmsissions EU in case GHG emissions are accounted. This measure does not have a direct impact on costs but its indirect impact on total costs, through the higher number of business that will perform GHG emissions accounting relative to the baseline, is accounted in the costs of other measures.

PM15: Voluntary application of CountEmissions EU in the transport sector with a label

PM15 (included in PO2) keeps the GHG emissions accounting for transport services voluntary, and it does not mandate the use of CountEmsissions EU in case GHG emissions are accounted. This measure does not have a direct impact on costs but its indirect impact on total costs, through the higher number of business that will perform GHG emissions accounting relative to the baseline, is accounted in the costs of other measures.

4. Environmental impacts

CountEmissions EU is expected to contribute to the reduction of GHG emissions from the transport and logistics sector in two ways. First, the implementation of a harmonised framework for GHG emissions accounting will provide more transparency with respect to the emissions of different

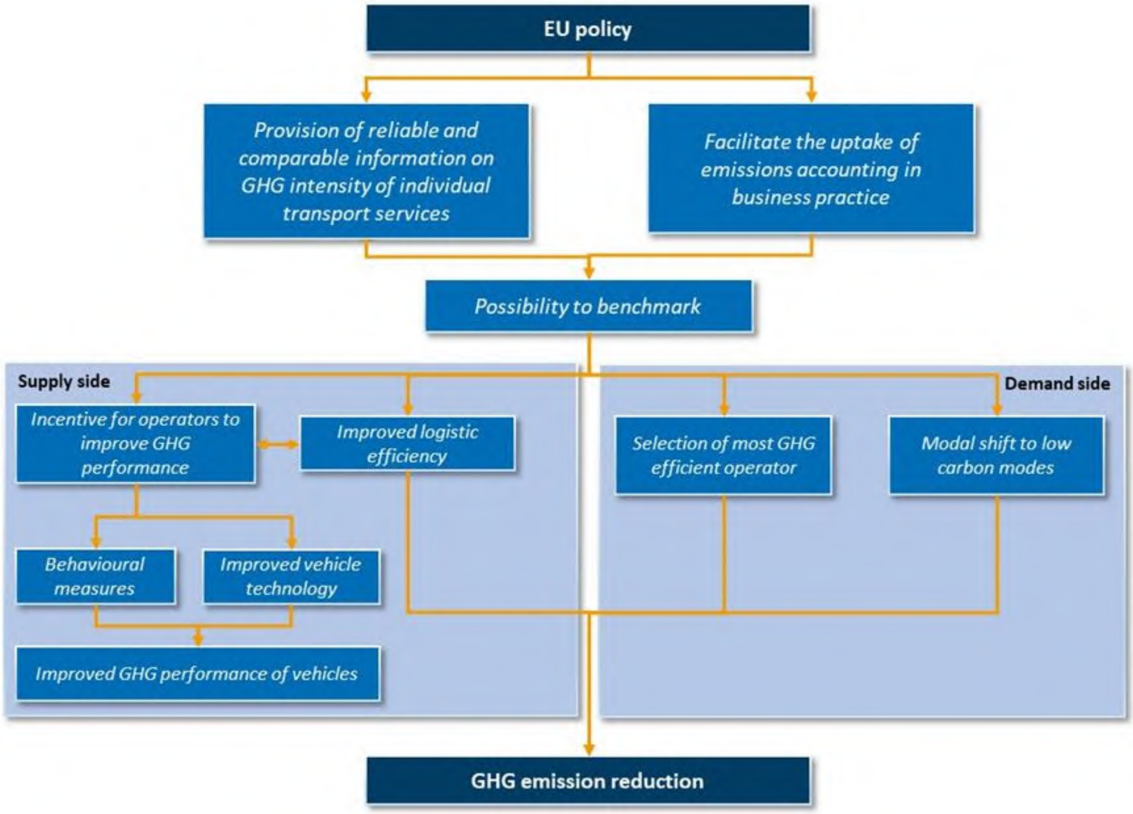
[226] Eurostat Structure of earnings survey, Labour Force Survey data for Non-Wage Labour

transport services and thus induce behavioural changes in the transport sector (mode change), which in turn result in lower GHG emissions[227]. Second, CountEmissions EU is also expected to indirectly contribute to GHG emissions savings, by providing harmonised GHG emission data for transport services that can be used by other (public and private) initiatives (e.g. in green financing or green public procurement), effectively contributing to lower GHG emissions and air pollutant emissions in the EU through improved transport efficiency. While the first set of direct impacts can be estimated, those triggered by the development of new programs using CountEmissions EU as their tool cannot be quantified, but are probably much larger than direct savings.

The empirical evidence on the effects between the GHG emissions accounting, changes in transport activity and the related reduction in the GHG emissions and air pollutants is scarce. Therefore, a number of assumptions and projections are based on the literature, case studies and use cases (including those presented in Annex 12), and the feedback from stakeholders' consultation (summarised in Annex 2).

Given the specific characteristics of the initiative, conceived rather as an enabler and tool for further measures reducing emissions and improving efficiency of transport services, the path of behavioural changes resulting from the application of various policy measures was key to identify impacts. This path of behavioural changes is illustrated in **Error! Reference source not found.** below.

Figure 11: Overview of potential behavioural changes - the supply and demand side of the transport market



Source : Ecorys and CE Delft (2023), Impact assessment support study

[227] Lewis, A., Dober, K., Ehler, V. et Al., LEARN Project inception Report, 2017.

Various policy measures and options may affect the transport choices made both on the supply and the demand side. On the supply side, the information on GHG emissions per transport service (when compared to similar figures from competitors) may incentivise transport operators to improve their transport efficiency (e.g. by increasing loading rates, further optimising of routing, shifting to greener transport solutions, etc.) and fuel efficiency (e.g., by using more fuel efficient vehicles/vessels or applying a fuel efficient driving style). These behavioural changes may result in a lower transport demand (in terms of kilometres) or lower GHG intensity per tonne-km and passenger-km. On the demand side, shippers and passengers are incentivised to take up more sustainable options, either by choosing more sustainable operators within a mode or by shifting to another mode of transport. The behavioural changes may also give rise to modal shift impacts as well as lower GHG intensity per tonne-km and passenger-km. While research on the transport choice behaviour suggest that in many cases presenting emissions figures to interested individuals might be more useful to generate awareness than to produce changes in behaviour, there is evidence that emissions information does improve pro-environmental behaviour among environmentally aware people and can indeed influence vehicle purchase choice, mode choice, and route choice.[228]

These findings may be evidenced by the results of the relevant EU initiatives and projects focused on calculation and reporting of emissions, and other sources that are useful in understanding the effects of the behavioural change (such as Lean and Green, and the US Smart Way programme mentioned above). A 2021 analysis of a survey amongst 800 European carriers[229] provides an insight into the European road freight SME carriers segment, being the largest target stakeholder group of this initiative. This analysis shows that calculating GHG emissions is the first step on a company's path towards decarbonisation, because it is the necessary precursor to the setting of meaningful emission reduction targets and monitoring progress towards achieving them. Additional benefit of monitoring and managing GHG emissions is therefore correlated with energy savings and lower fuel costs, which improve the operational efficiency. Furthermore, as large buyers of freight services are now declaring such targets and applying them to their Scope 3 emissions calculations (which include emissions from road carriers working on their behalf), carriers will need to have the capability to provide individual clients with relevant GHG emissions data. It is thus clearly beneficial that one common calculation standard is adopted by all players in the industry and across the transport chain to achieve harmonisation and comparability.

The analysis of direct environmental impacts covers GHG emissions, air pollutant emissions and avoided fuel use. The environmental impacts were quantified with the help of an Excel-based tool developed by Ecorys and CE Delft.

The main data source, for the levels of transport activity, GHG emissions and air pollutant emissions from transport, is PRIMES-TREMOVE. The source of the uptakes for GHG emissions accounting at

[228] Brazil, William et al. "An Examination Of The Role Of Emissions Information In Transport Behaviour: The Results Of A Smart Phone Trial In Dublin, Ireland". Trid.Trb.Org, 2017, https://trid.trb.org/view/1437202. Accessed 13 Jan 2023, and Silva, João de Abreu e et al. "The Influence Of Information-Based Transport Demand Management Measures On Commuting Mode Choice. Comparing Web Vs. Face-Toface Surveys". Transportation Research Procedia, vol 32, 2018, pp. 363-373. Elsevier BV, doi:10.1016/j.trpro.2018.10.066. Accessed 17 Jan 2023.

[229] Tölke, M. and McKinnon, A. (2021), Op.cit.

service level is based on elaborations by CE Delft and Ecorys at NACE-sector level, as explained in section 1 of Annex 4. Evidence was also based on the case studies summarised in Annex 11.

The model is based on two level assumptions. For the first level assumptions the shares of passengers and transport service providers making sustainable transport choices are assumed on the basis of the literature review and stakeholder consultations. The share of climate aware population[230] over time (2025-2050) is based on literature review[231] and cross-checked with the feedbacks received during the stakeholder consultations. These assumptions are instrumental to identify the shares of the activity that is impacted by CountEmissions EU.

On the basis of this information, Table 82 the assumptions[232] used for the period 2025-2050 are shown in the table below. No evidence was identified for using differentiated assumptions over the period.

Table 82: First level assumption values used for identifying the shares of activity for direct environmental impacts

Population	Shares over period 2025-2050
Passengers making sustainable choices among the climate aware populations	14%
Climate aware population over time	91%

Source : Ecorys and CE Delft (2023), Impact assessment support study

These values are used as proxy to identify the potential behavioural changes affecting the potential shift towards more sustainable transport modes, but also a potential reduction in activity due to changes in travelling habits.

The second level assumptions[233] are those related to the mode choices impacting the shift of activity between modes[234] and optimisation of trips. The values in Table 83 (passengers transport) and Table 84 (freight transport) are based on the literature[235], relevant case studies and use cases, and the feedback from stakeholders' consultation. They were also validated through a Peer Review[236].

[230] New Eurobarometer Survey: Protecting the environment and climate is important for over 90% of European citizens (3 March 2020)

[231] Yang, Morgan et al. "An Institutional Perspective On Consumers' Environmental Awareness And Pro-Environmental Behavioral Intention: Evidence From 39 Countries". Business Strategy And The Environment, vol 30, no. 1, 2021, pp. 566-575., https://ideas.repec.org/a/bla/bstrat/v30y2021i1p566-575.html. Accessed 16 Jan 2023. Daziano, R. et al. "Reframing Greenhouse Gas Emissions Information Presentation On The Environmental Protection Agency'S New-Vehicle Labels To Increase Willingness To Pay". Journal Of Cleaner Production, vol 279, 2021, p. 123669. Elsevier BV, doi:10.1016/j.jclepro.2020.123669. Accessed 17 Jan 2023. Daziano, Ricardo A. et al. "Increasing The Influence Of CO2 Emissions Information On Car Purchase". Journal Of Cleaner Production, vol 164, 2017, pp. 861-871. Elsevier BV, doi:10.1016/j.jclepro.2017.07.001. Accessed 17 Jan 2023.

[232] Feedbacks from stakeholder consultation and literature review does not provide further evidence for a modal shift in excess of 10% because of the harmonisation of GHG emissions methodology. Therefore, applying a conservative approach, the modal shift has been capped at 10%.

[233] CE Delft et al. (2023), Impact assessment support study

[234] McKinnon, A.C. (2023). Preparing Logistics for the Low-Carbon Economy. In: Merkert, R., Hoberg, K. (eds) Global Logistics and Supply Chain Strategies for the 2020s. Springer, Cham. https://doi.org/10.1007/978-3-030-95764-3_6

[235] Maja I. Piecyk, Alan C. McKinnon, Forecasting the carbon footprint of road freight transport in 2020, International Journal of Production Economics, Volume 128, Issue 1, 2010, Pages 31-42, ISSN 0925-5273, https://doi.org/10.1016/j.ijpe.2009.08.027.

[236] CE Delft et al. (2023), Impact assessment support study. Prof. Alan McKinnon (Kuhne University).

These values show the share of potential transport activity subject to shifting across modes and optimisation of trips due to GHG emissions accounting. They are used as proxies for the shift between modes and optimisation of trips.

Table 83: Second level assumption matrix for the share of potential passenger transport activity subject to shifting across modes and optimisation of trips due to GHG emissions accounting

Input mode (-)	**Output mode (+)**							
	Buses and coaches	Passenger cars and vans	P2W	Rail	Domestic and International intra-EU (air)	International extra-EU (air)	IWW and domestic maritime	Intra-EU maritime transport
Road transport								
Buses and coaches	0%	0%	0%	5%	0%	0%	0%	0%
Passenger cars and vans (taxis)	0%	0%	0%	2%	0%	0%	0%	0%
P2W	1%	0%	0%	0%	0%	0%	0%	0%
Rail	0%	0%	0%	0%	0%	0%	0%	0%
Air transport								
Domestic and International intra-EU	0%	0%	0%	50%	0%	0%	0%	0%
International extra-EU	0%	0%	0%	40%	0%	0%	0%	0%
Inland waterway and domestic maritime	0%	0%	0%	0%	0%	0%	0%	0%
Intra-EU maritime transport	0%	0%	0%	0%	0%	0%	0%	0%

Source : Ecorys and CE Delft (2023), Impact assessment support study

Table 84: second level assumption matrix for the share of potential freight transport activity subject to shifting across modes and optimisation of trips due to GHG emissions accounting

Input mode (-)	**Output mode (+)**			
	Road freight transport	Rail	IWW and domestic maritime	International maritime activity
Road transport	0%	40%	0%	0%
Rail	0%	0%	0%	0%
Inland waterway and domestic maritime	0%	10%	0%	0%
International maritime activity	0%	0%	0%	0%

Source : Ecorys and CE Delft (2023), Impact assessment support study

The proxies above together with the difference between the uptake of GHG emissions accounting in the different POs and the uptake in the baseline are used to derive the changes in transport activity in each policy option relative to the baseline (see Table 85). In the following step, energy intensity and emission intensity factors from PRIMES-TREMOVE are used to calculate the changes in emissions and fuel used.

More specifically, the energy use by policy option is derived based on the transport activity by transport mode corresponding to each option and the projected energy intensity per transport mode from the baseline scenario. The energy intensity is expressed in ton of oil equivalent (toe) per tonne-kilometre and takes into account all energy forms, including green electricity and hydrogen. The energy savings are computed by taking the difference between the energy use in the policy options and the baseline. Finally, projected average fuel costs in EUR per toe for each transport mode from the baseline scenario is used to monetise the energy savings. The average fuel costs takes into account all the energy forms used by transport mode, including green electricity and hydrogen. It needs to be clarified that the baseline scenario of this initiative includes significant reductions in the energy intensity of all modes over time. This is because it reflects the 'Fit for 55' and the REPowerEU packages. Yet, the rail transport shows significantly lower energy intensity per tonne-kilometres than other modes, as also the case today.

Similarly to the energy use, the GHG emissions by policy option is derived based on the transport activity by transport mode corresponding to each option and the projected emissions intensity per transport mode from the baseline scenario. The GHG emissions savings are computed by taking the difference between the energy use in the policy options and the baseline.

Table 85: Changes in transport activity due to CountEmissions EU relative to the baseline (% change relative to the baseline)

	2025	2030	2040	2050
PO1				
Total passenger transport activity (Gpkm)	0.0%	0.0%	-0.1%	-0.1%
Road transport	0.0%	0.0%	0.0%	0.0%
Buses and coaches	0.0%	0.0%	-0.1%	-0.1%
Passenger cars and vans	0.0%	0.0%	0.0%	0.0%
P2W	0.0%	0.0%	0.0%	0.0%
Rail	0.1%	0.5%	0.8%	0.8%
Air transport	0.0%	-0.3%	-0.5%	-0.5%
Domestic and International intra-EU	0.0%	-0.3%	-0.6%	-0.6%
International extra-EU	0.0%	-0.3%	-0.5%	-0.5%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
Intra-EU maritime transport	0.0%	0.0%	0.0%	0.0%
Total freight transport activity (Gtkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	-0.3%	-0.5%	-0.5%
Rail	0.1%	0.4%	0.7%	0.7%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
International maritime activity	0.0%	0.0%	0.0%	0.0%
	2025	**2030**	**2040**	**2050**
PO2				
Total passenger transport activity (Gpkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	0.0%	0.0%	0.0%
Buses and coaches	0.0%	0.0%	0.0%	0.0%
Passenger cars and vans	0.0%	0.0%	0.0%	0.0%
P2W	0.0%	0.0%	0.0%	0.0%
Rail	0.1%	0.2%	0.1%	0.0%
Air transport	-0.1%	-0.1%	0.0%	0.0%
Domestic and International intra-EU	-0.1%	-0.1%	-0.1%	0.0%
International extra-EU	0.0%	-0.1%	0.0%	0.0%

	2025	2030	2040	2050
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
Intra-EU maritime transport	0.0%	0.0%	0.0%	0.0%
Total freight transport activity (Gtkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	-0.1%	0.0%	0.0%
Rail	0.1%	0.1%	0.1%	0.0%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
International maritime activity	0.0%	0.0%	0.0%	0.0%
	2025	**2030**	**2040**	**2050**
PO3				
Total passenger transport activity (Gpkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	0.0%	0.0%	0.0%
Buses and coaches	0.0%	0.0%	0.0%	0.0%
Passenger cars and vans	0.0%	0.0%	0.0%	0.0%
P2W	0.0%	0.0%	0.0%	0.0%
Rail	0.0%	0.1%	0.0%	0.0%
Air transport	0.0%	-0.1%	0.0%	0.0%
Domestic and International intra-EU	0.0%	-0.1%	0.0%	0.0%
International extra-EU	0.0%	-0.1%	0.0%	0.0%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
Intra-EU maritime transport	0.0%	0.0%	0.0%	0.0%
Total freight transport activity (Gtkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	-0.1%	0.0%	0.0%
Rail	0.0%	0.1%	0.0%	0.0%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
International maritime activity	0.0%	0.0%	0.0%	0.0%
	2025	**2030**	**2040**	**2050**
PO4				
Total passenger transport activity (Gpkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	0.0%	0.0%	0.0%
Buses and coaches	0.0%	0.0%	0.0%	0.0%
Passenger cars and vans	0.0%	0.0%	0.0%	0.0%
P2W	0.0%	0.0%	0.0%	0.0%
Rail	0.1%	0.2%	0.1%	0.1%
Air transport	-0.1%	-0.1%	-0.1%	0.0%
Domestic and International intra-EU	-0.1%	-0.2%	-0.1%	0.0%
International extra-EU	-0.1%	-0.1%	-0.1%	0.0%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
Intra-EU maritime transport	0.0%	0.0%	0.0%	0.0%
Total freight transport activity (Gtkm)	0.0%	0.0%	0.0%	0.0%
Road transport	-0.1%	-0.1%	-0.1%	0.0%
Rail	0.1%	0.2%	0.1%	0.0%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
International maritime activity	0.0%	0.0%	0.0%	0.0%
	2025	**2030**	**2040**	**2050**
PO5				
Total passenger transport activity (Gpkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	0.0%	0.0%	0.0%

	2025	2030	2040	2050
Buses and coaches	0.0%	0.0%	0.0%	0.0%
Passenger cars and vans	0.0%	0.0%	0.0%	0.0%
P2W	0.0%	0.0%	0.0%	0.0%
Rail	0.0%	0.1%	0.0%	0.0%
Air transport	0.0%	-0.1%	0.0%	0.0%
Domestic and International intra-EU	0.0%	-0.1%	0.0%	0.0%
International extra-EU	0.0%	-0.1%	0.0%	0.0%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
Intra-EU maritime transport	0.0%	0.0%	0.0%	0.0%
Total freight transport activity (Gtkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	-0.1%	0.0%	0.0%
Rail	0.0%	0.1%	0.0%	0.0%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
International maritime activity	0.0%	0.0%	0.0%	0.0%
	2025	**2030**	**2040**	**2050**
PO6				
Total passenger transport activity (Gpkm)	0.0%	0.0%	-0.1%	-0.1%
Road transport	0.0%	0.0%	0.0%	0.0%
Buses and coaches	0.0%	0.0%	-0.1%	-0.1%
Passenger cars and vans	0.0%	0.0%	0.0%	0.0%
P2W	0.0%	0.0%	0.0%	0.0%
Rail	0.1%	0.5%	0.8%	0.8%
Air transport	0.0%	-0.3%	-0.5%	-0.5%
Domestic and International intra-EU	0.0%	-0.3%	-0.6%	-0.6%
International extra-EU	0.0%	-0.3%	-0.5%	-0.5%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
Intra-EU maritime transport	0.0%	0.0%	0.0%	0.0%
Total freight transport activity (Gtkm)	0.0%	0.0%	0.0%	0.0%
Road transport	0.0%	-0.3%	-0.5%	-0.5%
Rail	0.1%	0.4%	0.7%	0.7%
Inland waterway and domestic maritime	0.0%	0.0%	0.0%	0.0%
International maritime activity	0.0%	0.0%	0.0%	0.0%

Source : Ecorys and CE Delft (2023), Impact assessment support study

5. Sensitivity analysis

The sensitivity analysis builds on the following scenarios:

- In the first case (-A), we assumed a decrease by 40% in the share of passengers making sustainable choices among the climate aware population. Second level assumptions are kept unchanged.

- In the second case (-B), we assumed a decrease by 30% in the shares of activity shifted to more sustainable transport modes and optimisation of trips. First level assumptions are kept unchanged.

The results of the sensitivity analysis presented below for all policy options show that while the magnitude of the expected benefits may be somewhat lower, the ranking of the policy options remains unchanged.

