European Commission

JRC TECHNICAL REPORT

Revision of the EU Green Public Procurement Criteria for Road transport

Technical report and criteria proposal
Draft

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1 Introduction

1.1 Green public procurement

Public authorities' expenditures in the purchase of goods, services and works (excluding utilities and defence) constitute approximately 14% of the overall Gross Domestic Product (GDP) in Europe, accounting for roughly EUR 1.8 trillion annually (European Commission, 2016).

Thus, public procurement has the potential to provide significant leverage in seeking to influence the market and to achieve environmental improvements in the public sector. This effect can be particularly significant for goods, services and works (referred to collectively as products) that account for a high share of public purchasing combined with the substantial improvement potential for environmental performance. The European Commission has identified (road) transport as one such product group.

Green Public Procurement (GPP) is defined in the Commission's Communication "COM (2008) 400 - Public procurement for a better environment" as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured."

Therefore, by choosing to purchase products with lower environmental impacts, public authorities can make an important contribution to reducing the direct environmental impact resulting from their activities. Moreover, by promoting and using GPP, public authorities can provide industry with real incentives for developing green technologies and products. In some sectors, public purchasers command a large share of the market (e.g. public transport and construction, health services and education) and so their decisions have considerable impact. In fact, in the above mentioned Commission's communication the capability that public procurement has to shape production and consumption trends, increase demand for "greener" products and services and provide incentives for companies to develop environmental friendly technologies is clearly emphasised.

EU GPP is a voluntary instrument, meaning that Member States and public authorities can determine the extent to which they implement it.

The development of EU GPP criteria aims to help public authorities ensure that the goods, services and works they require are procured and executed in a way that reduces their associated environmental impacts. The criteria are thus formulated in such a way that they can be, if deemed appropriate by the individual authority, integrated into its tender documents with minimal editing.

GPP criteria are to be understood as being part of the procurement process and must conform to its standard format and rules as laid out by Public Procurement Directive 2014/24/EU (public works, supply and service contracts). Hence, EU GPP criteria must comply with the guiding principles of: Free movement of goods and services and freedom of establishment; Non-discrimination and equal treatment; Transparency; Proportionality and Mutual recognition. GPP criteria must be verifiable and it should be formulated either as Selection criteria, Technical specifications, Award criteria or Contract performance clauses, which can be understood as follows:

Selection Criteria (SC): Selection criteria refer to the tenderer, *i.e.*, the company tendering for the contract, and not to the product being procured. It may relate to suitability to pursue the professional activity, economic and financial standing and technical and professional ability and may- for services and works contracts - ask

specifically about their ability to apply environmental management measures when carrying out the contract.

Technical Specifications (TS): Technical specifications constitute minimum compliance requirements that must be met by all tenders. It must be linked to the contract's subject matter (the 'subject matter' of a contract is about what good, service or work is intended to be procured. It can consist in a description of the product, but can also take the form of a functional or performance based definition) and must not concern general corporate practices but only characteristics specific to the product being procured. Link to the subject matter can concern any stage of the product's life-cycle, including its supply-chain, even if not obvious in the final product, *i.e.*, not part of the material substance of the product. Offers not complying with the technical specifications must be rejected. Technical specifications are not scored for award purposes; they are strictly pass/fail requirements.

Award Criteria (AC): At the award stage, the contracting authority evaluates the quality of the tenders and compares costs. Contracts are awarded on the basis of most economically advantageous tender (MEAT). MEAT includes a cost element and a wide range of other factors that may influence the value of a tender from the point of view of the contracting authority including environmental aspects (European Commission, 2016). Everything that is evaluated and scored for award purposes is an award criterion. These may refer to characteristics of goods or to the way in which services or works will be performed (in this case they cannot be verified at the award stage since they refer to future events. Therefore, in this case, the criteria are to be understood as commitments to carry out services or works in a specific way and should be monitored/verified during the execution of the contract via a contract performance clause). As technical specifications, also award criteria must be linked to the contract's subject matter and must not concern general corporate practices but only characteristics specific to the product being procured. Link to the subject matter can concern any stage of the product's life-cycle, including its supply-chain, even if not obvious in the final product, *i.e.*, not part of the material substance of the product. Award criteria can be used to stimulate additional environmental performance without being mandatory and, therefore, without foreclosing the market for products not reaching the proposed level of performance.

Contract Performance Clauses (CPC): Contract performance clauses are used to specify how a contract must be carried out. As technical specifications and award criteria, also contract performance clauses must be linked to the contract's subject matter and must not concern general corporate practices but only those specific to the product being procured. Link to the subject matter can concern any stage of the product's life-cycle, including its supply-chain, even if not obvious in the final product, *i.e.*, not part of the material substance of the product. The economic operator may not be requested to prove compliance with the contract performance clauses during the procurement procedure. Contract performance clauses are not scored for award purposes. Compliance with contract performance clauses should be monitored during the execution of the contract, therefore after it has been awarded. It may be linked to penalties or bonuses under the contract in order to ensure compliance.

For each criterion there is a choice between two levels of environmental ambition, which the contracting authority can choose from according to its particular goals and/or constraints:

The **Core criteria** are designed to allow easy application of GPP, focussing on the key areas of environmental performance of a product and aimed at keeping administrative costs for companies to a minimum.

The **Comprehensive criteria** take into account more aspects or higher levels of environmental performance, for use by authorities that want to go further in supporting environmental and innovation goals.

As said before, the development of EU GPP criteria aims to help public authorities ensure that the goods, services and works they require are procured and executed in a way that reduces their associated environmental impacts and is focused on the products' most significant improvement areas, resulting from the cross-check between the key environmental hot-spots and market analysis. This development also requires an understanding of commonly used procurement practices and processes and the taking on board of learnings from the actors involved in successfully fulfilling contracts.

For this reason, the European Commission developed a process aimed at bringing together both technical and procurement experts to collate a broad body of evidence and to develop, in a consensus oriented manner, a proposal for precise and verifiable criteria that can be used to procure products with a reduced environmental impact.

1.1 Revision objectives

Based on this process, the EU GPP criteria for road transport were revised and finally published in January 2019. (https://ec.europa.eu/environment/gpp/pdf/criteria/transport.pdf). Another revision process for the 2019 EU GPP criteria has been launched in 2020.

The reason why the EU GPP criteria for road transport needs an early revision is the following: the criteria were developed in parallel to the revision of the Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles (Clean Vehicle Directive or CVD). Both processes were carried out ensuring the harmonisation of both policy instruments, however, due to different timeframes, the EU GPP criteria were published before the revision of the Clean Vehicle Directive was finalised. The Services of the European Commission in charge of the policies agreed that the EU GPP would be adjusted to the changes that the rest of the revision of the CVD could lead.

As result of the approval of the Directive (EU) 2019/1161 of the European Parliament and of the Council of 20 June 2019 amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles (revised CVD), the EU GPP criteria for Road transport require some adjustments in order to achieve a full harmonisation of both public procurement policy instruments. These adjustments mainly affect to the criteria on GHG emissions, while the rest will not be modified. The main differences between both policy instruments are gathered in Annex I. As voluntary tool, EU GPP ambition level will be equal or higher than the revised CVD, and it will cover criteria on other aspects, such noise, lubricants and management.

The revision process will consist of a written consultation of the draft technical report and the revised criteria proposal. Stakeholders will provide comments on the draft in June/July 2020 and the process is expected to be finalised by the end of 2020.

This technical report is the first draft of the revised criteria proposal and contains the information and rational that support this proposal. The report is published for written consultation at http://susproc.jrc.ec.europa.eu/Transport/documents.html. Stakeholders' feedback will be collected and integrated in the final version of the technical report and criteria proposal.

2 Scope and definitions

The scope of the current EU GPP criteria of road transport covers the following products and services:

- Purchase, lease or rental of cars, light commercial vehicles (LCVs) and L-category vehicles.
- Provision of mobility services.
- Purchase or lease of buses.
- Provision of public bus services.
- Purchase or lease of waste collection trucks.
- Provision of waste collection services.
- Provision of post, courier and moving services.

These categories are supported by the following definitions which set the references needed by contracting authorities to determine the subject matter of their contracts:

1) 'Purchase, lease or rental of cars, light commercial vehicles (LCVs) and L-category vehicles':

The information available regarding short term renting services shows that these services offer very young vehicles, which are usually below one year old. Therefore, renting services are proposed to be part of category 1.

- 'Cars and LCVs': M_1 and N_1 vehicles, as defined by Directive 2007/46;
- 'L-category' vehicles as defined by Regulation 168/2013.

2) 'Mobility services':

Mobility services involve buses, cars, LCVs and L-category vehicles. As part of these criteria, the following definitions might be applied:

- 'Special-purpose road passenger-transport services' as covered by common procurement vocabulary (CPV) code 60130000-8
- 'Non-scheduled passenger transport' as covered by CPV code 60140000-1. This should cover contracted public transport services (public transport contracted out to taxi companies, i.e. transport carried out for pupils/students who are not able to travel by themselves).
- 'Hire of buses and coaches with driver' as covered by CPV code 60172000-3
- 'Taxi services' as covered by CPV code 60120000-5.
- 'Car sharing': in this category, an organisation owns the vehicles and the platform. It is usually more standardised and reliable than the peer services, and some carmakers have an associated car sharing company.
- 'Combined mobility services' (CMS): services based on a new business model that offer a wide range of combined mobility options and offer it to users based on subscription and unified invoicing, possibly also with the services offered as packages adapted to the customer's needs, for example, a package of the trips usually done along the week. CMS are supported by some form of digital interface for the customer (app, web-based service etc.).
- 'Cycles': bicycles (CPV codes 34430000-0 and 34431000-7), cycle trailers, electrically power-assisted cycles (CPV code 34420000-7),
- 'Light electric vehicles and self-balancing vehicles' whose specific definitions are under development by CEN/TC 354 /WG 4.
- Definitions of cars, LCVs, L-category vehicles and buses also apply to this category

3) 'Purchase or lease of buses':

- 'M_2 and M_3 vehicles, as defined by Directive 2007/46.

- Category M_2: vehicles designed and constructed for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum mass not exceeding 5 tonnes.
- Category M_3: vehicles designed and constructed for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum mass exceeding 5 tonnes

Further definitions have been identified in the Consolidated Resolution on the Construction of Vehicles developed by the UNECE (UNECE, 2014)

For vehicles having a capacity exceeding 22 passengers in addition to the driver, there are three classes of vehicles:

- "Class I": vehicles constructed with areas for standing passengers, to allow frequent passenger movement.
- "Class II": vehicles constructed principally for the carriage of seated passengers, and designed to allow the carriage of standing passengers in the gangway and/or in an area which does not exceed the space provided for two double seats.
- "Class III": vehicles constructed exclusively for the carriage of seated passengers.

For vehicles having a capacity not exceeding 22 passengers in addition to the driver, there are two classes of vehicles:

- "Class A": vehicles designed to carry standing passengers; a vehicle of this class has seats and must have provisions for standing passengers.
- "Class B": vehicles not designed to carry standing passengers; a vehicle of this class has no provision for standing passengers.

- Other definitions relevant were found in the UNECE resolution:
  - "Articulated bus or coach" is a vehicle which consists of two or more rigid sections which articulate relative to one another; the passengers compartments of each section intercommunicate so that passengers can move freely between them; the rigid sections are permanently connected so that they can only be separated by an operation involving facilities which are normally only found in workshop.
  - Articulated buses or coaches comprising two or more non-separable but articulated units must be considered as single vehicles.

The definition of the categories 4), 5), 6) and 7) would also make reference to the definitions of categories 1) , 2) and 3), where relevant, but also to CPV categories, as appropriate, i.e.:

4) 'Bus services':

- 'Bus services' or 'Public transport services': the services should be defined as those covered by CPV codes 60112000-6 (Public road transport services).

It is worth noting that these three CPV categories refer directly to the definition of public transport services in the public procurement Directives with the explicit exception of rail public transport services.

5) 'Waste collection trucks':

- Vehicles of category N_2 and N_3, as defined by Directive 2007/46, that are designed to provide services that fall into the CPV categories of 'Refuse collection services' (CPV code: 90511000-2) and 'Refuse transport services' (90512000-9).

6) 'Waste collection services':

- Services that fall into the CPV categories of 'Refuse collection services' (90511000-2) and 'Refuse transport services' (90512000-9)

7) 'Post, courier and moving services':

- Services that fall into the CPV categories for various postal, courier and moving services:
  - Group 641 Post and courier services, with the exception of rail, airmail and mail transport over water
  - 79613000-4 Employee relocation services
  - 63100000-0 Cargo handling and storage services
  - 98392000-7 Relocation services

'Mobility services' may need additional definitions to better define the nature of the subject matter. This product group concerns all kinds of services for mobility of public authorities' staff with vehicles that are (partly) driven by others, including different transport modes, as well as car sharing concessions. This includes for example taxi services but also broader mobility service packages as offered by some more advanced lease companies. Such packages can include access to cars or LCVs, but also 'L-category' vehicles (i.e. two-, three- and small four-wheeled vehicles), bicycles and cargo bikes, as well as access to car-sharing schemes, public transport cards or multi-modal transport cards, etc. One of the differences with the first category (purchase, lease or rental of cars, LCVs and L-category vehicles) is that this new category does not only include vehicles driven by public staff or elected representatives, but also driven by others, as for example taxi services. Another important difference is that the provision of mobility services involves the use of a service fleet.

For a better understanding of the mobility services or 'Mobility as a service' (MaaS) concept, the following definitions will be used in this report (Holmberg, et al., 2016):

- Simplified car ownership: it offers their customers to share the ownership of a car with other users.
- Peer transport services: it leverages the excess of capacity (empty seats during a trip) and shares it with users. The MaaS provider does not own the vehicles; it only provides the platform for the pairing. The main example is Uber.
- Car sharing: in this category, an organisation owns the vehicles and the platform. It is usually more standardised and reliable than the peer services, and some carmakers have an associated car sharing company.
- Extended multimodal planners: they combine all the available transport options with real time transport data in order to help users plan the most efficient route to their destination. Some services can go beyond just planning by allowing you to purchase the necessary tickets for the suggest route.
- Combined mobility services (CMS); services based on a new business model such as UbiGo and MaaS.fi that offer a wide range of combined mobility options and offer it to users based on subscription and unified invoicing, possibly also with the services offered as packages adapted to the customer's needs, for example, a package of the trips usually done along the week. CMS are supported by some form of digital interface for the customer (app, web based service etc.).
- Integrated public transport systems: they aim at designing public transport in a way that it can easily integrate other mobility offers (e.g. car sharing, bike sharing, taxis, etc.). In Austria, the SMILE-project 4 2014-2015, aimed to include public transport, urban mobility services and national railway in the same concept offering planning options and ability to book and obtain tickets in the same app without subscription or packaging.
- Mobility broker: this concept also offers mobility subscriptions but these services go one step further in that mobility is offered as part of the house rent. This

demands that mobility services be included in the initial planning process of apartment complexes or city areas. The drive for such services is to enable densification of cities without the need of a personal car. The Vinnova financed project "Dencity" aims at delivering a working concept for a Mobility Broker in Frihamnen, Gothenburg.

The scope proposal would cover those services that could be purchased by a public procurer using a tendering procedure. This would rule out peer transport services, extended multimodal planners and integrated public transport systems. Therefore, the category would include taxi services, car sharing and combined mobility services.

Proposal of scope rearrangement

A scope rearrangement is proposed in the technical report in order to simplify and streamline the different categories, in the light of the similarities of the criteria set of some categories. This is the case of the outsource of public bus services, waste collection services and post and courier services. These services are either directly provided by the public authorities or outsourced to third parties. If the latter, the criteria structure and content are very similar, therefore it is proposed that these three categories are aggregated in one category called 'Public road transport services'.

Another modification in the current scope is related to the category 'Purchase or lease of buses". The scope has been broadened to encompass any heavy duty vehicles, since the rational is very much based on data from trucks. Waste collection vehicle would be part of this category, including specific requirements only for this sub-type of vehicles. This modification fully aligns the scope of EU GPP with CVD.

The scope proposal would then cover the following categories:

- Purchase, lease or rental of cars, LCVs and L-category vehicles.
- Purchase of mobility services.
- Purchase or lease of heavy duty vehicles.
- Outsource of public road transport services
- Purchase of post, courier and moving services.

3 Market analysis

The size of the overall markets for the vehicles and services in the product groups covered by the revised EU GPP criteria, and the proportion of these markets that might be procured by the public sector, are summarised in Table 1. Of these figures, those for the size of the car and LCV market are most certain, as these are based on industry figures (ACEA, 2018), while the size of the post and courier market comes from a Eurostat. The other figures included in Table 1 are estimates for the EU, based on information for a small number of countries, or even a single EU Member State. For 'services' in particular, it was challenging to identify the scale of the EU market, and in many cases it was not possible to identify relevant information. Table 1 also includes the information provided in the Impact assessment of the revised CVD (SWD(2017) 366), which covers:

- estimations of the proportion of vehicles which is operated/purchased by the public sector according to ex-post evaluation of the CVD. This ex-post evaluation was based on surveys to contracting authorities.
- estimations of the proportion of vehicles which is operated/purchased by the public sector according to TED (Tenders Electronic Daily). These estimations are based on the average of tenders along 2009-2015 (Ricardo, 2017). TED covers the tenders whose values are above the thresholds set by the EU Public Procurements Directives for them to be published throughout the EU.

Table 1: The size of the respective markets and the role of the public sector in these

Vehicle/service	**Size of the EU market**	**Proportion of which is operated/purchased by the public sector[3)]** CVD Ex-post evaluation (annual average 2012-2014)	**Proportion of which is operated/purchased by the public sector[3)]** Purchases/leases/services) reported in TED (annual average for 2009-2015
Passenger cars	15.1 million vehicles (new registrations 2018) [1)]	3.4%	0.5%
Light commercial vehicles (including light buses and coaches)	2.1 million vehicles (new registrations 2018) [1)]	2.8%	0.61%
Buses and coaches (> 3.5t)	39 000 (new registrations 2018) [1)]	75%	43.11%
Medium and heavy commercial vehicles	386 700 (new registrations 2018)[1)]	6.4%	11.25%
Post and courier services	€100 billion (2016) [2)]		
Moving services	€4.9 billion (2018) [2)]		

[1)] (ACEA, 2018)
[2)] (Eurostat, n.d.)
[3)] SWD(2017) 366 (Impact assessment Revised CVD)

Within the ranges of estimates provided in Table 1, it might be concluded that the public sector is responsible for procuring a number of vehicles within a range from 150000 to 625000 a year, and relevant services that might have a value in the order of billions of Euros, particularly when considering that no information was available for bus or waste collection services.

Where information was available, it was clear that the vehicle markets are still dominated by vehicles using diesel and petrol, rather than those using alternative fuels. According to the data reported in TED, the share of alternative fuelled passenger cars is 4.7% of public purchases of these vehicles, and 1.7% in the cases of buses. The proportion of alternative fuelled commercial vehicles is below 0.5% of public purchases.

4 Key environmental hotspots and improvement options

The analysis of the environmental hotspots showed that for all categories the main environmental impacts are related to the use phase of the vehicles. The main impacts during the use phase are the GHG emissions, air pollutant emissions and noise.

Closely related to the use phase are the environmental impacts related to the production of energy carriers (liquid or gaseous fuels or electricity). The main environmental issues of the supply chain of energy carriers are GHG emissions and air pollutant emissions.

Other environmental impacts occur during vehicle manufacturing, which is more relevant for electric vehicles where the battery manufacturing is the most impacting component. The scientific literature shows a detailed insight into the environmental impacts of the life cycle of electric batteries. EEA report *Electric vehicles from life cycle and circular economy perspectives* (EEA, 2018) provides a comprehensive literature review related to on the environmental impact of BEVs across the stages of their life cycle. The key findings are the following:

GHG emissions

- BEV typically produces more GHG emissions at the production phase than its ICEV counterpart does. This stems from the raw material extraction and processing and the manufacture of the batteries. While GHG emissions from ICEV production range from 4 to 10 tCO2e/vehicle, BEV vary from 7 to 15 tCO2e/vehicle. The battery is responsible for around 40% of these emissions.
- GHG emissions at the use phase are much lower in BEV than ICEV, and can offset the increase of the production. The benefit of BEVs in the use phase depends strongly on the electricity mix. The current share of renewable sources in the EU mix already allows for GHG emissions savings, which will increase proportionally to the decarbonisation of electricity. If BEV were charged with electricity from coal power plants, BEV and ICEV would have equivalent GHG emissions (~ 160 gCO2e/km). However, if BEV were charged with electricity from wind power, BEV would have almost zero emissions at the use phase (1-2 gCO2e/km)
- For the end-of-life stage GHG emissions from both BEVS and ICEVS are low in terms of the overall life cycle, though the data is quite uncertain. The potential for reuse and recycling of vehicle components is a key area of further research and development

Air pollutant emissions

- Electricity generation also emits air pollutants (NOx, PM, SOx) emissions. However, contrary to GHG emissions, the location of these emissions makes a difference in terms of impact. If thermal power plants are located far from the urban areas, the contribution of power stations to regional background levels of air pollution, which also affect the air quality in cities, will probably be outweighed by a reduction in local emissions.
- In this regard, a scenario analysis modelled the replacement of ICEVs in the vehicle fleet with BEVs and PHEVs, based on the EU reference scenario 2013 (EC, 2013) and 2050 electricity mix. The model shows how this shift in the fleet composition will result in in an overall net benefit in terms of lower emissions of carbon dioxide (CO2) and the air pollutants nitrogen oxides (NOx) and particulate matter (PM); and an overall increase in sulphur dioxide (SO2) due to emissions from the coal power plants. However, these results did not take into account the new BATs for large thermal power plants, which set stricter EU standards by mid-2021. These targets and requirements may accelerate the phasing out of coal-fired power plants and reduce SO2 emissions.