Table 86: First case (-A) - Summary of costs and benefits of the policy options – net present value for 2025-2050 compared to the baseline (in million EUR), in 2022 prices

	Difference to the Baseline					
	PO1-A	**PO2-A**	**PO3-A**	**PO4-A**	**PO5-A**	**PO6-A**
National public authorities (including NABs)						
Adjustment costs	0.1	0.1	0.1	0.1	0.1	0.1
Administrative costs	0.1	0.1	0.1	0.1	0.1	0.1
EEA						
Adjustment costs	3.6	3.6	3.9	3.9	3.6	3.9
European Commission						
Adjustment costs	2.7	0.3	2.4	0.0	5.3	0.0
Businesses						
Adjustment costs	95,010.8	1,084.6	1,374.4	1,542	2,283.7	67,927.7
Administrative costs	0.0	0.0	0.5	0.5	0.3	0.5
Benefits						
Avoided fuel used (operators and passengers)	8,290.3	1,268.4	574.6	1,932.7	504.4	8,290.3
Reduction in external costs of GHG emissions	2,303.1	356.3	160.0	539.3	139.9	2,303.1
Reduction in external costs of air pollution emissions	480.4	88.7	42.5	130.8	37.6	480.4
Reduction in external costs of accidents	2,208.4	339.5	153.8	516.2	134.9	2,208.4
Total costs	95,017	1,089	1,381	1,547	2,293	67,932
Total benefits	13,282.3	2,052.9	930.8	3,119	816.8	13,282.3
Net benefits	-81,735.0	964.1	-450.6	1,572.4	-1,476.3	-54,650.0
Benefits to costs ratio	0.1	1.9	0.7	2.0	0.4	0.2

Table 87: Second case (-B) - Summary of costs and benefits of the policy options – net present value for 2025-2050 compared to the baseline (in million EUR), in 2022 prices

	Difference to the Baseline					
	PO1-B	**PO2-B**	**PO3-B**	**PO4-B**	**PO5-B**	**PO6-B**
National public authorities (including NABs)						
Adjustment costs	0.1	0.1	0.1	0.1	0.1	0.1
Administrative costs	0.1	0.1	0.1	0.1	0.1	0.1
EEA						
Adjustment costs	3.6	3.6	3.9	3.9	3.6	3.9
European Commission						
Adjustment costs	2.7	0.3	2.4	0.0	5.3	0.0
Businesses						
Adjustment costs	95,010.8	1,084.6	1,374.4	1,542	2,283.7	67,927.7
Administrative costs	0.0	0.0	0.5	0.5	0.3	0.5
Benefits						
Avoided fuel used (operators and passengers)	7,561.3	1,154.2	522.5	1,759.3	458.6	7,561.3
Reduction in external costs of GHG emissions	2,028.7	315.3	141.8	476.8	124.0	2,028.7
Reduction in external costs of air pollution emissions	431.8	80.0	38.4	117.9	34.0	431.8
Reduction in external costs of accidents	1,934.7	297.4	134.7	452.2	118.2	1,934.7
Total costs	95,017	1,089	1,381	1,547	2,293	67,932
Total benefits	11,956.6	1,846.9	837.3	2,806	734.8	11,956.6
Net benefits	-83,060.8	758.1	-544.1	1,259.7	-1,558.4	-

						55,975.7
Benefits to costs ratio	0.1	1.7	0.6	1.8	0.3	0.2

6. Interest and motivations of main groups of stakeholders involved in transport services activities

Specific interests of various stakeholders groups have been taken in due account while constructing and assessing various policy options. These are elaborated in the table below.

Table 88: Main interest of different stakeholders with respect to the objectives of the initiative

Specific Objective	Stakeholder groups	Main interests
SO1: Ensure comparability of results from GHG emissions accounting of transport services	Transport service organisers (operators)	- Clear methodological guidance, and clear rules on input data establishing a level playing field on the market; - Methodological (regulatory) predictability; - Support for the business decision making; - Support for marketing of green transport services; - Support for corporate sustainability strategies.
	Transport service users	- Comparability of emissions data of various transport services, to make informed transport choices; - Methodological (regulatory) predictability (mostly for companies); - Support for business decision making (mostly for companies); - Support for the marketing of green transport services (mostly for companies – transport intermediaries); - Support for corporate sustainability strategies (mostly for companies).
	Other entities involved in accounting GHG emissions of transport services (calculation tools developers, business sector associations, emissions data intermediaries etc.)	- Stable and clear GHG emissions accounting rules for designing tools; - Stable environment for providing GHG emissions accounting services
SO2: Facilitate the uptake of GHG emissions accounting of transport services in business practice	Transport service organisers (operators)	- Decrease in costs of calculations over time; - Complete, accurate and trustful information on emissions from various transport services as an input to the business decision making; - Clear rules on commercially sensitive data; - Corporate strategies
	Transport service users	- Better clarity and transparency on the available transport services due to the increase of quantity of data; - Trust in the available GHG emission figures.
	Other entities involved in accounting GHG emissions of transport services (calculation tools	- Increased demand for the use of the calculation tools; - Clear rules on commercially sensitive data

	developers, business sector associations, emissions data intermediaries etc.)	

The stakeholders' consultation provided useful insights on different motivations to apply GHG emissions accounting, especially by transport service organisers (operators). The respondents to the survey indicated that "environmental awareness" is the most important motivation to account for emissions (see Annex 2). This motivation is supported by the evidence from the literature as reported in section 2.2 of the main report when explaining PD 4 and PD 5. The evidence points to the existence of corporate sustainability programmes, which often translate into sets of sustainability performance and improvements targets for operators and users alike, driven by corporate strategies and values, as for example the management's belief in the company's environmental responsibility and the company's value system displayed towards customers and third parties.

There may also be various commercial reasons for applying GHG emissions accounting. The need to address requirements from customers, users or passengers is, according to the respondents to the stakeholder survey, another important motivation for applying GHG emissions accounting. In some cases, it is related to contractual aspects when information on GHG emissions of transport activities is e.g. part of tendering requirements. Three interviewed transport associations and one transport management system supplier mentioned a third commercial reason to account emissions for transport operators: to optimise one's own operational efficiency. For example, detailed insight in GHG emissions can be used to optimise fuel use. Particularly large transport operators are expected to use the results of GHG emissions calculations for that purpose, while smaller transport operators are often not able to apply the sufficiently detailed GHG emission calculations (based on primary data) that would allow for operational optimisation. Finally, companies may also apply GHG emissions accounting to comply with (future) policies. These considerations are already reflected in Annex 2 and the IA Support Study.

ANNEX 5: COMPETITIVENESS CHECK

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 6.1.5 of the SWD
International competitiveness	+	Section 6.1.5 of the SWD
Capacity to innovate	++	Annex 4, 7 and section 6.1.5 of the SWD
SME competitiveness	+	Section 6.1.7 of the SWD and Annex 10

SYNTHETIC ASSESSMENT

Cost and price competitiveness

The preferred Policy Option 4 (PO4) establishes the binding opt-in application of the initiative on the EU market, requiring the use of the CountEmissions EU framework only by those entities that decide or are mandated to account GHG emissions of transport services. This approach will streamline the emissions quantification process, and provide businesses with clear guidance, supporting the forefront position of the EU on zero emissions vehicles, high-speed rail and intelligent transport systems, without excessive pressure on costs.

Given the increased uptake of the framework from the implementation year (2025) onwards, this choice will lead to adjustment costs for the businesses involved (see Annex 3), mostly associated with the necessary adaptations or establishment of the internal processes and systems. The adjustment costs will therefore include labour, IT and external services costs, the latter related with the use of specific technical tools and expertise. For large entities, these expenses will also be topped up with the mandatory verification of data and processes. These costs are expected to decrease gradually over time, given the regulatory and methodological clarity provided by the common framework, as well as the availability of specific facilitating measures, namely the implementation guidelines and technical support tools. Furthermore, as shown in Section 6 and Annex 4, the implementation of the initiative will lead to direct and indirect benefits for economic operators, resulting from better transparency on the performance of transport operations. These benefits will translate into energy savings, increased efficiency of transport activities, improved reputational image of businesses and overall societal costs decrease. Therefore, the overall impact on this dimension is considered positive.

International competitiveness

The regulatory and methodological clarity provided by the harmonised framework, and related benefits stemming from its use, are expected to improve the competitive position of EU companies on the international market. In principle, the framework will accelerate the deployment of low and zero emissions transport options, and contribute to increasing the market share of alternative fuels in the EU. Furthermore, by establishing the global ISO 14083 standard as the common reference methodology, PO 4 will enable EU entities to calculate emissions beyond the internal EU transport chains only, and provide an opportunity for a global methodological alignment, depending on the adherence to the ISO standard by third countries. This effect would have positive impact on the international cooperation, and additional benefits resulting from increased efficiency and emissions reduction. No other direct impacts on international competitiveness can be foreseen.

Capacity to innovate

The deployment of CountEmissions EU will lead to more sustainable and efficient transport decisions by final users, thus stimulating the innovation (including process innovation) and faster technology uptake by transport service organisers (especially operators). What is more, the increased sharing of transport emissions data will trigger further efforts of companies towards digital solutions, which may be particularly relevant for SMEs, and specifically microenterprises. Therefore, this assessment leads to a high score for 'Capacity to innovate' dimension.

SME competitiveness

Given that SMEs represent a substantial part of the transport market (especially road), the assessment on the overall cost and price competitiveness aspect as provided above, is applicable also for this dimension to a large extent . It should be noted that SMEs in general have lower capacity (resources) to bear additional requirements, which may result in a relatively higher proportion of the adjustment costs compared to their overall cost structure. However, PO4 has been designed to minimise negative impacts on SMEs, including the exemption of SMEs from the mandatory verification of GHG data and processes, the provision of implementation guidelines and certified technical support tools, as well as the establishment of a harmonised framework for the input data.

CountEmissions EU will therefore contribute to the establishment of the level playing field on the transport market, thus improving the position of SMEs, and at the same time enabling the surfacing of sustainable solutions concerning last mile, door-to-door mobility and logistics. This eventually results in a positive score for this competitiveness check dimension.

ANNEX 6: DISCARDED POLICY MEASURES

During the Impact Assessment process, a number of possible policy measures have been discarded, based on the analytical work and feedback from the stakeholders. This annex provides more detailed information on these measures and reasons for their discarding.

Policy measure	Relevant Driver	Short description	Reason for discarding
EU develops an entirely new reference methodology for accounting emissions from transport services	PD1	A completely, new, tailor-made reference methodology including all relevant design alternatives and the necessary level of detail in terms of the scope and method of the emission calculation, as well as the allocation of emissions to transport services. More details are provided in Annex 8.	Discarded due to the lack of proportionality. The analysis demonstrated limited added value for the achievement of the policy objectives, given the existence of other robust and widely accepted methods and initiatives for emissions accounting. This policy measure was not supported by the stakeholders due to: • the legacy methods for accounting emissions from transport services (such as ISO 14083 or CEN EN 16258 standards), • the uncertainty concerning the technical process related to the development and implementation of the methodology at the EU level.
EU establishes the CEN standard EN 16258 as the common reference methodology for accounting emissions	PD1	The CEN standard EN 16258 was published in 2012, and until February 2023, it was the only initiative offering specific emissions accounting methodology on the calculation and declaration of	Discarded due to the lack of relevance. CEN standard EN 16258 does not reflect the latest scientific knowledge related to the quantification of GHG emissions from

Policy measure	Relevant Driver	Short description	Reason for discarding
from transport services		energy consumption and GHG emissions related to transport services. The methodology is in wider use on the EU transport market. More details are provided in Annex 8.	transport services and leaves considerable room for users to make their own methodological choices. In February 2023, based on specific arrangements between CEN and ISO, EN 16258 was withdrawn and substituted by the new ISO standard 14083.
EU establishes the common reference methodology for accounting emissions from transport services based on Article L. 1431-3 of the French Transport Code	PD1	Article L. 1431-3 of the French Transport Code establishes provisions and a methodology for specific information disclosure, mandating transport service providers to inform users of their carbon dioxide emissions while performing respective transport services. The disclosure requirement became mandatory in 2013. More details are provided in Annex 8	Discarded due to the lack of relevance. Article L. 1431-3 of the French Transport Code was designed for use only in France; therefore, this methodology does not meet the expectations of stakeholders, preferring a global geographical scope of the GHG emissions accounting. In addition, building on the CEN standard EN 16258, this method will become redundant following the adoption of the new ISO 14083 methodology.
EU establishes the general framework of the Product Environmental Footprint (PEF) as the common reference methodology for accounting emissions from transport services	PD1	The Product Environmental Footprint framework was developed by the European Commission (EC) in the context of the Single Market for Green Products Initiative. PEF provides a horizontal and cross-sectoral method for the measurement of the environmental performance of a good or service throughout its full life cycle. More details are provided in Annex 8	Discarded due to the lack of relevance. The general PEF framework does not cover emissions generated at the level of transport services, thus preventing the provision of sufficient and adequate guidance for potential users performing activities related to transporting cargo or/and passengers. This method is not specifically recognised nor used in the business practice in the transport sector.

Policy measure	Relevant Driver	Short description	Reason for discarding
EU establishes the Corporate Value Chain Standard of the GHG Protocol as the common reference methodology for accounting emissions from transport services	PD1	The GHG Protocol Corporate Accounting and Reporting Standard of 2001 was a pioneering initiative establishing global standardised frameworks to measure and manage GHG emissions from private and public sector operations. The GHG Protocol enables to account indirect emissions from value chain activities, including from transport and logistics. More details are provided in Annex 8	Discarded due to the lack of relevance. Although highly valuable for accounting GHG emissions of companies, this methodology is less complete and accurate for addressing emissions stemming from the specific transport service level. Therefore, similarly as in the case of PEF, it does not provide sufficient and adequate guidance for potential users performing activities related to transporting cargo or/and passengers.
EU mandates the use of primary information to economic operators and other entities accounting emissions from transport services	PD2	Primary information on the actual fuel/energy consumed is required from economic operators and other relevant entities quantifying GHG emissions from transport services. The use of activity-based default values, i.e. emission intensity factors and modelled data is therefore not allowed.	Discarded due to the lack of proportionality. The consultation activities and desk research identified limited availability of primary information for certain categories of stakeholders (especially operators representing SMEs and microenterprises) and certain types of transport services (such as last mile operations). Therefore, the mandatory requirements for the exclusive use of primary information would create an excessive and disproportionate burden on businesses and other entities quantifying emissions of transport services.
EU provides recommendations for harmonized formats of emissions output data	PD3	The EC provides recommendations on the harmonised format and metrics (unit of measures) of any GHG data generated under the CountEmissions EU framework. The measure aims to facilitate the comparability and benchmarking of this data for better transparency on the market and informed decision making by data users.	Discarded due to the lack of effectiveness. The consultation activities and desk research identified that companies or groups of companies operating in particular segments of the transport sector very often use their own and specific data formats. Therefore, the recommendation as a policy instrument would not be effective enough to reach the full comparability of various data shared in the transport chain.

Policy measure	Relevant Driver	Short description	Reason for discarding
EU certifies specific sectorial implementation guidelines provided by the market	PD5	This measure establishes the mandatory certification of specific sectorial implementation guidelines developed by the market. These guidelines may include issues related to the interpretation of the common reference methodology, formulas for the calculation processes, best practices and default emission factors. For some sectors, such guidelines already exist (e.g. SCF & CEFIC (2021) for the chemical sector).	Discarded due to the lack of proportionality. The internal analysis demonstrated the separate certification process for sectorial implementation guidelines would be disproportionate and redundant. This conclusion was based on the fact that the retained policy measures already ensure a high level of methodological harmonisation, namely: • common emissions quantification method, • harmonised framework of input data (emission factors), • rules on a harmonised format and metrics of the output data, • verification system for GHG emissions data and calculation processes applied, • certified technical calculation tools, • horizontal guidelines for the harmonised implementation of CountEmissions EU across various segments of the transport sector.
EU provides specific implementation guidelines for each segment of the transport sector	PD5	The EU provides detailed implementation guidelines for each relevant segment of the transport sector. These guidelines include topics related to the interpretation of the common reference methodology, formulas for the calculation processes, best practices and default emission factors.	Discarded due to the lack of effectiveness. This measure would be associated with substantial costs, efforts and timescale thus leading to low efficiency and limited value added for achieving the objectives of the initiative. Moreover, it would bear the additional risk of misalignment of various sectorial approaches due to the lack of specific sectorial expertise and insufficient flexibility resulting from time-consuming procedures in the EU.

Policy measure	Relevant Driver	Short description	Reason for discarding
EU allows for GHG emissions calculation tools provided by the market (without further conformity check)	PD5	The development and implementation of calculation tools based on the CountEmissions EU framework is left to the market.	Discarded due to the lack of effectiveness. The proliferation of tools and the lack of control on their set-up and design would not guarantee sufficient alignment and conformity of these tools to CountEmissions EU, thus creating a risk of inaccurate and incomparable emissions calculation output figures. This risk may be particularly meaningful for SMEs that, due to the lack of in-house resources, are expected to be the main users of emissions calculation tools offered on the market.

ANNEX 7: RETAINED POLICY MEASURES

This annex provides a more detailed description of the retained policy measures and their links to the problem drivers, specific objectives and policy areas.

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
PD1	**PM1**: ISO 14083 is set as common reference methodology at EU level	The **EU establishes a common reference methodology** for CountEmissions EU based on the new **ISO standard 14083** '*Quantification and reporting of greenhouse gas emissions arising from transport chain operations*' (adopted in February 2023). ISO 14083 in principle addresses Well-to-Wheel GHG emissions, including emissions from the production of fuels. It builds on the harmonisation efforts led by European stakeholders (including industry and standardisation bodies), with the support of the EU-financed projects (COFRET, LEARN). It is currently the only specific standard for accounting emissions from transport services (replacing CEN EN 16258). Detailed characteristics and assessment of ISO 14083 is presented in Annex 8. The **EU also establishes rules for the future updates** and methodological adjustments of the common reference methodology[237].	**SO1**	**Methodological framework**
PD1	**PM2**: Product Environmental Footprint Category Rules for	The **EU establishes a common reference methodology** for CountEmissions EU based on the **Product Environmental Footprint Category Rules** for GHG emissions in transport,	**SO1**	**Methodological**

[237] These rules shall account for continuous development of the reference methodology, reflecting the scientific state of the art associated with the emissions accounting. Furthermore, the initiative shall include a mechanism allowing for additional methodological adjustments in case the use of the common reference methodology risks to result in undue imbalances between transport segments, for instance in the ex-ante perspective (before the service is provided).

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
	GHG emissions in transport, including rules for transport services, is set as common reference methodology at EU level	including rules for transport services. Product Environmental Footprint (PEF) originally developed by the European Commission in the context of Single Market for Green Products Initiative, provides a cross-sectoral method for the measurement of the environmental performance of a good or service throughout its full life cycle. The general PEF framework does not provide relevant guidance on the calculation of GHG emissions at the transport service level, therefore the implementation of this method would require specific category rules (i.e. set of calculation rules) to be developed for the transport sector. These category rules shall be established by the EU through secondary legislation. Detailed characteristics and assessment of PEFCR is presented in Annex 8. The **EU also establishes rules for the future updates** and methodological adjustments of the common reference methodology[238].		**framework**
PD1	**PM3**: A common reference methodology is set at EU level, based on ISO 14083 but with additional elements and increased accuracy	The **EU establishes a common reference methodology** for CountEmissions EU building on the **ISO standard 14083 with additional methodological elements** (for instance specific allocation metrics, LCA for certain vehicle components related to the source of energy, etc.) to ensure increased accuracy and comparability of the GHG emissions data. The additional elements complementing the ISO 14083 framework shall be developed by the EU through the secondary legislation Detailed characteristics and assessment of the methodology based on upgraded ISO standard 14083 is presented in Annex 8.	**SO1**	**Methodological framework**

[238] Idem

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
		The **EU also establishes rules for the future updates** and methodological adjustments of the common reference methodology[239].		
PD2 PD3	**PM4**: The use of primary data is recognised and centralised databases for default values are established at EU level (by European Environment Agency). Modelled data is used in conformity with the reference methodology	The EU **recommends the use of primary information** while accounting emissions, to improve the accuracy and reliability of various GHG emissions output data. **The use of primary information is recognised** in line with specific provisions referred to in PM8 and PM9. In case the primary information is not available for an economic operator, the EU allows the use of default values derived from a common **database of GHG emission intensity factors** established at the central EU level. The EU also establishes a **database of GHG energy emission factors** (in case of PO5 this database will include LCA emission factors) and mandates its use for any calculations under the CountEmissions EU framework. This database of emission factors shall include values provided through relevant EU regulatory initiatives, including those forming part of the upcoming Fit-for-55 package. Specific emission factors shall be developed in line with relevant methods and provisions recognised by the EU. The development and maintenance of the databases is executed by the European Environmental Agency (EEA), supported by the HorizonEurope programme[240]. The use of modelled data is allowed insofar the modelling is conform to the selected reference methodology and its possible adjustments in line with PM1, PM2 or PM3, respectively.	**SO1**	**Input data and sources**

[239] Idem

[240] HORIZON-CL5-2023-D6-01-08: Future-proof GHG and environmental emissions factors for accounting emissions from transport and logistics operations

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
PD2 PD3	**PM5**: The use of primary data is incentivised and centralised databases for default values are established at EU level. Quality assurance of external databases operated by third parties is provided at EU level (by European Environment Agency). Modelled data is used in conformity with the reference methodology	The EU **recommends the use of primary information** while accounting emissions, to improve the accuracy and reliability of various GHG emissions output data. **The use of primary information is recognised** in line with specific provisions referred to in PM8 and PM9. In case the primary information is not available for an economic operator, the EU allows the use of default values from a **core database of GHG emission intensity factors** established at the central EU level, and/or from **other relevant databases** operated by third parties at the sectorial and national levels. The databases operated by third parties undergo a **quality check based on specific rules set up by the EU** through the secondary legislation. The EU also establishes a **database of GHG energy emission factors** and mandates its use for any calculations under the CountEmissions EU framework. The database of energy emission factors shall include values provided through relevant EU regulatory initiatives, including those forming part of the upcoming Fit-for-55 package. Specific energy emission factors shall be developed in line with relevant methods and provisions recognised by the EU. The development and maintenance of the EU-level databases is executed by the European Environmental Agency (EEA), supported by the HorizonEurope programme[241]. EEA also performs the quality check of external databases operated by third parties. The use of modelled data is allowed insofar the modelling is conform to the selected reference methodology and its possible adjustments in line with PM1, PM2 or PM3, respectively.	**SO1**	**Input data and sources**

[241] Ibidem

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
PD1 PD3 PD4	**PM6**: Minimum requirements for harmonised GHG output data formats and metrics are provided at EU level, together with common rules on communication and transparency	The EU provides **minimum requirements for the harmonised formats and metrics** of the GHG emissions output data, to facilitate and simplify the sharing of these data along the transport chain. The EU sets up specific **requirements for the communication and transparency** with respect to any claims related to the GHG emissions accounting of transport services, based on CountEmissions EU[242].	**SO1-SO2**	**Harmonised emissions output data and transparency**
PD3 PD4 PD5	**PM7**: Horizontal guidelines for the harmonised implementation of CountEmissions EU in various sectors and segments of the transport market are provided at EU level	The EU provides horizontal **guidelines for the harmonised implementation of CountEmissions EU** across sectors and segments of the transport market including: • Data requirements and management; • Emissions calculation guidance and best practices; • Assurance and verification of the emissions data; • Guidance on data sharing.	**SO1-SO2**	**Sectoral Implementation Support**
PD4	**PM8**: Mandatory process and data verification for all entities falling under the scope of CountEmissions EU is established at EU level	EU establishes **a mandatory verification system** for the conformity to CountEmissions EU as regards the GHG emissions data generated from transport services and the processes applied for their quantification. The verification applies to all economic operators that calculate and disclose GHG emissions data from transport services. The economic operators are required to perform this	**SO2**	**Conformity**

[242] Including in conformity to the Unfair Commercial Practices Directive (UCPD)

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
		verification at least on annual basis. The verification shall be based on **specific conformity assessment rules established by the EU**[243] through the secondary legislation, and shall be undertaken by a verifier accredited by national accreditation bodies appointed by the Member States pursuant to Regulation (EC) No 765/2008[244]. The conformity assessment rules shall include provisions related to the recognition of primary data referred to in PM4 and PM5. The economic operators undergoing the verification of their GHG emissions data and the calculation processes are entitled to obtain **a certificate of conformity** to CountEmissions EU.		
PD4	**PM9**: Mandatory process and data verification for entities above a certain size falling under the scope of CountEmissions EU is established at EU level	EU establishes **a mandatory verification system** for the conformity to CountEmissions EU as regards the GHG emissions data generated from transport services and the processes applied for their quantification. The verification applies to all economic operators not falling under the definition of SME[245] that calculate and disclose GHG emissions data from transport services. The economic operators are required to perform this verification at least on annual basis. The verification shall be based on **specific conformity assessment rules established by the EU**[246] through the secondary legislation, and shall be undertaken by a verifier accredited by	**SO2**	**Conformity**

[243] For instance taking an example of the rules on financial audits
[244] This Regulation lays down rules on the organisation and operation of accreditation of conformity assessment bodies performing conformity assessment activities
[245] Commission Recommendation 2003/361/EC of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises (OJ L 124, 20.5.2003, p. 36).