Ecosystem impacts

- The effects of BEVs on freshwater ecotoxicity and eutrophication can be higher than for ICEVs because of the impacts associated with mining and processing metals and mining and burning coal to produce electricity.
- The proportion of low-carbon electricity generation is expected to increase both in Europe and in key battery production locations in the future, e.g. China, South Korea and Japan (EC, 2016; ICCT, 2018b), which will help to reduce these impacts.

Batteries are further studied in the Ecodesign prepatory study for batteries (VITO, Fraunhofer, Viegand Maagøe, 2019) which analysed several base cases of batteries used in different vehicles. The conclusion is that the production phase of the batteries, and particularly the cathode active material, has the biggest contribution on the total life cycle impact in all impact categories.
Ecodesign study used the EcoReport 2014 tool according to the Methodology for ecodesign of energy-related products (MEErP), however, the European Commission has developed as specific Product Environmental Footprint (PEF) method for rechargeable batteries tested in the Product Environmental Footprint (PEF) pilot. The PEF is a

harmonised methodology for the calculation of the environmental performance of products (i.e. goods and/or services) from a life cycle perspective. According to the comparison carried out in the Ecodesign study, the results of the PEF pilot are similar to the Ecodesign study.

5 Category 1: Purchase, Lease or Rental of Cars, LCVS and L-Category vehicles

5.1 Scope of the category

This category covers the purchase, lease or rental of:

- 'Cars and LCVs': M_1 and N_1 vehicles, as defined by Directive 2007/46;
- 'L-category' vehicles as defined by Regulation 168/2013.

Special purpose vehicles such as armoured vehicles are excluded from the scope.

5.2 Overview of the revision of the EU GPP criteria

The tables below show a summary of the revision proposal for the current EU GPP criteria of the category 'purchase and lease of cars and LCVs. The proposal is further described in the following sections. The common criteria for vehicle categories in Section 10 also apply.

	Purchase/lease/rental of cars, LCV and L-category vehicles				
		Criterion	**Core**	**Compr**	**Revision proposed**
TECHNICAL SPECIFICATIONS	1	CO_2 emissions and energy efficiency	X	X	Thresholds according to revised CVD
	2	Air pollutant emissions	X	X	Minor modifications to adjust to TS 1
	3	Gear shift indicators (GSI)	X		Removed due to modifications in TS1
	4	Energy consumption displays	X	X	No modifications
	5	Traffic information and route optimisation		X	No modifications
	6	Minimum warranty of the battery		X	Updated to market developments
AWARD CRITERIA	1	Lower CO_2 emissions	X	X	Removed due to modifications in TS1
	2	Energy efficiency	X	X	Extended to core level
	3	Improved air pollutant emissions performance	X		No compr level due to modifications in TS1
	4	Zero tailpipe emission capability	X		
	5	Speed limiter		X	No modifications
	6	Extended warranty		X	No modifications

5.3 Criteria proposal

5.3.1 CO_2 emissions and energy efficiency

5.3.1.1 Proposed criteria

Core criteria	**Comprehensive criteria**

<table>
<tr><th colspan="2">Technical Specification</th></tr>
<tr><td>TS1. Type-approval CO_2 value
Type-approval CO_2 emissions of vehicles must not exceed the following values:<table><tr><th>Vehicle type</th><th>CO_2 g/km</th></tr><tr><td>All M1 and N1 vehicles</td><td>Until 31 December 2025: 50 (WLTP)
From 1 January 2026: 0</td></tr></table>L-category vehicles must be battery electric.
Verification:
The tenderer must provide the vehicle’s certificate of conformity.</td><td>TS1. Type-approval CO_2 value
Type-approval CO_2 emissions of vehicles must not exceed the following values:<table><tr><th>Vehicle type</th><th>CO_2 g/km</th></tr><tr><td>All M1 and N1 vehicles</td><td>0</td></tr></table>L-category vehicles must be battery electric.
Verification:
The tenderer must provide the vehicle’s certificate of conformity.</td></tr>
<tr><td>Core criteria</td><td>Comprehensive criteria</td></tr>
<tr><td colspan="2">Award criteria</td></tr>
<tr><td>AC1. Lower CO_2 emissions
Points will be awarded to vehicles presenting lower type-approval CO_2 emissions than those required in TS1, in proportion to the reduction achieved.
Verification:
See above TS1</td><td></td></tr>
<tr><td colspan="2">AC2 Energy efficiency
Points will be awarded to those vehicles with best energy efficiency expressed in kWh/100km according to the and WLTP test procedure in 2019[1)]
Verification:
The tenderer must provide the vehicle’s certificate of conformity.</td></tr>
<tr><td colspan="2">[1)] A reduction of 10 Wh/km in the energy efficiency of a battery electric vehicle travelling an average of 10 000 km/year can save from EUR 15 to EUR 20 per year, depending on the electricity price.</td></tr>
</table>

5.3.1.2 Rationale

Incentives for electric vehicles

The use phase has the largest share in the GHG emissions of cars and LCVs. There are various technical options for reducing these emissions, either by making ICEVs more fuel-efficient, through hybridisation, or by switching to plug-in hybrid vehicles, full electric or fuel-cell vehicles. In the case of more efficient ICEV, the CO2 reduction targets set in the EU is a mandatory policy that already push the market towards more efficient conventional vehicles. However, electric vehicles require additional drivers to increase their share in the EU market, which is still very low. Sales of plug-in hybrid and battery electric vehicles each accounted for 1% of all new cars in 2018. Plug-in hybrid cars were quite successful in Sweden (6%), while battery electric vehicles reached the highest market share in the Netherlands (5%) (ICCT, 2020).

Therefore, requirements for CO_2 type approval values in EU GPP criteria are proposed to incentivise the purchase of the following types of vehicles, depending on the CO_2 value:

- Until 2025, plug-in hybrid electric vehicles and from 2026 onwards, full electric and fuel cell electric vehicles, at core level Plug-in hybrid electric vehicles will be a feasible option in those areas with insufficient charging points, while that infrastructure is developed.
- full electric and fuel cell electric vehicles, at comprehensive level.

This is in line with the definitions and timeline of the revised CVD (Annex I).

Costs of alternative powertrains

The cost of alternative vehicles depends on country specific incentives and tax schemes. An ICCT report (ICCT, 2018) compares the cost variation of electric cars in a group of countries (France, Germany, Netherland, Norway and UK). They found that consumer ownership costs for BEVs are lower than gasoline and diesel counterparts and PHEVs across the five markets, assuming a four-year lifetime and focusing on the top-selling models. This corresponds with subsidies or tax breaks for BEVs, most pronouncedly in Norway

In addition, the number of full electric and plug-in cars on the market will increase in the coming years. ICCT (ICCT, 2016a) estimated that the costs associated with Li-ion batteries were expected to drop: from €375 to €205 per kWh for PHEVs and €160 per kWh for BEVs in 2030 in the optimistic scenario, or €250 and €200 per kWh in the midrange scenario. This cost reduction would be derived from the replacement of high-cost materials and economies of scale, improvements to the cell and electrode structure design, and high-volume production processes with reduced wastage. IEA (IEA, 2017) shows that some manufacturers predicted even lower costs, up to €80 per kWh in 2022.

Tank-to-wheel (TTW) or Well-to-wheel (WTW)

The type approval CO_2 values only cover the tailpipe emissions during the use phase of the car (tank-to-wheel emissions, TTW). Another option would be a technical specification based on CO_2 type approval translated into WTW GHG emissions. This option would require setting values for calculating well-to-wheel (WTW) emissions based on recognised references In this case, WTT emission values would then need to be set for each fuel/energy carrier at EU level. Therefore, the application would become more complex, which was confirmed by the public procurers that participated in the last revision of the EU GPP criteria (JRC, 2019). TTW is preferred by public procurers since it is much easier to implement in a call for tender, and it is based on metrics used by all manufacturers and well known by the consumers. This is also in line with overall CO_2 legislation in the EU for vehicles. Later on, in the discussion on the purchase of buses, public procurers agreed that the fuel is not part of the call for tender to purchase the vehicles. In case there are fuel contracts or infrastructure installations involved, these are usually settled prior to the purchase of the vehicles. Therefore, the choice of WTW factors might entail some issues, since in most cases it is not possible to know the pathway of the fuels consumed. Note that it is even more complicated with passenger cars and LCVs compared to buses, because passenger cars/LCVs are more often not linked to any infrastructure.

The limitation of a criterion based on a TTW metric is that it does not provide incentives for improving the energy efficiency of BEVs (which in turn may reduce GHG emissions caused by electricity generation). This could be solved by setting an award criterion for those offers with higher energy efficiencies.

TTW option is not able to reflect the environmental benefits of the use of biomethane in natural gas vehicles. However, the WTW approach would not be a solution, since the refilling of the natural gas vehicles with biomethane depends on the type of fuel available

at the stations, and therefore it cannot be ensured. The use of a dedicated supply is not common practice in cars and LCVs. Besides, any measure that could entail an increase of natural gas demand by the EU fleet of LDVs should be evaluated cautiously since LDVs are responsible for 15% of the EU's emissions of CO_2 and 75% of the CO_2 emitted by road transport. Final energy demand from cars and powered two-wheelers is responsible for more than half of total final energy demand in transport, including rail and aviation (EC, 2016). Biomethane for transport competes with other final uses of biomethane and biogas, such as space and water heating and cogeneration, so even if the transport demand could be met with biomethane, the side effect may be an increase of fossil share in those competing final uses. Therefore, the biomethane supply would need to demonstrate additionality to ensure that the increase of demand does not generate a shortage elsewhere.

Verification

The Directive 2007/46/EC sets the legal framework for the type approval of the motor vehicles covered by the scope of the EU GPP criteria. According to this Directive, the manufacturers must issue a certificate of conformity which is a statement delivered by to the buyer in order to assure that the vehicle complies with the legislation in force in the European Union at the time it was produced. The certificate of conformity also enables the competent authorities of the Member States to register vehicles without having to require the applicant to supply additional technical documentation. The certificate of conformity includes among other data, the environmental performance of the vehicle (noise and air pollutant emissions, energy efficiency, CO_2 emissions, where applicable). This document is therefore proposed for the verification of criteria related to those environmental issues. An example of Certificate of Conformity can be consulted in Annex II.

5.3.2 **Air pollutant emissions**

5.3.2.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS2. Air pollutant emissions *Note: this criterion applies to M1 and N1 vehicles with a reference mass1) not exceeding 2 610 kg. M1 and N1 vehicles with a reference mass exceeding 2 610 kg will have to comply with TS2 Air pollutant emissions of category 3 (Section 7.3.2.1).* All new cars and LCVs must comply with an RDE emission performance which is at most equal to 0.8 times the Euro 6 limit values for NOx and PN (not including the applicable measurement margin[2)]). *If purchasing vehicles to be used in areas with air quality issues[3)]:* Vehicles must have zero tailpipe emissions. **Verification:** The tenderer must provide the vehicle's certificate of conformity.	**TS2. Air pollutant emissions**
Award criteria	
AC3. Improved air pollutant emissions performance (*Same for core and comprehensive)* *Note: this criterion applies to M_1 and N_1 vehicles with a reference mass not exceeding 2 610 kg. M_1 and N_1 vehicles with a reference mass exceeding 2 610 kg will have to comply with AC3 Improved air pollutant emissions performance of category 3 (Section 7.3.2.1).* Points will be awarded proportionally to the air polluting emissions performance to vehicles that have an RDE performance better than Euro 6 limit values for NOx and PN (not including the applicable measurement margin). Points will be awarded according to the following formula: $$Points = \left(\frac{NOx_{high} - NOx}{NOx_{high} - NOx_{low}}\right) \times PNOx_{max} + \left(\frac{PN_{high} - PN}{PN_{high} - PN_{low}}\right) \times PPN_{max}$$ Where • NOx_{high} and NOx_{low} is the highest and lowest NOx emissions in mg/km among the offers presented to the call for tender. • PN_{high} and PN_{low} is the highest and the lowest PN emissions in #/km among the offers presented to the call for tender • *NOx and PN* are the NOx and PN emissions of the offer evaluated • $PNOx_{max}$ *and* PPN_{max} are the maximum points to be awarded for	

each air pollutant. **Verification:** The tenderer must provide the vehicle's certificate of conformity.	
AC4. Zero tailpipe emission capability (*Same for core and comprehensive)* *Note: this criterion applies to M_1 and N_1 vehicles with a reference mass not exceeding 2 610 kg. M_1 and N_1 vehicles with a reference mass exceeding 2 610 kg will have to comply with AC3 Improved air pollutant emissions performance of category 3 (Section 7.3.2.1).* Points will be awarded to those vehicles that can demonstrate a minimum zero tailpipe emission capability, meaning the range the car can travel without any tailpipe emissions, in proportion to the capability of the vehicle. *The contracting authority will set the minimum zero tailpipe emissions range reference threshold according to the expected use profiles in the call for tender (a proposed default range could be 40 km) Vehicles that are not equipped with an internal combustion engine will be awarded extra points than those equipped with an internal combustion engine).* **Verification:** The tenderer must provide the vehicle's certificate of conformity.	

Explanatory notes

[1)] 'Reference mass' means the mass of the vehicle in running order, as declared in the certificate of conformity, minus the uniform mass of the driver of 75 kg, plus a uniform mass of 100 kg;

[2)] The RDE max values will be declared in the certificate of conformity as mg/km or particle number/km, as appropriate, and will not include the measurement margin which is only linked with the uncertainties of the measurement equipment. This is because the uncertainty margin of 0.5, currently set in legislation, is under review and thus bound to change. Therefore, if a manufacturer declared a value today with the applicable margin added (i.e. value+margin 2017), and the margin was subsequently lowered in 2018, that declaration would be at a disadvantage compared to a manufacturer who would declare in 2018 (i.e. value+margin 2018), although the two cars would have the same emissions.

The table below lists the RDE NOx max and PNmax limit values to qualify under the EU GPP criteria, which the values declared in the vehicle's certificate of conformity will have to comply with.

From 1 January 2021	M and N1 Class I		N1 class 2		N1 class III	
	Diesel	Gasoline	Diesel	Gasoline	Diesel	Gasoline
NOx (mg/km)	64	48	84	60	100	66
PN (#/km)	5×10^{11}	5×10^{11}	5×10^{11}	5×10^{11}	5×10^{11}	5×10^{11}

[3)]Areas with air quality issues are those areas where traffic restriction measures are put in place to comply with the air pollutant emissions limits set by the Air Quality Directive (Directive 2008/50/EC)

5.3.2.2 Rationale

All newly registered cars and LCVs have to comply with the Euro 6 emissions standard. Therefore, the EU GPP criteria for cars and LCVs should go beyond these mandatory requirements, and there are two ways for this purpose:

- Improving the air pollutant emissions performance by the implementation of Euro 6d stage.

- Requiring zero tailpipe emission or zero tailpipe emission capability.

Performance on the RDE test

For passenger cars and LCVs, the Real-Driving Emission (RDE) testing procedures will be introduced in 2017. The European Parliament agreed on requiring real 'Real Driving Emissions' (RDE) tests for all new models by September 2017, and for all new vehicles by September 2019 (stage Euro 6d), with a not-to-exceed value of 2.1 times higher than the Euro 6 limit value. In January 2020, not-to-exceed value is set as the Euro 6 limit value, taking into account measurement margins of error for all new models (and by January 2021 for all new cars). The EU GPP criteria should go beyond the mandatory limits which are applicable for all new vehicles and properly account for vehicles which offer further reductions in air pollutant emissions compared to the mandatory limits. Therefore, the criterion proposal sets a stricter tier, so the vehicle must meet 80% of the air pollutant emissions of emission limits. This is in line with the revised CVD.

The past experiences show that the measurement margin will decrease over time. This means that if a manufacturer declared a value in 2017, adding the applicable margin (i.e. value+margin 2017) and the margin was subsequently lowered in 2018, that declaration would be at a disadvantage compared to a manufacturer who would declare in 2018 (i.e. value+margin 2018) although the two cars would have the same emissions. Therefore in order to be able to compare vehicles in a fair manner, the measurement margin will not be written on the Certificate of Conformity, since the margin is only linked with the uncertainties of the measurement equipment, and not to the vehicle performance.

Zero tailpipe emission capability

Air quality in urban areas is one of the main impacts derived from the exhaust gases from vehicles, thus, a criterion is proposed to promote those technologies that can prove zero tailpipe emission capability. This concept can be expressed as the range (or the distance) that the vehicle is able to travel without emitting any air pollutant. This definition would include plug in-hybrid, pure electric and hydrogen vehicles, but would exclude hybrid technology. These technologies are the ones selected by the core technical specification on type approval CO_2 emissions, which are also linked to the electric range of the vehicle. Therefore, the award criterion on zero tailpipe emission capability will add the electric range as another parameter to evaluate the performance of the vehicles that are qualified at corelevel.

Zero tailpipe emissions in urban areas with poor air quality

Several European cities have problems with bad air quality that trigger traffic-calming measures. Some of them have set up low emission zones where the circulation of vehicles is restricted. In order to align the criteria with those measures, the technical specification proposal requests the public authorities to purchase zero tailpipe emission vehicles, if they are to be used in urban areas with poor air quality.

5.3.3 **Technical options to reduce GHG emissions**

5.3.3.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS3. Gear shift indicators (GSI) *Note: this criterion does not apply to automatic vehicles. The criterion is not relevant for electric and plug–in hybrid vehicles, so it is not part of the comprehensive criterion.* LCVs must be equipped with a gear shift indicator, meaning a visible indicator recommending that the driver shift gear. **Verification:** The tenderer must provide the technical sheet of the vehicle where this information is stated.	
	TS4. Traffic information and route optimisation *Note: This criterion may be requested by contracting authorities if the vehicle is to be used in urban areas with congestion issues, or to be driven to places that the drivers are not familiar with and no other information system (e.g. smartphones) is available.* *Note: This criterion will not apply to vehicles used for special purposes that require a high level of floating car data protection, e.g. security forces fleets, official vehicles used by members of the government, etc.* Vehicles must be equipped with traffic information and route optimisation systems meant to interact with the driver providing pre-trip information services to help avoid congestion and make other journey choices to optimise the trip route. The system must be an embedded system, meaning a complete communication module, consisting of a modem and a subscriber identity module (SIM), permanently integrated into the car **Verification:** The tenderer must provide the technical sheet of the vehicle where this information is stated.
Award criteria	
	AC5. Speed limiter Points will be awarded to those vehicles equipped with a speed limiting device, meaning an on-board device that automatically limits a vehicle's speed to a certain maximum speed as set in the device. **Verification:**

	The tenderer must present the technical sheet of the vehicle where this information is stated.

5.3.3.2 Rationale

Energy consumed in the use phase of passenger cars also depends on other factors than technology, such as driving behaviour, vehicle-pavement interactions, congestion, etc. This implies that measures that help drivers to improve these conditions should be incentivised.

The core criteria set should be kept as simple as possible, in order to facilitate their use by public procurers. The multiple and different technical options could become too burdensome and discourage the uptake of the GPP criteria. To this end, the technical measures described in this section have been assessed according to their cost-effectiveness, their market penetration and their means of verification: those options that are clearly cost-effective, available in the market but not in all the models, and easy to verify will be proposed for the core level.

Energy consumption displays

Energy consumption displays (or eco-driving displays) help car drivers to see whether their driving style adjustments have a positive impact on energy consumption and can reduce energy consumption between 0.3 and 1.1% for €0-20 installation cost (EC, 2014d). These displays are not mandatory yet. They are very common in large passenger cars, but not so much in small cars. Because these displays are also relevant for electric vehicles, the more broad term energy consumption display seems to be more appropriate than the current used term 'fuel consumption displays'.

Traffic information and route optimisation

The literature reviewed showed that congestion in roads can lead to a surge of emissions: the increase in emissions at 45 km/h (a typical average speed on urban roads) due to congestion is approximately 40% compared to a road with stable free-flow traffic (Garbarino, et al., 2016). Traffic information and route optimisation systems are already available in many models (connected cars) (Everis, 2015) but would entail additional costs, according to the OEMs websites. . The saving potentials will depend on each specific situation, and on the availability of intelligent traffic systems to provide the needed traffic data. Therefore it is proposed as technical specification at comprehensive level which the contracting authority may require only in those urban areas with congestion issues, or if the drivers of the vehicles have to travel to places that they are unfamiliar with. An exemption is added for vehicles that require a high level of floating car data protection, e.g. security forces.