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
		national accreditation bodies appointed by the Member States pursuant to Regulation (EC) No 765/2008. The conformity assessment rules shall include provisions related to the recognition of primary data referred to in PM4 and PM5. The economic operators undergoing the verification of their GHG emissions data and the calculation processes are entitled to obtain **a certificate of conformity** to CountEmissions EU. The verification of conformity may be requested by third parties, including the EU and Member States, especially in case an entity is reported not to follow CountEmissions EU.		
PD4	**PM10**: Voluntary process and data verification for all entities are established at EU level	EU establishes **a voluntary verification system** for the conformity to CountEmissions EU as regards the GHG emissions data generated from transport services and the processes applied for their quantification.. The verification shall be based on **specific conformity assessment rules established by the EU**[247] though the secondary legislation, and shall be undertaken by a verifier accredited by national accreditation bodies appointed by the Member States pursuant to Regulation (EC) No 765/2008. The conformity assessment rules shall include provisions related to the recognition of primary data referred to in PM4 and PM5. The economic operators undergoing the verification of their GHG emissions data and the calculation processes are entitled to obtain **a certificate of conformity** to CountEmissions	**SO2**	**Conformity**

[246] For instance taking an example of the rules on financial audits
[247] Ibidem

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
		EU. The verification of conformity may be requested by third parties, including the EU and Member States, especially in case an entity is reported not to follow CountEmissions EU.		
PD5	**PM11**: Emissions calculation tools are provided at EU level (by the European Commission)	The **EU develops and establishes GHG emissions calculation tools** at the central EU level, based on the common reference methodology and a set of default values for the input data. These tools include a data sharing and exchange mechanism and may be used by any economic operator and any other relevant entities for quantifying and disclosing GHG emissions data from transport services. Security and privacy of the data is ensured by the adherence to the confidentiality standards related to data sharing and exchange. These tools shall be established based on the secondary legislation.	**SO2**	**Complementary measures**
PD5	**PM12**: Emissions calculation tools are provided by the market but they are certified at EU level	The development and provision of GHG emissions calculation tools is left for the market. **The EU establishes a certification process** for any commercial and non-profit tools offered publicly for the wider use by the EU economic operators and other entities quantifying and disclosing GHG emissions data from transport services. **The EU sets up specific assessment rules for the certification process** through the secondary legislation, to ensure the conformity of these tools with the CountEmissions EU framework. These rules include provisions related the security and privacy of data, and the adherence to the confidentiality standards related to data sharing and exchange. The certification shall be undertaken by a body accredited by national accreditation bodies appointed by the Member States pursuant to Regulation (EC) No 765/2008. The economic operators and other entities undergoing the certification of their GHG emissions calculation tools are entitled to obtain **a certificate of conformity** to CountEmissions EU.	**SO2**	**Complementary measures**
PD5	**PM13**: Mandatory application of CountEmissions EU in the	The **EU mandates all economic operators and other entities organising and providing transport services on the EU market to quantify GHG emissions** from their services	**SO2**	**Applicability**

Driver	Policy measure	Short description	Link to the specific objective	Policy Area
	transport sector	based on the CountEmissions EU framework. A transition period until 2035 is foreseen, after which all companies involved in transport services should account GHG emissions.		
PD5	**PM14**: Binding opt-in application of CountEmissions EU in the transport sector	The **EU mandates the use of the CountEmissions EU framework to those economic operators (including SMEs) and other entities that decide both to quantify and disclose GHG emissions data** from transport services offered and provided on the EU market.	**SO2**	**Applicability**
PD5	**PM15**: Voluntary opt-in application of CountEmissions EU in the transport sector with a label	The **EU recommends the use of the CountEmissions EU framework to the economic operators (including SMEs) and other entities quantifying GHG emissions** from their transport services offered and provided on the EU market. In case an economic operator, or another entity decides to account GHG emissions based on CountEmissions EU, it is obliged to correctly apply the common framework. The application of CountEmissions EU is **recognised through a label** to be established by the EU.	**SO2**	**Applicability**

ANNEX 8: ANALYSIS OF METHODOLOGICAL CHOICES FOR COUNTEMISSIONS EU

The selection of a common reference methodology is one of the key policy areas for CountEmissions EU. In principle, this choice shall ensure that the emissions calculations performed across the entire transport sector provide uniform GHG emissions data, according to a single set of methodological steps. In other words, the methodology needs to offer a clear guidance on the scope of the emission calculation and provide for consistent and unambiguous calculation rules. Preferably, it should also be proportionate and avoid unnecessary complexity that would lead to excessive burden and costs for the market players.

This annex shows the rationale behind the choice of appropriate methods for CountEmissions EU. It is composed of three sections. The first section, "Methodological elements" presents a list of specific technical components and their design alternatives offered by various emissions accounting methods. The second one "Assessment and ranking of the methodological elements" includes the analysis of appropriateness of these components and alternatives in the context of CountEmissions EU. Finally, "Selection of the reference methodology" provides insights from the evaluation of the emissions accounting methods, and the selection (based on specific criteria) of those that best fit the purpose of the initiative, and that should be considered while developing respective policy measures and options.

The analyses are based on the Impact assessment support study.

7. METHODOLOGICAL ELEMENTS

Two main "clusters" of methodological elements and their design alternatives for the analysed methods were identified in the context of the impact assessment:

- The scope of GHG emission calculation;
- The method of GHG emission calculation and allocation to transport services.

Table 89**Error! Reference source not found.** below shows these elements in more detail.

Table 89: Overview of specific methodological elements and relevant design alternatives of various available and emerging methods.

Element	Design alternatives			
Scope of GHG emission calculation				
Geographical scope	Global	European		
Type of emissions included	CO_2-emisisons	non-CO2 GHG emissions originating from combustion of fuel	non-CO2 GHG emissions originating from refrigeration	

	Global warming effect of emission of non-CO2 products (e.g. water vapour, contrails, NOx) at high altitudes	Global warming effect of black carbon emissions		
Activity boundaries of the methodology	Vehicle propulsion emissions related from energy use (TTW)	Emissions from auxiliary processes (other than propulsion) during vehicle operation (TTW) (e.g. cooling of freight)	Vehicle operation emissions related to leakage and spills	Emissions from hub activities
	Emission from energy provision (WTT), excluding energy infrastructure construction	Emission from construction and dismantling of energy production infrastructure	Life cycle GHG emission of vehicle construction and maintenance	Life cycle GHG emission of vehicle infrastructure construction and maintenance
Intended users	Transport service operator	Transport service organiser	Transport service user (excl. organiser)	
Use perspective	Ex-post	Ex-ante short term	Ex-ante calculations for long term scenarios	
Emissions perspective	Service average GHG emissions	Time/situation specific average GHG emissions	Marginal GHG emissions	
The method of emissions calculation and allocation to transport services				
Required granularity of calculation	Total GHG of transport operator	Total GHG emission of transport service user (freight) or organiser	Transport service type	Transport chain element / leg (average over period)
	Single vehicle	Individual trip	Total GHG emissions of hub operator	Per activity at hub
Allocation parameter for allocation to transport services	Tonne-km	passenger-km	tonne-km SFD	
	passenger-km-SFD	tonne-km GCD	passenger-km-GCD	
Allocation granularity for allocation to transport services	On company level (e.g. average for transport company)	transport leg level (e.g. average between hubs)	Trip level - journey specific	
Flexibility in calculation method	The user can choose the calculation option from a predefined list.	The required calculation option depends on the stakeholder group applying the calculations.	The calculation options are ranked from most preferable to least preferable calculation option.	The calculation option with best accuracy, comparability is prescribed for all users

Source: Ecorys and CE Delft (2023), Impact assessment support study

8. ASSESSMENT AND RANKING OF THE METHODOLOGICAL ELEMENTS

Seven criteria were established to assess (where applicable) the appropriateness of these methodological elements and their design alternatives for CountEmissions EU:

- Relevance: The extent to which the element is relevant for the GHG emissions within the influence sphere of the reporting entity and/ or serves the decision-making to reduce GHG emissions both internal and external to the company.
- Applicability by stakeholders: The complexity the reporting entity encounters when applying the element in the quantification of emissions and reporting.
- Acceptability by stakeholders: The extent to which stakeholders are willing to apply the element in the quantification of emissions and reporting, taking into account the efforts needed and the value they get out of it.
- Accuracy: The extent to which the reported emissions are free of errors and faithfully represent the actual emissions.
- Comparability: The extent to which the element allows for meaningful comparisons of GHG emissions over time and between reporting entities (in the same market).
- Reproducibility: The extent to which different organisations using the same methodology and data would arrive at the same GHG emission estimates
- Robustness: The frequency with which the element has to be updated over time and the amount of effort that requires.

Scoring results per each methodological cluster are presented below.

a) Cluster "Scope of emission calculations"

Geographical scope

The geographical scope relates to the extent to which a method can be applied to account transport emission in different geographical areas, and can take into account various modes of transport and different types of fuels and vehicles. In this context, a European and global scopes were considered.

The objectives of CountEmissions EU focus on the European transport sector. However, for the EU27, 40% of international trade is performed with countries outside the EU27[248] and 56% of the passengers in aviation is on flights to or from countries outside the

[248] Eurostat: "Intra-EU27 (from 2020) trade, by Member State, total product", and "Extra-EU27 (from 2020) trade, by Member State, total product" ; year 2019.

EU27[249]. Considering these numbers a strong case can be therefore made for a global scope[250]. On the one hand, this global scope would make the emissions quantification more complex, partly because different emission factors would have to be used for various countries and regions. On the other hand, a number of existing methods (like GHG Protocol, GLEC, ISO 14083) already apply the global scope, making it possible to account emissions in a full transport chain with origins or destinations both inside and outside Europe.

Looking at the targeted stakeholders' consultation, 20 out of 28 respondents of the survey favour the global scope for the common accounting methodology.

Table 90 shows the selected and discarded design alternatives for the methodological element 'Geographical scope'.

Table 90: Selected and discarded design alternatives for the methodological element 'Geographical scope'

Selected design alternatives	**Discarded design alternatives**
– Global scope	– EU scope

Source: Ecorys and CE Delft (2023), Impact assessment support study

Type of emissions stemming from transport operations

Important greenhouse gasses emitted by transport are carbon dioxide (CO2), methane (CH4), nitrous (N2O) and chlorofluorocarbons (CFCs), e.g. from air conditioning. These have global impact on the climate. The greenhouse gasses can be emitted for instance during the vehicle operation, production of an energy carrier, or the manufacturing of a transport means.

Besides the GHG emission, global warming is also caused by water and air polluting emission from aviation at high altitude, leading to clouds and aerosols. The global warming effect from emissions at high altitude is more regional[251]. Finally, black carbon emission, mainly caused by diesel and fuel oil combustions have a local global warming effect due to the absorption and scattering of sunlight.

<u>CO2-emisisons</u>

For CountEmissions EU it is clear that CO2-emisisons are fundamental, as they are by far the main type of GHG emitted by transport (e.g. ca 98% in GHG emissions of gasoline and diesel combustion[252]). CO2-emissions can be accurately calculated from the fuel consumption and fuel emission factors (kg of CO2 per amount of fuel) as they are

---

[249] Eurostat: "International intra-EU air passenger transport by reporting country and EU partner country", and " International extra-EU air passenger transport by reporting country and partner world regions and countries"; march 2022.
[250] Ehrler, et al., 2016
[251] IPCC, 1990
[252] IFEU, 2019

linearly related to the amount of fuel used. CO2-emission calculations are usually well comparable and reproducible.

Because of the limited data needed to make a calculation, the methods for calculating (especially direct) CO2 emissions are considered robust.

Non-CO2 GHG-emissions from fuel combustion

Other greenhouse gasses such methane (CH4) and nitrous oxide (N2O) do not have a very large contribution in the total GHG emissions of transport in general (e.g. ca 2% in GHG emissions of gasoline and diesel combustion[253]). Nonetheless, they can have important impacts on the GHG emissions from using specific fuels, such as CNG and LNG, which can cause significant methane emissions.

For a fair comparison between fuels, it is therefore relevant to include the other greenhouse gasses, specifically methane and nitrous oxide emissions. Precise calculation for these gasses is more complex than for CO2, as the emissions do not only depend on fuel consumption but also on engine technology. However, accurate default factors for fuel-technology combinations are already available in databases such as the EMEP/EEA guidebook[254]. The global warming potential (GWP) values, needed to express the emission in CO2 equivalents, are regularly updated with new insights by the Intergovernmental Panel on Climate Change (IPCC)[255]. However, some variations between methods may exists in case these are not fully aligned with the most recent IPCC values, thus giving a slightly lower score on robustness than in the case of the CO2 emissions.

Non-CO2 GHG-emissions from refrigeration

Cooling systems in refrigerated transport, and air conditioning often make use of refrigerants such as hydrofluorocarbons (HFCs) which are fluorinated greenhouse gasses with a very high global warming potential (GWP). The use of these gasses is regulated by the F-gas Regulation[256] and the MAC Directive[257].

Although the use of F-gases is currently reduced in the business practice, they are still being used and small losses can have high GHG impacts. The monitoring of refrigerants losses from air conditioning and cooling systems (or the amount of refilling required) is therefore very relevant, and for instance has been included in the calculation method of the upcoming ISO 14083. Including the climate impact of refrigerants in GHG calculations is less common though, especially when the type of a refrigerant or the exact losses are unknown. Given the high difference in global warming potential of various refrigerants (with GWP values below 150 to above 10,000[258]), the default factors

[253] idem
[254] https://www.eea.europa.eu/publications/emep-eea-guidebook-2019
[255] https://www.ipcc.ch/
[256] Regulation (EU) No 517/2014
[257] Directive 2006/40/EC
[258] According to the GHG protocol, 2016

available for these types of emissions are characterised by some degree of uncertainty. Finally, new refrigerants with lower GWP are being developed, demanding regular updates of the emission factors, and thus resulting in medium score on robustness for this alternative.

Global warming effect of non-CO2 emissions at high altitudes

Besides the CO2-emisisons and other GHG emission from fuel burning, aviation contributes to global warming with non-CO2 climate impacts from NOx, SOx and soot, and also water vapour emissions at high altitude. In conjunction with the anthropogenic sources, these emissions modify atmospheric composition (gases and aerosols), hence radiative forcing and climate[259].

The non-CO2 climate impact of a flight depends on the quantity and type of emissions, but also on where (altitude, geographical location), and under which conditions (time and local weather conditions) the flight takes place. The effect is expressed by the metric radiative forcing, which expresses the difference between incoming solar radiation and outgoing terrestrial radiation. This metric describes climate impact effects at a certain moment and cannot be expressed easily in CO2-equivalents, which takes into account the GWP of emissions measured over a time period of 100 years[260].

Of the available methodologies assessed, only the GHG Protocol mentions the option to apply a multiplier to cover the effect of non-CO2 climate impacts, but notes that there is very significant scientific uncertainty around the magnitude of the effect, with a factor of 1 -8.5[261] .

The GLEC framework leaves open the option to include it in future updates. The draft of ISO 14083 does not include the effect in the methodology. At the moment, only average multipliers are used in some calculation tools (e.g. EcoTransIT) to quantify the effect, but no accurate methods is present yet, and therefore the existing approaches are often not widely accepted. Specifically, the average indicators that are applied very often do not represent trip specific effects and do not allow for a good comparison of emissions. As the current approaches are not harmonised, results are also not reproducible.

Because of the low scores on the analysis, this design alternative was therefore not put forward for the present initiative. However, given its relevance for emissions calculations, the climate impact of this effect is being researched and it might be considered to include it in the framework at a later stage when more accurate methods are available.

Black carbon emissions

Black carbon is a form of particulate matter emissions and consists of dark carbon particles produced from the incomplete combustion of fuels. When airborne, black

[259] IPCC, 1999
[260] IPCC, 2007; IVE, 2020
[261] Jungbluth, 2019

carbon absorbs and scatter sunlight, which can lead to increased temperatures. When deposited on earth, especially in the cryosphere, black carbon causes snow and ice to melt faster, due to reduced reflectivity[262].

The accounting of black carbon itself is quite complex and requires extensive datasets with emission factors differentiating between fuels, engine types, and by preference, also the use characteristics. The databases should be regularly reviewed to keep them up-to-date. After carbon dioxide, black carbon has the second biggest impact on climate forcing in the atmosphere overall. A coalition, with amongst others Smart Freight Centre, ICCT and Smartway, has developed a method to account for black carbon emissions, and to measure it alongside GHG emissions. Respectively, the GLEC framework gives guidance on the reporting of black carbon alongside GHG emission. This method, however, does not express the impact of black carbon in global warming terms, which would be very difficult given the dependency on location and weather.

Although it is considered very relevant, there is no adequate methodology yet to include the effect of black carbon in GHG accounting in an accurate way at this point of time. Because of the low scores from the analysis, this alternative is not currently considered for CountEmissions EU.

Table 91 presents the list of selected and discarded design alternatives for the methodological element 'Type of emissions.

Table 91: Selected and discarded design alternatives for the methodological element 'Type of emissions'

Selected design alternatives	Discarded design alternatives
– CO_2 emissions – Non-CO_2 GHG emissions from fuel combustion – Non-CO_2 GHG emissions from refrigeration	– Global warming effect of non-CO_2 emissions (e.g. water vapour, contrails, NO_x) of aviation at high altitudes. – Black carbon emissions

Source: Ecorys and CE Delft (2023), Impact assessment support study

The results of the stakeholders' interviews broadly support this selection of the design alternatives. As regards the stakeholders who contributed on this issue, 12 preferred CO_2-equivalent emissions in the scope, while only two stakeholders from maritime and aviation suggested focusing on CO_2 emissions only (in line with the scope applied in the schemes currently used in those sectors, i.e. EU MRV and CORSIA). Both stakeholders did however mention that an extension to non-CO_2 GHG emissions could be considered in the future.

Activity boundary

The activity boundary sets the scope for the type of activities and events that are to be included in the methodological framework.

[262] SFC, 2017

The identified design alternatives are:

- Emission from vehicle propulsion: engines exhaust emissions, also called the Tank-To-Wheel emissions (TTW);
- Emissions from auxiliary processes (vehicle operation related emissions from energy use other than propulsion): emissions from auxiliary processes on vehicles, such as cooling and refrigeration, the operation of on board cranes for transhipment, and vehicle interior heating;
- Emissions from leakage and spills: vehicle operation related emissions stemming from the loss of refrigerants from the cooling system, fuel evaporation or boil-off (e.g. LNG);
- Emissions from hub activities: emissions from activities at locations where passengers and/or goods switch from one vehicle or mode of transportation to another (hubs). Hub activities are, for example, transhipments operations in ports, terminal operations at airports and sorting centres for distribution;
- Emissions from energy provision (WTT), excluding energy infrastructure construction: all the GHG emissions of operational processes to provide the energy carrier for use in vehicles or at hubs. They include processes such as extracting, producing, processing, storing, and transporting of energy carriers;
- Emissions from construction and dismantling of energy production infrastructure: these emissions are often not included in the WTT as they are not directly related to the fuel use. As the contribution of energy production infrastructure on the total emissions of renewable energy sources is relatively high, by including these emissions a fairer comparison can be made between renewable and fossil energy use;
- Life-cycle GHG emissions of vehicle construction, maintenance and disposal: concerns the emissions associated to materials used to construct vehicles, the actual construction activities, transport of vehicles, maintenance activities and disposal activities;
- Life-cycle emissions of transport infrastructure construction, maintenance and disposal: these are the emissions from the materials used, construction and maintenance activities, demolition of infrastructure, etc.

The analysis of each individual design alternative is provided below.

Vehicle propulsion emissions

The basis for GHG accounting of transport services are the vehicle propulsion emissions, which should be fundamental to the methodology. The calculation of propulsion emissions is supported by all available methods. The accuracy, comparability, reproducibility and robustness for this alternative can in principle be high, particularly when calculations are based on actual fuel consumption figures.

All stakeholders participating in the targeted survey and interviews supported the coverage of these emissions by the harmonised framework.

Emission from auxiliary processes

Not all transport operations include auxiliary processes, but for specific services, such as cooled transport or the heating system in passenger busses, the impact can be in the order of 10-30% of the total GHG emission of fuel combustion[263]. Sometimes, the auxiliary processes are driven by the main engine and sometimes by auxiliary engines or generators. It is therefore important to include the auxiliary processes for a fair comparison between various transport options.

The inclusion of auxiliary processes is already included by most existing GHG quantification methods, such as by EN 16258, GLEC, and the French Transport Code. The calculation of auxiliary processes is similar to that of vehicle propulsion emissions, and only requires extra information on the fuel consumption of the auxiliary engine or generator. The applicability, acceptability and the other respective assessment criteria are therefore attributed the same score as for the design alternative "vehicle propulsion emissions".

Emissions from leakage and spills

Leakage and spills include emissions from refrigerants and boil-off of LNG for example. As explained for CO2-emisissions from refrigeration, and for methane emissions, small quantities can already have a large GHG effect due to the high GWP values of these substances. The emissions of leakage and spills can therefore be very relevant[264].

However, calculations of the climate impact of these emissions is less common than for CO2, as is the provision of default factors for the calculations.

None of the existing methods, except the concept ISO 14083 standard, clearly addresses this emissions type. Including it in the calculation requires monitoring of refrigerant refilling or the application of default emissions for certain engine technologies. The applicability and acceptability therefore have an average score of 3 in the analysis. Accuracy, comparability, reproducibility and robustness also score average, as the approach for different kind of spills and leakages is not as well established as for emissions from the propulsion.