Speed limiters

Speed limiters are on-board devices that automatically limit the speed of a vehicle to a certain maximum speed as set in the device. Two systems of speed limiters are offered: separate speed limiters and cruise control with speed limiters. The separate speed limiter is installed by the manufacturer and generally cannot be adjusted by the driver. For the cruise control with speed limiter, however, the speed limiter is a functionality of the cruise control system which can be adjusted by the driver. These 'open' speed limiters are common on-board devices; however, they are not usually standard factory-equipped equipment for small models. The 'closed' ones are not so frequent but they bring similar CO_2 reductions than the open ones. Since the most common ones are the open devices that rely on the user behaviour, it is proposed that these devices are part of the comprehensive level as award criterion.

Criteria removed

Gear shift indicators (GSI)

Electric motors do not need gears, since they deliver their maximum torque at zero RPM and have a much larger RPM range than internal combustion engines. Besides, they are able to the best power output within that broad RPM range. Most electric vehicles are not equipped with gearbox, except very expensive premium models.

5.3.4 **Durability of the battery**

5.3.4.1 Proposed criterion

Core criteria	**Comprehensive criteria**
Technical specification	
TS6 Minimum warranty (*Same for core and comprehensive)* *If the contracting authority is requiring battery electric vehicles:* The tenderer must provide a minimum warranty of the battery of 160 000 km or 8 years against capacity loss below 70% of its original value at delivery according to EN 62660. **Verification:** The tenderers must present a declaration with the warranty terms.	
Award criteria	
AC6 Extended warranty (*Same for core and comprehensive)* *If the contracting authority is requiring battery electric vehicles:* Points will be awarded to those tenders offering an extension of the minimum warranty set by the TS in proportion to the value of the extension. **Verification:** Same as TS7	
Note *The technology of electric vehicles is evolving very quickly towards more durable and reliable batteries. For that reason, the thresholds proposed in this criterion should be cross-checked with the options available in the market at the moment of the call for tenders.*	

5.3.4.2 Rationale

The manufacture of the battery is the major contributor to the environmental impacts of battery electric vehicles. Most LCA literature uses lifetimes in the range of 100 000 and 160 000 km, and highlight that longer lifetimes of the batteries will obviously entail a reduction of the life cycle impacts of the vehicle. This is supported by the outcomes of the Ecodesign Preparatory study for batteries (VITO, Fraunhofer, Viegand, 2019), which includes minimum battery pack/system lifetime requirements as a possible policy option.

Longer lifetimes of the battery can be promoted by means of criteria on time/distance and capacity warranties. Table 2 gathers the warranties offered by the some OEMs in March 2020 (information from OEMs websites).

Table 2: Battery warranties offered by OEMs

OEM	warranty time (years)	warranty distance (km)	Capacity covered by the warranty	Source
BMW	8	160 000	70%	https://insideevs.com/news/390799/bmw-extended-european-warranty-i3-batteries/
Ford	8	160 000	"Loss of battery capacity due to or resulting from gradual capacity loss is NOT covered"	https://www.ford.com/cmslibs/content/dam/brand_ford/en_us/brand/resources/general/pdf/warranty/2020-Ford-Hybrid-Car-Truck-Warranty-version-1_frdwa_EN-US_04_2019.pdf
Mercedes	6 – 8 (depending on the size of the battery)	100 000	70%	http://tools.mercedes-benz.co.uk/current/passenger-cars/pdfs/owners-area/HV-Battery-Warranty.pdf
Nissan	5 – 8 (depending on the size of the battery)	100 000 – 160 000 (depending on the size of the battery)	70%	https://www.nissan.co.uk/ownership/nissan-car-warranties.html
Opel	8	160 000	70%	https://www.opel.es/simplemente-electrico/resumen/baterias-opel-electricos.html
Peugeot	8	100 000	70%	http://www.peugeot.es/gama/selector-de-coches/nuevo-partner-tepee-electric.html
Renault	8	160 000	66%	http://www.renault.es/gama-renault/gama-vehiculos-electricos/zoe/renault-zoe/prefieres-comprar-bateria.jsp
Tesla	8	160 000 – 240 000 (depending on the model)	70%	https://www.tesla.com/support/vehicle-warranty

OEM	warranty time (years)	warranty distance (km)	Capacity covered by the warranty	Source
Volkswagen	8	160 000	"Gradual reduction in battery capacity over time is integral to the nature of the component, and does not represent a defect under the terms of this guarantee, as long as the reduction in capacity is not in excess of the value specified for this vehicle in the owner's manual" (no further information found)	http://www.volkswagen.co.uk/owners/warranty/new-car/terms-and-conditions

Therefore, a criterion on warranty of the battery is proposed in order to reward those manufacturers that improve the lifetime of batteries.

Since the technology of BEV is developing very fast towards more durable and reliable batteries, it is recommended updating the benchmark set by this criterion as often as possible. This recommendation has been added by means of an explanatory note.

Apart from that, there must be new policy instruments that may need be taken into account in the future, since the European Commission is considering the revision of the Batteries Directive. A first evaluation was already carried out in the Commission Staff Working Document on the evaluation of the Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC (COM (2019) 166 final and SWD(2019) 1300 final).

6 Category 2: Mobility Services

6.1 Scope of the category

This category covers the purchase of special-purpose bus services, non-scheduled bus services, hire of buses and coaches with driver services, taxi services, car sharing services and combined mobility services that are purchased by the contracting authority as final users of the services, using the following vehicles:

- 'Cars and LCVs': M_1 and N_1 vehicles, as defined by Directive 2007/46
- 'Buses': M_2 and M_3 vehicles as defined by Directive 2007/46, and having a maximum mass exceeding 5 tonnes.
- 'L-category' vehicles as defined by Regulation 168/2013.
- 'Cycles': Bicycles, cycle trailers, electrically power assisted cycles,
- 'Light electric vehicles and self-balancing vehicles' whose specific definitions are under development by CEN/TC 354 /WG 4.

6.2 Overview of the new EU GPP criteria

In the case of purchasing mobility services, various types of measures exist for improving the environmental performance. First of all, the whole criteria set proposed for Category 1 as presented in the previous section could be potentially requested when purchasing services. However, an approach based on fleet performance is needed to make these criteria feasible and workable for services. In addition, several other criteria would only apply to services. These are discussed below. The common criteria for service categories in Section 11 also apply.

	Mobility services				
		Proposed criterion	**Core**	**Compr**	**Revision proposed**
TS	1	Type-approval CO_2 value	X	X	Alignment to adjust to the general ambition level of CVD
	2	Air pollutant emissions	X	X	Update of yearly tiers
AWARD CRITERIA	1	CO_2 emissions	X	X	No modifications
	2	Air pollutant emissions	X	X	No modifications

6.3 Criteria proposal

6.3.1 GHG emissions

6.3.1.1 Proposed criteria

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">Technical Specification</td></tr>
<tr><td>
TS1. Type-approval CO_2 value
The average type-approval CO2 emissions of the service fleet must not exceed the result of the following values:
<table>
<tr><th>Vehicle type[1)]</th><th>Average CO_2 g/km (WLTP)</th></tr>
<tr><td>Cars — Small (M_1)</td><td>99</td></tr>
<tr><td>Cars — Mid-size (M_1)</td><td>101</td></tr>
<tr><td>Cars — Large (M_1)</td><td>118</td></tr>
<tr><td>LCV — Small (N_1 class I)</td><td>119</td></tr>
<tr><td>LCV — Medium (N_1 class II)</td><td>145</td></tr>
<tr><td>LCV — Large (N_1 class III)</td><td>162+0.096*(M — 1766.35)</td></tr>
</table>
L-category vehicles must be battery electric.

Verification:
The tenderer must present, in a spreadsheet, the list of vehicles of the service fleet, their CO_2 emissions type approval (supported by the respective certificates of conformity) and the calculation of their average.
</td><td>
TS1. Type-approval CO_2 value
The average type-approval CO2 emissions of service fleet must not exceed 50 g/km WLTP

L-category vehicles must be battery electric.

Verification:
The tenderer must present, in a spreadsheet, the list of vehicles of the service fleet, their CO_2 emissions type approval (supported by the respective certificates of conformity) and the calculation of their average.
</td></tr>
<tr><td colspan="2">Award criteria</td></tr>
<tr><td colspan="2">
AC1. CO_2 emissions (Same for core and comprehensive)
Note: the contracting authority will set in the call for tender what types of vehicles are required to provide the service.
For cars and LCVs
Points will be awarded to those tenders offering a service fleet whose average CO_2 type approval is equal or below the core TS1 proportionally to the average CO_2 type approval of the fleet.
For buses
Points will be awarded to those tenders offering a service fleet composed of [the contracting authority may set a percentage, all the vehicles of the fleet, specific vehicle categories or sub-categories or the vehicles to be used in specific routes, see explanatory note] vehicles equipped with one of the eligible technologies set by the core TS1 of category 3 (Section 7.3.1.1).
</td></tr>
</table>

Verification: the tenderer must present, in a spreadsheet, the list of vehicles of the service fleet, their CO_2 emissions type approval (supported by the respective certificates of conformity) and the calculation of their average, for cars and vans, or the technical sheet of the vehicle where these technologies are stated, for buses.

Note

The definitions of the three vehicle types for cars are provided in the table below.

Passenger car types used in GPP criteria	***Corresponding segments according to segmentation used by the European Commission (http://ec.europa.eu/competition/mergers/cases/decisions/m1406_en.pdf)***
Small	*A: mini cars* *B: small cars*
Mid-size	*C: medium cars*
Large	*D: large cars* *E: executive cars* *F: luxury cars* *S: sport coupés* *M: multi-purpose cars* *J: sport utility cars (including off-road vehicles)*

6.3.1.2 Rationale

In terms of alternative fuels Eurostat statistics show that the share of alternative fuels in cars is still very limited (5%), and the market is dominated by diesel and petrol engines. For LCV, the share is even lower (1%) and the most of the fleet is composed by diesel engines.

In the case of L- vehicles, the criteria proposal is focused on powered two-wheelers (PTW) which cover mopeds (L1e) and motorcycles (L3e). Electric PTWs still account for only 0.3% of the market; however they experienced a 60% surge in purchases between 2009 and 2010, and a similar growth in consequent years.

For buses, the rationale is explained in Sections 7.3.1 and 8.3.1.

The average age of fleet has been increasing the last year to reach 40% of cars above 10 years and 10% below 2 years. However, these figures cover both private and professional fleets, and the vehicles used in the category of mobility services tend to be younger, due to larger annual mileage and consequent higher replacement rates, and to meet their clients' demands as well. Besides, some companies are specialised in specific models: premium, hybrid, electric, etc. In Brussels, the car sharing company Zen Car offers 20 electric cars and 40 pick-up/drop-off points (BBL Belgium; et al, 2011).

In Germany, the average age of vehicles used in car sharing is also much lower than that of private cars. For instance, total CO_2 emissions of German Car-Sharing cars are about 16% below those of all newly-registered German cars. According to their website, Cambio's fleet is no older than 4 years (Cambio carsharing, 2016)).

Mobility services tend to use better performing cars than the average fleets. Many car sharing fleets also have a higher percentage of hybrid or electric cars compared to personal cars, such as the EkoRent service in Finland (100% electric cars) or the LetsGo service in Denmark (15 % electric cars) (Laine, et al., 2018). The business model of

mobility services is considered a promising market driver to increase the uptake of electric vehicles. The service company assumes the initial purchase price, and the "range anxiety" that hinders the purchase by private users is mitigated (Amsterdam Roundtable Foundation and McKinsey & Company, 2014).

For these reasons, the proposed criteria comprise technical specifications on the average CO2 emissions of the fleet. The threshold is stricter at comprehensive level in order to promote those companies that have full electric fleets. The figures set for core level are substantiated in the 2025 targets for CO2 emissions of cars and vans, as explained below. Since the value proposed for the average CO2 emissions of the fleet is well below to the best in class vehicle in the market, the fleet will need to be a combination of very new and zero tailpipe emissions vehicles. This will be a positive driver to promote the renewal of fleets and the penetration of zero tailpipe emissions vehicles.

2025 targets

The declared CO_2 emissions of new cars and LCVs have decreased in the last years to comply with the 2020/2021 targets under the CO_2 emission regulations (Regulations (EC) No 443/2009 and (EU) No 510/2011). On 17 April 2019, the European Parliament and the Council adopted Regulation (EU) 2019/631 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles (vans) in the EU. This Regulation started applying on 1 January 2020, replacing and repealing the former Regulations setting CO2 emission standards for cars ((EC) 443/2009) and vans ((EU) 510/2011). From 2025 on, manufacturers will have to meet the new targets set for the fleet-wide average emissions of new cars and vans registered in a given calendar year, with stricter targets applying from 2030. These targets are defined as a percentage reduction from the 2021 starting points:

- Cars: 15% reduction from 2025 on and 37.5% reduction from 2030 on
- Vans: 15% reduction from 2025 on and 31% reduction from 2030 on

In order to come up with the thresholds for this criterion, the 2025 targets have been applied to the best available vehicles in the market in 2020. The database of Institute for the Diversification and Saving of Energy (IDAE) of the Government of Spain (IDAE, n.d.) provides the figures of WLTP and NEDC CO2 emissions of new vehicles. There is an apparent lack of data among the hybrid models, which are the ones that result in a higher ratio WLTP/NEDC (JRC, 2017). Therefore, from this database, the most efficient non-hybrid vehicles have been identified, and the 2025 targets applied to calculate the thresholds. The results are shown in Table 3:

Table 3: Different tiers for CO2 type approval of cars and vans

Fuel type	Size category	NEDC/WLTP CO_2 emission of most fuel efficient vehicles 2020	WLTP Threshold calculated deducting 2025 target to the most efficient vehicle
		In g/km	In g/km
CARS			
Petrol	Small (segment A, B)	96/117	99
Petrol	Mid-size (segment C)	98/119	101
Petrol	Large (all other segments)	119/139	118
LCVs			
Diesel	Small N1 class I	116/140	119
Diesel	Large N1 class II	127/171	145

For the comprehensive criteria, the CO_2 values are set at the level that can be met by PHEVs (plug-in hybrid electric vehicles) and REEVs (range extended electric vehicles).

N1 Class III

N_1 Class III includes a wide range of vehicles of different sizes, purpose and weight, and this variety may be difficult to reflect by a single threshold. One limit value might restrict the choices of LCVs, and thus it might hinder the purchase of the most appropriate vehicle for the needs of the public procurer. A suitable option is setting the thresholds for N_1 Class III vehicles based on the mass of the vehicle.

The target that LCVs have to reach by 2020 is expressed as follows:

147+0.096*(M — 1766.35) (NEDC)

To translate this formula into WLTP, WLTP/NEDC ratios estimated by JRC (JRC, 2017) can be used. The ratios can be found in Tables E.1 and E.2 of the JRC report. Similar to the rest of vehicles, the 2025 target is applied for defining the weight-based threshold. The result would be the following:

162+0.096*(M — 1766.35) (WLTP)

6.3.2 **Air pollutant emissions**

6.3.2.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS2. Air pollutant emissions TS2.1 Until December 2024: All HDV used in carrying out the service must meet at least Euro V, and: • 2021: 64% of HDV must meet Euro VI. • 2022: 72% of HDV must meet Euro VI. • 2023: 80% of HDV must meet Euro VI. • 2024: 88% of HDV must meet Euro VI. The tier applicable will correspond to the year that the call for tender is launched. From January 2025: All HDV used in carrying out the service must meet at least Euro VI Where vehicles are not certified as meeting Euro V or higher, but technical after-treatment has achieved the same standard, this should be documented in the tender. Until December 2026, all cars and LCV used in carrying out the service must meet at least Euro 6, and: 2021: 15% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2022: 30% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2023: 45% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2024: 60% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2025: 75% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2026: 90% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. From January 2027, all cars and LCV used in carrying out the service must meet at least Euro 6d-TEMP or Euro 6d standard All L-category vehicles used in carrying out the service must meet at least Euro 4. TS2.2. *In case urban areas with air quality issues:* LCVs and L-category vehicles must have zero tailpipe emissions If there is no charging infrastructure available, or the expected use profile requires large ranges: The vehicles may at the least be zero	**TS2. Air pollutant emissions** Until December 2022 : All HDV used in carrying out the service must meet at least Euro V, and. • 2021: 84% of HDV must meet Euro VI. • 2022: 92% of HDV must meet Euro VI. The tier applicable will correspond to the year that the call for tender is launched. From January 2023: All HDV used in carrying out the service must meet at least Euro VI Where vehicles are not certified as meeting Euro V or higher, but technical after-treatment has achieved the same standard, this should be documented in the tender. Until December 2025, all cars and LCV used in carrying out the service must meet at least Euro 6 2021: 25% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard, and: 2022: 40% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2023: 55% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2024: 70% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2025: 85% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. From January 2026, all cars and LCV used in carrying out the service must meet at least Euro 6d-TEMP or Euro 6d standard All L-category vehicles used in carrying out the service must meet at least Euro 4. **Verification:** The tenderer must provide the technical sheets of the vehicles where emission standards are defined, and where applicable the partnership agreement with the urban consolidation centre. For those vehicles having achieved the standard mentioned above following a technical upgrade the measures must be documented and included in the tender, and this must be verified by an independent third

tailpipe emissions capable, meaning a LCV that can travel the minimum range of 40 km without emitting any tailpipe emissions. **Verification:** The tenderer must provide the technical sheets of the vehicles where emission standards are defined. For those vehicles having achieved the standard mentioned above following a technical upgrade the measures must be documented and included in the tender, and this must be verified by an independent third party.	party.
Award Criteria	
AC2. Air pollutant emissions (*Same for core and comprehensive, not applicable if zero tailpipe emissions required for all vehicles in the technical specification TS1.2.)* Points will be awarded to those tenders offering either: (a). A higher percentage than the one set by the TS1, or (b). cars and vans and L-category vehicles that have an emission performance better than Euro 6/4, or (c). natural gas buses and zero-emission capable vehicles, meaning with a minimum range of 40 km without emitting any tailpipe emissions for cars and LCVs, and plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV) for buses and L-category vehicles, and fuel cell electric vehicles (FCEV) for buses. *(to be detailed to which extent points will be attributed to higher percentages, better performance and zero tailpipe vehicles. Zero tailpipe emissions vehicles must be given more points than vehicles with better performance than Euro 6/4 and natural gas buses)*. **Verification:** See above TS1	

6.3.2.2 Rationale

Concerning fleet composition in terms of Euro standards, for cars and LCV, the share of the total fleet in 2015 of Euro 6 was 15%, and around 55% lower than Euro 5, which means 30% Euro 5 (TML, 2012). This means that there was an important room of improvement in the average emissions of the fleet.

For buses, the rationale is explained in Sections 7.3.2 and 8.3.2

A JRC study (Clairotte, et al., 2015) in the framework of the Regulation 168/2013 includes representative data of products placed on the EU market between September 2014 and June 2015. According to this study, less than 1% of mopeds and motorcycles complied with Euro 5, and 63% of mopeds and 8% of motorcycles complied with Euro 4. Note that the enforcement timing of Euro standards for L-category vehicles according to Regulation 168/2013 is the following:

	L-vehicle	**New types of vehicles**	**Existing types of vehicles**
Euro 4	L1e, L2e, L6e	1 January 2017	1 January 2018
	L3e, L4e, L5e, L7e	1 January 2016	1 January 2017
Euro 5	L1e-L7e	1 January 2020	1 January 2021

Setting a minimum proportion of Euro 6 and Euro 5 might entail an increase of the replacement rate, and therefore a larger investment. Only 10% of the fleet is below 2 years. However, and as said before, the average age of professional fleets is usually lower than the private ones.

It is proposed that all vehicles comply with Euro V at core level, in order to prevent the use of low performance vehicles. Following the pattern of the current criterion, a minimum percentage of 64% of Euro VI is proposed for core in 2021 and 84% for comprehensive level. The replacement of vehicles will naturally increase the penetration of Euro VI in the fleets, and therefore these percentages need to raise yearly according to the typical replacement rates to maintain the same ambition level. For these reasons, the criteria proposal includes yearly increments of 8%. This will stimulate the acceleration of the replacement rate to increase the share of Euro VI buses. The criteria also comprise a percentage of LCVs complying with Euro 6d-TEMP or Euro 6d standard, to incentivise the penetration of the Euro 6d stage, which requires Real Driving Emissions tests. The technical specification at core level also includes a provision to request zero tailpipe emission vehicles in urban areas with poor air quality.

These technical specifications are complemented with award criteria to promote a better performance of the fleet in line with the criteria of categories 1 and 3.

6.3.3 **Combined mobility services**

6.3.3.1 Proposed criteria

Explanatory note
Combined mobility services *Combined mobility services (CMS) offer a wide range of combined mobility options which usually include public transport and renting bicycles. A key feature of CMS is the capacity to meet the travel demands of customers using the most appropriate and efficient transport mode, or combination of modes. The mobility solutions are optimised to reduce the ratio energy consumed per distance and passenger (energy/[km.passenger]); this is achieved by prioritising the non-motorised vehicles and public transport modes. Therefore, the level of multi and intermodality is a crucial element in meeting the travel need in the most efficient way. The level of multi and intermodality of the mobility service could be defined as the different types of transport modes that the service is able to offer, and its combinations in one trip. Transport modes are understood to mean: private cars, L-category vehicles, electric bikes, bikes, public transport, ride sharing, etc. The combined mobility services are still at a very early stage of development. However, the potential of this type of service to stimulate the modal shift towards non-motorised and public transport services is very significant, and it is recommended that public procurers explore the possibility of procuring combined mobility services instead of other mobility services that do not offer intermodality, if there are operators available.*

6.3.3.2 Rationale

The combined mobility services (CMS) offer a wide range of combined mobility options which might include public transport and bikes renting. This could be used as a way to promote the modal shift towards non-motorised and public means of transport.

These mobility solutions are optimised to reduce the ratio energy consumed per distance and travel, and this is the result of prioritising the non-motorised vehicles and public transport modes. Therefore, the level of multi and intermodality is a crucial element to meet the travel demand in the most efficient way. Besides, Holmberg et al. (Holmberg, et al., 2016) highlight that the environmental improvement that might be derived from the mobility services relies on the assumption that the primary customer group is the car-user, and not the public transport everyday user. This will result in a modal shift towards public transport, and not the other way around. The intermodality, referring to the seamless use of several different modes in one trip chain, is therefore a key element to ensure the environmental improvement from mobility services. The level of multi and intermodality of the mobility service could be defined as the different types of transport modes that the service is able to offer, and its combinations in one travel. By transport modes is meant private cars, L-category vehicles, electric bikes, bikes, public transport, ride sharing, etc. The tenderer may need to create a partnership with other suppliers, public transport operators and other fleet operators, as shown in Figure 1.

Figure 1: Summary of Integrated Mobility Services around the World (Kamargianni, et al., 2015)

Name	Place	Integrator	Integration level**						Modes included
			1	2	3	4	5	6	
Communauto + BIXI + Public transport + local Taxi	Canada	Communauto (car sharing)	X						
SBB + Mobilty +Publibike/Quickbike	Switzerland	SBB (rail)	X						
STIB+Cambio	Brussels, Belgium	Cambio (car sharing)	X	X					
Hannovermobil	Hannover, Germany	Üstra (public transport)	X	X	X*	X			
EMMA	Montpellier, France	TAM (public transport)	X*	X	X	X	X*		
Smile	Vienna, Austria			X	X	X			
Moovel	Germany	Moovel (application)		X	X*	X			
SHIFT	Los Angeles, USA	SHIFT (all modes)		X	X	X	X	X	 + Valet
UbiGo	Gothenburg, Sweden	CLOSER, Lindholmen Science Park AB (research)		X	X	X		X	
Helsinki Model	Helsinki, Finland			X	X	X		X	 + on demand transport

* Partial integration

**1:Cooperation only in terms of providing discounts for combined subscriptions

2: Ticketing integration

3: Payment integration

4: ICT integration

5: Institutional integration

6: Mobility packages

The combined mobility services are still at a very early stage of development to come up with workable criteria for public procurement. In the Nordic countries, Ubigo was the pioneer project developed in Goteborg during 2014, offering a range of mobility options to users based on subscription and unified invoicing (Kamargianni, et al., 2015), (Holmberg, et al., 2016). The potential of this type of services to stimulate the modal shift is very relevant, and an explanatory note recommends that public procurers explore the possibility of procuring combined mobility services, instead of other mobility services that do not offer intermodality.

7 Category 3: Purchase or lease of heavy duty vehicles

7.1 Scope of the category

This category covers the purchase or lease of heavy duty vehicles defined as M_2,M_3. N_2 and N_3 vehicles by Directive 2007/46, i.e. buses and trucks, including waste collection vehicles.

7.2 Overview of the revision of the EU GPP criteria

The tables below show a summary of the revision proposal for the current EU GPP criteria of the category 'purchase and lease of buses'. The proposal is further described in the following sections. The common criteria for vehicle categories in Section 10 also apply.

	Purchase/lease of heavy duty vehicles				
		Criterion	**Core**	**Compr**	**Revision proposal**
TECHNICAL SPECIFICATIONS	1	Technological options to reduce GHG emissions	X	X	List of technologies aligned to revised CVD
	2	Air pollutant emissions	X	X	Modifications to adjust to TS1
	3	Auxiliary units	X	X	No modifications
	4	Exhaust pipes	X	X	No modifications
AWARD CRITERIA	1	Technological options to reduce GHG emissions	X	X	Removed
	2	Air conditioning gases		X	No modifications
	3	Improved air pollutant emissions performance	X		Modifications to adjust to TS1
	4	Auxiliary units		X	No modifications

7.3 Criteria proposal

7.3.1 GHG emissions

7.3.1.1 Proposed criteria

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">Technical Specifications</td></tr>
<tr><td></td><td></td></tr>
<tr><td colspan="2">TS1 Technological improvement options to reduce GHG emissions
The vehicles must be equipped with one of the following technologies:

List of eligible technologies
<table><tr><th>Technology</th></tr><tr><td>Full electric and plug-in vehicle</td></tr><tr><td>Hydrogen fuel cell vehicle *)</td></tr><tr><td>OEM dual-fuel natural gas vehicle with a gas energy ratio over the hot part of the WHTC test-cycle of at least 50% *)</td></tr><tr><td>High pressure direct injection natural gas vehicles *)</td></tr><tr><td>Dedicated natural gas vehicles *)</td></tr></table>*) Hydrogen and natural gas vehicles require a minimum percentage of renewable fuel supply to be eligible (see note below)
*) Hydrogen and natural gas vehicles require a minimum percentage of renewable fuel supply to be eligible (see note below)
**) Currently, plug-in hybrid technology is not being used for inter-city buses and coaches, and although its future use cannot be discarded, there is not a clear usage pattern visible at the moment

Verification:
The tenderer must present the technical sheet of the vehicle where these technologies are stated.</td></tr>
<tr><td colspan="2">Award criteria</td></tr>
<tr><td></td><td>AC2. Air conditioning gases
Points will be awarded to those vehicles equipped with an air conditioning system that uses a refrigerant with a global warming potential (GWP), related to CO_2 and a time horizon of 100 years, below 150.
Verification:
The tenderer must provide the name, formula and GWP of the refrigerating gas used in the air conditioning system. If a mixture of gases is used (n number of gases), the GWP will be calculated as follows:
GWP= Σ(Substance X1 % x GWP(X1)) + (Substance X2 % x GWP(X2)) + …
(Substance Xn % x GWP(Xn))
where % is the contribution by weight with a weight tolerance of +/- 1 %.
GWP of gases can be found in Annexes I and II</td></tr>
</table>

	of the Regulation (EU) No 517/2014 (http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.150.01.0195.01.ENG)

Notes

Qualification of technologies

The contracting authorities may qualify fuel cell electric vehicles as eligible technology if they have a supply of hydrogen produced with renewable sources generated on-site, meeting at least 15% of their demand.

The contracting authorities may qualify an OEM dual-fuel natural gas vehicle as eligible technology, if they have a supply of renewable methane meeting at least 35% of their demand

The contracting authorities may qualify high pressure direct injection natural gas vehicles as eligible technology , if they have a supply of renewable methane meeting at least 10% of their demand

The contracting authorities may qualify dedicated natural gas vehicles as eligible technology, if they have a supply of renewable methane meeting at least 25% of their demand

Renewable methane means biomethane and synthetic methane produced with a surplus of renewable electricity, meaning the renewable electricity production that exceeds the demand during certain periods and creates a surplus production of electricity (power-to-gas).

7.3.1.2 Rationale

A technology-neutral approach based on GHG emissions would be the most suitable option to promote a level playing field for the development of new technologies. The definition of the reference vehicle would be the first step towards this approach. It would need enough data on consumption and CO_2 emissions to come up with distributions and averages to support the definition of the reference vehicles. For trucks, this approach would be already feasible by means of VECTO (Vehicle Energy Consumption calculation Tool).

VECTO is the simulation tool developed by the European Commission that must be used for determining CO_2 emissions and Fuel Consumption from Heavy Duty Vehicles (trucks, buses and coaches).

From 1 January 2019 the tool is mandatory for new trucks under certain vehicle categories in application to the certification legislation under type approval.

As of 2019, the CO_2 emissions and fuel consumption data determined with VECTO, together with other related parameters, will be monitored and reported to the Commission and made publicly available for each of those new trucks.

In the case of buses, the monitoring and reporting of CO_2 emissions using VECTO is expected to be in force within the next years.

Besides VECTO, there are other methods to evaluate the fuel consumption and CO_2 emissions from buses. The UITP (International Association of Public Transport) has also developed their Standardised on-road tests which are especially designed for buses and are used by some public procurers. Apart from that, there are other national and local cycles as the new LowCVP UK Bus test cycle, used by the initiative Low Emission Buses of DfT's Office of Low Emission Vehicles (OLEV). This initiative sets up a subsidies scheme to help reduce GHG emissions from UK bus fleets and to improve air quality. The scheme defines a Low Emission Bus (LEB) as the one producing 15% less WTW emissions compared with an equivalent Euro V diesel bus, based on a methodology developed by the LowCVP (LowCVP, 2016). However, the EU harmonised tool VECTO should be used.

Therefore, there is a transitional situation where the lack of comparable data on utility-specific CO_2 emissions of buses will prevent a technology neutral approach. In the case of trucks, VECTO is available and in principle, setting technology neutral criteria would be possible. However, this would not fit with the revised CVD, whose definition of clean heavy duty vehicle still relies on a technology specific approach. For the sake of a full harmonisation that underpins the objectives enshrined in the CVD, it is proposed to maintain the technology specific approach also for trucks. This will also avoid any confusion among contracting authorities about how to plan their purchases to comply with the mandatory requirements set by the CVD.

Identification of technologies

The EU GPP criteria aim at incentivising the purchase of the best technologies currently in the market. The following technologies were initially identified as potential options to reduce GHG emissions compared to a conventional diesel bus:

- Natural gas vehicle
- Hybrid vehicle
- Full Electric Vehicle and Plug-in Hybrid Electric Vehicle
- Fuel Cell Electric Vehicle

Other sources of information have been analysed to identify best technologies. These have demonstrated at least 5% GHG emissions reduction compared to a conventional diesel vehicle. Table 4 gathers the information from the literature reviewed (Zacharof & Fontaras, 2016), (Ricardo, 2013), (ICCT, 2017), including the type of technology, whether it is appropriate for city buses or coaches, or both, and a rough estimation of the GHG reduction.

Table 4. List of technologies for city buses and coaches (Ricardo, 2013), (Zacharof & Fontaras, 2016)

Type of technology	**Technology**	**City bus**	**Coach**	**Approx. GHG reduction (WTW) %**
Smart ancillaries, parasitic loss reduction	Smart / clutched compressor	yes	yes	6
Smart ancillaries, parasitic loss reduction	Smart alternator / improved alternator	yes	yes	5
Hybridisation	Stop/start battery systems	yes	no due to constant speed operation	9
Hybridisation	Mild hybrid	yes	no due to constant speed operation	13
Hybridisation	Flywheel hybrid	yes	no due to constant speed operation	15
Hybridisation	Full Series hybrid	yes	no due to constant speed operation	15 - 40
Hybridisation	Full Parallel hybrid	yes	no due to constant speed operation	15 - 35
Alternative fuels	Full electric and plug-in vehicle	yes	no	30 - 100

Alternative fuels	Fuel cell vehicle	yes	yes	10 - 100
Aerodynamics	Active flow control	no due to low speed operation	yes	1 - 12
Aerodynamics	Boat tails/ extension panels	no due to low speed operation	yes	4 - 5

Regarding natural gas vehicles, there are two different engines that determine their performance: compression-ignition engines used in dual-fuel vehicles and spark-ignition engines used in dedicated vehicles. According to basic thermodynamics, compression-ignition engines are, in general, more efficient than spark-ignition since they work at higher compression ratios. The efficiency losses of dedicated vehicles due to this reason vary between 20 and 45% (LowCVP, 2017). LowCVP report also indicates that dedicated natural gas vehicles will be optimised in the coming years; however, the improvement is expected to be marginal.

Dual-fuel engines run on both diesel and natural gas, with gas energy ratios (meaning the percentage of diesel fuel replaced by gas in dual-fuel mode) from 24 to 47%. Efficiency losses of dual-fuel vehicles compared to conventional diesel are small, but most dual-fuel vehicles are aftermarket conversions and they show high levels of methane slips. These emissions of methane, with a GWP of 25, cancel the potential benefits of the lower carbon intensity of natural gas (IEA, 2017), (LowCVP, 2017). New OEM dual-fuel vehicles still represent a very small share of the market, but the number is growing (Ricardo-AEA, 2015). Since they are new vehicles in the market, they must be compliant with Euro VI limit for methane, which is expected to entail a significant decreasing of methane slip (LowCVP, 2017), (ICCT, 2016a). According to Ricardo-AEA, methane slip could be abated to 1% of the total GHG emissions of the vehicle. However, none of the test programmes consulted (Ricardo-AEA, 2015), (Cenex and Atkins, 2016), (LowCVP, 2017) measured the methane slips of OEM dual-fuel vehicles. Substitution rates will also improve in OEM dual-fuel vehicles, up to 50%. Manufacturers are also developing high pressure direct ignition (HPDI) engines that use diesel fuel as a pilot in a compression ignition engine. This technology is expected to achieve gas energy ratios above 95% with no loss of engine efficiency. This engine was developed by Westport, and Volvo has recently implemented it in trucks (Ricardo, 2013), (Cenex and Atkins, 2016).

With all this data, it is feasible to estimate the theoretical relative performance of a natural gas vehicle compared to an equivalent diesel vehicle, assuming both are identical in engine size and transmission, which might not be reproducible in real practice. The natural gas vehicles are also assumed to be compliant with Euro VI methane limit. The results are shown in Table 5:

Table 5: Theoretical relative performance of natural gas vehicles compared to diesel vehicle

	Efficiency loss	Gas energy ratios	% WTW reduction
OEM Dual-fuel	4%	45 - 50%	5.2 - 6.4
Dedicated	20 - 45%	100%	5.2 – (-15.0)
High pressure diesel/gas injection	0%	95%	14.3

WTW factors (JEC - Joint Research Centre-EUCAR-CONCAWE collaboration, 2014)
Diesel = 88.6 gCO_{2eq}/MJ
CNG = 69.3 gCO_{2eq}/MJ
LNG = 74.5 gCO_{2eq}/MJ

This analysis is based on a literature review of the performance of natural gas trucks, in particular a report from LowCVP, *Emissions Testing of Gas-Powered Commercial Vehicles* (LowCVP, 2017). It gathers the results of a test programme carried out on dedicated and dual-fuel natural gas trucks, and the Low Carbon Truck Trial (LCTT) (Cenex and Atkins, 2016) that consists of 12 consortia projects with 35 participating companies that tested a sample of 371 vehicles under different duty cycles. No similar test programmes for buses have been found. This is a limitation of the analysis since some results might not be equivalent for buses, or the technology might not be available. However, the estimations of the relative performance in Table 5 are in line with the overall performance of natural gas buses reported by other sources (TNO (CIVITAS WIKI), 2016), (Clean Fleets, 2014), (Ricardo, 2013).

Based on this information, OEM dual-fuel natural gas vehicles that can demonstrate a gas energy ratio of at least 50% are included in this first screening of technologies. Vehicles equipped with HPDI are also included, though it is not clear whether this technology is currently available for buses.

Technologies grading based on the GHG emissions reduction potential

As shown above, there are technology types suitable for each duty cycle: hybridisation for urban cycles and aerodynamics for interurban cycles. Within the urban cycle list, different levels of GHG emissions reduction are apparent: some technologies show modest reductions, as smart ancillaries, others range from 10 to 20%, as mild hybridisation technologies, and some of them can reach up to 40%. These different performance levels enable the classification of technologies that is necessary to formulate a combination of technical specification and award criterion. Table 4 shows the classification for the proposed criterion, where technologies that can reach 10% would be class C, up to 20% would be B, and more than 20% A.

Table 6. List of technologies for urban cycles and classification

Technology type	**Technology**	**Class according to GHG reduction**
Smart ancillaries, parasitic loss reduction	smart / clutched compressor	C
Smart ancillaries, parasitic loss reduction	smart alternator / improved alternator	C
Hybridisation	Stop/start battery systems	C
Alternative fuels	Fuel cell vehicle	C
Hybridisation	Mild hybrid	B
Hybridisation	Flywheel hybrid	B
Hybridisation	Full Series hybrid	B
Hybridisation	Full Parallel hybrid	B
Alternative fuels	Full electric and plug-in vehicle	A
Alternative fuels	OEM dual-fuel natural gas vehicle with a gas energy ratio over the hot part of the WHTC test-cycle of at least 50%.	C
Alternative fuels	High pressure direct injection natural gas vehicles	B

There are not the same variations of GHG emissions reduction in the technologies for interurban cycles, which range 3 – 15%. The report *Fuel Efficiency Technology in European Heavy-Duty Vehicles: Baseline and Potential for the 2020–2030 Time Frame* (ICCT, 2017) analysed the potential of CO_2 reduction of several technologies for tractor-trailers and rigid trucks, under three duty cycles: urban, regional and long haul. The reduction of hybridisation of rigid trucks resulted in 6.1% for regional delivery and 2.3% for long haul. The list of technologies for interurban cycle is gathered in Table 7.

Table 7: List of technologies for interuban cycles and classification

Technology type	Technology	Class according to GHG reduction
Alternative fuels	Fuel cell vehicle	C
Alternative fuels	OEM dual-fuel natural gas vehicle with substitution ratios of at least 50%.	C
Alternative fuels	High pressure direct injection natural gas vehicles	B
Alternative fuels	Full electric and plug-in vehicle	A
Aerodynamics	Active flow control	C
Aerodynamics	Boat tails/ extension panels	C
Hybridisation (only for inter-city buses)	Stop/start battery systems	C
Hybridisation (only for inter-city buses)	Mild hybrid	C
Hybridisation (only for inter-city buses)	Flywheel hybrid	C
Hybridisation (only for inter-city buses)	Full Series hybrid	C
Hybridisation (only for inter-city buses)	Full Parallel hybrid	C

Ambition levels

The technologies included in the criterion are those classified A, with the aim of aligning it with definition of clean heavy duty vehicles set by the revised CVD. This definition discards promoting conventional diesel vehicles (hybridisation), focusing on alternative fuelled vehicles.

Although hydrogen fuel cell vehicles and natural gas vehicles are classified as C or B, these technologies are kept within the lists since they can be upgraded to A provided they run on fuels produced under specific pathways. This is further explained below.

Technologies classification according to fuels pathway

The fuels are not part of the call for tender to purchase the vehicles. The contracts with the fuels suppliers or the infrastructure installation are settled prior to the purchase of the vehicle. Therefore, the WTT part is evaluated and sorted out separately from the call for tender for the purchase of the vehicle. This means that the criteria for the purchase of vehicles cannot include requirements on the fuels, but the pathways of the fuels supplied clearly influence the GHG reduction potential of certain technologies, and therefore their classification.

In the case of fuel cell electric buses, the WTW GHG saving potential heavily depends on the pathway to produce the hydrogen. If it is from electrolysis using 100% renewable energy, the savings are ensured. On the contrary, the production of hydrogen by means of natural gas steam reforming raises some doubts: one report (TNO (CIVITAS WIKI), 2013) does not include results that prove a better performance but just indicates it is a very promising technology, while another report (Roland Berger, 2015) suggests a saving potential of 10%. Given that this technology is still on the learning curve and further development is needed, it is proposed that fuel cell electric buses are included as class C. However, the contracting authority may classify them as B or A if there is a supply of hydrogen produced with renewable sources generated on-site.

This is also the case of dedicated natural gas buses. If they run on fossil natural gas, the GHG emissions reduction compared to a diesel reference vehicle is very narrow (3 - 4%) (TNO (CIVITAS WIKI), 2013) (TNO (CIVITAS WIKI), 2016), or could even result in an increment of GHG emissions due to efficiency losses derived from replacing compression-ignition diesel engines by spark-ignition dedicated gas engines (Ricardo, 2013), (LowCVP, 2017). However, the use of biomethane turns the natural gas bus into one of the best options. It is therefore proposed that the contracting authority is enabled to qualify dedicated natural gas buses as an eligible technology if there is a supply of renewable methane meeting at least 10% of their demand. The additional 5% is a buffer aimed at offsetting a possible increase of GHG emissions of the vehicle when running on fossil natural gas. The supply of biomethane would also entail the classification of OEM dual-fuel vehicles as B or A, and HPDI vehicles as A. Dual-fuel vehicles require higher percentages since natural gas only shares 50% of their total energy consumption.

Air conditioning

Air conditioning gases are also relevant for buses, because a large share of the bus fleet is equipped with air-conditioning systems (MAC). Buses and coaches are excluded from the MAC Directive (2006/40/EC) which provides a gradual phase-out of refrigerant HFC-134a from mobile air conditioners in passenger cars and light commercial vehicles, although refrigerant R134a is the main refrigerant for buses (some buses use R407C). However, the HFCs used in these systems are affected by the phase-down put in place by the F-gas Regulation (Regulation (EU) No 517/2014), which will exert a strong pressure on prices of these gases as the supply will become more restricted. Therefore, there is a strong regulatory driver in place that favours the use of low GWP or even non-HFC (e.g. CO_2) technologies in this sector.