Emissions from hub activities

To allow a good comparison between emissions of different (multimodal) transport chains, it is very important to include the GHG emission of activities at hubs. For example, the comparison of a combination of transports by inland waterways and truck with direct truck transport is only fair when hub activities are considered. CO2-emissions of the transhipment need to be accounted to determine which option is more CO2-

[263] Ricardo Energy & Environment, 2021; OV magazine, 2018
[264] Saharidis & Konstantzos, 2018

efficient, as hub emissions can be significant (e.g. they may sum up to 5-7% of the total emissions of a road shipment in the chemical sector[265]). Emissions at hubs can be calculated directly from the energy consumption, with a method comparable to that of vehicle operation. For hub operators, that have access to the energy consumption figures, emission calculation is therefore not much more complex than for vehicle propulsion related emissions.

However, default factors are not as common as for vehicle operation. Recently a guideline and tool have been released[266], also referred to in the concept ISO 14083, but the development of default emission intensity factors within that project is still on-going. Therefore, the applicability of these calculations is scored slightly lower than for vehicle propulsion emissions (2). With a similar method as for vehicle propulsion related emissions, the criteria on accuracy, comparability, and robustness score equally well.

From the stakeholder interviews, it became clear that the coverage of emissions from hub activities is strongly supported. Three transport associations, tree research oriented organisations and one transport operator explicitly voiced the need for including these emissions. Only one transport association directly discarded this alternative, fearing that it would complicate the calculation process.

Emissions from the energy provision (excluding energy infrastructure construction)

As GHG emission have global impact, emissions of the energy provision (WTT) are very relevant to be included in emission accounting to assure a fair comparison between different fuels and energy carriers in the energy lifecycle (WTW) perspective. This becomes very clear, for instance, when analysing the electricity as an energy source, where electric powered vehicles may not be actually zero emissions, in case this electricity is produced from fossil fuels. Also, for some of the fossil fuels the share of WTT emissions in the WTW perspective is very significant. For example, for the use of LNG[267] in maritime transport this share may be up to 40%[268].

Most of the current general (not mode specific) GHG methods do include the emissions of energy provision, and Well-To-Tank fuel emission factors are commonly used. There are, however, differences in WTT emission factors of fuels, which are not related to physical differences of the fuel, but to calculation methods or updates. JRC, for example, has published WTT emission factors for diesel and gasoline based on 2 different approaches, the marginal and the average[269]. Both approaches, together with other emission factors are applied across methods and tools. The comparability and robustness (emission factors are unregularly updated) at the level of the transport sector is therefore currently not optimal.

[265] McKinnon & Piecyk, 2010)
[266] Fraunhofer IML, 2019
[267] Liquefied natural gas
[268] ICCT, 2021b
[269] JRC, 2020

There is a strong support from stakeholders for the inclusion of the emissions from energy provision. The vast majority (93%, i.e. 26 out of 28 respondents) of the stakeholders who filled in the targeted survey, prefers the inclusion of these emissions. At the stakeholder interviews, only two representatives from the maritime sector were opposing the inclusion of WTT emissions at this moment of time.

Emissions from the construction and dismantling of energy production infrastructure

Whereas emissions from the energy provision are included in a number of methods, in many cases these do not (explicitly) cover emissions from the construction and dismantling of energy production infrastructure. The upcoming ISO 14083 standard does recommend the inclusion of these emissions, to account amongst others, emission related to solar cell and windmill production, recognising that GHG emissions from these infrastructures is not zero.

The contribution of emissions from the construction and dismantling of energy production infrastructure in the WTT figures of fossil fuels is limited (2-3%). For the renewable and nuclear energy the contribution to the total emission is very relevant though[270]. GHG emissions of specific infrastructure is not easily available[271], therefore in this case the calculation should be based on average life cycle analysis studies or databases. In relation to the differences in GHG emission between the infrastructure of different energy carriers, the accuracy in calculating these emissions is still reasonable due to the limited number of variables and significantly lower complexity than in the case of transport infrastructure.

For businesses, the accounting of these types of emissions would not be associated with particular efforts and costs. Therefore, the applicability and acceptability of this design alternative would score reasonably well, as long as the emissions are included in the available WTT emission factors of energy carriers. However, at this point of time these effects very often are not directly reflected in the existing datasets and databases, therefore causing some issues for their full application in regular business practice. This drawback results in average scores on these criteria.

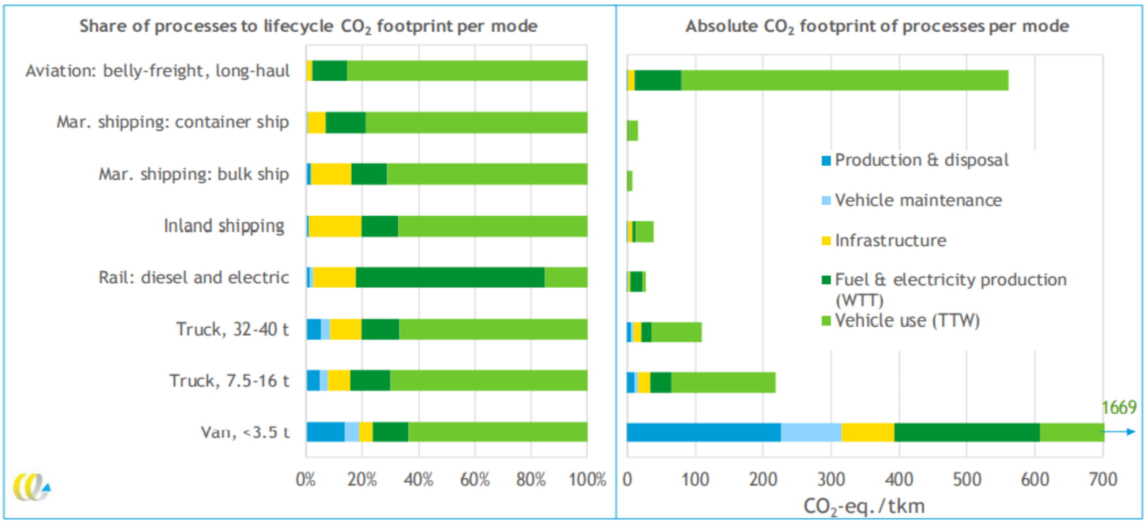
Life-cycle GHG emissions of vehicle construction, maintenance and disposal

Emissions from vehicle construction, maintenance and disposal can be as high as 20% of the total life cycle emissions for cars and vans and are much lower for larger vehicles such as truck, ships and planes[272]. The difference in construction, maintenance and disposal emissions between similar vehicles is only a fraction of this 20% and these emission are not expected to play a decisive factor in the comparison of transport services with similar vehicles of the same mode. Between modes, the difference in construction, maintenance and disposal emissions is larger, as shown in Figure Figure 12 below.

---

[270] CE Delft, 2020
[271] The specific source for the energy used is often not known (e.g. coal-fired or gas-fired power plant).
[272] CE Delft, 2021

Figure 12: Share of processes in LCA GHG emissions for key vehicle categories



Source: CE Delft, 2021

It should be noted however, that data for vehicle construction are not easily available from vehicle manufacturers, and may be subject of substantial variations and uncertainty, in particular for those stemming from the production taking place outside the EU. In addition, translation of the total construction and maintenance emissions of a vehicle to values per kilometre, strongly depends on the use and lifetime of the vehicle, which is not known on forehand and therefore less accurate. The comparability and reproducibility are therefore limited. Also, the default figures should also be regularly updated as the production processes are continuously changed and improved, giving lower score on robustness.

None of the current transport specific GHG methods that were analysed in the context of this Impact Assessment, includes vehicle construction maintenance and disposal emissions[273]. Despite low scores on the analysis, this characteristic may be seen as quite relevant as it may account for the entire spectrum of emissions related to a transport activity, seen as a product. In addition, this alternative was supported by a number of stakeholders consulted (see below). However, given important uncertainties of the underlying factors, it should be taken into account rather for the potential future development of CountEmissions EU, when more information becomes available. On this very point, instead of inclusion of all life cycle emission of the vehicle, one might consider only those elements that make real difference between transport options, such as the emissions associated with the powertrain[274].

---

[273] These elements would be in general covered by the PEF methodology. However, PEF is not transport specific and in the absence of specific product category rules, currently it does not cover the vast majority of lifecycle emissions related to transport activities.

[274] In line with the inclusion of emissions from the construction and dismantling of energy production infrastructure it might be considered to only include the emission of the powertrain production, which for battery electric vehicles would include the CO2-emission of the production of batteries. There are discussions on the environmental impact of the battery production and whether this element could be

Among stakeholders, opinions on the inclusion of full lifecycle emissions differ widely. The OPC and targeted survey may indicate that citizens and in general transport service users are more in favour of this approach, while transport operators (and associations representing them and operators of freight greening programmes) being strongly against[275]. These results would possibly suggest a distinction between the final beneficiaries of transport services and the stakeholders that are more integral part of the transport system, and are directly impacted by the provision of a specific emissions quantification methodology. On the other hand however, these results may have been also affected by the limited understanding of this technical and complex matter, especially by those who are not dealing with it in the everyday practice. In the targeted interviews, none of the participating stakeholders supported the inclusion of lifecycle emissions in the CountEmissions EU framework (at least at this moment of time), and this opinion was shared by the attendees of the stakeholder workshop.

Life cycle emissions of infrastructure construction, maintenance and disposal

Infrastructure emissions are estimated to represent up to 20% in transport GHG life cycle emissions on average. However, the difference in emissions from the existing infrastructure is not expected to play a decisive factor in the comparison between modes or within modes, as the impact of vehicle use is strongly dominant for accounting emissions from transport operations. Both transport service operators and users have very little influence on the GHG emission of infrastructure construction[276], hence the inclusion of infrastructure emissions is not relevant for making transport choices based on GHG emissions data. Instead, information on this type of emissions may be important factor to support planning and decisions on new investments in transport infrastructure.

What is more, infrastructure emissions for a specific trip are hard to determine accurately as they depend on many factors, such as the specific infrastructure objects being used, their properties (including bridges, tunnels, type of road, type of surface etc.), traffic intensity, the year of construction and lifetime. Emission factors with this accuracy are hardly available, which makes a reliable comparison impossible. None of the current GHG transport accounting methods includes infrastructure construction maintenance and disposal emissions. The PEF methodology allows it under certain conditions, but in the

covered by including it in the scope. The rationale for the inclusion would be that the difference in CO2-emissions between vehicles with and without batteries is relatively large as compared to the uncertainty in the emission data. According to CE Delft, 2021, batteries can have up to 10% share in the lifecycle emissions of electric cars, whereas they are zero for vehicles with only internal combustion engines (ICE), having no batteries. None of the current transport GHG methodologies, however, includes these emissions in the scope of the calculation framework.

[275] In the targeted survey, 5 of the 9 transport service users indicated that they prefer full life-cycle emissions, while only 2 out of 8 transport operators/associations share this preference. In the OPC, 17 out of 20 EU citizens indicated that they prefer full life-cycle emissions over WTW emissions compared to 20 out of 58 companies that shared the same view (34 of them supporting the WTW approach)

[276] It can be indirectly associated with new infrastructure investments where the information on transport demand may play a role in the decision-making. However, the construction on infrastructure is subject to specific environmental impact assessment, based on relevant methodologies and lifecycle of this infrastructure

absence of the Product Category Specific Rules for transport services, it does not provide specific guidance on how to apply it in business practice.

Because of the low score in the analysis, this characteristic is not considered for CountEmissions EU.

Table 92 presents selected and discarded design alternatives for the methodological element 'Activity boundary'.

Table 92: Selected and discarded design alternatives for the methodological element 'Activity boundary'

Selected design alternatives	Discarded design alternatives
– Vehicle propulsion emissions – Emissions from auxiliary processes – Emissions from leakage and spills – Emissions from hub activities – Emissions from energy provision (WTT), excluding energy infrastructure construction – Emissions from construction and dismantling of energy production infrastructure – Life-cycle GHG emissions of vehicle construction, maintenance and disposal[277]	– Life-cycle emissions of vehicle infrastructure construction, maintenance and disposal.

Source: Ecorys and CE Delft (2023), Impact assessment support study

Intended user

From the analysis of current methodologies and standards, the main groups of users of the methodological framework for GHG accounting are:

- Transport service organisers and hub operators;
- Transport operators, distinguished here from the first category, given their important role as entities carrying out physical transports of passengers or freight as a service;
- Transport service users.

Most of the current methods account for all three types of users as provided above. Article L. 1431-3 of the French transport code is the sole exception, as it envisages only transport service organisers and operators to report emissions of their services. Also, it is worth noting that most methods expect transport operators to calculate emissions based on primary data (e.g fuel use and transport performance) whereas they allow transport users and organisers to use default factors and "modelled" emission values.

<u>Transport operators</u>

[277] This design alternative has been included in the construction and assessment of the policy options (specifically PO3 and PO5) with an important caveat that it may not be ready for the full implementation on the EU transport market in the short and medium term.

It is very relevant to include transport operators as they have access to primary energy data of the vehicles and so are able to calculate GHG emission of transport very accurately. When operators share data with their users, the users can also calculate their emission accurately based on primary data of the operator.

Transport service organisers

In the passenger segment, transport organisers (like travel agencies) act as intermediaries between transport operators and end users, and therefore need to be able to account emissions to provide information on the performance of various transport choices for passengers.

In freight transport, logistics service providers and freight forwarders are often the contact point between a manufacturer/shipper (cargo owner) and a transport operator. These can organise complete transport chains from origin to destination of the goods. Therefore, it is very relevant that transport organisers have a solid methodology to report the emissions to users, such that the latter can make decisions based on GHG emissions of transport options.

When transport organisers cannot get information from their transport operators, default emission factors or models are needed to make GHG calculation. This makes the methods more complex than for transport operators who can often simply use primary data.

Transport service users

Passenger transport service users can be individual passengers, customers (end users of the service) or organisation and businesses buying transport for their employees. Individual passengers would not be the intended users of CountEmissions' methodology, but rather be the beneficiaries of the initiative. On the other hand, organisations and businesses usually need a relevant method to quantify and report on the GHG emissions of business travels they purchase, especially when this information is not supplied by the transport service operator or organiser.

Freight transport service users are shippers/cargo owners and individual customers of online stores. Very often shippers are strongly interested in the emissions of services they buy, especially for making informed transport choices, and also for regulatory reporting purposes. It is therefore important and relevant that the Count Emissions EU includes a suitable method for shippers to calculate these emissions in a consistent way. As regards the individual customers of online stores, similarly to passengers they would be rather the beneficiaries of the common methodology than its regular users.

In general, when transport service users cannot get proper and accurate information from their transport operators or organisers, default emission factors or models are needed to make GHG calculations. In case a harmonised approach for calculating emissions is available in the transport sector, the administrative burden to aggregate and compare various emissions data will be however significantly reduced.

In order to cover emissions accounting along the entire transport chain, it is therefore recommended that CountEmissions EU methodology applies respectively to transport service organisers, operators, and users, although the use of the harmonised methodology by the latter group is considered to be at a lower level than for the other two.

As shown in Table 93 all these design alternatives should be relevant for the scope of CountEmissions EU.

Table 93: Selected and discarded design alternatives for the methodological element 'Intended user'

Selected design alternatives	**Discarded design alternatives**
– Transport service organiser – Transport operator – Transport service user	

Source: Ecorys and CE Delft (2023), Impact assessment support study

Use perspective

Emission accounting can be made after (ex-post) or before (ex-ante) a service is performed. Ex-post calculations are often used to report GHG emissions of transport activities to third parties, and to monitor emissions reduction over years. Ex-ante accounting can be used for short term decision making (e.g. comparing train and aviation for a certain trip) or applied for strategic decision making in the longer term (e.g. for investments in infrastructure or modal shift policies).

The identified use perspectives are therefore the following:

- Ex-post
- Ex-ante for short term decision making
- Ex-ante for long term strategies

Ex-post

All existing methodologies and standards take ex-post calculations into account, based on the realised transport performance data. As ex-post calculations are based on real practice, this use perspective is potentially most accurate and comparable and therefore also very relevant. Having the actual transport data (for transport operations), no estimations need to be made, thus making the calculation highly reproducible. Also among stakeholders, there is strong support for ex-post calculations. Only one (a public authority) out of 27 stakeholders participating in the targeted survey indicated that there is no need to cover ex-post calculations by the harmonised methodological framework.

Ex-ante for short-term decision-making

To allow transport service users for making their transport choices effectively, ex-ante information on GHG emissions of transport services appears as a very powerful tool for creating incentives and therefore represents a relevant option for CountEmissions EU. The ex-ante calculations should be preferably based on ex-post outputs with additional prognoses on routing and vehicle use. In case only default values are used, these should be sufficiently reliable and accurate, to prevent from generating incorrect information on GHG emissions that may lead to perverse incentives and unintended adverse effects on the transport market. Therefore, it is important to determine appropriate parameters and assumptions reflecting the type of a service concerned and its characteristics, for instance regarding the re-use of primary data obtained from a similar service, the definition of service averages, loading and occupancy rates, or the uptake of specific default values.

Most existing methods/standards allow for both kind of calculations (ex-post and ex-ante for short term decision making), suggesting that stakeholder applicability should not be a major problem. Finally, there is strong support from stakeholders for this kind of emissions calculations: 21 out of 27 respondents to the stakeholder survey see the need for ex-ante calculations

<u>Ex-ante for long term strategies</u>

CountEmissions EU will not directly address long-term strategic decisions and projections that are based on specific methodological frameworks, and require tailor made estimations for the future emission factors and vehicle use. Since the ex-ante calculations for long-term scenarios do not reply to the objectives of CountEmissions EU, this characteristic is not considered for its future reference methodology.

Selected and discarded design alternatives for the methodological element 'Use perspective' are presented in Table 94.

Table 94: Selected and discarded design alternatives for the methodological element 'Use perspective'

Selected design alternatives	**Discarded design alternatives**
– Ex-post – Ex-ante for short term decision making	– Ex-ante for long term strategies

Source: Ecorys and CE Delft (2023), Impact assessment support study

Emission perspective

For the emission perspective we may distinguish three design alternatives:

- Service average GHG emissions: give information on the average performance (in terms of emissions) of a transport service from a specific transport operator. It allows a comparison between different transport operators for a particular transport service.

- Time/situation specific average GHG emissions: take into account differences in emission levels of a transport service over the day, e.g. due to variance in occupation rates (higher in peak hours) or traffic situation (e.g. peak hour). This time differentiation can be used to express the difference in the performance (in terms of emissions) of the service over the day. In peak hours, for example, the occupation of a train is higher than during off-peak hours, leading to lower emission per passenger-kilometre than on average. On the other hand, a taxi will probably have higher GHG emission per passenger kilometre in peak hours, because of increased GHG emission per kilometre during time spent in traffic jams.

- Marginal GHG emissions: whereas average (day average or specific time average) emissions address the efficiency of a transport service or system, marginal GHG emissions consider the impacts of changing the utilisation of a service. Marginal GHG emissions are defined as the extra GHG emissions as a result of an extra passenger or extra cargo (Bigazzi, 2020). In passenger scheduled (e.g. rail passenger) transport, the extra passenger will, on average, hardly add to the total GHG emission (Rietveld, 2001), whereas an extra customer for a taxi will likely have the same impact as an average taxi passenger. The marginal perspective can be applied to both service average GHG emissions and time specific average GHG emissions. When applied to time specific average GHG emissions, off-peak emissions of public transport will in general be lower than during peak hours, as these hours extra passengers in public transport might lead to extra vehicle operations (as existing vehicles do not have capacity to transport additional passengers), which is unlikely during off-peak hours. The marginal perspective is particularly relevant for ex-ante GHG emission calculations, as it informs transport service users on the impact of other transport decisions, such as switching modes or changing departure times (Bigazzi, 2020).

Service average GHG emissions

Service average emissions are very relevant and give transport service users the possibility to compare different transport services on their performance. When longer term (e.g. annual) averages are used, influences of weather conditions or traffic circumstances have no effect on the calculated emissions. The relevance of transport service average GHG emissions is therefore high. The calculation of averages does not require a journey specific information, and therefore the applicability, acceptability and accuracy score high. When calculated at the service level (especially when using precise ex-post emissions data, based on primary information), e.g. a flight from Paris to Madrid or a parcel from Berlin to Warsaw, the average performance of operators can be fairly compared.

Time/ situation specific average GHG emissions

Time specific or situation specific average GHG emissions reflect the GHG emissions of a service under specific circumstances. For ex-post calculations it can be useful for transport operators to understand the difference in GHG efficiency between peak hours and off-peak hours, or the effect of weather circumstances (e.g. temperature effects on the efficiency of electric vehicles). They can use the information to optimise operations and improve the overall performance.

Whereas time/situation specific information can be very relevant for self-assessment of a transport operator, it might be less useful or even misleading for transport service users, especially in the ex-ante calculation perspective. For instance, while the GHG-emissions per passenger-kilometre of public transport are lower during peak hours (due to high occupancy rates), it might not be favourable to attract more passengers during this time (it may even increase the total level of GHG emissions due to higher weight of a vehicle, or in case more vehicles have to be scheduled in peak hours to transport additional travelers). Also, parcel delivery during peak hours might result in higher GHG emissions for this delivery, but it still might me the best option in the overall delivery system of the transport operator.

Therefore, based on the analysis performed in this Impact Assessment, only mediocre score can be attributed to the relevance of time/situation specific average GHG emissions. Similar score should be attributed to the criterion related to the applicability, as more detailed input data is needed than for calculating the service average GHG emissions. The acceptability will score average too, because of extra efforts that are required to generate emissions data, and their limited relevance for transport service users. As regards the accuracy, comparability, reproducibility and robustness, the time/situation specific average GHG emission also score lower than service average GHG emissions, due to higher complexity and additional choices that need to be made, and which can lead to significant differences between the GHG emissions outputs (e.g. depending on the definition of peak hours or allocation of fuel to different traffic situations).

Marginal GHG emissions

Marginal emissions are relevant to inform transport service users on the effect of their choices for a certain transport mode or a certain transport service operator. The applicability of marginal emissions, however, very much depends on the specific situation and vary by context. For public transport, the difference between the average emissions and the marginal emissions will, for example, depend on the population density of the area where the transport services is provided, the density of the transport network, the actual occupancy rates and traffic conditions e.g. during rush hour and off-peak. The calculation of such marginal emissions may require a broad set of specific data and possibly specific elasticity factors, giving the relation between vehicle use and passenger demand. The calculations are therefore very complex and burdensome, thus negatively affecting the applicability and acceptability of this design alternative. A method to calculate marginal emissions is not yet broadly established and is still subject to scientific research. Consequently, the accuracy, comparability, and reproducibility are given the average score too. In addition, to provide correct values, the elasticity values and input data need be monitored on permanent basis, resulting in a low score on robustness.