7.3.2 **Air pollutant emissions**

7.3.2.1 Criterion proposal

Core criteria	**Comprehensive criteria**
Technical specification	
TS2. Air pollutant emissions performance (*Same for core and comprehensive)* M_3 vehicles and M_2 vehicles with a reference mass[1)] exceeding 2 610 kg must meet Euro VI. M_2 vehicles with a reference mass[1)] not exceeding 2 610 kg must comply with the TS2 Air pollutant emission performance of category 1 (Section 5.3.2.1). **Verification:** The tenderer must present the certificate of conformity of the vehicle. For those vehicles having achieved the standard mentioned above following a technical upgrade the measures must be documented and included in the tender, and this must be must be verified by an independent third party.	
Award criteria	
AC3. Improved air pollutant emissions performance Points will be awarded to the following technologies: • plug in hybrid electric vehicles (PHEV)[2)] • battery electric vehicles (BEV) and • hydrogen fuel cell electric vehicles (FCEV). **Verification:** The tenderer must provide the vehicle's certificate of conformity. For those vehicles having achieved the abovementioned standard following a technical upgrade the measures must be documented and included in the tender, and this must be verified by an independent third party.	
Notes: *1) 'Reference mass' means the mass of the vehicle in running order, as declared in the certificate of conformity, minus the uniform mass of the driver of 75 kg, plus a uniform mass of 100 kg;* *2) In the case of plug-in hybrid electric vehicles, the total daily hours that a city bus is operated in full electric depends on the specific duty cycle and the charging strategy. Therefore, the contracting authorities need to ensure that the plug-in hybrid buses will be able to maximise their daily hours of operation in full electric mode along their daily cycles using the charging infrastructure available.*	

7.3.2.2 Rationale

All new heavy duty vehicles placed on the market must comply with Euro VI, which sets quite strict limits on air pollutants. Euro VI reduces the PM emission limits by 67% compared to Euro IV and V, and includes a PN (particle number) limit. It also decreases the NOx emission limit by 77% compared to Euro V. The standard also replaces the European Stationary Cycle and Transient Cycle used for testing by the World harmonized Transient cycle, which covers cold and hot start, and in general stricter testing conditions (load, idle time). Euro VI introduces in-service conformity testing using Portable Emission Measurement Systems, the first one to be carried out within 18 months of the approval and then every 2 years. Other changes are a new limit for ammonia emissions--due to the selective catalytic reduction systems using urea--and stricter limits for methane on CNG and LNG vehicles (ICCT, 2015).

The lifetime of buses is quite long, with an average of 12 years (UITP, 2015). The figures of stocks of buses and coaches in EU show that about half of the buses and coaches are older than 10 years. The other half is distributed evenly with age. For this reason, there is a market for used buses that must be taken into account. That leads to a technical specification requesting the compliance with Euro VI, if needed by means of retrofitting exhaust after treatment technology to existing buses.

Tests carried out by LowCVP (LowCVP, 2017) in heavy good vehicles showed that Euro VI had been effective in cutting overall NOx emissions by over 98% when compared to Euro V vehicles. Euro VI dedicated natural gas vehicles increase that reduction in NOx emissions to 99%. Only electric and hydrogen buses can reduce the emissions further, to zero tailpipe air pollutants emissions. The award criterion gives preference to those vehicles capable to run without emitting any air pollutant, i.e. zero tailpipe emission capable. This definition would include plug-in hybrid, pure electric and hydrogen vehicles. Given that there is not a harmonised test method to measure the zero tailpipe emissions capability of HDV expressed in distance, the criterion is proposed to directly select the technologies. This set of technologies is equivalent to those included in the definition of "zero emission vehicles" within the revised CVD, and sets specific targets for zero emission buses.

In the case of plug-in hybrid vehicles, the buses may have little capacity to operate full electric, and there is not a harmonised way to compare their performances. According to the to *ZeEUS eBus Report An updated overview of electric buses in Europe* (ZeEUS project, 2017), the total daily hours that a city bus is operated in full electric depends on the specific duty cycle and the charging strategy. The share of full electric hours ranges from 33% of the VECTIA buses that operate in Valladolid, to 74% of Volvo buses in Stockholm, reaching even 100% in the case of Volvo buses in Gothenburg and the Scania bus in Södertälje (ZeEUS project, 2017). Although it is not possible to set a requirement as a minimum percentage of operation time in full electric, the contracting authorities should be warned about this issue so they are able to make the correct decisions taking into account the charging infrastructure and the specific bus cycles.

The scope of the criterion has been clarified, since some M_2 vehicles are subject to Euro 6 standards, not Euro VI, so the criteria on air pollutant emissions of category 1 should apply to those M_2 vehicles.

7.3.3 **Auxiliary units**

7.3.3.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS2. Auxiliary units (*Same for core and comprehensive)* *Note: this criterion is applicable to waste collection vehicles* The vehicle's emissions from the separate engines for auxiliary units (e.g. compactor, lifter, etc. to be defined by the contracting authority) must meet the exhaust emission limits according to Regulation (EU) No 2016/1628, Stage V. **Verification:** The tenderer must present either a type approval certificate, or a test report from an independent laboratory according to the Regulation (EU) No 2016/1628.	
Award criteria	
	AC2. Electrification of auxiliary engines Points will be awarded to those vehicles equipped with electric auxiliary units. **Verification:** The tenderer must present the technical sheet of the vehicle where this information is stated.

7.3.3.2 Rationale

The current EU GPP criteria are extracted from the Blue Angel standard RAL-UZ 59 'Low-Noise and Low-Pollutant Municipal Vehicles and Buses'. This document has been updated in April 2014. The requirements within the RAL-UZ 59 are based on compliance with the Directive 97/68/EEC (Stage IIIa), which was replaced by Regulation (EU) No 2016/1628 of the requirements related to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery (NRMM). The NRMM Regulation defines emission limits for NRMM engines for different power ranges and applications. It also lays down the procedures engine manufacturers have to follow in order to obtain type-approval of their engines. The Stage V limits came into effect on 1 January 2018 for approval of new engine types, and in 2019 for all engines placed in the market. For the same reasons related to typical lifetimes of HDV (see previous section), it is proposed as technical specification at core and comprehensive levels.

An award criterion is added for the electrification of the auxiliary engines. Electrification of the stationary phases of operation could significantly reduce the need to turn on the internal combustion engines and thus reduce both air pollutant and noise emissions.

7.3.4 **Exhaust pipe location**

7.3.4.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS3. Exhaust pipes (location) (*Same for core and comprehensive)* Buses' exhaust pipes must be located on the opposite side of the passenger door at the rear of the vehicle. **Verification:** The tenderer must provide the technical sheet of the vehicle.	

7.3.4.2 Rationale

This criterion remains as it is, since it is still relevant for health reasons.

7.3.5 **Durability of the battery for battery electric vehicles**

7.3.5.1 Information to set the warranty terms of the batteries for battery electric vehicles.

Explanatory notes
Information to set the warranty terms of the batteries for battery electric vehicles *(If the contracting authority is requiring battery electric vehicles)* According to the ZeEUS eBus report *'An updated overview of electric buses in Europe'* (ZeEUS project, 2017)*, the suppliers of LiFePO4 batteries usually offer warranty periods ranging from 2 to 5 years, 4-5 years being the most frequent period. There is less data on lithium nickel manganese cobalt oxide (LiNiMnCoO2 or NMC) batteries, which range from 2 to 6 years. Lithium titanate batteries show higher warranty periods, up to 15 years, and graphene ultracapacitors from 8 to 11 years. Other suppliers offer tailored warranties depending on the leasing contract, which may include performance monitoring over an agreed timeframe.* *Further details can be found in the ZeEUS eBus report 'An overview of electric buses in Europe':* *http://zeeus.eu/uploads/publications/documents/zeeus-ebus-report-internet.pdf* *The technology of electric vehicles is evolving very quickly towards more durable and reliable batteries. For that reason, the public authority should look at the latest available information on what the market can deliver when formulating the call for tenders.* *Public authorities could also reward longer warranty periods via an award criterion.*

7.3.5.2 Rationale

The report *ZeEUS eBus Report An overview of electric buses in Europe* (ZeEUS project, 2017) gathers the specifications of numerous models of electric buses, including warranty periods. According to this report, the suppliers of $LiFePO_4$ batteries usually offer warranty periods ranging from 2 to 5 years, being 4-5 years the most frequent period. There is less data of Lithium Nickel Manganese Cobalt Oxide ($LiNiMnCoO_2$ or NMC) batteries, which range from 2 to 6 years. Lithium titanate batteries show higher warranty periods, up to 15 years, and graphene ultracapacitors from 8 to 11 years. Other suppliers offer tailored warranties depending on the leasing contract, and which may include performance monitoring over an agreed timeframe.

The ZeEUS report displays very clearly the current EU market of electric buses: the uptake of electric buses has increased in the last years, but the context is still transitional and the transport providers are on a learning curve. A minimum warranty criterion expressed in too rigid terms could jeopardise the development of new technologies and materials in a not yet mature market. However, battery requirements are a crucial element in the total cost of ownership of the electric vehicles, and all contracts require a minimum warranty of the batteries. Given that it is not possible to set specific criteria that represent all types of buses, technologies and duty cycles, the information provided by the ZeEUS report is included as information to set the terms of the warranties.

8 Category 4: Road transport services

8.1 Scope of the category

This category covers the outsourcing of the following road transport services for which public authorities are responsible:

- Public bus services
- Waste collection services
- Post services

Using:

- M_1, M_2 and M_3 vehicles
- N_1, N_2 and N_3 vehicles, as defined by Directive 2007/46, that are designed to provide waste collection services and waste transport services.

8.2 Overview of the revision of the EU GPP criteria

In the case of the outsourcing of public road transport services, various types of measures exist for improving the environmental performance. First of all, the whole criteria set proposed for Category 3 as presented in the previous section could be potentially requested when outsourcing services. However, an approach based on fleet performance is needed to make these criteria feasible and workable for services, since service providers will usually rely on an existing fleet. In addition, several other criteria would only apply to services. These are discussed below. The common criteria for service categories in Section 11 also apply.

Road transport services					
		Proposed criterion	**Core**	**Compr**	**Revision proposed**
TECHNICAL SPECIFICATIONS	1	Technological options to reduce GHG emissions	X	X	Alignment to revised CVD approach
	2	Tyres - rolling resistance	X	X	No modifications
	3	Tyre Pressure Monitoring Systems (TPMS)	X	X	No modifications
	4	Fuels	X	X	No modifications
	5	Air pollutant emissions	X	X	Update of yearly tiers
AWARD CRITERIA	1	Technological options to reduce GHG emissions	X	X	No modifications
	2	Air pollutant emissions	X	X	No modifications
	3	Noise emissions		X	No modifications
CPC	1	New vehicles	X	X	No modifications

8.3 Criteria proposal

8.3.1 GHG emissions

8.3.1.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specification *(These criteria apply only if the operators own or lease the service fleet)*	
TS1. Technological options to reduce GHG emissions **Option 1** The fleet must be composed of the following shares of vehicles equipped with one of the eligible technologies listed among the core TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1) or compliant with TS1 type approval CO2 emissions of category 1: 1.25 x share of the public purchase set by revised CVD for the country. **Option 2** The service network must be operated using vehicles: HDVs: equipped with one of the eligible technologies listed among the TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1). *The contracting authority may set the technology/ies among the eligible technologies listed as one of the core TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1) or leave this choice to the tenderer.* *The contracting authority may also set if some specific routes must be covered with specific technology/ies.* Cars and LDVs: compliant with core TS1 type approval CO2 emissions. **Verification:** Same as TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 5.3.1.1) together with the list and technical sheets of the whole fleet.	**TS1. Technological options to reduce GHG emissions** **Option 1** The fleet must be composed of the following shares of vehicles equipped with one of the eligible technologies listed among the core TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1) or compliant with TS1 type approval CO2 emissions of category 1: 1.5 x share of the public purchase set by revised CVD for the country. **Option 2** The service network must be operated using vehicles: HDVs: equipped with one of the eligible technologies listed among the TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1). *The contracting authority may set the technology/ies among the eligible technologies listed as one of the core TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1) or leave this choice to the tenderer.* *The contracting authority may also set if some specific routes must be covered with specific technology/ies.* Cars and LDVs: compliant with comprehensive TS1 type approval CO2 emissions. **Verification:** Same as TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 5.3.1.1) together with the list and technical sheets of the whole fleet.
TS1. Cyclelogistics (*Same for core and comprehensive)* *Note: this TS will apply to vehicles used in post and courier urban deliveries. Public authorities could also prescribe for what kind of deliveries cyclelogistics have to be used.* (*in cities where the urban infrastructure is suitable, and there are sufficient cyclelogistics operators*).	

The tenderer must offer a service fleet that includes cycles and cycle trailers, which may be electrically power assisted cycles. The cycles and cycle trailers will be aimed at minimising the use of motorised vehicles and addressing last mile issues, according to the emissions reduction plan set by the TS1 Environmental management practices within the common criteria for service categories.

This criterion may be fulfilled by means of a partnership with an urban consolidation centre whose fleet is composed by bikes and cargo bikes.

Verification: The tenderer will present the specifications of the service fleet, and where applicable the partnership agreement with the urban consolidation centre

TS2. Tyre Pressure Monitoring Systems (TPMS) (*Same for core and comprehensive)*

All the vehicles must be equipped with systems compliant with TS1 on TPMS as defined in Section 10.1.1 of Common criteria for vehicle categories

Verification:

Same as TS1 on TPMS in Section 10.1.1 of Common criteria for vehicle categories together with the list and technical sheets of the whole fleet.

TS3. Vehicle tyres – rolling resistance (*Same for core and comprehensive)*

All the vehicles must be equipped with tyres compliant with TS2 on vehicle tyres as defined in the Section 10.1.1of Common criteria for vehicle categories

Verification:

Same as TS2 on vehicle tyres in Section 10.1.1of Common criteria for vehicle categories together with the list and technical sheets of the whole fleet.

TS4. Fuels (*Same for core and comprehensive)*

Note: this criterion is applicable only if the contracting authority qualifies or upgrades a technology according to the note of the TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1) and the tenderer offers that technology to comply with TS1. The contracting authority may set higher percentages of renewable fuel supply according to the available supply in their national or regional market.

The share of renewable fuel supply must comply with the percentages set in the note of the TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 5.3.1.1).

Verification:

The tenderer must provide a copy of the contract(s) that has (have) been signed with the supplier(s) and the description and technical specifications of the production and the dedicated fuel supply system.

Award Criteria *(These criteria apply only if the operators own or lease the service fleet)*

AC1. Technological options to reduce GHG emissions (*Same for core and comprehensive)*

Points will be awarded to tenders offering:

Option 1: *(if applicable)* more routes than the ones set by the TS1 (see above) to be operated with vehicles compliant with core TS1 of category 3 (Section 7.3.1.1).

Option 2: fleet to be used under the contract with the proportion of vehicles (%) larger than TS1 (see above), in proportion to the excess over the TS1 (see above).

If the fleet is composed of technologies of different classes, triple points than class C will be granted to class A, and double points to class B.

Verification:

See above TS1

8.3.1.2 Rationale

According to the literature, hybrid technologies are commercially available and should be seen as a first stage of electrification of the EU fleet, with payback times up to 1.5 years (Ricardo, 2013). Some alternative fuels powertrains are more costly but could lead to larger GHG emissions savings. The technologies based on aerodynamics are also

available, but their market penetration is also limited (3 – 10%) (Zacharof & Fontaras, 2016).

The market penetration of the technologies is expected to grow in the next years driven by the revised CVD. The Directive sets minimum procurement targets for the EU countries, for 2025 and 2030, ranging from 27 to 45% in 2025 and from 38 to 65% in 2030 in the case of buses. To reinforce the action of the CVD, it is proposed that the fleet composition offered by the tenderer must exceed the targets set by the CVD for each country. This would turn EU GPP criteria in an additional tool to the mandatory policy to accelerate the penetration of these technologies in the market.

A second option can be chosen for those contracting authorities that prefer setting which routes are to be operated with vehicles equipped with the eligible technologies. This option would be suitable for vehicles that require special infrastructure and also facilitate the verification of the criterion.

For public transport services, it is common that the fleet is owned by the contract authority and just the operation is outsourced. It has been also clarified that the criteria proposal would only apply in those cases where the operator owns or leases the service fleet.

8.3.2 **Air pollutant emissions**

8.3.2.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification *(These criteria apply only if the operators own or lease the service fleet)*	
TS2. Air pollutant emissions Until December 2024: All HDV used in carrying out the service must meet at least Euro V, and: • 2021: 64% of HDV must meet Euro VI. • 2022: 72% of HDV must meet Euro VI. • 2023: 80% of HDV must meet Euro VI. • 2024: 88% of HDV must meet Euro VI. The tier applicable will correspond to the year that the call for tender is launched. From January 2025: All HDV used in carrying out the service must meet at least Euro VI Where vehicles are not certified as meeting Euro V or higher, but technical after-treatment has achieved the same standard, this should be documented in the tender. Until December 2026, all LCV used in carrying out the service must meet at least Euro 6, and: 2021: 15% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2022: 30% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2023: 45% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2024: 60% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2025: 75% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2026: 90% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. From January 2027, all LCV used in carrying out the service must meet at least Euro 6d-TEMP or Euro 6d standard All L-category vehicles used in carrying out the service must meet at least Euro 4. **Verification:** The tenderer must provide the technical sheets of the vehicles where emission standards are defined. For those vehicles having achieved the standard	**TS2. Air pollutant emissions** TS2.1. Until December 2022 : All HDV used in carrying out the service must meet at least Euro V, and. • 2021: 84% of HDV must meet Euro VI. • 2022: 92% of HDV must meet Euro VI. The tier applicable will correspond to the year that the call for tender is launched. From January 2023: All HDV used in carrying out the service must meet at least Euro VI Where vehicles are not certified as meeting Euro V or higher, but technical after-treatment has achieved the same standard, this should be documented in the tender. Until December 2025, all LCV used in carrying out the service must meet at least Euro 6 2021: 25% of LCV must meet the Euro 6d-TEMP or Euro 6d standard, and: 2022: 40% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2023: 55% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2024: 70% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2025: 85% of LCV must meet the Euro 6d-TEMP or Euro 6d standard. From January 2026, all LCV used in carrying out the service must meet at least Euro 6d-TEMP or Euro 6d standard All L-category vehicles used in carrying out the service must meet at least Euro 4. TS2.2. *In case urban areas with air quality issues:* LCVs and L-category vehicles must have zero tailpipe emissions If there is no charging infrastructure available, or the expected use profile requires large ranges: The vehicles may at the least be zero tailpipe emissions capable, meaning a LCV that can travel the minimum range of 40 km without emitting any tailpipe emissions. **Verification:** The tenderer must provide the technical sheets of the vehicles where emission

mentioned above following a technical upgrade the measures must be documented and included in the tender, and this must be verified by an independent third party.	standards are defined, and where applicable the partnership agreement with the urban consolidation centre. For those vehicles having achieved the standard mentioned above following a technical upgrade the measures must be documented and included in the tender, and this must be verified by an independent third party.
Core criteria	**Comprehensive criteria**
Award Criteria *(These criteria apply only if the operators own or lease the service fleet)*	
AC2. Air pollutant emissions (*Same for core and comprehensive, not applicable if zero tailpipe emissions required for all vehicles in the technical specification TS2.2)* Points will be awarded to those tenders offering either: (a). A higher percentage than the one set by the TS2 (see above), or (b). Cars and LCVs and L-category vehicles that have an emission performance better than Euro 6/4 that have an emission performance better than Euro 6/4 OR (c). Zero-emission capable vehicles, meaning with a minimum range of 40 km without emitting any tailpipe emissions for cars and LCVs, and plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV), and fuel cell electric vehicles (FCEV) for HDV *(to be detailed to what extent points will be attributed to higher percentages, better performance and zero tailpipe vehicles. Zero tailpipe emission capable vehicles must be given more points than vehicles with better performance than Euro 6/4 and natural gas HDVs)*. **Verification:** See TS2 above	

8.3.2.2 Rationale

Similarly to the GHG emission criteria, the criteria on air pollutant emissions and EURO compliance should be set as a proportion of the fleet. The average share of Euro VI heavy duty vehicles in the current fleets is 8% (data from ICCT, ACEA and OICA, EU-28 and EFTA average). More than 60% of the heavy duty vehicles using diesel is still equipped with Euro III (implemented in 2000), 11% with Euro IV (in 2005) and 15% complies with Euro V. The average age of the bus fleet has been increasing the last year to reach 55% of buses above 10 years and less than 10% below 2 years (Eurostat, 2015e)

It is proposed that all vehicles comply with Euro V at core level, in order to prevent the use of low performance vehicles. Following the pattern of the current criterion, a minimum percentage of 64% of Euro VI is proposed for core in 2021 and 84% for comprehensive level. The replacement of vehicles will naturally increase the penetration of Euro VI in the fleets, and therefore these percentages need to raise yearly according to the typical replacement rates to maintain the same ambition level. For these reason, the criteria proposal includes yearly increments of 8%. This will stimulate the acceleration of the replacement rate to increase the share of Euro VI buses. The criteria also comprise a percentage of LCVs complying with Euro 6d-TEMP or Euro 6d standard, to incentivise the penetration of the Euro 6d stage, which requires Real Driving Emissions tests.