As shown in Table 95, the preferred design alternative for CountEmissions EU is the one related to the service average GHG emissions.

Table 95: Selected and discarded design alternatives for the methodological element 'Emission perspective'

Selected design alternatives	**Discarded design alternatives**
– Service average GHG emissions	– Time/situation specific average GHG emissions

	– Marginal GHG emissions

Source: Ecorys and CE Delft (2023), Impact assessment support study

However, given the specific case of comparative claims between the passenger scheduled service and on-demand passenger service (such as taxi), additional consideration should be made for the ex ante comparison of the scheduled passenger services and the on-demand services, where applying the average based approach may give an undue advantage to the latter.

b) Cluster "Emission calculation method and allocation to transport services"

Minimum level of granularity of emission calculation

GHG emission accounting can be performed with different granularity, which is important to allow for the comparability of data. The granularity defines the minimum level of transport activity for which the energy consumption needs to be distinguished. The following levels of granularity have been identified:

- Total GHG emissions of transport operator;
- Total GHG emissions of transport service user of organiser;
- Total GHG of hub operator;
- Transport service type[278];
- Transport chain element[279].
- Single vehicle;
- Individual trip;

Total emission of transport operator, hub operator and transport service user or organiser

Total emissions of a transport service operator and hub operator can be calculated relatively easily and accurately from the energy consumption. This reasoning also broadly applies to transport organisers or users, but in these cases more efforts are needed to quantify emissions, and the output may be less accurate especially when modelled or default values are used. Although information on total emissions at the company level is relevant for the general monitoring purpose, it is useless for the comparability needs, as transport activities of individual companies vary significantly. This design alternative has therefore been discarded for CountEmissions EU.

[278] Transport service type can be, for example: rail transport, container transport or delivery of packages. Transport services might include multiple modes and hub operations. Transport service users provide transport services that include the transport of passengers or goods from A to B.
[279] A transport chain element is the transport between two hubs with a single mode. Transport modes can be changed at hubs.

Transport service type

When company data are differentiated per type of service (rail, road, container transport, etc.), they are better comparable with other services of similar kind. GHG data generated at this level also give useful information on the efficiency of a given service. Also, in this case, energy consumption figures or default data and models are available for the emissions calculation, thus scoring high on the applicability and acceptability. This level of granularity was supported in the stakeholders' survey, where 16 out of 28 respondents (57%) mentioned the service type as the preferred level of granularity. However, at the generic service type level, the emissions cannot be specified for a particular service user, and therefore not sufficient neither relevant for CountEmissions EU.

Transport chain elements/ leg (service level)

Breaking down the GHG emission to leg level, means that a company should monitor the fuel consumption of transport between to hubs (or hubs and destination). Also, some variance in the definition of transport leg is possible. For example, it can be differentiated between different types of destinations (e.g. destinations in the inner city, the suburbs and outside the city). This level of granularity is applied by most of the general methods (covering all modes) and it is also used in combination with the data on transport performance on a particular leg, as the basis of allocation (see the next item). It is therefore very relevant. This level of granularity does require more efforts for calculation, as more differentiation in the data is needed, but allows for a good comparability between GHG emissions outputs, at the level of a transport service and service user specific.

Single vehicle level

Emissions at single vehicle level are relevant for monitoring GHG efficiency and can be used to feed data to be generated at other levels. Fuel consumption, for instance, can be monitored via refuelling data or on-board computer data, which is relatively easy and accurate. Information stemming from the single vehicle granularity level may in some cases feed in quantifying emissions at the operational level, but since it does not directly allow for comparison between competing transport services, it would be discarded as a design alternative for the common reference methodology.

Individual trip

Calculation at the level of individual trips may also be relevant and useful for CountEmissions EU framework. However, it should be noted that the resulting data do not provide a good representation of the transport service at average, thus affecting the comparability between various services. For instance, the emissions generated at the level of an individual trip may substantially depart from typical emissions from this service due to an accident or other unexpected event taking place while performing the operation. In addition, this approach requires substantial effort to allocate the fuel consumption of a vehicle to a specific trip. The relevance, acceptability and accuracy are therefore lower than for the granularity at transport chain element level.

Per activity at hub

For hubs the comparability GHG emissions data is higher when emissions are expressed per activity and therefore this alternative was retained for CountEmissions EU. This level of granularity requires however, that energy consumption per type of machine or activity is monitored or that these data are available otherwise (via a model or defaults).

Based on the analysis two alternatives are selected for CountEmissions EU, as shown in Table 96.

Table 96: Selected and discarded design alternatives for the methodological element 'Minimum level of granularity of emission calculation'

Selected design alternatives	**Discarded design alternatives**
– Transport chain element (service level) – GHG emissions per activity	– Total GHG emissions of transport operator and/or hub operator – Total GHG emissions of transport service user or organiser – Transport service type – Single vehicle – Individual trip

Source: Ecorys and CE Delft (2023), Impact assessment support study

Parameter for the allocation to transport services

The emissions generated by a transport activity can be derived from a measurement of the consumed fuel, but can also be estimated by multiplying the actually driven distance with an emission factor that is representative for the type of vehicle and transport mode that is used. The distance unit (kilometres) can be measured including the concepts of actually driven distance (ADD), great circle distance (GCD), and shortest feasible distance (SFD)[280]:

- Actually Driven Distance is the distance driven by the vehicle. This distance can be for instance measured by the vehicle's odometer.

- Great Circle Distance. The great circle distance is the shortest distance between two points on the surface of the Earth, measured along the surface of the Earth. It is also known as the "as the crow flies" distance: this distance does not consider any infrastructure, so two points are connected directly, as if there is a straight road between them. The GCD is associated with the net transport work independent of the operational details, such as the chosen modality, infrastructure density and routing of the goods flow. It is considered the most suitable measure for distance especially for long haul intercontinental trips.

- Shortest Feasible Distance is the shortest distance between two places on a mode-specific network. The SFD may not be the most optimal route as it may include slow moving streets, or toll roads. The advantage of the SFD is that it is easily

[280] TNO, 2021

understood, that it can be computed ex-ante and that under certain conditions it is the same for all users that use the same software to compute it. Computation of SFD depends on the software implementation, state of infrastructure and implicit assumptions, such as avoidance of city centres[281].

To fulfil the objectives of CountEmissions EU, the selected method should allow for the allocation of GHG emissions data from transport activities to specific users. In case there are a number of users in the same transport chain, this allocation should be performed in a correct and balanced way.

There are different metrics identified from the current methods that have been taken into account for the analysis:

- Tonne-km: the amount of freight in tonnes multiplied by the actual distance over which it is transported;

- Passenger-km: the number of passenger multiplied by the actual distances (in km) over which they are transported;

- Tonne-km SFD: the amount of freight in tonnes multiplied by the shortest feasible distance (SFD) between origin and destination;

- Passenger-km SFD: the number of passengers multiplied by the shortest feasible distance (SFD) between origin and destination;

- Tonne-km GCD: the amount of freight in tonnes multiplied by the shortest feasible distance (GCD) between origin and destination;

- Passenger-km GCD: the number of passengers multiplied by the shortest feasible distance (GCD) between origin and destination.

Tonne-km and passenger-km (real/ SFD or GCD) concepts are used across all investigated methods, as the standard allocation parameters.

Real tonne-km and passenger-km

Allocation of emission based on real passenger- or tonne-kilometre is quite common and therefore applicable and acceptable. However, the calculation based on the real tonne-kilometres can be difficult for multimodal transport or multiple distribution trips, as it requires the monitoring of the real driven kilometres per delivery. Moreover the allocation in a delivery round, quite arbitrary, depends on the way the route is driven, and therefore the services at the end of a distribution round may get allocated more GHG emissions. For (public) passenger transport it is often easier to monitor real passenger kilometres as trains and public transport busses drive the same routes every time, which makes the metric also more accurate and reproducible. On the other hand, GHG intensity factors based on real passenger-kilometres or tonne-kilometres do not allow for a good

[281] idem

comparison on efficiency, as emissions generated on detouring will not be properly reflected[282].

Tonne-km SFD and passenger-km SFD

Applying the allocation based on tonne-km SFD is already included in some of the current GHG methodologies, such as GLEC, and the concept ISO 14083. The method proves to be easily applicable as no detailed routing data are needed (score 1). In addition, based on the discussion with the stakeholders, it appears that is may also feature high on the acceptability criterion, although the methods is not commonly known and practiced in the transport sector, especially in the passenger segment. The allocation based on tonne-km SFD or passenger-km SFD is independent of the actual route, and may improve accuracy, comparability, and reproducibility as compared to real-passenger and tonne-km. Shortest feasible distance can be interpreted in different ways though, and may depend on the route planner, the mode of transport and the moment in time.

Tonne-km GCD and passenger-km GCD

The allocation based on tonne-km GCD is already included in a number of current GHG emissions accounting methodologies, such as GLEC, Topsector Logistics, and the concept ISO 14083. It also features in some of the emissions calculation tools, including BigMile. The method is assessed as being easily applicable, as no detailed routing data are needed. Similarly as for the SFD, the acceptability for the freight segment can be scored a bit higher than for the passenger one, the reason being that for the latter the allocation of passenger-km based on passenger-km GCD is not being practised yet, except in aviation (mostly to make the repartition between passengers and freight). Allocation based on tonne-km GCD or passenger-km GCD improves accuracy, comparability, and reproducibility compared to real-passenger and tonne-km, and also to the SFD metrics, as the great circle distance between two locations is a constant factor and does not depend on route planners, new infrastructure or modes. When Great Circle Distance is applied then only one interpretation of the metrics is possible giving high accuracy, comparability reproducibility and robustness (TNO, 2021).

Based on the analysis of the various allocation parameters, all but the real tonne-km are selected as design alternatives for CountEmissions EU.

Table 97: Selected and discarded design alternatives for the methodological element 'Allocation parameter'

Selected design alternatives	Discarded design alternatives
– Real passenger-km – Tonne-km SFD and passenger-km SFD – Tonne-km GCD and passenger-km GCD	– Real tonne kilometre

Source: Ecorys and CE Delft (2023), Impact assessment support study

Granularity for the allocation to transport services

[282] McKinnon, 2015; TNO, 2021

The allocation granularity is closely correlated with the granularity of emission calculation. However, while the latter gives the level at which fuel/emissions information needs to be collected, the allocation granularity defines at which level the emission/fuel should be allocated to services. As shown above, the emissions from a transport service provider can be allocated based on passenger-km or tonne-km per client. However, this allocation can be also made from a different perspective, namely:

- at the company level (e.g. average for transport company);
- at the transport leg level (e.g. average between hubs);
- at the trip level - journey specific.

The company level (e.g. the average for a transport company)

Allocation of total emissions at the company level provides no data on the emissions related to a specific transport service. Company level calculations are not complex, as no detailed input on fuel consumption of a given service or trip is needed. Acceptability and applicability of this alternative is therefore high amongst the transport operators, and stakeholders in general. However, since the results cannot be generated for a specific service, this option scores very low on the accuracy, comparability and relevance. Consequently, it will not be taken into account for CountEmissions EU.

Transport leg level (e.g. average between hubs.)

Between hubs, where transport activities are performed with similar vehicle types, the GHG intensity factors calculated for the allocation are usually representative for the specific type of a service, and can be compared to other ones involving similar activities. The relevance of this allocation is therefore high, provided that data on fuel consumption is also detailed at the leg level. These data can be available for most companies, and tools to perform this kind of allocation are already in use (e.g. BigMile). This option provides a good insight in the network performance of an operator, and is quite well reflects actual emissions generated by a specific service, with high accuracy and comparability.

Trip level - journey specific

Trip level allocation provides more detailed information on emissions generated during the specific trip, and often reflect specific elements, such as weather and traffic conditions. This results in a high score on the accuracy. Allocation at the trip level requires however the provision of detailed information, e.g. on fuel consumption for this particular trip, which makes this option less applicable and acceptable by stakeholders.

To conclude, to compare various transport services, the average performance at the leg level is sufficient to provide valuable and relevant information, and hence it is most relevant for the needs of CountEmissions EU. The allocation at the trip level might be however considered in special cases, especially where more detailed service performance data is required.

Table 98: Selected and discarded design alternatives for the methodological element 'Allocation granularity'

Selected design alternatives	Discarded design alternatives
– Transport leg level – Trip level – journey specific	– Company level

Source: Ecorys and CE Delft (2023), Impact assessment support study

Flexibility in the calculation method

A number of the available methods allow for a significant level of flexibility for choosing relevant methodological elements while calculating emissions. In this respect, several distinctive approaches may be considered under CountEmissions EU, to account for specific requirements regarding the choice of these methodological elements:

- The user can choose a methodological element from a predefined list, without further restrictions;
- The choice of a methodological element depends on the stakeholder group applying the calculations, and is adapted to data availability and common practice of this stakeholder group;
- The available methodological elements are ranked from most preferable to least preferable choices. These elements are labelled to express the quality of the method.
- The methodological element with best accuracy, reproducibility and comparability is prescribed for all users.

The different design alternatives related to the "Flexibility in the calculation method" and their scores on the respective assessment criteria are discussed in more detail below.

<u>The user can choose the methodological element from a predefined list without further restrictions</u>

Some of the current GHG methodologies allow more than one calculation choice. For example, CEN EN 16258 recommends calculation on real distance metrics, but also accepts SFD or GCD concepts for the distribution calculations. The applicability and acceptability are therefore high, as this alternative allows users that are already applying a specific methodological element to continue it without excessive hassle and implementation costs. On the other hand, this approach very often leads to increased ambiguity and may be considered as potentially hindering the comparability and reproducibility of the emissions output data (TNO, 2021). Therefore, this design option has not been considered for CountEmissions EU.

<u>The required calculation option depends on the stakeholder group applying the calculations</u>

The choice of a certain methodological element can also be differentiated according to the type of users and their capability of performing calculations. For example, passenger transport service operators may use actual data to express CO2-intensity values for the allocation of emissions, whereas freight transport service operators may be required to use intensity values based on SFD or GCD. This design alternative would have a good acceptability and applicability amongst users as it shows a high degree of adaptability. Due to better alignment in the method amongst stakeholders performing similar type of activities, the accuracy, comparability and reproducibility of the resulting GHG emissions data would score higher than in the first alternative above, at least for the individual stakeholders' groups.

<u>The calculation options are ranked from most preferable to least preferable (and labelled)</u>

Most of the current methods allow for more than one calculation alternative, but clearly state a preference for one of the choices offered. For example, the concept ISO 14083 recommends the use of GHG emissions of energy production infrastructure, but allows leaving them out when the underlying data are not available. The acceptability and applicability therefore score well, and the accuracy, comparability and reproducibility are marked at the same level as in the previous alternative

For this design alternative one may also consider that these preferences are labelled, clearly differentiating between the best choice and the less preferred, alternative ones. This approach would create additional incentives for the methodology users to adopt the best quality label at the most convenient time..

<u>The calculation alternative with best accuracy, reproducibility and comparability is mandated for all users</u>

This alternative mandates the most relevant methodological elements, enabling accuracy, comparability and reproducibility of the GHG emissions data. However, the mandatory component would likely translate in slightly lower acceptability and applicability by the stakeholders. On the other hand, some specific requirements might apply as from a certain date, and this date may be possibly differentiated for certain stakeholders' groups.

Based on the attributed scores the last three design alternatives were selected for the analysis of the most relevant reference GHG accounting methodology to be applied under CountEmissions EU.

Table 99: Selected and discarded design alternatives for the methodological element 'Flexibility in the calculation method'

Selected design alternatives	**Discarded design alternatives**
– The required calculation option depends on the stakeholder group applying the calculations – The calculation options are ranked from most preferable to least preferable (and labelled) – The calculation alternative with best accuracy, reproducibility and comparability is mandated for all users	– The user can choose the methodological element from a predefined list without further restrictions

Source: Ecorys and CE Delft (2023), Impact assessment support study

c) Preferred methodological design alternatives

Table *100* gives an overview of all 42 design alternatives, distinguished between those selected as the most appropriate (green) and those that were discarded (orange) for defining conditions for the proper reference methodology under CountEmissions EU.

Table 100: Overview of selected and discarded design alternatives per methodological element

Element	**Design options**			
Scope of emission calculation				
Geographical scope	Global	European		
Type of emissions included	CO_2-emisisons	non-CO2 GHG emissions originating from combustion of fuel	non-CO2 GHG emissions originating from refrigeration	
	Global warming effect of emission of non-CO2 products (e.g. water vapour, contrails, NOx) at high altitudes	Global warming effect of black carbon emissions		
Activity boundaries of the methodology	Vehicle propulsion emissions related from energy use (TTW)	Emissions from auxiliary processes (other than propulsion) during vehicle operation (TTW) (e.g. cooling of freight)	Vehicle operation emissions related to leakage and spills	Emissions from hub activities
	Emission from energy provision (WTT), excluding energy infrastructure construction	Emission from construction and dismantling of energy production infrastructure	Life cycle GHG emission of vehicle construction and maintenance	Life cycle GHG emission of vehicle infrastructure construction and maintenance
Intended users	Transport service operator	Transport service organiser	Transport service user (excl. organiser)	
Use perspective	Ex-post	Ex-ante short term	Ex-ante long term scenarios	
Emission perspective	Service average GHG emissions	Time/ situation specific average GHG emissions	Marginal GHG emissions	
The method of emission calculation and allocation to transport services				
Minimum level of granularity of emission calculation	Total GHG of transport operator	Total GHG emission of transport service user (freight) or organiser	Transport service type	Transport chain element / leg (average over period)
	Single vehicle	Individual trip	Total GHG emissions of hub operator	Per activity at hub
Allocation	Tonne-km	passenger-km	tonne-km SFD	

parameter for allocation to transport services	passenger-km-SFD	tonne-km GCD	passenger-km-GCD	
Allocation granularity for allocation to transport services	On company level (e.g. average for transport company)	transport leg level (e.g. average between hubs)	Trip level - journey specific	
Flexibility in calculation method	The user can choose the calculation option from a predefined list.	The required calculation option depends on the stakeholder group applying the calculations.	The calculation options are ranked from most preferable to least preferable calculation option and includes labelling.	The calculation option with best accuracy, comparability is prescribed for all users

Source: Ecorys and CE Delft (2023), Impact assessment support study

9. SELECTION OF THE REFERENCE METHODOLOGY

The reference methodology for CountEmissions EU may be newly developed within the initiative, but may also be based on an existing or emerging method. This section provides the rationale behind the choice of the most relevant methods, to be further included in respective policy measures and policy options.

a) Overview of the existing and emerging methods

Table 101 outlines the most important GHG emissions accounting standards and methodologies. Detailed description and assessment of these methods, as well as various emissions calculating tools is provided in the technical support study

Table 101: Overview of the main standards and methodologies for GHG emissions accounting in the transport sector

Standard/methodology	Transport modes covered	Geographical coverage	Type of instrument
Corporate value chain (scope 3) standard of the GHG protocol	All modes	World-wide	Standard
CEN standard EN 16258	All modes	EU	Standard
ISO 14083	All modes	World-wide	Standard
Product Environmental Footprint (PEF)	All modes	EU	Legislation with methodology
Article L. 1431-3 of the French transport code (Objectif CO_2)	All modes*	France	Legislation with methodology and program (Objectif CO_2)

Parcel Delivery Environmental Footprint	All modes involved in parcel delivery	EU	Standard
GLEC framework v1.0	All freight modes*	World-wide	Methodology framework
SmartWay program	All freight modes*	North America	Program and methodology
Topsector Logistics method	All freight modes*	EU (mainly applied in NL)	Methodology
Clean Cargo Working Group Carbon Emissions Accounting Methodology	Sea transport of containers	World-wide	Program and methodology
EU MRV	Sea shipping	EU	Legislation with methodology
IMO DCS	Sea shipping	World-wide	Legislation with methodology
CORSIA	Aviation	World-wide	Program and methodology
ICAO/IATA RP1678	Aviation freight	World-wide	Standard
IATA Recommended practice per-passenger CO_2-calculation Methodology	Aviation passenger	World-wide	Standard
EU ETS aviation	Aviation	EU	Legislation with methodology

Source: Ecorys and CE Delft (2023), Impact assessment support study

b) Shortlisted methods

Out of all the standards and methodologies presented above, five methods cover both freight and passenger segments of the transport sector, and all transport modes. This is the condition sine qua non for a single method for the quantification of emissions from all types of transport services in the multimodal perspective. These methods were therefore shortlisted as the potential reference methodologies for CountEmissions EU:

- Article L. 1431-3 of the French transport code (Objectif CO2)
- Corporate value chain (scope3) standard of the GHG protocol
- Product Environmental Footprint (PEF)
- CEN standard EN 16258
- ISO 14083.

These shortlisted methods were consequently compared and analysed with respect to the design alternatives identified under section 2 as the most relevant for CountEmissions EU. This is presented in Table 102 below.

Table 102: Comparing the shortlisted methods to the selected design alternatives

Policy elements	Article L. 1431-3 of the French transport code	Corporate value chain (scope3)	PEF	CEN standard EN 16258	concept ISO 14083
Scope of emission calculation					
Geographical scope	France	Global			
Type of GHG emissions	CO_2-eq of combustion and refrigeration				
Activity boundaries	WTW propulsion and auxiliary processes (excl. energy infra)	WTW propulsion and auxiliary processes (incl. energy infra) + hubs leakages and spills		WTW propulsion and auxiliary processes (excl. energy infra)	WTW propulsion and auxiliary processes (incl. energy infra) + hubs, leakages and spills
Intended user	Transport service operator, organiser and user	Transport service organiser and user	Transport service operator, organiser and user		
Use Perspective	Ex-post and ex-ante short term				
Emission perspective	Service average GHG emissions	Not defined (focus on product/ company average GHG emission)		Service average GHG emissions	
The method of emission calculation and allocation to transport services					
Minimum level of granularity of emission calculation and allocation	leg level and trip level	not defined	not defined	leg level and trip level	leg level and trip level and per hub activity
Metrics for GHG intensity factors and allocation	Based on passenger-km or tonne-km	Not defined	Not defined	All alternatives	Based on tonne-km or passenger-km SFD or GCD
Flexibility in calculation approach (e.g. input data and metrics)	The user can choose the metrics from a predefined list (not selected)	not defined	not defined	The user can choose the metrics from a predefined list (not selected)	The required calculation method depends on the stakeholder group applying the calculations.

Source: Ecorys and CE Delft (2023), Impact assessment support study

As shown in Table 102, most of the selected design alternatives are covered by the existing methodologies. There are, however, a few important caveats:

- Article L. 1431-3 of the French transport code applies a national scale. All other methodologies apply a global scale. However, while the PEF methodology can be technically implemented to account emissions from international transport chains, it is not used elsewhere, thus creating issues for a potential global alignment.

- Article L. 1431-3 of the French transport code and the CEN standard do not cover the emissions of leakages and spills, hub activities and the emissions of construction and dismantling of energy production infrastructure. The other methodologies do cover the emissions of all relevant transport/logistic activities.

- The corporate value chain (scope 3) standard does not consider transport operators, but only transport users and organisers. The other methodologies do cover all types of entities.

- The Corporate value chain (scope 3) standard and the PEF do not give specific guidance on allocation of emissions for transport. Both methods allow for the allocation rules, but these are not specified across the transport sector[283].

- Article L. 1431-3 of the French Transport Code recommends the use of the real tonne-kilometres as allocation parameter instead of the preferred SCF or GCD tonne-kilometres. Both the CEN standard and ISO do allow the use of these allocation parameters for freight transport. ISO does, however, provide more guidance on which allocation parameter should be applied.

- As for the methodological element 'flexibility in calculation approach', both Article L. 1431-3 of the French Transport Code and the CEN-standard provide more than preferred flexibility to the users on the approach to be chosen for the calculations of GHG emissions. ISO 14084 does provide more specific guidance on the calculation approach to be applied.

c) Screening the shortlisted methods

These five methodologies were screened on the following criteria:

- Completeness of methodology (does it address the selected design alternatives)
- Acceptability and applicability for users
- Accuracy and comparability
- Coherence with industry initiatives and other policy initiatives

Table 103 presents results of the screening analysis.

Table 103: Screening analysis of existing/emerging methodologies for CountEmissions EU

Methodology	Completeness	Acceptability and applicability of	Accuracy and comparability	Coherence with industry initiatives

[283] Within the framework of the PEF, currently specific calculation rules (i.e. category rules) are being developed for aircrafts, which do include specific allocation rules for life cycle emissions of aircrafts.

		users		and other policy initiatives
Article L. 1431-3 of the French transport code	3	3	3	4
Corporate value chain (scope3) standard of the GHG protocol	4	4	4	3
PEF / OEF	4	4	4	3
CEN standard EN 16258	3	2	3	4
Draft ISO 14083	2	1	2	2

Scores from 1-5 range from high to low

Source: Ecorys and CE Delft (2023), Impact assessment support study

From the existing methodologies/standards, the (draft) ISO 14083 norm is most complete on the scope and calculation/allocation methods (as shown in the previous section). It also received a significant support from the stakeholders participating in various consultation activities, including in the workshop and some individual interviews. Therefore, its acceptability features high in the assessment. Accuracy and comparability of output data were also ranked high, although the methodology leaves some room to users to make their own decisions, which may slightly lower the score on this criterion. ISO 14083 has been developed with the support of many stakeholders, based on GLEC and EU financed research projects (COFRET, LEARN). The coherence with industry activities is therefore considered to be at the good level. No specific inconsistencies with the policy framework were identified either. Based on these remarks, the method has been selected as a specific policy measure to be considered under CountEmissions EU.

From the other existing methodologies/standards, particularly CEN standard EN 16258, and to a lesser extent, Article L. 1431-3 of the French transport code are considered reasonable alternatives. Both are already in use, and therefore are very acceptable and applicable for the market players. However, they have more limited methodological scope compared to ISO 14083 concept, e.g. emissions of hubs and from leakages and spills are not included. Also, the methodologies do not give direction on the use of specific calculation options to be made, leaving considerable room to users to make their own methodological decisions[284]. Therefore, these methodologies produce less accurate and comparable GHG emissions figures than those expected under ISO 14083. Furthermore, Article L. 1431-3 of the French transport code is restricted for the use in France only, thus negatively affecting its acceptability among broader stakeholders' groups. Finally, EN 16258 has been withdrawn upon the publication of the ISO 14083, and therefore in the medium and long perspective it would not be any more coherent with relevant industry and regulatory initiatives. The same applies for Article L. 1431-3 of the French transport code, which currently relies on EN 16258. For these reasons, CEN EN 16258 and Article L. 1431-3 of the French transport code have been discarded as policy measures.

[284] For instance, the CEN standard allows the use of all relevant types of allocation parameters

As mentioned above, the Corporate value chain standard of the GHG protocol and the general PEF framework do not give specific guidance for allocation of transport emissions to transport services. Although highly valuable for accounting GHG emissions of companies or products, these methods are considered less complete and accurate for quantifying emissions at the specific transport service level. Consequently, they score lower on the comparability of emissions data produced. Also their acceptability and applicability do not feature high, since these methods do not give complete guidance on how to effectively calculate emissions for various type of transport services. Furthermore, these methods are not sufficiently aligned with specific needs of the transport sector (e.g. concerning allocation rules), resulting in a medium score on the coherence. For these reasons, also these two methodologies were discarded.

d) New reference methodology

In addition to the methods shortlisted above, a new, specific and tailored reference methodology may be considered for CountEmissions EU. In this respect, the following alternatives have been identified:

- A complete new reference methodology. This methodology should provide more guidance to entities accounting emissions than the current/emerging methodologies/standards, thus resulting in more accurate and comparable results. The methodology will cover all preferred design alternatives discussed in Section II.

- A new reference methodology based on ISO 14083, but with additional elements and increased accuracy. This idea comes from the fact that ISO 14083 still provides quite some flexibility to users. This may negatively affect the accuracy and comparability of the GHG emission figures generated with the use of the common framework. This new methodology, therefore, builds on ISO 14083 but provides more guidance on specific methodological elements, including:

    - Clear definition of a transport operation category (TOC) per market segment. In ISO 14083, the transport chain category is defined as a group of operations of a certain transport operator, with similar characteristics (e.g. the final leg from a distribution centre to clients). The transport chain category is the level at which emission are allocated to services, and for which relevant emission intensity factor is applied (g/ tkm GCD or SFC). Within ISO, it is up to the user to define the transport operation category. Different competitors might apply differently the boundaries of a transport operation category, which may lead to incomparable results. The new methodology may define precisely these rules.

    - Time aggregation: ISO 14083 recommends to base the emission calculations on annual average emissions on each transport leg, trip or hub activity but allows different time periods as well, when explained by a user. A precise time aggregation may be put forward by the new methodology per specific transport segment;

- Allocation parameter: ISO 14083 provides users the opportunity to make use of tonne-km GCD or SFD (for freight transport) and passenger-km GCD or SFD (for passenger transport) as the allocation parameter. In this new reference methodology only allocation based on GCD kilometres may be allowed;
- Alternatives for mass-based allocation: the tonne-km (real, SFD or GCD) is usually applied as the standard allocation parameter. However, for some types of freight transport (e.g. parcel delivery) other metrics than tonne-km are more appropriate, e.g. m^3-km or container-km. ISO 14083 leaves it up to the user whether they would like to use another metric. In this new methodology, this metric may be clearly defined (and prescribed) for each transport segment;
- Inclusion of GHG emissions from the production of batteries for the electric vehicles.

• New Product Environmental Footprint category rules for transport, including rules for transport services. The general PEF framework does not provide much guidance on the calculation of GHG emissions at the transport service level, as it was discussed above. For this new methodology, therefore, specific category rules (i.e. set of calculation rules) for transport may be developed. The PEF method already offers a guide to develop emission factors (JRC, 2020a) and compliant emission factors datasets (EC, 2022). With the category specific rules for transport, the industry can further develop the environmental footprint calculation of their own product (i.e. the movement of goods or people). Therefore, it is important that these category rules allow the allocation of GHG emissions to services, like ISO 14083 (instead of physical goods). In line with the general approach followed within the PEF, these category rules for transport would need to cover life cycle emissions, a scope which is broader than in the other methodologies reported on the long list. However, given the scope of CountEmissions EU, only GHG emissions (and not other emission types and environmental impacts) would be considered.

e) Assessment of the relevance of the new methodologies

Table 104 presents the results of the screening analysis of the new methodologies on the criteria identified in section III.c

Table 104: Screening analysis of new methodologies for CountEmissions EU

Methodology	Completeness	Acceptability and applicability of users	Accuracy and comparability	Coherence with industry initiatives and other policy initiatives
A new reference methodology	1	5	1	N.A.
A new reference methodology referring to ISO 14083	1	3	1	3
New PEF category	2	3	2	3

rules for transport, including rules for transport services				

Source: Ecorys and CE Delft (2023), Impact assessment support study

A completely new reference methodology would offer the opportunity to increase the accuracy and comparability by providing more direction on specific methodological elements and choices. However, it would score very low on the acceptability and applicability of users, mostly due to the existence of specific and well recognised emissions quantification initiatives that are already (or will be) used in the business practice (such as ISO 14083 or CEN EN 16258), and the uncertainty concerning the technical process related to the development and implementation of the methodology in the EU. In addition, the development of the new methodology would require substantial time and efforts to complete the work, and to ensure it is robust, consistent and applicable on the market. As regards the criterion related to the coherence to industry and policy initiatives, it cannot be reasonably assessed at this stage. Given all the arguments above, this alternative was not retained for CountEmissions EU. This assessment is supported by the results of stakeholders' consultation where a number of stakeholders indicated the future CountEmissions EU reference methodology should build on the existing methods.

If the new reference methodology builds on ISO 14083, it can be reasonably assumed that it reflects most of the features of the standard, and to large extent takes into account the results of stakeholders' consultation organised during the process of its establishment. This may be translated in fair acceptance and applicability on the market, as well as reasonable coherence with relevant industry initiatives. On the other hand, the positive assessment will be adversely affected by more stringent requirements related to specific methodological choices, as presented above. One should note however, that these stricter requirements would allow for the increased accuracy and comparability of the output data, thus providing an argument for considering this method under CountEmissions EU, even if it results in lower stakeholders' support.

New Product Environmental Footprint Category Rules (PEFCR) for transport (including specific rules for transport services) may represent an interesting but significantly more complex alternative to ISO 14083. First, they are expected to feature fairly well on the accuracy and comparability criterion, considering that robust rules could be developed to address GHG WTW emissions, and these could be further complemented with relevant elements of the LCA approach. As shown in Table 104, PEFCR will nevertheless score lower on this criterion, given uncertainty on the accuracy of default values addressing emissions from the production and dismantling of vehicles. Secondly, this method is considered to be rather complete in terms of the coverage of the preferred methodological design alternatives, however the level of this completeness cannot be evidenced in the absence of specific PEFCR. In addition, PEFCR are expected to be much more demanding on the data to be collected and the calculations to be executed with respect to the life-cycle approach. Together with substantial efforts and time anticipated to produce a number of specific PEFCR (however still lower than in the case of a completely new methodology), these factors lower the score on acceptability and applicability. Finally, the PEFCR are supposed to be well aligned with specific EU environmental policy initiatives (such as the Single Market for Green Products) but they may not reach substantial level of alignment with the leading industry initiatives, which would be rather based on WTW/TTW emissions boundaries. As mentioned above, the idea of including the full LCA in CountEmissions EU reference methodology received some support in the stakeholders' consultation, but still lower than the WTW. However, given all the arguments above, the new PEFCR for transport were retained for further assessment as a respective policy measure.

f) Selected methods

Based on the analysis presented in the previous sections three methods were retained for the assessment under respective policy options:

- ISO 14083;
- A new reference methodology based on ISO 14083, but with additional elements and increased accuracy;
- New Product Environmental Footprint Category Rules for transport, including rules for transport services.

ANNEX 9: 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.

×××××	××××	×××	××	×	o	✓	✓✓	✓✓✓	✓✓✓✓	✓✓✓✓✓
Extremely negative	Strongly negative	Very negative	Negative	Moderately negative	No or negligible impact	Moderately positive	Positive	Very positive	Strongly positive	Extremely positive

	PO1	PO2	PO3	PO4	PO5	PO6
Specific policy objective 1: Ensure the comparability of results from GHG emissions accounting of transport services						
Expected improvement of the comparability of GHG emissions data shared in the transport chains (based on the relevant methodology, generated with accurate input data, and communicated	Strongly positive impact on the comparability. The mandatory use of a precise reference methodology based on the ISO standard 14083 (with additional elements	Moderately positive impact on the comparability. PO2 includes the ISO standard 14083 as a reference methodology, and a centralised approach for the input data that, once combined, may	Very positive impact on the comparability. The binding-in (mandatory for those that account and disclose GHG emissions data of transport services) application of a	Strongly positive impact on the comparability. This option envisages the binding-in (mandatory for those that account and disclose GHG emissions data of	Positive impact on the comparability, although lower than in PO3. This option includes a very comprehensive future LCA methodology based on specific transport-	Strongly positive impact on the comparability. The mandatory use of a conducive methodology established through ISO standard 14083 will ensure increased

from trusted sources in unambiguous and clear manner)	and improved accuracy) will ensure increased accuracy of the underlying factors and formulas behind the processes related to the accounting of emissions. On the other hand, this methodology will require time and resources to make it completed and eventually offered for the use of stakeholders in the EU. In addition, given the inclusion of additional methodological elements, this choice may lead to some inconsistencies between accounting emissions practices in the international transport networks (mostly affecting maritime transport and aviation). Secondly, PO1	offer a high level of comparability of GHG emission figures on the market. However, PO2 envisages a voluntary application of the common methodological framework that leaves its use to the discretional decision of the concerned entities. The latter feature may eventually result in lesser methodological alignment on the market in the short and medium term, thus significantly lowering the score on the comparability criterion for this option.	precise reference methodology based on the ISO standard 14083 (with additional components) will ensure increased accuracy of the underlying factors and formulas behind the processes related to the accounting of emissions. On the other hand, this methodology will require more time and resources to make it completed and eventually offered for the use of stakeholders in the EU. In addition, given the inclusion of additional methodological elements, this choice may lead to some inconsistencies between accounting emissions practices in the international transport networks	transport services) application of more conducive methodology, namely the new (international) ISO standard 14083. It does not offer the same level of precision as methodology embedded in PO1 and PO2, however it has already been fully developed and is available for the wider use in the transport sector. What is more, this methodology is based on a robust research process, including an extensive public consultation, and offers the opportunity to align emissions accounting approaches in the international transport networks. On the other hand,	related Product Environmental Footprint Category Rules. This methodology will enable to calculate emissions in full lifecycle perspective, i.e. 'from cradle to grave' and will be mandated to all those that account and disclose GHG emissions data of transport services (binding-in). However, the timescale and resources necessary to establish specific PEFCRs would be more important than for the methodology envisaged under PO1 and PO3. PEFCRs do not exist yet and would need to be entirely developed. In addition, the use of this methodology will likely result in even	accuracy of the underlying factors and formulas behind the processes related to the accounting of emissions. It does not offer the same level of precision as methodology embedded in PO1 and PO2, however it has already been fully developed and is available for the wider use in the transport sector. What is more, this methodology is based on a robust research process, including an extensive public consultation, and offers the opportunity to align emissions accounting approaches in the international transport networks. On the other hand, similarly as in PO3 and PO4, this option enables, under specific

	envisages fully centralised, and EU-controlled databases of default values, thus guaranteeing that all input data used for accounting emissions comes from the same source.		(mostly affecting maritime transport and aviation). Secondly, this option also enables, under specific conditions, the provision of external emissions intensity factors databases. The decentralised approach may offer more adequate default values reflecting the specificity of respective segments of the transport sector, however it eventually may lead to some incoherence between input data used by various entities accounting emissions across the EU.	similarly as in PO3 and PO6, this option enables, under specific conditions, the provision of external emissions intensity factors databases. The decentralised approach may offer more adequate default values reflecting the specificity of respective segments of the transport sector, however it eventually may lead to some incoherence between input data used by various entities accounting emissions across the EU.	larger misalignment with respect to the existing emissions accounting practices in the transport sector, and especially at the international level. Secondly, PO1 envisages fully centralised, and EU-controlled databases of default values, thus guaranteeing that all input data used for accounting emissions comes from the same source. However, the accuracy of these default values may be compromised by significant degree of uncertainty related to the valuation of emission factors in the LCA perspective.	conditions, the provision of external emissions intensity factors databases. The decentralised approach may offer more adequate default values reflecting the specificity of respective segments of the transport sector, however it eventually may lead to some incoherence between input data used by various entities accounting emissions across the EU.
	PO1	PO2	PO3	PO4	PO5	PO6
Specific policy objective 2: Facilitate the uptake of GHG emissions accounting in business practice						

(1) Expected increase of use of the common methodological framework by economic operators and other relevant entities	Extremely positive impact on the use of the common methodological framework This option will mandate the uptake of CountEmissions EU to all entities that are involved in transport services activities in EU 27. This uptake will be gradual until 2035, where it will apply across the board. The uptake will be further strengthened by measures increasing confidence and trust in the GHG emissions data on the market: the mandatory data and process verification system, and centralised emissions calculation tools offered on the market	Positive impact on the use of the common methodological framework. This positive impact is foreseen despite the lax application of CountEmissions EU on the EU market and the voluntary verification system for processes and data. This assessment is driven mostly by the fact that PO2 includes a more conducive methodology (ISO 14083), recognises the use of CountEmissions EU through a label, and offers dedicated emissions calculation tools to be managed at the central EU level. The latter feature may especially attract interest of SMEs that	Moderately positive impact on the use of the common methodological framework. PO3 will require the use of the CountEmissions EU framework only from those entities that account and disclose GHG emissions data of transport services, and therefore this option will not reach the same level of uptake in the short and medium term as it would be the case of fully mandatory application. What is more, PO3, envisages the use of a more comprehensive methodology based on ISO 14083, but with additional components, leading to increased costs and complexity for businesses. This will limit the uptake of the	Very positive impact on the increase uptakes of the GHG emissions accounting. PO4 will require the use of the CountEmissions EU framework only from those entities that account and disclose GHG emissions data of transport services, and therefore this option will not reach the same level of uptake in the short and medium term as it would be the case of fully mandatory application. However, PO4 envisages the inclusion of a conducive and well recognised (existing) methodology provided by the ISO standard 14083 that is expected to result in substantially higher voluntary market	Moderately positive impact on the use of the common methodological framework, however lower than in PO3. Similarly as for PO3 and PO4, this option will require the use of the CountEmissions EU framework only from those entities that account and disclose GHG emissions data of transport services. Therefore PO5 will not reach the same level of uptake in the short and medium term as it would be the case of fully mandatory application. What is more, PO5 envisages the use of the most comprehensive LCA methodology, still to be developed through	Extremely positive impact on the use of the common methodological framework As PO1, this option will mandate the uptake of CountEmissions EU to all entities that are involved in transport services activities in EU 27. This uptake will be gradual until 2035, where it will apply across the board. PO6 envisages the inclusion of a conducive and well recognised (existing) methodology provided by the ISO standard 14083. This process will be supported through the provision of a verification system for processes and data (for large companies), and the certification of emissions calculation

	by the EU. This option (together with PO6) proves to be the most effective option in terms of uptake increase, totalling additional 918,003 companies in 2030 and 1,703,841 companies by 2050 relative to the baseline. Out of the total number of companies accounting for GHG emissions of transport services, 915,130 SMEs and 2,873 large companies by 2030, and 1,699,423 SMEs and 4,418 large companies by 2050 relative to the baseline.	represent the majority of entities operating on this market. PO2 will increase the uptake by 30,219 companies in 2030 and 1,388 companies by 2050 relative to the baseline. Out of the total number of companies accounting for GHG emissions of transport services, 29,586 SMEs and 633 large companies by 2030, 1,361 SMEs and 27 large companies by 2050 relative to the baseline.	framework, despite the increased level of trust in GHG emissions figures, ensured through the provision of a verification system for processes and data (for large companies), and the certification of emissions calculation tools developed by the market. PO3 will increase the uptake by 26,745 companies in 2030 and 3,640 companies by 2050 relative to the baseline. Out of the total number of companies accounting for GHG emissions of transport services, 25,611 SMEs and 1,134 large companies by 2030, 3,139 SMEs and 501 large companies by 2050 relative to the baseline.	uptake. This process will be supported through the provision of a verification system for processes and data (for large companies), and the certification of emissions calculation tools to be developed by the market. PO4 will increase the uptake by 39,358 companies in 2030 and 9,139 companies by 2050 relative to the baseline. Out of the total number of companies accounting for GHG emissions of transport services, 38,224 SMEs and 1,134 large companies by 2030, 8,638 SMEs and 501 large companies by 2050 relative to the baseline.	specific PEFCRs. This choice will lead to increased implementation costs and additional complexity for businesses, thus limiting the uptake of the framework over time. The above factors will result in slightly positive score for this criterion, despite the increased level of trust in GHG emissions figures, ensured through the provision of a verification system for processes and data (for large companies), and the certification of emissions calculation tools developed by the market. PO5 will increase the uptake by 25,102 companies in 2030 and 2,783 companies by 2050 relative to the	tools to be developed by the market. This option (as PO1) proves to be the most effective option in terms of the uptake increase, totalling additional 918,003 companies in 2030 and 1,703,841 companies by 2050 relative to the baseline. Out of the total number of companies accounting for GHG emissions of transport services, 915,130 SMEs and 2,873 large companies by 2030, and 1,699,423 SMEs and 4,418 large companies by 2050 relative to the baseline.

					baseline. Out of the total number of companies accounting for GHG emissions of transport services, 24,006 SMEs and 1,096 large companies by 2030, 2,320 SMEs and 463 large companies by 2050 relative to the baseline.	
Expected decrease in the well-to-wheel GHG emissions	Extremely positive impact on the expected decrease in the well-to-wheel GHG emissions The reduction in WTW GHG emissions is strongly correlated with the level of uptake of the framework addressed above. PO1 will effectively reduce 22.1 million tonnes of GHG cumulative emission over the period 2025-	Positive impact on the expected decrease in the well-to-wheel GHG emissions The reduction in WTW GHG emissions is strongly correlated with the level of uptake of the framework addressed above. PO2 will effectively reduce 3.7 million tonnes of GHG cumulative emission over the period 2025-	Moderately positive impact on the expected decrease in the well-to-wheel GHG emissions The reduction in WTW GHG emissions is strongly correlated with the level of uptake of the framework addressed above. PO3 will effectively reduce 1.7 million tonnes of GHG cumulative emission over the period 2025-	Very positive impact on the expected decrease in the well-to-wheel GHG emissions The reduction in WTW GHG emissions is strongly correlated with the level of uptake of the framework addressed above. PO4 will effectively reduce 5.6 million tonnes of GHG cumulative emission over the period 2025-	Moderately positive impact on the expected decrease in the well-to-wheel GHG emissions The reduction in WTW GHG emissions is strongly correlated with the level of uptake of the framework addressed above. PO5 will effectively reduce 1.5 million tonnes of GHG cumulative emission over the period 2025-	Extremely positive impact on the expected decrease in the well-to-wheel GHG emissions The reduction in WTW GHG emissions is strongly correlated with the level of uptake of the framework addressed above. PO1 will effectively reduce 22.1 million tonnes of GHG cumulative emission over the period 2025-

	2050.	2050.	2050.	2050.	2050.	2050.