These technical specifications are complemented with award criteria to promote a better performance of the fleet in line with the criteria of category 3.

8.3.3 **Noise emissions**

8.3.3.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Award Criteria *(These criteria apply only if the operators own or lease the service fleet)*	
	AC3. Noise emissions Points will be awarded to those tenders offering a service fleet totally composed of vehicles compliant with the AC1 on vehicle noise emissions set in the Section 10.2.1 of the common criteria for vehicle categories. **Verification:** The tenderer must present the list of the vehicles of the service fleet and their certificates of conformity.

8.3.3.2 Rationale

Vehicle noise can have significant negative impacts on the health of residents, especially in case of traffic in or nearby residential areas. This is particularly relevant for buses used in urban public transport.

An award criterion is proposed to promote the use of low noise vehicles by the service providers, at comprehensive level to keep the simplicity of the core criteria set.

8.3.4 **New vehicles**

8.3.4.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Contract Performance Clauses *(These criteria apply only if the operators own or lease the service fleet)*	
CPC1. New vehicles (*Same for core and comprehensive)* If a vehicle of the service fleet is replaced, the new vehicle must help in keeping or improving the service fleet features (composition and technologies) in terms of GHG emissions and air pollutant emissions as offered in the tender. The contractor will keep records which must be made available to the contracting authority for verification purposes. The contracting authority may set rules for penalties for non-compliance.	

8.3.4.2 Rationale

A fleet can change over the duration of the contract. In order to maintain the level of environmental performance of the fleet or even to continuously improve it over time, a CPC can lay down the requirements for replacements.

8.3.5 **Route optimisation for waste collection services**

8.3.5.1 Proposed explanatory notes

Explanatory note
Route optimisation for waste collection services There are route optimisation systems incorporating computerised vehicle routing and scheduling (CVRS) technology that are able to reduce fuel consumption by 5 % to 15 %. These systems may use: (a). models that predict the level of filling of bins, based on data from Pay-as-you–throw systems or by means of weight systems installed in the trucks (b). sensors set inside the bins that monitor real time data of the level of filling of bins. Both technologies are currently mature and available on the market. Therefore, it is recommended that the contracting authority explore the possibilities of implementing these route optimisation systems within their waste collection systems.

8.3.5.2 Rationale

There are commercially available software tools incorporating Computerised Vehicle Routing and Scheduling (CVRS) technology that could improve the modelling and optimisation of collection operations (Zeschmar-Lahl, et al., 2016). Zeschmar-Lahl et al also describe some examples of collection optimisation, where CVRS were able to reduce the fuel consumption from 5% to 15%. These models could be fed with data from Pay-as-you–throw systems or by means of weight systems installed in the trucks. There are also systems providing real time data of the bin fill level. A case study resulted in a reduction of the collection and hauling distances by 17%, the number of stops to collect containers is decreased by 14% and the operational cost (fuel consumption) reduced by 15% (Johansson, 2016). However, the implementation of these systems seem to be decided at strategic level by the contracting authorities in charge of waste collection services, so tenderers would not offer them as a bonus over their competitors' offers. For

this reason, only an explanatory note informing about the benefits of the route optimisation systems is proposed.

9 Category 5: Post, courier and moving services

9.1 Scope of the category

This category covers the procurement (not the outsource) of post, courier and moving services, which comprise:

- Group 641 Post and courier services, with the exception of rail, airmail and mail transport over water
- 79613000-4 Employee relocation services
- 63100000-0 Cargo handling and storage services
- 98392000-7 Relocation services

9.2 Overview of the new EU GPP criteria

The table below show a summary of the proposal for the EU GPP criteria of the new category 'post, courier and moving services'. The proposal is further described in the following sections. As for another services, an approach based on fleet performance is needed to make the criteria feasible and workable. The common criteria for service categories in Section 11 also apply.

	Post, courier and moving services				
		Proposed criterion	**Core**	**Compr**	**Revision proposed**
TS	1	Type-approval CO2 value	X	X	Alignment to adjust to the general ambition level of CVD
	2	Cyclelogistics		X	No modifications
	2	Air pollutant emissions	X	X	Update of yearly tiers
AWARD CRITERIA	1	CO_2 emissions	X	X	No modifications
	2	Air pollutant emissions	X	X	No modifications

9.3 Criteria proposal

9.3.1 GHG emissions

9.3.1.1 Proposed criteria

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">Technical specification</td></tr>
<tr><td>TS1. Type-approval CO_2 value
<u>Cars and vans</u>
The average type-approval CO2 emissions of the service fleet must not exceed the result of the following values:
<table>
<tr><th>Vehicle type[1)]</th><th>Average CO_2 g/km (WLTP)</th></tr>
<tr><td>Cars — Small (M_1)</td><td>99</td></tr>
<tr><td>Cars — Mid-size (M_1)</td><td>101</td></tr>
<tr><td>Cars — Large (M_1)</td><td>118</td></tr>
<tr><td>LCV — Small (N_1 class I)</td><td>119</td></tr>
<tr><td>LCV — Medium (N_1 class II)</td><td>145</td></tr>
<tr><td>LCV — Large (N_1 class III)</td><td>162+0.096*(M — 1766.35)</td></tr>
</table>
<u>L-category vehicles</u> must be battery electric.
<u>HDVs</u>
The fleet must be composed of the following shares of vehicles equipped with one of the eligible technologies listed among the core TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1) or compliant with TS1 type approval CO2 emissions:
1.25 x %revised clean vehicle directive.
This criterion may be fulfilled by means of a partnership with an urban consolidation centre whose fleet complies with the technical specification.

Verification:
The tenderer must present, in a spreadsheet, the list of vehicles of the service fleet, their CO_2 emissions type approval (supported by the respective certificates of conformity) and the calculation of their average.</td><td>TS1. Type-approval CO_2 value
The average type-approval CO2 emissions of service fleet must not exceed 50 g/km WLTP
<u>L-category vehicles</u> must be battery electric.
<u>HDVs</u>
The fleet must be composed of the following shares of vehicles equipped with one of the eligible technologies listed among the core TS1 Technological improvement options to reduce GHG emissions of category 3 (Section 7.3.1.1) or compliant with TS1 type approval CO2 emissions:
1.5 x %revised clean vehicle directive.

This criterion may be fulfilled by means of a partnership with an urban consolidation centre whose fleet complies with the technical specification.

Verification:
The tenderer must present, in a spreadsheet, the list of vehicles of the service fleet, their CO_2 emissions type approval (supported by the respective certificates of conformity) and the calculation of their average.</td></tr>
<tr><td colspan="2">TS2. Cyclelogistics (Same for core and comprehensive)</td></tr>
</table>

Note: this TS will apply to vehicles used in post and courier urban deliveries. Public authorities could also prescribe for what kind of deliveries cyclelogistics have to be used. (*in cities where the urban infrastructure is suitable, and there are sufficient cyclelogistics operators*). The tenderer must offer a service fleet that includes cycles and cycle trailers, which may be electrically power assisted cycles. The cycles and cycle trailers will be aimed at minimising the use of motorised vehicles and addressing last mile issues, according to the emissions reduction plan set by the TS1 Environmental management practices within the common criteria for service categories. This criterion may be fulfilled by means of a partnership with an urban consolidation centre whose fleet is composed by bikes and cargo bikes. **Verification:** The tenderer will present the specifications of the service fleet, and where applicable the partnership agreement with the urban consolidation centre
Award criteria
AC1. CO_2 emissions (only applicable to LCVs and L-category vehicles) (*Same for core and comprehensive)* Points will be awarded proportionally to the average CO_2 type approval of the fleet for LCVs or to the share of vehicles equipped with eligible technologies for HDVs. **Verification:** the tenderer must present, in a spreadsheet, the list of the vehicles of the service fleet, their CO_2 emissions type approval (supported by the respective certificates of conformity) and their average calculation.

9.3.1.2 Rationale

In the case of post and courier services, the penetration of electric vehicles have increased in the last years. The LaMiLo (last mile logistics) project (LaMilo, 2014) includes case studies, summarized below:

- UPS is testing and analysing the use of a fleet of electric vehicles in urban traffic systems to reduce CO2 emissions, noise and particulate emissions in Karlsruhe (Germany) and London (UK). The vehicles being used are conventional diesel vehicles that have been modified into electric vehicles. These electric vehicles are being used mainly in inner city areas and on trips shorter than 80km. The vehicles return to the depot with about 20% residual charge and are then recharged at a specific loading facility by the responsible person. All vehicles are charged through the night.
- As part of the IKONE project, about 50 Mercedes-Benz Vito E-CELL transporters powered by electricity are used by selected partners and the large German parcel logistics service provider DPD in the Stuttgart region. Their field of application involves various commercial activities and delivery tasks. The Stuttgart region has a very difficult topography (situated in a basin) and the filed test focused on the analysis of the vehicle use in these specific conditions. The logistics provider had to change their business model to accommodate electric vehicles (EVs) by splitting the delivery of B2B and B2C parcels, and delivering the generally smaller B2C parcel with EV.
- The Green Link (TGL) is a company making parcels deliveries in central Paris with an entire fleet of battery electric vehicles (EVs). TGL started operations in 2009 and is now using 3 urban hubs in Paris and trying to develop in other French cities and other countries. At the end of 2013, the volume of parcels distributed was 2 500 per day, and the business was expected to grow to a volume of about

5 000 parcels per day in 2014. The scale of growth is limited by the size of the current urban hubs.

Cyclelogistics has demonstrated its capability to operate in urban deliveries. According to CIVITAS 42% of all motorized trips in urban areas could be shifted to logistics by bicycle (this corresponds to 25% of all trips) (EPOMM, 2012). Also a deliverable within the project Cyclelogistics ahead (Chiffi & Galli, 2014a) indicates a high potential for municipal document delivery, like small documents, internal mail and consultation documents to residents, to shift to cargo bikes. It is proposed as technical specification, requiring that the fleet contains cycles and cycle trailers, aimed at helping operators to address last mile issues, within the framework of the emissions reduction plan set by the TS1 Environmental management practices.

Urban consolidation solutions are coming back to the urban planning responding to the increasing last mile issues due to the growing e-commerce (LaMiLo, 2015). It is a key element to increase the electrification of the delivery fleet and to implement cyclelogistic solutions.

Urban consolidation is not a new concept: urban consolidation centres (UCC) or urban hubs were a popular measure in city logistics 25 years ago. In Europe 150 UCC projects were started, but only 5 projects survived (Vahrenkamp, 2013). One of the main reasons was that the additional transhipment often prevented them of being cost-effective. In addition, urban retailers were reluctant to use the service provided by the UCC, since the added value was not apparent for them (Verlinde, et al., 2012).

The LaMiLo (last mile logistics) project deliverable Public sector influence on last mile logistics (LaMiLo, 2015) includes the consolidation solutions as a policy measure to reduce the number of delivery vehicles in the urban area and therefore the issues derived from congestion. This is further supported by the findings of the EEA report report *The first and last mile — the key to sustainable urban transport* (EEA, 2019). For this reason, the criteria includes a provision to enable the compliance by means of the fleet of an UCC.

9.3.2 **Air pollutant emissions**

9.3.2.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS2. Air pollutant emissions TS2.1 Until December 2024: All HDV used in carrying out the service must meet at least Euro V, and: • 2021: 64% of HDV must meet Euro VI. • 2022: 72% of HDV must meet Euro VI. • 2023: 80% of HDV must meet Euro VI. • 2024: 88% of HDV must meet Euro VI. The tier applicable will correspond to the year that the call for tender is launched. From January 2025: All HDV used in carrying out the service must meet at least Euro VI Where vehicles are not certified as meeting Euro V or higher, but technical after-treatment has achieved the same standard, this should be documented in the tender. Until December 2026, all cars and LCV used in carrying out the service must meet at least Euro 6, and: 2021: 15% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2022: 30% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2023: 45% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2024: 60% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2025: 75% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2026: 90% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. From January 2027, all cars and LCV used in carrying out the service must meet at least Euro 6d-TEMP or Euro 6d standard All L-category vehicles used in carrying out the service must meet at least Euro 4. TS2.2. *In case urban areas with air quality issues:* LCVs and L-category vehicles must have zero tailpipe emissions If there is no charging infrastructure available, or the expected use profile requires large ranges: The vehicles may at the least be zero	**TS2. Air pollutant emissions** Until December 2022 : All HDV used in carrying out the service must meet at least Euro V, and. • 2021: 84% of HDV must meet Euro VI. • 2022: 92% of HDV must meet Euro VI. The tier applicable will correspond to the year that the call for tender is launched. From January 2023: All HDV used in carrying out the service must meet at least Euro VI Where vehicles are not certified as meeting Euro V or higher, but technical after-treatment has achieved the same standard, this should be documented in the tender. Until December 2025, all cars and LCV used in carrying out the service must meet at least Euro 6 2021: 25% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard, and: 2022: 40% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2023: 55% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2024: 70% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. 2025: 85% of cars and LCV must meet the Euro 6d-TEMP or Euro 6d standard. From January 2026, all cars and LCV used in carrying out the service must meet at least Euro 6d-TEMP or Euro 6d standard All L-category vehicles used in carrying out the service must meet at least Euro 4. **Verification:** The tenderer must provide the technical sheets of the vehicles where emission standards are defined, and where applicable the partnership agreement with the urban consolidation centre. For those vehicles having achieved the standard mentioned above following a technical upgrade the measures must be documented and included in the tender, and this must be verified by an independent third party.

tailpipe emissions capable, meaning a LCV that can travel the minimum range of 40 km without emitting any tailpipe emissions. **Verification:** The tenderer must provide the technical sheets of the vehicles where emission standards are defined. For those vehicles having achieved the standard mentioned above following a technical upgrade the measures must be documented and included in the tender, and this must be verified by an independent third party.	
Award Criteria	
AC2. Air pollutant emissions (*Same for core and comprehensive, not applicable if zero tailpipe emissions required for all vehicles in the technical specification TS1.2.)* Points will be awarded to those tenders offering either: (d). A higher percentage than the one set by the TS1, or (e). cars and vans and L-category vehicles that have an emission performance better than Euro 6/4, or (f). natural gas buses and zero-emission capable vehicles, meaning with a minimum range of 40 km without emitting any tailpipe emissions for cars and LCVs, and plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV) for buses and L-category vehicles, and fuel cell electric vehicles (FCEV) for buses. *(to be detailed to which extent points will be attributed to higher percentages, better performance and zero tailpipe vehicles. Zero tailpipe emissions vehicles must be given more points than vehicles with better performance than Euro 6/4 and natural gas buses)*. **Verification:** See above TS1	

9.3.2.2 Rationale

Same as for category 2.

10 Common criteria for vehicle categories 1, 3 and 5

10.1 Technical options to reduce GHG emissions

10.1.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specification	
TS1. Tyre Pressure Monitoring Systems (TPMS) (*Same for core and comprehensive)* LCVs and heavy duty vehicles must be equipped with tyre pressure monitoring systems, meaning a system fitted on a vehicle which can evaluate the pressure of the tyres or the variation of pressure over time and transmit corresponding information to the user while the vehicle is running, or, in the case of buses and waste collection trucks, with systems that transmit corresponding information to the operator site. **Verification:** The tenderer must provide the technical sheet of the vehicle where this information is stated.	
TS2. Vehicle tyres – rolling resistance (*Same for core and comprehensive)* *(not to be used if, for safety reasons, tyres with the highest wet grip class, snow tyres or ice tyres are needed)* The vehicles must be equipped with a) Tyres that comply with the highest fuel energy efficiency class for rolling resistance expressed in kg/tonne, as defined by Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters. OR b) Retreaded tyres *Note: Regulation (EC) No 1222/2009 is currently under revision, and as part of this process, the European Commission has put forward proposal COM(2018) 296. This criterion will need to be updated according to the new legislation, once it is in force.* **Verification:** The tenderer must provide the label of the tyre according to Regulation (EC) No 1222/2009 for tyres under case a, or the Notice of approval according to Annex 1 of UNECE Regulation 109 for retreaded tyres (case b).	
TS3. Vehicle specific eco-driving information (*Same for core and comprehensive)* Vehicles must be equipped with information/ instructions on eco driving. In the case of ICEV, the user manual of the vehicle must include guidelines on early shifting, maintaining a steady speed at low revolutions per minute (RPM) and anticipating traffic flows. In case of hybrid and electric vehicles, the information must include information on the use of the regenerative braking to save energy. For plug-in hybrid electric vehicles and range extender electric vehicles, the instructions must include specific instructions to maximise the kilometres driven electrically. This information / instructions may be provided in the form of training sessions (if the public authority choses this option, it needs to prescribe a minimum amount of hours of training to be provided). **Verification:** The tenderer must provide the technical sheet of the vehicle where this information is stated or description and the contents of the training sessions.	

10.1.2 **Rationale**

Tyre pressure monitoring systems (TPMS)

Tyre pressure monitoring systems are monitoring tools that help a driver to adjust their behaviour and achieve an average fuel consumption reduction of 1% (Mustafic, et al., 2014) at relative low cost (€220 without shipping and installation). TPMS have a cost-effectiveness of -€39 and -€64/tCO_2). TPMS are mandatory for new passenger cars, but not for LCVs and heavy duty vehicles.

Vehicle tyres/rolling resistance

Low rolling resistance tyres can reduce fuel consumption by a few percent. The best performing tyres according to the Tyre Labelling Directive are widely available, but often not chosen by consumers due to low awareness. In addition to this, the Energy Efficiency Directive 2012/27/EU states:

'Central governments that purchase products, services or buildings, insofar as this is consistent with cost-effectiveness, economical feasibility, wider sustainability, technical suitability, as well as sufficient competition, must: …

..- purchase only tyres that comply with the criterion of having the highest fuel energy efficiency class, as defined by Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters. This requirement must not prevent public bodies from purchasing tyres with the highest wet grip class or external rolling noise class where justified by safety or public health reasons'

Given the market availability, it seems to be justified to also require public procurers to purchase vehicles equipped with new tyres of the highest fuel energy efficiency class, as part of the EU GPP criteria. Therefore it is included as a technical specification for core and comprehensive.

The Regulation (EC) No 1222/2009 does not apply to retreaded tyres, which must comply with the provisions of UNECE Regulation 109 as a compulsory condition to be placed on the market. The use of retreaded tyres instead of new tyres brings environmental benefits due to the reduction of raw materials consumption and waste generation. Therefore, the technical specification can be complied with both low rolling resistance tyres and retreaded tyres. The Regulation (EC) No 1222/2009 is currently under revision and hence this criterion will need to be updated accordingly.

Vehicle specific eco-driving information

Most estimates available in literature indicate that eco-driving techniques may result in an average emission reduction and fuel consumption of 10 to 15% (CE Delft, 2012), and the cost of implementation is very low. However, according to the CE Delft report, this reduction potential will decrease in the long term, since future vehicles will become more energy efficient, and will incorporate technologies which automate eco-driving. The report estimated that this reduction potential would be 10% in 2020, 7% by 2030 and 2% by 2050.

The criteria proposed are more specified for vehicles with an electric drivetrain (including hybrids) including specific guidance for the use of the regenerative braking in order to save energy. For Plug-in Hybrid Electric Vehicles and Range Extender Electric Vehicles specific instructions to maximize the kilometres driven electrically are included in the criteria.

This criterion is also necessary for buses and waste collection vehicles, particularly hybrid and plug-in hybrid vehicles. It was also indicated that manufacturers sometimes provide training sessions to ensure that the vehicle is driven in a safe and efficient way.

10.2 Noise emissions

10.2.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specifications	
	TS4. Tyre noise *(not to be used if, for safety reasons, tyres with the highest wet grip class, snow tyres or ice tyres are needed)* The vehicles must be equipped with a) tyres whose external rolling noise emission levels are 3dB below the maximum established in Annex II, Part C of Regulation (EC) No 661/2009. This is equivalent to the top category (of the three available) of the EU tyre label external rolling noise class. OR b) retreaded tyres *Note: Regulation (EC) No 1222/2009 is currently under revision, and as part of this process, the European Commission has put forward proposal COM(2018) 296. This criterion will need to be updated according to the new legislation, once it is in force.* **Verification:** The tenderer must provide the label of the tyre according to Regulation (EC) No 1222/2009 for tyres under case a) or the Notice of approval according to Annex 1 of UNECE Regulation 109 for retreaded tyres (case b)
Award criteria	
	AC1. Vehicle noise Points will be awarded to vehicles whose noise emissions are compliant with the Phase 3 limits of Regulation (EU) No 540/2014. The noise emissions will be tested according to Annex II of Regulation (EU) No 540/2014. **Verification:** The tenderer must provide the vehicle's certificate of conformity.