ANNEX 10: SME TEST

Step (1) of the SME test (identification of affected businesses).	
Directly affected. SMEs in the scope of CountEmissions EU: all SMEs in the NACE sub-sectors involved in transport services activities (1,767,702 companies according to Eurostat[285]) would fall under the broad scope of CountEmissions EU. It should be noted that SMEs represent 99.7% of the companies in the sub-sectors involved in transport services activities. Based on desk research and information obtained through the stakeholders' consultation, it is estimated that the number of SMEs quantifying their emissions at the transport service level was around 21,342 in 2020. These SMEs will be directly affected. ***Indirectly affected***. The number of SMEs indirectly affected will be larger, since they often are part of complex transport chains (especially in freight transport). Emissions measurement and calculation is increasingly required to meet expectations of investors or address specific regulatory requirements. To some extent, large companies will therefore require the provision of service level emissions information from SMEs, thus incentivising the uptake of the CountEmissions EU framework. This assumption has been reflected in the projections made for the three applicability measures: PM13 (Mandatory application), PM14 (Binding opt-in application) and PM15 (Voluntary opt-in application).	See sections 6.1.7 (Impacts on small and medium enterprises) and Annex 4
Step (2) of the SME test (consultation of SME stakeholders).	
Targeted questions were included in the consultation activities to sick the SMEs' views. The methodological approach consisted in gathering specific data on SMEs and micro-enterprises from stakeholders (through the OPC, targeted survey and targeted interviews), notably in relation to the costs for the GHG accounting, but also potential benefits. SMEs were requested to identify themselves, thus allowing a specific analysis of SME responses and a comparison with other respondents. ***Targeted consultations.*** The survey questionnaires and interviews included tailored questions for SMEs. 10 out of 39 respondents to the survey questionnaire in the targeted stakeholders' consultation identified themselves as SMEs. In addition, 4 of the 39 stakeholder interviews were conducted with representatives of SMEs. These activities were complemented with specific case studies on the experiences of SMEs with emissions accounting at service level.	See Annex 2 (Stakeholder consultation)

[285] https://nacev2.com/en/activity/transportation-and-storage

Open Public Consultation. The OPC was organised from to 25 July to 20 October 2022. The public consultation was extended by 3 days in order to give stakeholders more time to reply. 100 out of 161 respondents to the OPC identified themselves as SMEs (those that replied to the specific question).	
Step (3) of the SME test (assessment of the impacts on SMEs).	
Direct impacts on SMEs. *Total costs* for SMEs are estimated to be the highest in PO1 (EUR 0.5 billion in 2025, EUR 3.9 billion in 2030 and EUR 6.3 billion in 2050), followed by PO6 (EUR 344.7 million in 2025, EUR 2.8 billion in 2030 and EUR 4.5 billion in 2050), then at large distance by PO5 (EUR 101.2 million in 2025, EUR 156.4 million in 2030 and EUR 37.4 million in 2050), PO4 (EUR 68 million in 2025, EUR 115.4 million in 2030 and EUR 19.9 million in 2050), PO3 (EUR 57.9 million in 2025, EUR 103.8 million in 2030 and EUR 11.9 million in 2050) and PO2 (EUR 50.9 million in 2025, EUR 93.9 million in 2030 and EUR 4.7 million in 2050). The breakdown of the total costs between adjustment and administrative costs and by measure is provided in Table 105 and Table 106. As already explained, while under PO2, PO3, PO4 and PO5 the application of CountEmissions EU in the transport sector is voluntary (i.e. voluntary opt-in with a label in PO2 and binding opt-in in PO3, PO4 and PO5), PO1 and PO6 foresee the mandatory application and thus leads to significantly higher costs. At the same time, PO2 results in the lowest total costs among the options, due to the voluntary opt-in foreseen by this option. Expressed as present value over 2025-2050, the total costs for SMEs in PO1 are estimated at EUR 93.8 billion relative to the baseline, for PO6 EUR 67.2 billion relative to the baseline, for PO5 at EUR 1.8 billion, for PO4 at 1.4 billion, for PO3 at EUR 1.1 billion and for PO2 at 1 billion. The highest share of the total costs for each policy option relates to adjustment costs for setting of a common reference methodology at EU level (94% and 89% of the total costs in PO4 and PO6 respectively for ISO 14083, 91% in PO3 for ISO 14083 with additional elements and increased accuracy, 88% in PO2 for ISO 14083, 85% in PO1 for ISO 14083 with additional elements and increased accuracy and 73% in PO5 for PEFCR). The second category of costs in terms of the share of the total costs relates to the use of the calculation tools. On the other hand, as the verification of data and processes (PM9) is not imposed on SMEs PO3 and PO4 result in adjustment costs savings related to the verification activities. Due to the higher number of companies involved compared to PO3 and PO4, and the assumption that a certain proportion of SMEs would however undergo the verification activities, these costs	See sections 6.1.7 (Impacts on small and medium enterprises) and Annex 4

savings do not result in PO6. Administrative costs for the calculation tools developers, related to the certification of the tools[286], represent 0.03% of the total costs in PO3 and 0.02% in PO4 and PO5. All policy options are expected to incentivise behavioural change, leading to higher use of more sustainable transport modes and optimised trips. Thus, all policy options are expected to lead to *energy costs savings* for SMEs relative to the baseline (see Table 105 and Table 106). Expressed as present value over 2025-2050, they are estimated at EUR 9.9 billion in PO1 and PO6, followed by PO4 (EUR 2.3 billion), PO2 (EUR 1.5 billion), PO3 (EUR 0.7 billion) and PO5 (EUR 0.6 billion). *PO2 and PO4 are estimated to result in net benefits for SMEs relative to the baseline*. PO4 would lead to the highest net benefits estimated at EUR 43.7 million in 2025, EUR 70 million in 2030 and EUR 28.1 million in 2050 relative to the baseline, while PO2 at net benefits of EUR 23.1 million in 2025, EUR 46.7 million in 2030 and EUR 2.2 million in 2050. On the other hand, PO1, PO3, PO5 and PO6 are estimated to result in net costs (see Table 105 and Table 106). Expressed as present value over 2025-2050, the net benefits for PO2 and PO4 are estimated at EUR 0.5 billion and EUR 0.9 billion, respectively, while the net costs in PO1 at EUR 83.9 billion, in PO6 at EUR 66.6 billion, in PO5 at EUR 1.3 billion and in PO3 at EUR 0.4 billion. ***Indirect impacts on other SMEs***. *A* higher number of SMEs from sectors not directly related to transport or performing transport services on their own may be involved in accounting their GHG emission performance due to the increased demand in the context of the transport chains. However, the precise number is not possible to quantify.	
Step (4) of the SME test (minimizing negative impacts on SMEs).	
Minimizing negative impacts. The following topics appeared as relevant for the SMEs in the stakeholders' consultation: the potential costs (burden), the effects on competitiveness in procurement processes, and the insufficient number of skilled staff to implement GHG emissions accounting. As regards the cost element, SMEs' concerns included the insufficient availability of data (especially primary data) for the quantification of GHG emissions and additional resources needed to comply with specific requirements under the initiative. Firstly, it should be noted that the voluntary opt-in and binding opt-in in policy options PO2, PO3, PO4, PO5 give SMEs the possibility to	See sections 6.1.7 (Impacts on small and medium enterprises), 7 (How do options compare), 8 (Preferred policy option), Annex 4

[286] In the assessment it has been assumed that the calculation tool developers are SME.

decide if to undergo GHG emissions accounting of their transport services according to the harmonised method. Secondly, PO3, PO4, PO5 but also PO6 envisage a measure exempting SMEs from the mandatory verification of GHG emissions data (PM9), thus allowing SMEs to choose, and to lower potential costs. Thirdly, measures dealing with the use of input data (PM4 and PM5) provide relatively higher benefits for SMEs than for large companies. The problems of data availability are generally experienced more acutely by SMEs and such companies tend to rely on default values because of their high costs to collect primary data. Given the particular difficulties faced by SMEs with the GHG accounting at service level, the analysis has also shown that they would benefit more than larger operators of harmonised guidelines (PM7), as well as, of dedicated calculation tools either established at the EU level (PM11), or provided by the market and certified at EU level (PM12). Finally, the harmonised formats for the output data (PM6) would also result in relatively higher benefits for SMEs that usually do not have sufficient resources to analyse various data elements provided by third parties in the transport chain. ***Alternative options***. The impact assessment considered the alternative measure of mandating the use of primary data for the quantification of GHG emissions from transport services. This option was not retained on the grounds of efficiency and proportionality.	

Table 105: Total costs and benefits for SMEs in PO1, PO2 and PO3 relative to the baseline (EU27), in million EUR (2022 prices)

	Difference to the Baseline								
	PO1			PO2			PO3		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Recurrent and one-off costs	490.8	3,866.2	6,288.2	50.9	93.9	4.7	57.9	103.8	11.9
Adjustment costs	490.8	3,866.2	6,288.2	50.9	93.9	4.7	57.8	103.8	11.9
Administrative costs	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02
Benefits (energy costs savings)	51.7	390.7	775.1	74.0	140.6	6.9	37.2	83.6	2.4
Net costs/costs savings	**439.1**	**3,475.5**	**5,513.1**	**-23.1**	**-46.7**	**-2.2**	**20.7**	**20.2**	**9.5**

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 106: Total costs and benefits for SMEs in PO4, PO5 and PO6 relative to the baseline (EU27), in million EUR (2022 prices)

	Difference to the Baseline								
	PO4			PO5			PO6		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Recurrent and one-off costs	68.0	115.4	19.9	101.2	156.4	37.4	344.7	2,767.6	4,501.4
Adjustment costs	68.0	115.4	19.9	101.2	156.4	37.3	344.7	2,767.5	4,501.4
Administrative costs	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Benefits (energy costs savings)	111.7	185.4	48.0	33.6	77.0	2.2	111.7	185.4	48.0
Net costs/costs savings	**-43.7**	**-70.0**	**-28.1**	**67.6**	**79.5**	**35.1**	**233.0**	**2,582.1**	**4,453.4**

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 107: Recurrent and one-off costs for SMEs by policy measure in PO1, PO2 and PO3 relative to the baseline (EU27), in million EUR (2022 prices)

	Difference to the Baseline								
	PO1			PO2			PO3		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Adjustment costs	490.8	3,866.2	6,288.2	50.9	93.9	4.7	57.8	103.8	11.9
PM1 - ISO 14083 set as common reference methodology				44.8	82.2	4.0			
PM2 - PEFCR set as common reference methodology									
PM3 - ISO 14083 with additional elements and increased accuracy set as common reference methodology	412.2	3,270.1	5,317.4				52.9	94.2	11.2
PM8 - Mandatory process and data verification for all entities	41.1	294.7	479.9						
PM9 - Mandatory process and data verification for entities above certain size							0.0	0.6	-1.3
PM10 - Voluntary process and data verification for all entities				2.9	5.0	2.3			
PM11 - Emissions calculation tools are provided at EU level	37.6	301.4	490.8	3.1	6.6	-1.6			
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level							4.9	9.1	2.1
Administrative costs	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level							0.02	0.02	0.02
Total net costs	490.8	3,866.2	6,288.2	50.9	93.9	4.7	57.9	103.8	11.9

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

Table 108: Recurrent and one-off costs for SMEs by policy measure in PO3, PO4 and PO6 relative to the baseline (EU27), in million EUR (2022 prices)

	Difference to the Baseline								
	PO4			PO5			PO6		
	2025	2030	2050	2025	2030	2050	2025	2030	2050
Adjustment costs	68.0	115.4	19.9	101.2	156.4	37.3	344.7	2,767.5	4,501.4
PM1 - ISO 14083 set as common reference methodology	63.2	106.1	21.5				310.1	2,471.7	4,019.4
PM2 - PEFCR set as common reference methodology				80.7	123.8	14.1			

PM3 - ISO 14083 with additional elements and increased accuracy set as common reference methodology									
PM8 - Mandatory process and data verification for all entities									
PM9 - Mandatory process and data verification for entities above certain size	0.0	0.5	-1.7	5.9	9.1	7.1	4.7	46.5	75.9
PM10 - Voluntary process and data verification for all entities									
PM11 - Emissions calculation tools are provided at EU level									
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level	4.8	8.9	0.1	14.7	23.6	16.1	29.8	249.4	406.1
Administrative costs	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
PM12 - Emissions calculation tools are provided by the market but they are certified at EU level	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total net costs	68.0	115.4	19.9	101.2	156.4	37.4	344.7	2,767.6	4,501.4

Source : Ecorys and CE Delft (2023), Impact assessment support study; Note: negative values reflect costs savings, where relevant.

ANNEX 11: CASE STUDIES AND USE CASES

This annex includes two case studies (the US SmartWay program and the SNCF[287] initiative based on Article L. 1431-3 of the French Transport Code) and four use cases (eco-labelling of transport services, sustainable delivery services, permit to enter low or zero emissions zones, green public procurement) supporting the evidence underlying the impacts and potential applications of CountEmissions EU.

1- Case study of United States Environmental Protection Agency SmartWay Program

Brief Description

SmartWay is a voluntary partnership program established in 2004 by the US Environmental Protection Agency (EPA) to reduce greenhouse gas emissions and air pollution from the freight transportation industry. It aims to improve environmental performance, energy efficiency, and sustainability in the sector, which includes trucking, rail, maritime, and logistics operations. The EPA has also collaborated with counterparts in Canada to establish (in 2012) a Canadian branch of the SmartWay program. More than 4000 North American companies are now part of the partnership with at least 3500 of those coming from the United States. This case study focuses on the US EPA program.

Emissions accounting is a key component of the SmartWay system that helps participants monitor their environmental performance and identify areas for improvement. The program provides specific tools and resources (split by mode and activity) for participants to accurately measure, benchmark, and report their emissions, including: greenhouse gases (GHG), nitrogen oxides (NOx), and particulate matter (PM).

GHG accounting: drivers, scope, choices in accounting methodology

Key aspects of the SmartWay program's emissions accounting approach include:

- Data collection: participants provide information on their fleet's operations, fuel consumption, and emissions, which is then used to calculate their environmental performance.
- Emissions quantification: the EPA has developed tools which use standardised methodologies and emissions factors to help participants quantify their emissions and energy consumption. These tools are provided for: logistics companies; truck carriers; rail carriers; air carriers; barge carriers; and shippers. A user guide is developed for each tool and partners submit data annually.
- Performance benchmarking: since 2011 the initiative enables participants to compare their environmental performance with industry averages and peer

[287] Société nationale des chemins de fer français: national rail operator in France

groups, which promotes best practices and helps identify opportunities for improvement.

- Reporting and recognition: participants are encouraged to report their emissions data and progress towards meeting their environmental goals. The EPA recognises high-performing partners with awards and public acknowledgment, promoting a culture of continuous improvement.
- Collaboration and sharing: the initiative fosters collaboration among stakeholders to share knowledge, experience, and best practices in emissions reduction and efficiency.

It is important to acknowledge the benchmarking and reporting dimension of the program, which provides additional functionality with respect to the current scope of CountEmissions EU. SmartWay is designed to take advantage of competitive pressures in the transportation market by providing purchasing managers with environmental performance information that shippers can use to assess and select firms based on their environmental performance.

SmartWay has three types of partners: shipper partners (organisations that ship freight); carrier partners (businesses that carry or move goods for shippers); and logistics company partners (firms that hire freight carriers and manage freight shipments for shippers). There is also an 'affiliates' category for organisations that do not fall into these categories but want to participate in SmartWay. Note that deep sea shipping is not included into the scope at this moment, however SmartWay has a memorandum of understanding (MoU) with the Clean Cargo Working Group to include their ocean going freight trade lane emission factors into SmartWay, and SmartWay is initiating coding changes in the tools and database to execute on this aspect. Emissions from transhipment points (e.g. ports, hubs, DCs) are not included into the scope at the moment. However, SmartWay is exploring the potential to include emissions from distribution hubs.

The headline incentive from SmartWay (to encourage voluntary participation) is an integrated set of no-cost, peer-reviewed sustainability accounting and tracking tools to help companies make informed freight transport choices. These tools are then supposed to help registered partners to measure, benchmark, and report emissions and to improve freight efficiency and environmental performance across their supply chain.

SmartWay computes different KPIs for the different user types as shown directly below[288]:

[288] Davydenko, I., et al. "Towards harmonization of Carbon Footprinting methodologies: a recipe for reporting in compliance with the GLEC Framework, Objectif CO2 and SmartWay for the accounting tool BigMile™." TNO Report 11486 (2019).

Table 109: SmartWay KPIs

Emission measurement unit measured per year per pollutant (CO_2, NO_x, PM_{10}, $PM_{2.5}$, black carbon)	**Shipper**	**Logistics company**	**Multimodal carrier[21]**	**Air carrier[22]**	**Truck carrier[23]**	**Rail carrier[24]**	**Barge carrier[25]**
tonnes (total emissions)	■	■	■	■	■	■	■
g/mile	■	■	■	■	■		■
g/tonne-mile	■	■	■			■	■
g/average payload tonne-mile				■	■		
g/thousand cubic foot-miles					■		
g/thousand utilized cubic foot-miles					■		
g/railcar-mile						■	
g/truck-equivalent-mile						■	

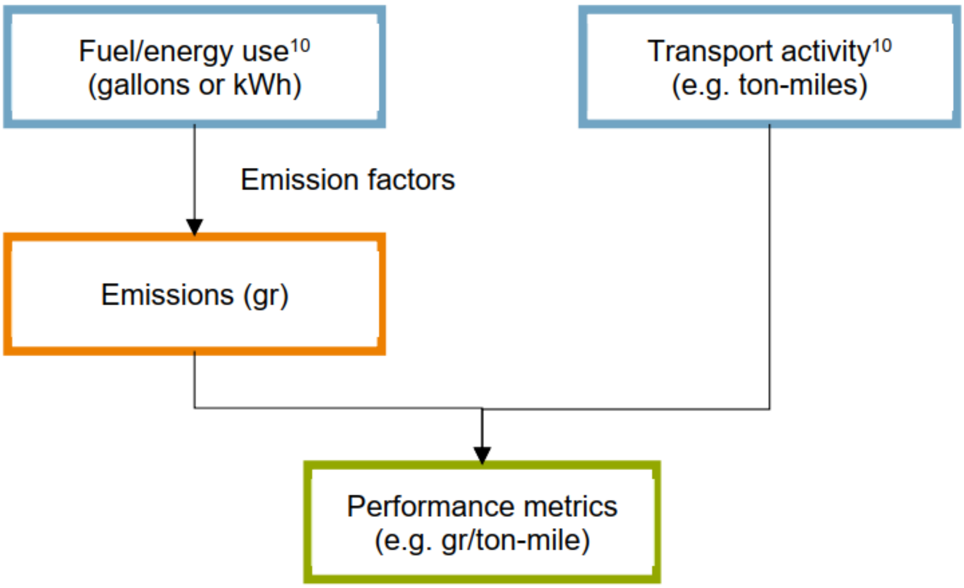
Source: Ecorys and CE Delft (2023), Impact assessment support study

Methods and tools

SmartWay is centred on the use of tools, which are mentioned in the previous section. The computations are hidden from the user. The underlying detailed methodology is provided in the documents related to each tool, which can be found (updated each year) on the SmartWay website.

The general SmartWay methodological approach is similar to other common carbon accounting methods for freight transport (e.g. GLEC). Fuel and energy use are converted to emissions, which are divided by the transport activity to calculate the performance metrics. Both fuel/energy use and transport activity are input per year and then disaggregated:

Figure 13: SmartWay approach



Source : Ecorys and CE Delft (2023), Impact assessment support study

It should be noted that the SmartWay methodology enables to produce not only CO2 emission output, but also computes emissions of other pollutants (NOx, PM2.5, PM10 and black carbon). SmartWay provides a conversion table for the quantity of fuel expressed in gallons to be converted into grams of CO2. The table provides Tank-To-Wheel (TTW)[289] conversion factor for CO2 emissions[290]. Emissions related to cooling (e.g. reefer) are also included in the calculation. It should be noted that SmartWay does not include any guidance on emissions related to infrastructure and vehicles production chain.

Impacts and costs

The impacts associated with the implementation of SmartWay have been reported by EPA since 2004. SmartWay currently (as of 2022) claims to generate a saving of 357 million barrels of oil- equivalent along with the avoidance of 152 million metric tons of CO2, 2.7 million short tons of NOx, and 112,000 short tons of PM since 2004 by its partners.[291] SmartWay further claims a total fuel cost saving for the industry of USD 47.6 billion, which contributes directly to lower consumer costs. The program highlights that the distribution of positive impacts is overwhelmingly in communities near ports, borders

---

[289] Davydenko, I., et al. "Towards harmonization of Carbon Footprinting methodologies: a recipe for reporting in compliance with the GLEC Framework, Objectif CO2 and SmartWay for the accounting tool BigMile™." TNO Report 11486 (2019).

[290] https://app4.erg.com/smartwayweb/portal/download/SmartWay_2021_LTL_Carbon_Calculator_Technical_Documentation.pdf

[291] See: https://www.epa.gov/smartway/smartway-program-successes; or alternatively the SmartWay Program Highlights for 2022 at https://www.epa.gov/system/files/documents/2023-02/420f23007.pdf

and truck stops. However, the methodology used to arrive at these figures is not officially provided.

There has not been a large amount of detail collected on costs associated with SmartWay. The EPA budget allocated directly to SmartWay is not revealed as a line item in EPA budget plans. However, it is assumed that between 2004 and 2011 the program reportedly provided more than USD 30 million in financing to help truck owners, especially small- and medium-sized firms, buy cleaner, more fuel-efficient trucks. It had a direct administrative budget over that period of USD 1.5 million.

The participating stakeholders classify economic costs in three distinct categories: administrative, investment and ongoing operational.

Administrative costs: participation in the SmartWay program requires time and resources for data collection, emissions accounting, and reporting. These efforts may include staff time, software, and training expenses. Although these are limited with the use of centralised tools. In addition to the resource demand imposed on carriers, the SmartWay team at EPA expend a sizable percentage of their staffing budgets on administrative activities to ensure collection and management of good quality data from the partners (access to this data is a large part of the value of the program).

Investment costs: to improve environmental performance, participants invest in more fuel-efficient vehicles, technologies, or infrastructure. Primarily to reduce fuel use or freight activity. Examples include the adoption of aerodynamic equipment, low-rolling-resistance tires, or anti-idling technologies. These activities result in additional capital costs, but these costs are arguably taken based on more transparent and precise information related to the future emissions reduction and the associated costs savings.

Ongoing operational costs: Companies may face higher ongoing operational costs, such as increased maintenance expenses or additional training for drivers to adopt more fuel-efficient driving practices. Again, these costs are evidently incurred based on more transparent and precise information stemming from the calculated levels of emissions.

The evolution of costs associated with data collection

One of the most critical elements of SmartWay is the data collection and benchmarking. Trucking companies that participate in SmartWay are responsible for completing annual reports that require data related to operations, including fleet composition, activity summaries, fuel consumption, etc. These reports are prepared manually and the time needed to complete SmartWay submissions varies from a few hours up to several days according to stakeholder interviews[292]. The variation results from: the fleet's size and sophistication (in its data recording practices); and familiarity with the SmartWay reporting process.

[292] Sharpe, Ben. "Modernizing data collection and reporting methods for the SmartWay Program." (2019).

The emergence of IT technologies, driven to a large extent by regulatory requirements that commercial drivers maintain electronic logs, provides a strong future opportunity to standardise and automate data collection, management and reporting processes. In addition to providing location tracking, telematics systems and electronic logging devices (ELDs) connect to on-board diagnostic (OBD) ports in vehicles and thus have access to the extensive operations data collected by various systems such as the engine, emissions aftertreatment systems, transmission and driveline, and chassis.

Data collection and quality assurance represents a significant percentage of fleets' overall time spent engaging with the SmartWay program. Automating SmartWay data collection and submission is a value proposition for fleets, SmartWay staff, and telematics providers. All of the interviewees in 2019 research conducted by Ben Sharpe expressed a desire for SmartWay to modernize the data collection and reporting methods[293]. The fleet and trucking association representatives stated that automating much of the SmartWay data process could save them time and money and allow them to participate more fully in the program.[294] A common theme in the interviews was also that data privacy must be a major focus if automatic data collection is to be successfully implemented.[295] A telematics company interviewed, reported that they would soon market automatic SmartWay report creation to prospective customers. Costs are expected to reduce.

Benefits

As summarised earlier, among the benefits claimed to result directly from the program are:

- Fuel savings: By adopting more fuel-efficient technologies and practices, companies can save on fuel costs. According to the EPA, from 2004 to 2022, SmartWay partners saved over 357 million barrels of oil, which translates to a cost savings of more than USD 47.6 billion.
- Emission reductions: SmartWay partners have significantly reduced their emissions, improving air quality and mitigating climate change. As of 2022, the EPA reported that partners had prevented the 152 million metric tons of CO2, 2.7 million short tons of NOx, and 112,000 short tons of PM.
- Enhanced reputation: By participating in the initiative, companies can demonstrate their commitment to sustainability and environmental responsibility. This can lead to improved brand image, customer loyalty, and potential business opportunities.
- Cost-sharing and collaboration: Participation in the SmartWay Initiative provides opportunities to collaborate with other stakeholders, share best practices, and access resources to reduce the costs associated with implementing sustainable solutions. SmartWay enables companies across the supply chain to exchange performance data.

---

[293] Sharpe, Ben. "Modernizing data collection and reporting methods for the SmartWay Program." (2019).
[294] Sharpe, Ben. "Modernizing data collection and reporting methods for the SmartWay Program." (2019).
[295] Sharpe, Ben. "Modernizing data collection and reporting methods for the SmartWay Program." (2019).

With consistent, quality-checked information and tools, SmartWay helps companies spend less time figuring out their freight supply chain footprints.

- Regulatory compliance: By proactively reducing emissions and adopting cleaner technologies, companies can stay ahead of potential future regulations and avoid potential fines and penalties.

While all other benefits are claimed by the program itself, recent (2023) research by Scott and co-authors evaluates the SmartWay Program by using a method to assess the investment decisions and performance of the SmartWay partner (trucking) companies against non-partner companies[296]. The results demonstrate that participation in the EPA SmartWay program can facilitate a significant reduction in greenhouse gas emissions, especially due to investments in newer trucks and cleaner technologies. The analysis estimated that between 2012 and 2019 the SmartWay Program reduced commercial transport-related emissions from operations by 25.2 million metric tons of CO2 (equivalent of almost 15.2 billion truck-miles) by increasing the incentive to invest in newer, cleaner trucks alone. These research results suggest the EPA program level claims are credible.

2- Case study of the SNCF GHG calculation methodology for transport services: application of Article L. 1431-3 of the French Transport Code[297]

Brief description

The calculation methodology used by the SNCF complies with the methodological guide published by the French government as regards the calculation and declaration of GHG emissions of transport[298].

In order to promote lowest emissions in transport, Article L.1431-3 of the French Transport Code establishes that any persons who market or organize a transport service for people, goods or removals must provide the beneficiary of the service with information on the quantity of GHG emitted by the mode or modes of transport used to provide this service. Articles from D. 1431-1 to D. 1431-23 of the Code set the calculation principles common to all modes of transport. They specify the procedures for informing the beneficiary as well as the timetable for implementing the provisions. The methodology is based on the European standard relating to the calculation and declaration of energy and GHG emissions from transport services (CEN EN 16258).

The quantities of GHGs taken into account are those emitted during the operation of modes of transport and those originating from the upstream phase of production of energy sources (e.g., refining, transport, distribution, etc.). The information on the

---

[296] Scott, Alex, et al. "Do voluntary environmental programs matter? Evidence from the EPA SmartWay program." Journal of Operations Management 69.2 (2023): 284-304.

[297] SNCF (2022). Greenhouse gases information for transport services, Social, Territorial and Environmental Commitment Department. Link available here

[298] See *Méthodologie pour le calcul et la déclaration de la consommation d'énergie et des émissions de gaz à effet de serre (GES) des prestations de transport (fret et passagers)* (2012). Document available here

quantity of GHG emitted is determined for each segment of the itinerary travelled during the transport activity.

GHG accounting: drivers, scope, choices in accounting methodology

The French Transport Code describes the general methodology allowing a transport company to calculate the quantity of energy consumed for each segment of the itinerary, by performing the product of the distance-based energy consumption rate of the mode of transport used by the distance travelled. The quantity of energy is multiplied by an emission factor specific to each type of energy. This factor establishes the correspondence between the quantity of energy consumed and the quantity of GHG emitted. The values of the GHG emission factors of the various energy sources are available on the website of the relevant authority: Agence de l'environnement et de la maîtrise de l'énergie (ADEME).

When it comes to the GHG calculator of the SNCF, emissions of rail passenger activities are estimated by multiplying the distance travelled[299] by the average amount of CO2e emitted per passenger-km, according to the type of train operated. Notably, the SNCF GHG calculator distinguishes 4 main types of trains: TGV, Intercités, TER and Transilien.

For each type of train, the average amount of CO2e emitted per km travelled is calculated for each year by dividing the energy consumption of the previous year (applying a CO2e emission factor according to the type of energy)[300] by the average volume of passengers transported during the previous year and the distance they travelled (i.e., passenger-km based on scope 3 input data). Accordingly, the calculation methodology provides the amount of GHG emitted as follows.

$$GHG\ emissions\ \left(\frac{gCO2e}{km}\right) = \frac{\sum \begin{matrix} electricity\ consumption\ \cdot electricity\ emission\ factor + \\ diesel\ consumption\ \cdot diesel\ emission\ factor + \\ biodiesel\ consumption\ \cdot biodiesel\ emission\ factor \end{matrix}}{passenger \cdot km}$$

Following a methodological change introduced by the ADEME for the electricity emission factor, the SNCF has chosen to introduce the average national energy mix value and no longer use a specific value for rail traction electricity. On the one hand, this methodological choice allowed the SNCF to harmonise the calculator with the existing international practices. On the other hand, it determined an increase of the French emission factors, as shown in Table 110

Table 110: Emission factors by type of passenger train service (gCO2e/kWh)

Time	Intercites	TGV	Transilien	TER
Before 2019	**5.29**	**1.73**	**4.75**	**24.81**
After 2019	6.73	2.71	7.04	26.93

[299] The distance travelled is taken from the kilometric databases for the rail lines.
[300] Line losses and all empty journeys are included in the calculations.

Variation	27.2%	56.6%	48.2%	8.5%

Source: SNCF (2022)

Eventually, according to the implementing Decree No 2017-639 of 26 April 2017, the emission factors are as follows:

- Electricity for transport: 60.7 gCO2/kWh in 2019 and 59.9 gCO2/kWh in 2020;
- Off road diesel with emission factor: 3.16 kgC02/litre; and
- Biodiesel B100: 1.21 kgCO2e/litre.

Multimodal aspects of passenger transport services are also considered by the methodology developed by the SNCF. In this respect, for the SNCF's passengers travelling with the use of other transport modes, the methodological approach is as follows:

- For coaches the figures are calculated by the company providing the service, but if the actual data is not available, the SNCF methodology is applied using emission factors provided by the SNCF.
- For taxis, cars rented with driver and other transport on demand, the figures are calculated by the owner of the company, based on the ADEME fuel consumption and CO2e emissions factors.
- For urban collective transport, the figures used in the SNCF calculator are provided by the RATP, the regional transport operator of Île-De-France, and the SNCF provides information to RATP regarding figures for regional service Transilien.[301]

Table 111 and Table 112, respectively, outline the emissions factors developed for passengers travelling by SNCF trains (domestic and international) and by collective transport, road and air services. The tables show also how the emission factors have evolved over time.

Table 111: Emissions for SNCF passengers (gCO2e/km)

Type of service	Type of train	2016	2021	2022
Domestic	Intercites	10.80	5.29	6.73
	TGV INOUI	n. a.	1.90	2.99
	TGV OUIGO	3.20	0.73	1.15
	Transilien	5.80	4.75	7.04
	RER	5.80	4.10	6.20
	TER	29.70	24.81	26.93

[301] See also dedicated page on SNCF website

International	Thalys	11.60	6.68	7.32
	Eurostar	8.20	6.64	7.48
	Lyria	3.20	2.05	3.23
	RENFE and SNCF in cooperation	27.00	5.40	6.00
	DB and SNCF in cooperation	11.30	4.50	5.00
	TGV INOUI Italia	n. a.	8.50	10.30

Source: SNCF (2016, 2021, 2022)

Table 112: Emissions for passengers travelling by other transport modes (gCO2e/km)

Transport mode	2016	2021	2022
Metro	3.8	2.5	3.8
Tramway	3.3	2.2	3.4
Bus RATP	96.5	98.0	104.0
Bus other operators	n. a.	110.0	110.0
Coach interurban	171.0	146.0	146.0
Car average	162.0	111.0	111.0
Car short distance	148.0	134.0	134.0
Car long distance	90.0	75.0	75.0
Domestic flight < 500 km	168.0	167.0	167.0
Domestic flight 500-1000 km	n. a.	126.0	126.0

Source: SNCF (2016[302], 2021[303], 2022)

Other considerations

Between 2019 and 2021, the ADEME has set up a working group to calculate the carbon impact of vehicle manufacturing for inclusion in the transport emissions factors. The SNCF has contributed to this workgroup. These factors are now available in ADEME's Base Carbone in the 'All data' category. However, these emission factors are not taken into account in the regulations of Article L1431.3 of the Transport Code and are therefore not applicable in this context.

Impacts

The main impacts of the application of the SNCF calculator are associated with the environmental aspects. The use of the calculator results in principle in the improved awareness at company level, and also among the SNCF users. For the SNCF this is an important source of information, especially when it comes to plan and implement measures for low carbon transport services.

Based on the emissions factors provided in previous tables, **Error! Reference source not found.**Table 113 shows examples of CO2e emissions for passengers travelling on certain routes by SNCF trains compared to alternative journeys by car.

Table 113: Examples of CO2-eq. emissions for passengers travelling on certain routes by SNCF trains compared to alternative journeys by car

Type of train	Origin-Destination	Train		Alternative mode		
		Distance (km)	Emission (gCO2e/km)	Mode	Distance (km)	Emission (gCO2e/km)
TGV	Paris-Lyon	563	1.7	Car	466	35.0
	Paris-Lille	258	0.8	Car	226	17.0
	Bordeaux-Paris	617	1.8	Car	587	44.0
	Paris-Rennes	374	1.1	Car	350	26.3
	Marseille-Paris	883	2.6	Air	627	88.4
	Paris-Strasbourg	503	1.5	Car	488	36.6
	Paris-Nice	978	2.9	Air	674	95.0

302 SNCF (2016). Greenhouse gases information for transport services, Social, Territorial and Environmental Commitment Department (version dated 2016, July 8th).

303 SNCF (2021). Greenhouse gases information for transport services, Social, Territorial and Environmental Commitment Department (version 2021).

	Paris-Toulouse	713	2.1	Air	571	80.5
	Lyon-Marseille	381	1.1	Car	314	23.6
	Lille-Lyon	794	2.4	Air	558	78.7
OUIGO	Nantes-Paris	385	0.4	Car	386	29.0
	Lyon-Marseille	320	0.4	Car	314	23.6
	Avignon-Marne La Vallee	697	0.8	Car	702	52.7
Lyria	Paris-Geneve	692	2.2	Air	408	57.5
Thalys	Paris-Bruxelles	314	2.3	Car	312	44.0
Intercites	Clermont Ferrand-Paris Bercy	420	2.8	Car	425	31.9
	Limoges-Paris	400	2.7	Car	394	29.6
	Bayonne-Toulose	199	1.3	Car	300	22.5
TER	Paris-Trouville Deauville	281	7.6	Car	199	22.1
	Grenoble-Lyon	131	3.5	Car	113	12.5
	Marseille-Nice	218	5.9	Car	205	22.8
	Geneve-Lyon	129	3.5	Car	150	16.7
	Arcachon-Bordeaux	59	1.6	Car	72	8.0
Transilien	Paris-Gare de Lyon-Juvisy	20	0.1	Car	21	2.8
	Paris-Montp-Versaille-Chantiers	15	0.1	Car	26	3.5
	Paris Nord-Ermont-Eaubonne	14	0.1	Car	14	1.9
	Paris St. Lazare-La Defense	6	0.0	Car	8	1.1
	Magenta-Chelles-Gournay	18	0.1	Car	21	2.8

Source: SNCF (2022)

Taking into account estimates based on the calculator, the SNCF has identified a number of measures to achieve energy savings, improve energy performance and consume new non-fossil energies. According to SNCF's financial annual report[304], these measures constitute an opportunity to improve the share of rail and sustainable mobility in general,

[304] See SNCF (2022). Rapport Financier Annuel Groupe SNCF.

while providing services of passengers and goods. These measures can be summarised as follows:

- train the train drivers to implement eco-driving saving. According to company's estimations eco-driving would allow to save up to 10% energy on a journey;
- during parking, an idle rolling stock consumes 10-30% of the total consumption, depending on the transport activities. SNCF envisages to save 5-25% of current parking consumption implementing 'eco-parking' device on the passenger transport activity on all rolling stock, both electric and diesel. For example, the expected gain for a TER train, the regional passenger transport, is around 48 ktCO2e/year by 2025 (i.e., around 10% of CO2e emissions from TER trains);
- replace fossil fuels with bio-fuels. This measure includes tests carried out for the services operated between Paris and Granville in the second half of 2021. The analysis of the impacts of these operations is in progress, however the current deployment of biofuels (i.e., B100) is estimated to reduce GHG emissions from diesel trains by 60%;
- design and introduce lighter equipment and superstructures (e.g. catenary systems) and rolling stock with a lower environmental footprint.

3- Use cases for CountEmissions EU

Eco-labelling of transport services	
Aim	Inform stakeholders about the (relative) performance of transport operators.
How it works	Participating transport operators will report their emissions to the manager of the initiative. This manager processes the results of individual companies and rewards an ECO-label depending on their performance. A better GHG performance could result in a higher eco-label.
Example of a practice application	Lean and Green is a greening program which has started in the Netherlands around 2010 by the public initiative Connekt[305]. Since then more than 500 companies from 14 European countries have participated in the program. In the program, participants promise to reduce CO_2 emissions. For different emission reduction levels and associated efforts, performance ratings (stars) are awarded. This stimulates companies which want to continue with GHG emissions as they are able to demonstrate their progress. Also, companies are anonymously compared against competitors active in the same market. More information on Lean & Green can be found in Annex C of the Impact Assessment support study accompanying this report.
(Expected) GHG emissions reduction potential	ECO-labelling offers participants a reason to accelerate GHG emission reduction. For instance, companies participating in the Lean & Green program have reduced over 700 kton CO2 emissions since the start of Lean and Green, or about 0.7% of road transport emissions in the Netherlands.
Other benefits	Eco-labelling may incentivise transport operators and users to choose for more sustainable options (e.g. modal shift to more sustainable modes, increased transport efficiency, etc.). Depending on the actual choices made, this may have a positive effect on the other externalities (e.g. reducing air pollutant emissions, noise, congestion) as well, although it is difficult to predict the size and sign of this effect.
Sources used for the analysis	

[305] https://connekt.nl/

Smart Freight Centre (SFC, 2019a), Global Logistics Emissions Council Framework for Logistics Emissions Accounting and Reporting TK'Blue Agency (ongoing) Topsector Logistiek (2021), Richtlijn 18 – Benchmarken Topsector Logistiek (2022), Lean & Green Stakeholder interviews

Sustainable delivery B2C services	
Aim	The aim of using GHG emission data by sustainable delivery services is fourfold: • Show customers that the delivery company offers sustainable transport solutions; • Let customers be in control with regard to the environmental impact of the delivery of their goods (e.g. fast delivery: high CO_2 footprint, later delivery date: lower CO_2 footprint); • Create awareness about the GHG impact of customers' choices; • Optimise transport operations in terms of their environmental impact.
How it works	Based on the GHG emission figures, transport companies are able to calculate the impact of the different delivery services. GHG emissions of each individual delivery can be calculated and communicated. Companies can reduce the GHG emissions of their delivery services by optimising delivery routes and/or offer differentiated services based on their GHG impact. This can be realised by giving customers the opportunity to choose between different timeslots for delivery which makes it possible to, for example, optimise routing or choose between different modes of transport.
Example of a practice application	Multiple companies already apply this in practise. Example are DHL Go Green, UPS My Choice and Bewust Bezorgd (a Dutch initiative to calculate CO_2-emissions of delivery options of online retailers).
(Expected) GHG emissions reduction potential	The Netherlands is among the European countries with the highest e-commerce activity (83% of the population buy online). Which makes them a frontrunner with regard to B2C activities. While in the Netherlands delivery services of packages accounted for approximately 4% of the 3.6 Mtons of CO2 resulting from city

	logistics in 2015 (Topsector Logistiek, 2017), this share is growing and therefore the sustainable delivery services may become an important contributor toward emissions reduction in urban areas.
Other benefits	Better utilisation of transport infrastructure capacity, positive impact on noise and other externalities, improved environmental awareness of customers.
Sources used for analysis	
Ignat & Chankov (2020) Pereira Marcilio Nogueira et al. (2022) Topsector Logistiek (2017) Outlook City Logistics 2017 Stakeholder interviews	

Permit to enter Low or Zero emission zones	
Aim	To create a healthier environment for the inhabitants and to contribute to reaching climate reduction targets, city authorities may decide to introduce a low or zero emission zone for all or a selection of vehicles.
How it works	The Low or Zero emission zone is a predefined area in which vehicles that emit more than allowed are prohibited to enter. Checks by the local enforcement agencies can be automated via cameras and related software (licence plates), or manual based on supplied permits.
Example of a practice application	Low emission zones are already common practise in multiple countries, like the United Kingdom (London and Glasgow), Belgium (Antwerp and Brussels), France (Paris), Germany (Berlin and Munich), Spain (Barcelona and Madrid), Italy (Rome and Milan) and the Netherlands (Amsterdam, Rotterdam and Utrecht). Zero emission zones are announced for over thirty cities in the Netherlands for freight transport entering the zone, which is in most cases the city centre. Also in China such zones for freight transport are planned (e.g. Shenzen, Foshan and Luoyang).
(Expected) GHG emissions reduction potential	Currently, the zones are in general focused more on air pollutants, than GHG emissions. The entry requirements are often based on Euro classes from type approvals of vehicles. One of the reasons for this situation is that standard combustion engines can run also on biofuels (besides diesel) and that it is difficult to account for differences in fuel types. However, using information on GHG

	emission to establish specific entry requirements may also be considered to further increase the potential of a zone. Given that total CO_2 emissions from city logistics in the Netherlands was around 3.6 Mtons per year (with a bandwith of 2.7-4.5 Mtons, the impact of the introduction of 30-40 zero emission zones in the largest cities in the Netherlands is estimated to be around 1 Mton of CO_2 to be saved (PBL, 2021). On a city level De Bok et al. (2020) concluded, based on a simulation study for Rotterdam, that GHG emissions from transport operations can be potentially reduced by 90% within the zero emission zone, compared to the current 10% reduction in the total Rotterdam area.
Other benefits	Further reduction of other externalities, new sustainable business models and concepts that may result in less traffic (e.g. through cargo bundling) but also in more traffic in the city (e.g. through the use of light electric vehicles which have less loading capacity).
Sources used for analysis	
(CE Delft, 2016) , De omvang van stadslogistiek (De Bok et al., 2020), Simulation of the impacts of a zero emission zone on freight delivery patterns in Rotterdam (ICCT, 2021b) , A global overview of zero-emission zones in cities and their development progress (PBL, 2021), Klimaat en Energieverkenning 2021	

Green public procurement	
Aim	Governmental organisations can be a driving force behind the transition towards zero or low emission transport. Not only through imposing environmental regulations, but also by establishing specific requirements in the public procurement procedures, e.g. related to the maximum amount of GHG emissions which are allowed for the requested transport services. If a transport company cannot comply with these requirements, it does not qualify as a supplier.
How it works	Governmental organisations tend to procure a large amount of services. Due to the size of a procured service or amount of assets involved (in case public services require their own vehicles to execute the service), governmental organisations are able to influence the operations of the service provider. Where the assignment is large enough, transport companies are be able to adjust their fleet and/or operations to fulfil the demand and get the contract.
Example of a practice application	Currently, the main factor behind green procurement of transport services in the EU is the Clean Vehicle Directive, which sets national targets for the share of clean vehicles in the total number of vehicles procured by all types of governments. However, specific GHG emission targets for procured transport services may be an important enabler to increase the potential of green procurement in reducing transport related emissions.
(Expected) GHG emissions reduction potential	The impact assessment of the Clean Vehicle Directive indicates that a decrease of 17% of CO_2-emissions is possible on all vehicles procured and subsequently utilised by governments. By using targets defined in amounts of GHG emissions per transport services, this reduction potential could be further increased.
Other benefits	Higher share of clean vehicles may result in lower levels of air pollutant emissions.
Sources used for analysis	
(EC, 2009b), Staff Working Document Impact Assessment of a Directive amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles (Lindfors & Ammenberg, 2021) Using national environmental objectives in green public procurement: Method development and application on transport procurement in Sweden	

Stakeholder interviews