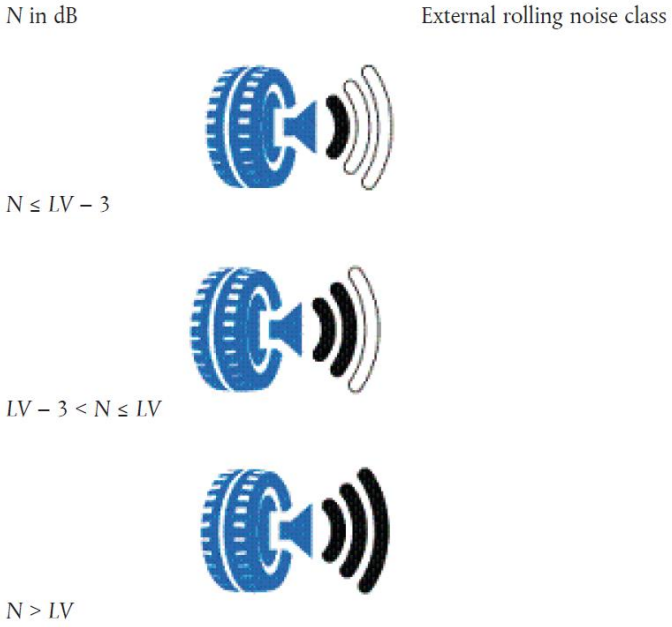
10.2.2 Rationale

Vehicle noise can have significant negative impacts on the health of residents, especially in case of traffic in or nearby residential areas. Public authorities should therefore gradually reduce the noise levels of both the tyres and vehicle of their fleet.

Tyre noise

Vehicle tyre noise is regulated by Regulation (EC) No 661/2009 and the labelling Regulation (EC) No 1222/2009, which obliges the tyre manufacturer to inform the customer about the external rolling noise class as follows:

Figure 2: External rolling noise classes (LV = Limit Values)



The Regulation (EC) No 1222/2009 does not apply to retreaded tyres, which must comply with the provisions of UNECE Regulation 109 as a compulsory condition to be placed on the market. Similar to the rolling resistance criterion, it is proposed that this criterion can be complied with both low noise tyres and retreaded tyres.

Since currently all tyres have to meet the limits set by Regulation (EC) No 661/2009, only the top category of the labelling Regulation (N≤ LV -3) can provide an additional benefit. In Table 8 the limit values for C1 tyres according to Regulation (EC) No 611/2009 are listed. The proposed limits that are 3 dB below the limit values are presented in the last column. Compliance with these limits will mean the tyres fall within the best performing class of labelling Regulation (EC) No 1222/2009. The Regulation (EC) No 1222/2009 is currently under revision and hence this criterion will need to be updated accordingly.

Table 8: Limit values for C1 tyres according to Regulation 611/2009 and proposed limits

Tyre class	Nominal section width (mm)	Limit values (dB(A))	Proposed limit (dB(A))
C1A	≤185	70	67
C1B	>185 ≤215	71	68
C1C	>215 ≤245	71	68
C1D	>245 ≤275	72	69
C1E	>275	74	71

The criterion is proposed to be a technical specification only at comprehensive level, for the sake of simplifying the core level which focuses on GHG and air pollutant emissions.

Vehicle noise

The Directive 2007/46/EC has been amended by Regulation (EU) No 540/2014, which will introduce stricter emissions limits for vehicle noise in three phases:

- Phase 1 applicable for new vehicle types from 1 July 2016;
- Phase 2 applicable for new vehicle type from 1 July 2020 and for first registration from 1 July 2022;
- Phase 3 applicable for new vehicle type from 1 July 2024 and for first registration from 1 July 2026.

Therefore, Phase 1 is already in force, but only for new vehicle types and not for all new sold vehicles. However, Phase 1 is already achieved by 90% of the cars and LCVs on the market.

In the case of heavy duty vehicles, Regulation (EU) No 540/2014 sets noise limits for N3 vehicles between 79 and 82 dB(A) for phase 1 and being applicable for new vehicles types from 1 July 2016. . Phase 2 (range 77 – 81 dB(A)) will be applicable for new vehicle type from 1 July 2020 and for first registration from 1 July 2022, and phase 3 (range 76 – 79 dB(A)) will be applicable for new vehicle type from 1 July 2024 and for first registration from 1 July 2026. The regulation does not include any provision to exclude waste collection trucks, or vehicles for special purposes, in general. According to a report from TNO (TNO, 2012) there was technology commercially available for shielding and encapsulation for trucks in 2010, and there were models that fulfilled phase 3 limits available in the market.

Therefore, the award criterion at comprehensive level is proposed to promote phase 3 compliant vehicles.

11 Common criteria for service categories

11.1 Competence of tenderer and staff training

11.1.1 Proposed criteria

Core criteria	Comprehensive criteria
Selection criteria	
SC1. Competences of the tenderer (*Same for core and comprehensive)* The tenderer must have relevant experience in each of the following areas: - identifying, evaluating and implementing the available technologies and measures to reduce the well-to-wheel GHG emissions and air pollutants emissions - monitoring and reporting procedures of the GHG emissions **Verification:** Evidence in the form of information and references related to relevant contracts (possibly of a similar size) carried out in the previous 5 years which included the above elements.	
Contract performance clause	
CPC1. Drivers training (*Same for core and comprehensive)* *Note: This contract performance clause will only apply if the service includes a driver and where drivers are not requested to have the driver certificate of professional competence (driver CPC) according to Directive 2003/59/EC* All drivers involved in carrying out the service for the duration of the contract period must be trained in a recognised institution on environmentally-conscious driving on a regular basis to increase fuel efficiency. Adequate training, with a minimum duration of 16 hours, must be provided to all new staff working under the contract within 4 weeks of starting employment, and an update on the above points, with a minimum duration of 4 hours, must be provided for all other staff at least once a year. The service provider must document and report yearly the amount (hours) and subject of training provided to each member of staff working on the contract to the contracting authority. All drivers involved in carrying out the service for the duration of the contract period must regularly receive information on their fuel efficiency performance (at least once per month). The yearly staff training records must be made available to the contracting authority for verification purposes. The contracting authority may set rules for penalties for non-compliance.	

11.1.2 Rationale

Fleet management is a crucial element to optimise the vehicle use, increase the technical performance of the fleet and take up best available technologies. The selection criteria proposal sets a minimum experience on identifying, evaluating and implementing technologies and measures to reduce GHG and air pollutant emissions. This selection criterion is aimed at ensuring the competences of the tenderer to manage their fleet according to environmental performance.

This is complemented with a staff training contract performance clause, which requires the drivers to be trained in eco-driving measures, which include proper feedback to drivers to reduce fuel consumption. In this specific service category, this would only

apply to those services that include a driver, i.e. taxi services and post, courier and moving services.

The number of hours proposed for the update training in the first version of the technical report has been halved to 4 hours. This training duration results in a cost-effective measure while the cost of 8 hours training per year would exceed the benefits gained by this measure (see section 12.4.2)

For bus and waste collection services, there is a mandatory training for drivers set by Directive 2003/59/EC, which lays down the provisions for the initial qualification and periodic training of drivers of certain road vehicles for the carriage of goods or passengers. The topic 'advanced training in rational driving to optimise fuel consumption' is within the obligatory content of the training according to the Directive.

11.2 Environmental management measures

11.2.1 Proposed criteria

Technical specification
TS1. Environmental management measures (*Same for core and comprehensive)* The tenderers must have written procedures to: 1. monitor and record the GHG and air pollutant emissions of the service. The indicators used must be emissions and energy consumption of the service both in total per year and per passenger/tonne/unit transported-kilometre or another unit that reflects the performance of the service. 2. implement an emissions reduction plan with measures aimed at reducing the GHG emissions and air pollutants emissions. 3. evaluate the deployment of the emission reduction plan by tracking any changes in the indicators and the implementation of the measures of the plan in real practice. 4. implement the necessary actions to correct any deviations from the plan or any increase of the indicators, and if possible prevent them in the future. **Verification:** The tenderer must provide: 1. the procedure for monitoring and recording the indicators listed in Section 1) 2. the emissions reduction plan. 3. the evaluation procedure to ensure implementation of the emissions reduction plan 4. the correction procedure to correct the deviations found in the evaluation, and if possible prevent them in the future. Environmental management systems certified against ISO 14001 or EMAS will be deemed to comply if they cover the environmental objective of reducing GHG and air pollutant emissions of the service fleet. The tenderer must provide the environmental policy showing the commitment to achieve this objective, together with the certificate issued by the certification body *Note: the contracting authority may award points to those tenders offering significant improvements in their environmental management measures.*
Contract performance clause
CPC2. Environmental management measures (*Same for core and comprehensive)* The service provider must document and report, over the contract duration. - the results of the monitoring of indicators and - the results of the evaluation and the correction and prevention actions, where applicable, according to the written procedures provided for verifying the TS1 Environmental management measures. These reports must be made available to the contracting authority for verification purposes. The contracting authority may set rules for penalties for non-compliance and bonuses for exceeding the objectives set by the emissions reduction plan.

11.2.2 Rationale

Fleet management measures need to be supported by monitoring and planning, aimed at ensuring a proper implementation and guaranteeing continuous improvement. An environmental management system (EMS) is a systematic way to minimise the environmental issues of an organisation. It is particularly helpful to ensure the environmental performance of services, where an important part of the criteria must rely on best practices, staff training and other operational requirements. Some national GPP criteria require the company to have a certified environmental management system.

Although EMS is a very useful tool to develop systematic improvement processes, the leeway offered by the ISO standards may hinder their application in practice. Their requirements are so general that their interpretation may be difficult for the non-expert users. In addition, ISO certified EMS might be particularly difficult to be achieved by SMEs which may lead to their exclusion of the tender process. It is therefore proposed a technical specification inspired on the plan-do-check-act (PDCA) principles which constitute the basis of the management systems, and structured as follows:

- Monitoring the environmental issues by means of environmental indicators: in this case, the environmental issues are energy consumption, GHG and air pollutant emissions.
- Implementation of the operational procedures to minimise the environmental aspects: this would mean an emissions reduction plan that covers the service provided over contract period
- Evaluation of the implementation of the procedures and correction of the deviations found: there must be a systematic way to ensure the proper implementation of the emissions reduction plan and the minimisation of indicators. For this purpose, it is necessary to carry out a regular evaluation of both indicators and plan, and to set corrective and preventive actions where needed. This is proposed to be done by tracking the evolution of the indicators over the contract duration, and checking how the emissions reduction plan is deployed real practice.

The technical specification is complemented with a contract performance clause to ensure the implementation of the environmental management measures. It also works as a tool for the contracting authority to reward those contractors that achieve more ambitious targets, by means of bonuses. Besides, the technical specification indicates that the contracting authority may award points to environmental management measures that entail a significant improvement compared to the conventional practices. These provisions are in line with the comments suggesting a more dynamic and positive approach that can stimulate the continuous improvement of the service performance.

11.3 Maintenance of the fleet

11.3.1 Proposed criteria

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">Contract performance clause</td></tr>
<tr><td colspan="2">CPC3. Low viscosity lubricant oils (Same for core and comprehensive)
Unless the manufacturer of the vehicle recommends another type of lubricant, the contractor must replace the lubricants of the vehicles providing the service with low viscosity engine lubricant oils (LVL). LVL are those corresponding to SAE grade number 0W30 or 5W30 or equivalent.
The contractor will keep records which must be made available to the contracting authority.</td></tr>
<tr><td colspan="2">CPC4. Vehicle tyres – rolling resistance (Same for core and comprehensive)
(not to be used if, for safety reasons, tyres with the highest wet grip class, snow tyres or ice tyres are needed)
The contractor must replace the worn tyres of vehicles providing the service with
a) new tyres that comply with the highest fuel energy efficiency class for rolling resistance expressed in kg/tonne, as defined by Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters.
OR
b) retreaded tyres
The contractor will keep records which must be made available to the contracting authority.
Note: Regulation (EC) No 1222/2009 is currently under revision, and as part of this process, the European Commission has put forward proposal COM(2018) 296. This criterion will need to be updated according to the new legislation, once it is in force.</td></tr>
<tr><td></td><td>CPC5. Tyre noise
(not to be used if, for safety reasons, tyres with the highest wet grip class, snow tyres or ice tyres are needed)
The contractor must replace the worn tyres of vehicles providing the service with
a) new tyres whose external rolling noise emission levels are 3dB below the maximum established in Annex II, Part C of Regulation (EC) No 661/2009. This is equivalent to the top category (of the three available) of the EU tyre label external rolling noise class
OR
b) retreaded tyres
Note: Regulation (EC) No 1222/2009 is currently under revision, and as part of this process, the European Commission has put forward proposal COM(2018) 296. This criterion will need to be updated according to the new legislation, once it is in force.
The external rolling noise emissions of the tyre</td></tr>
</table>

	model must have been tested according to the Annex I of Regulation (EC) No 1222/2009. The contractor will keep records which must be made available to the contracting authority. *Note: The Regulation (EC) No 1222/2009 is currently under revision and the contracting authority may need to update this criterion accordingly once the new legislation is in force.*
Award criteria	
	AC1 Lubricant oils, hydraulic fluids and grease Points will be awarded to those tenders including the use of the following for the maintenance of the service vehicles: - Re-refined lubricant oils, meaning oils derived from used oils that underwent a process that returns the oil to a quality suitable for its original use. - Hydraulic fluids and greases that have no health or environmental hazard statement or R-phrase at the time of application (Lowest classification limit in Regulation (EC) No 1272/2008 or Council Directive 99/45/EC). The cumulative mass percentage of substances present in the hydraulic fluids and greases that are both nonbiodegradable and bioaccumulative must not be more than 0.1 % (w/w). **Verification:** The tenderer must provide the technical sheets of lubricants and hydraulic fluids and greases. Hydraulic fluids and greases that are compliant with the EU Ecolabel or equivalent type 1 ecolabel that includes the requirements set by AC1 will be deemed to comply.
Note on the purchase of maintenance services *The contracting authority may include these criteria within the call for tenders of vehicle maintenance services. However, these criteria only cover a small part of the maintenance activities and cannot be considered as EU GPP criteria for vehicle maintenance services.* *The contracting authority may set rules for penalties for non-compliance with the different contract performance clauses.* ***Note on requirements for Central Government procurement on the purchase of tyres*** *Article 6 and Annex III of the Energy Efficiency Directive (2012/27/EU), which had to be transposed into national law by June 2014, set out specific obligations for public authorities to procure certain energy efficient equipment. This includes the obligation to purchase only those tyres that:* 'comply with the criterion of having the highest fuel energy efficiency class, as defined by Regulation (EC) No 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labelling of tyres with respect to fuel efficiency and other essential parameters. This requirement must not prevent public bodies from purchasing tyres with the highest wet grip class or external rolling noise class where justified by safety or public health reasons'	

This obligation is limited to central government and for purchases above the thresholds set out in the procurement directives. Moreover, the requirements have to be consistent with cost-effectiveness, economic feasibility, wider sustainability, technical suitability and sufficient competition. These factors can differ between public authorities and markets. For more guidance on the interpretation of this aspect of Article 6 and Annex III of the EED regarding procurement of energy-efficient products, services and buildings by central government authorities, see the Commission guidance document COM/2013/0762 final, Communication from the Commission to the European Parliament and the Council, Implementing the Energy Efficiency Directive – Commission Guidance[1),]

Regulation (EC) No 1222/2009 is currently under revision, and as part of this process, the European Commission has put forward proposal COM(2018) 296. This CPC will need to be updated according to the new legislation, once it is in force.

[1)] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=celex:52013DC0762

11.3.2**Rationale**

Sections 10.1 and 10.2 describe the requirements on rolling resistance and noise proposed for tyres used in new purchased vehicles. Tyres are replaced along the lifetime of the vehicle, and therefore the same requirements should apply in maintenance activities. For this purpose, contract performance clauses are proposed requiring the contractor to comply with the tyres criteria over the service contract. In the case of rolling resistance of tyres, it is proposed to be part of both core and comprehensive levels to be fully harmonised with the provisions of the Energy Efficiency Directive on the purchase of tyres by governments (see Section 10.1).

The use of low viscosity lubricants (LVL) is relevant to improve the engine performance, and it is a cost-effective option (WIP; Q1, 2008). Since lubricants are degraded and replaced regularly along the lifetime of the vehicle, LVL should be required as part of the maintenance criteria of the service categories.

The criteria proposed set also includes some requirements on lubricants related to other life cycle stages of the lubricant itself. The current criterion is partially based on the EU Ecolabel of Lubricants (Commission Decision (EU) 2018/1702)

11.4 Explanatory note on fleet composition requirements

11.4.1 Proposed note

Explanatory note
Whenever a contracting authority requires a service provider to use a fleet with a certain percentage of the vehicles compliant with criteria on CO2 emissions or air pollutant emissions, the contracting authority should consider the means of verification. It can be cumbersome for the contractor to provide information and for the public authority to verify information about which vehicles were used for which distances on which day and calculate the average. Therefore, if it is not considered feasible to ask for all vehicles to meet the requirement, the contracting authority could determine that on specific routes, only compliant vehicles can be used (e.g. in areas with air quality issues), or that one or several vehicle categories has to be compliant. These issues may be less relevant for the outsourcing of public bus services and waste collection services, where the planning and the monitoring of the services facilitate the verification of the fleet performance used to provide the services.

11.4.2 Rationale

Some of the criteria proposed in this technical report are based on fleet composition that fulfil GHG and air pollutant emissions criteria set for LDVs and buses within the scope of the vehicles categories (see Sections 5 and 7). Setting requirements on a share of the fleet or on the average fleet performance does not ensure the performance of the group of vehicles actually providing the service, especially if they are part of a large fleet, or if the service is provided to meet specific mobility needs. The verification of the actual performance of the service would need information about which vehicles are used for which distances on which day and calculate the average, and this can entail administrative burdens for both the contractor and the contracting authority. The alternative would be that the totality of the fleet is compliant with those criteria, but this may be too strict and would create a barrier for the development of these services. Another option would be splitting the service in subsets, meaning for example routes or specific categories or sub-categories of vehicles, and apply the requirements on 100% of the vehicles providing services to those subsets. All these alternatives are gathered in an explanatory note to guide the contracting authority in the writing of the call for tender.

12 Life cycle cost assessment of some case studies

12.1 Introduction

This chapter contains a life cycle cost assessment of some case studies of public procurement applying some of the criteria proposed in this technical report:

- Case study 1: purchase of electric buses instead of diesel buses for a share of the vehicle fleet
- Case study 2: training on eco-drive for drivers of a post and courier service

The costs of the case scenarios are compared to a business-as-usual scenario without the EU GPP criterion. It is worth to highlight that, in some cases, the best scenario in terms of environmental impact could be to find alternatives to road transport, such as rail, or ICT solutions such videoconferencing.

The following types of costs will be estimated:

a) Total cost of ownership:
   - Acquisition costs
   - Fuel costs
   - Maintenance costs
   - Insurance
   - Taxes

b) Cost of externalities: emissions of carbon dioxide (CO_2), and emissions of oxides of nitrogen (NOx), non-methane hydrocarbons (NMHC) and particulate matter (PM), which are the ones covered by the Clean Vehicle Directive (Directive 2009/33/EC)

12.2 Case studies overview

The cases studies are described below, including the main assumptions set for the life cycle cost assessment.

12.2.1 Technical options for buses

The first case study is a large municipality in Europe with an average bus fleet of 200 buses. The municipality renews the public transport bus services, applying the TS2 for category 4 which sets that 12% of the fleet to be used under the contract must be vehicles that comply with the core TS1 of category 3. The core TS1 of category 3 criteria is fulfilled, among others, by means of electric buses, which would replace average diesel buses. The case study is summarised in Table 9.

Table 9: Case study 1 Electric buses

Definition	**Explanation**
Category	CATEGORY 4: BUS SERVICES
Vehicle	Buses
Criterion type	Technical specification, GHG emissions
Criterion	TS2 GHG emissions both core and comprehensive
Actor	Large city in Europe with 200 buses

Case	The city renews their bus fleet over the course of 14 years by new buses. Every year, 15 new buses are purchased instead of diesel buses.

Assumptions

Table 10 presents the main assumptions that are used for the LCC calculation for this case.

Table 10: Assumptions case 1

Variable	Assumption	Source / explanation
Acquisition costs baseline excl tax	€213 675	(IEA, 2018)
Registration tax	4.3%	(CE Delft, 2016)
Average VAT	22%	(CE Delft, 2016)
Fuel consumption	0.36 l/km	(AEA, 2011)
Mileage	3 scenarios: - 50 000 km/year - 60 000 km/year - 70 000 km/year	
Fuel price incl. Taxes	€1.04 / liter diesel	(European Commission, 2016)
Electricity price incl. Taxes	€0.15 / kWh	(European Commission, 2016)
Lifetime	14 years	(TIAX, 2011)
Maintenance	15.5 EUR cent /km	(CE Delft, 2007)
Insurance	2 117 €/year	Calculation based on (CE Delft, 2016a).
Circulation taxes	517 €/year	Same proportion to circulation taxes as for passenger cars.

Additionally, the following assumptions were made:

- The investment cost for the electric bus is 55% higher compared to the diesel bus (IEA, 2018) and (BNEF, 2018).This concerns only the vehicle costs. The cost for the electrical vehicle is higher mainly because of battery costs, but also due to lower production volumes.
- As electric vehicles are given tax exemptions in several countries, it is assumed that these buses does not pay circulation taxes.
- Infrastructure cost opportunity charging: €10 000 per bus (TNO (CIVITAS WIKI), 2014).
- Electric bus energy efficiency: it consumes 56% less energy than the diesel bus comparator (TNO (CIVITAS WIKI), 2013)
- Assumption for maintenance: 20% of the diesel bus comparator however, there is a large range found in the technical literature. The maintenance costs are potentially 40% lower for electric buses (Olsson, et al., 2016), but based on market experiences also 0% is possible (CE Delft, 2015).
- No change in insurance costs.

- No energy taxation is assumed on electricity used for electric buses.

12.2.2 Staff training on ecodriving in post and courier services

The second case presents a lifecycle cost analysis of staff training on ecodriving. The contracting authority is a central government that purchases the provision of post and courier services. The contract performance clause Drivers training sets that the service contractor must ensure adequate training, with a minimum duration of 16 hours. It must be provided to all new staff working under the contract within four weeks of starting employment and an update on the above points, with a minimum duration of 4 hours, for all other staff working under the contract at least once a year. Additionally, the staff is presented feedback on their fuel efficiency monthly, to further ensure that the benefits of the ecodriving training are sustainable on the longer term. The cost calculation will show the cost and benefits of this criterion on a yearly basis. The labour costs of the driver are excluded from the analysis, as they are the same in all cases. The case study is summarised in Table 9.

Table 11: Case study 3 Staff training on ecodriving in post and courier services

Definition	**Explanation**
Category	POST AND COURIER SERVICES
Vehicle	LCVs
Criterion type	Selection criteria, Optimized vehicle use
Criterion	CPC1. Staff training
Actor	Central government that purchases post and courier services,
Case	Every driver providing the service will follow the ecodriving training. Lifetime assessment for a period of 15 years, 10 000 – 30 000 km/year. All vans are large diesel vans.

Assumptions

Table 12 presents the main assumptions that are used for the LCC calculation for this case.

Table 12: Assumptions case 2

Variable	**Assumption**
Acquisition costs incl tax	€42 000
Registration tax	4.3%
Average VAT	22%
Mileage	3 scenarios: - 10 000 km/year - 20 000 km/year - 30 000 km/year
Fuel price	€1.04 / liter
Lifetime	15 years

Maintenance	3.0 EUR cent /km
Insurance	557 €/year
Circulation taxes	89 €/year (Calculation based on CE Delft, 2016a
CO_2 emissions test	190 g CO_2 /km

The starting point for encouraging employees to adopt an eco-driving style is often to implement a driving course, which immediately results in significant fuel reduction. However, these savings reduce rapidly if driving courses are not regularly updated or if the management does not take follow-up measures to evaluate the impact of the training. These follow-up measures may include monitoring the performance of individual drivers and offering feedback to the drivers about their performance.

The cost of applying a full eco-driving package like outlined above includes:

- The trainer fee for the driving course and loss in man hours when employees are in training. A report by FLEAT (FLEAT, 2010) does include this loss of man hours, which results in costs of €300 to €1 000 per driver. In this cost calculation a full eco-driving package like outlined above includes:
    - 1 training (16 hours) per driver of €650 (including loss in man hours), which is given once per driver over the lifetime of a vehicle (15 years)
    - 1 yearly 4 hours training per driver of €180
- The emission reduction due to eco-driving is approximately 10% (CE Delft, 2012) sustained through yearly repeated training.
- Setting up a monitoring and feedback system, and the actual execution the system. The costs are highly dependent on the complexity of the monitoring and feedback, etc. and assumed to be included in the total package for yearly training as provided by the driving training company.

12.3 Calculation of external costs

The assumptions used for the calculation of external costs apply to calculation of all cases studies. Aside from the Total Cost of Ownership directly to the user, the cost of externalities are also included, meaning CO_2, NOx, NMHC and PM, the ones covered by the Clean Vehicles Directive. In all cases the vehicles are assumed to be Euro 6 / VI, which is relevant for air pollutants external costs.

The emission factors for CO_2, NOx, NMHC and PM for the vehicles are based on STREAM Passenger 2014 (CE Delft, 2014) for car and bus, and STREAM Freight 2016 (CE Delft, 2016) for LCVs.

The emissions that result from the production of the fuels (and electricity) are also included in the calculation. The values used are displayed in Table 13.

Table 13 Upstream emission factors (WTT)

	NOx	**SO_2**	**NMVOC**	**PM**	**CO_2**
	g/MJ	g/MJ	g/MJ	g/MJ	g/MJ
Diesel (fossil)	0,032	0,098	0,033	0,003	20,7
Gasoline (fossil)	0,041	0,126	0,045	0,004	19
Electricity	0,119	0,225	0,001	0,006	106,7

Source: (CE Delft, 2016): diesel and gasoline, IMPACT update (DG MOVE, 2014): (COWI; VHK, 2011): CO_2 electricity.

The report 'EU Reference Scenario 2016 Energy, Transport and GHG Emissions Trends to 2050' (EC, 2016)shows an evolution of the electricity mix towards 35% of renewable energy sources in 2020 and more than 40% in 2030 , which will lead to a steady decrease in carbon intensity of power generation. . The average carbon intensity over the period 2010 - 2020 recommended by the Methodology for Ecodesign of Energy-related Products is based on those projections and will be used in the calculations (COWI; VHK, 2011)

The cost factors used for externalities are taken from (DG MOVE, 2014) and shown in Table 14, after converting to 2015 prices using GDP at market prices (PPS per capita).

Table 14 External cost factors for upstream emissions and direct transport emissions €/tonne (2015)

	Upstream electricity and refineries	**Transport**
EU27	**high height of release**	**low height of release**
CO_2	€ 100	€ 100
NOx	€ 8 954	€ 11 834
NMVOC	€ 1 724	€ 1 742
PM2.5	€ 20 966	€ 121 673*

(CE Delft, 2008)

12.4 Results of the life cycle costs assessment

In this section, the results of the LCC calculations are presented for the three case studies. For each case, the life cycle costs have been estimated in € per vehicle and km with and without taxes, and including external costs from CO_2, NOx, NMHC and PM. Finally, the cost savings for the case study is calculated, compared to the business as usual scenario, i.e. without the application of the EU GPP criteria.

12.4.1 Technical options for buses

Electric buses

In the case study of electric buses, the acquisition costs are higher, but fuel costs (including taxes) are lower. There are also maintenance cost savings, although it is uncertain how much they will amount to.

Figure 3 and Figure 4 show the life cycle costs with and without taxes per vkm for diesel and electric buses. The figures show that the fuel taxes have a high impact on the LCC calculation. For the case with taxes, the total costs of electric buses including external costs are at the same level, or lower, compared to diesel buses. Without taxes, electric buses will have LCC between 20% and 40% higher than diesel buses.

Figure 3 Life cycle costs with taxes per vkm for diesel and electric buses

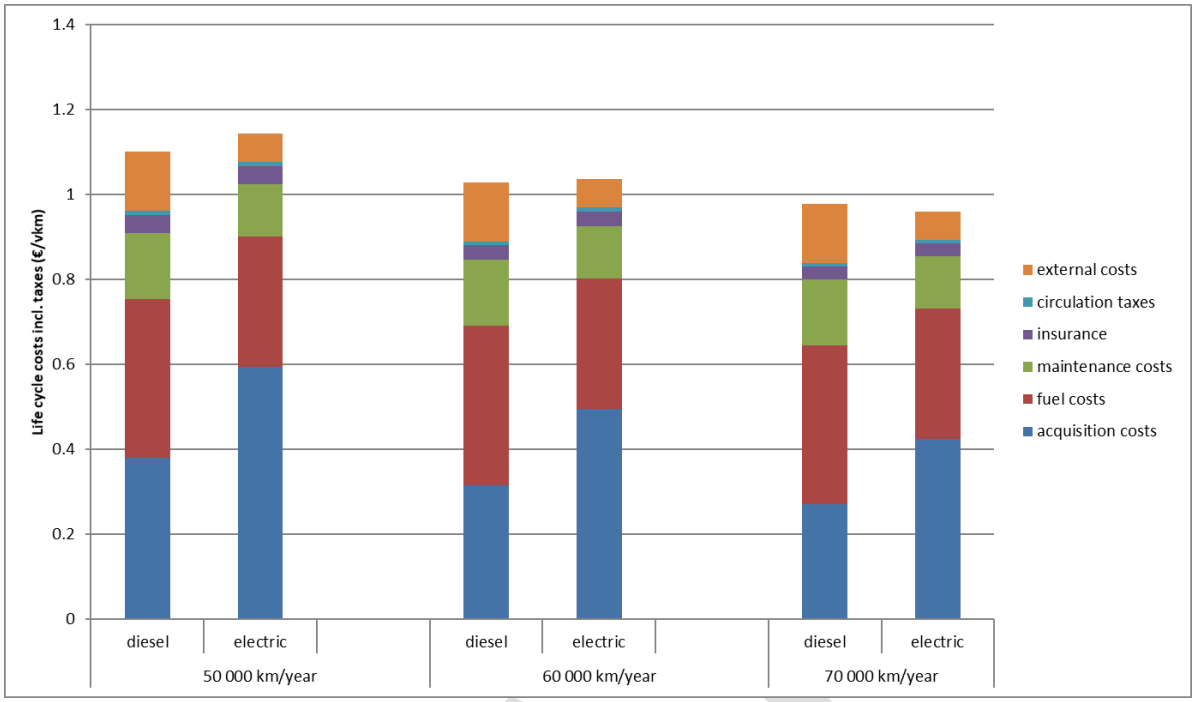
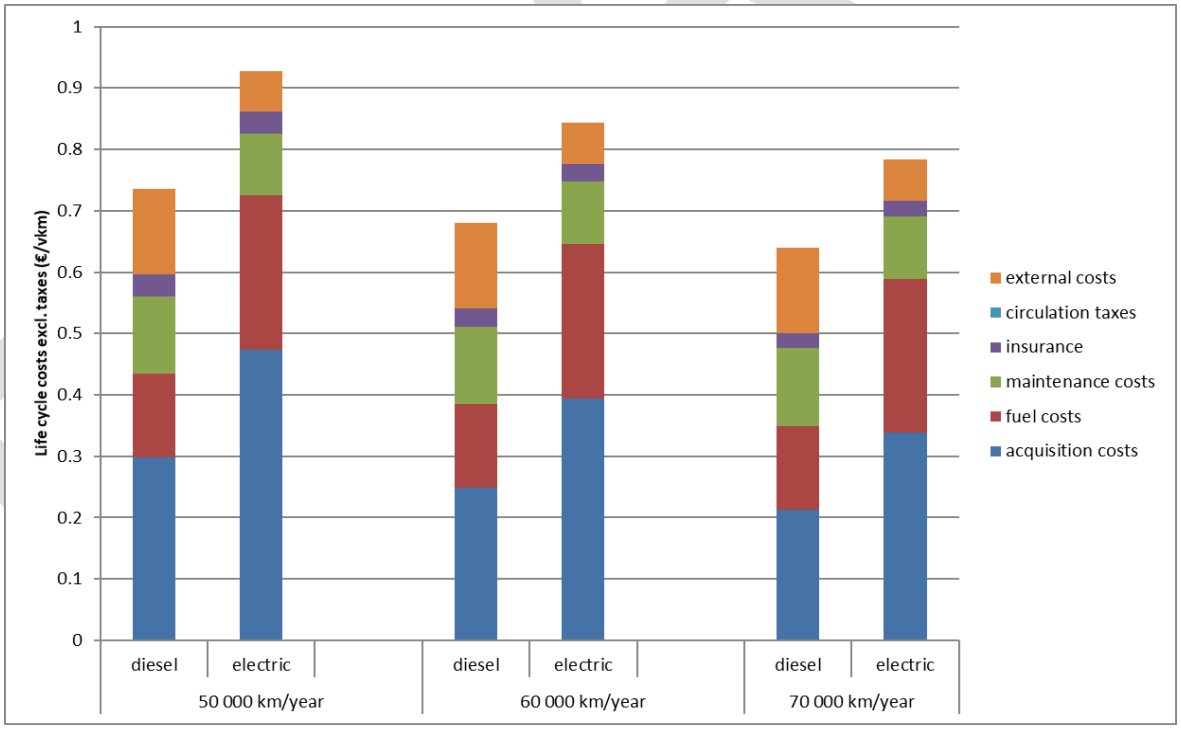


Figure 4 Life cycle costs without taxes per vkm for diesel and electric buses



The results show that the investment costs are relatively high in comparison to the cost and maintenance savings, and external costs savings can add up to about a third of the investment costs. However, it is worth to highlight that the air pollutants released upstream by the power plants are usually emitted at considerable heights and often in

sparsely populated areas. The emissions are mixed with large volumes of air and their contribution to air quality issues in urban areas is relatively small. Conversely, traffic emissions occur at low levels, in the ambient air layer, and they are the main source of pollution in urban areas. Since electric vehicles do no produce tailpipe emissions they are able to improve the air quality of cities.

As can be derived from , the total cost savings are very dependent on the actual maintenance cost savings. Maintenance costs are expected to be lower for electric vehicles, because there are less moving parts in the engine, less wear and tear and fewer components that break down. However, as the technology for electric buses is on a learning curve, some technical failures can be expected and accompanying reparation costs. Therefore, the outcomes are relatively uncertain, but still give an indication of the LCC for electric buses compared to those of diesel buses.

Other alternative powertrains (natural gas, hydrogen) were studied from a LCC perspective in the previous revision of the EU GPP criteria (JRC, 2019).

12.4.2 Staff training on ecodriving in post and courier services

In the third case, the cost of the staff training on ecodriving is partly compensated by fuel savings and external cost savings. Figure 5 and Figure 6 show the LCC results with and without taxes per vkm for the service with and without strict CO_2 norms.

Figure 5 Life cycle costs with taxes per vkm for LCVs with and without ecodriving training

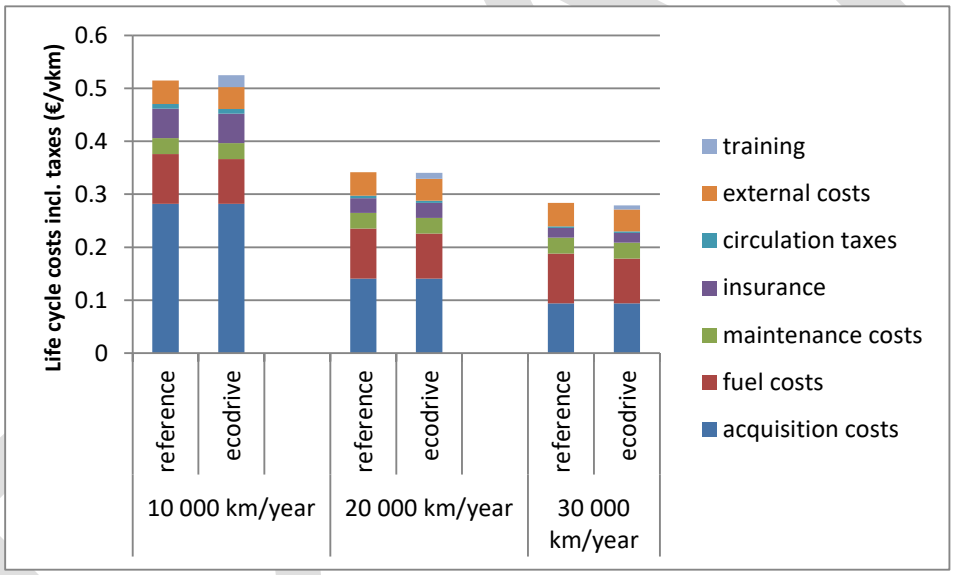


Figure 6 Life cycle costs without taxes per vkm for LCVs with and without ecodriving training

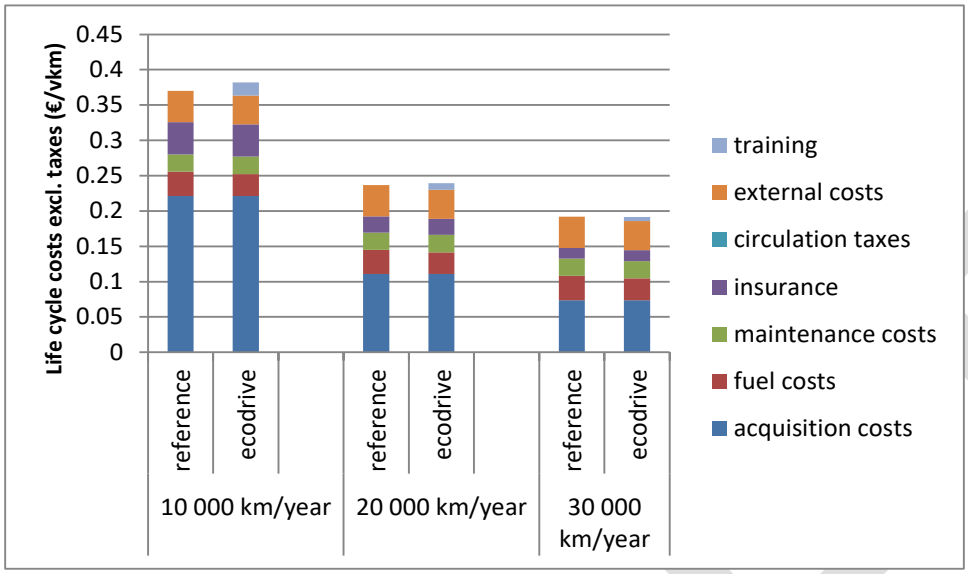


Table 15 and Table 16 show the cost savings of the ecodriving criterion per driver including and excluding taxes in different scenarios. The analysis shows that the training is relatively expensive compared to the cost savings, but for a higher mileage, the criterion is more favourable.

Table 15 Cost savings of ecodrive criterion per driver including taxes (€/year)

Parameter	**Scenario**		
	10 000 km/year	**20 000 km/year**	**30 000 km/year**
Cost of training per driver (€/year)	€ -220	€ -220	€ -220
Fuel cost savings per driver (€/year)	€ 90	€ 190	€ 280
External cost savings per driver (€/year)	€ 30	€ 60	€ 90
Total per driver (€/year)	€ -100	€ 30	€ 150

Table 16 Cost savings of ecodrive criterion per driver excluding taxes (€/year)

Parameter	**Scenario**		
	10 000 km/year	**20 000 km/year**	**30 000 km/year**
Cost of training per driver (€/year)	€ -180	€ -180	€ -180
Fuel cost savings per driver (€/year)	€ 30	€ 70	€ 100
External cost savings per driver (€/year)	€ 30	€ 60	€ 90

Total per driver (€/year)	€ -120	€ -50	€ 10

It is relevant to highlight that the effects of this training go beyond the boundaries of the post and courier services, since it is also likely that drivers will improve their driving behaviour when they use their private cars.

13 Annex I. Main differences between EU GPP comprehensive criteria for road transport and the revised CVD

NOTE: This tables show the main differences between the EU GPP comprehensive criteria for road transport and the Directive (EU) 2019/1161 on the promotion of clean and energy-efficient road transport vehicles (revised CVD). The 2019 criteria is aligned with the revised CVD, while the core criteria still include technologies using conventional fuels (e.g. hybridisation).

Main differences are highlighted in yellow.

<table>
<tr><th>EU GPP Road transport</th><th>Directive (EU) 2019/1161 on the promotion of clean and energy-efficient road transport vehicles</th></tr>
<tr><td>Approach
The EU GPP identifies categories of vehicles and services. For the purchase, renting or leasing of vehicles, it sets criteria on the vehicle itself. For the purchase or outsourcing of services, criteria on vehicles are set on the fleet, e.g. setting a share of the fleet that must comply with a specific criterion.</td><td>Approach
The revised CVD sets a definition of 'clean vehicle' and sets minimum procurement targets for the share of clean heavy-duty vehicles in the total number of heavy-duty vehicles covered by contracts of purchase, renting, leasing of vehicles and service contracts.</td></tr>
<tr><td>Comprehensive criterion CO2 for cars and vans (M1 and N1)
Type-approval CO_2 emissions of vehicles must not exceed the following values:
<table><tr><th>Vehicle type</th><th>CO_2 g/km</th></tr><tr><td>All M_1 and N_1 vehicles</td><td>2018: 45 (NEDC)
2019: 40 (WLTP)
2020: 35 (WLTP)
2021: 25 (WLTP)</td></tr></table></td><td>Emission thresholds for clean light-duty vehicles (includes M1 and M2, which are small buses, and N1 - vans)

Until 31 December 2025: 50 gCO2/km

From 1 January 2026; 0 CO2 g CO2/km</td></tr>
</table>

Comprehensive criterion GHG emissions for buses

The vehicles must be equipped with one of the technologies classified A in the following table:

Technology	**Class**
Full **electric** and plug-in vehicle	A
Hydrogen fuel cell vehicle *)	A under the conditions set in the note below
OEM dual-fuel **natural gas** vehicle with a gas energy ratio over the hot part of the WHTC test-cycle of at least 50 % *)	A under the conditions set in the note below
High pressure direct injection **natural gas** vehicles *)	A under the conditions set in the note below
Dedicated **natural gas** vehicles *)	A under the conditions set in the note below

) Hydrogen and natural gas vehicles require a minimum percentage of **renewable fuel supply to be classified A*

A clean vehicle (in the case of buses) means:

(b) a vehicle of category M3 using alternative fuels as defined in points (1) and (2) of Article 2 of Directive 2014/94/EU of the European Parliament and of the Council, excluding fuels produced from high indirect land-use change-risk feed stock for which a significant expansion of the production area into land with high-carbon stock is observed in accordance with Article 26 of Directive (EU) 2018/2001 of the European Parliament and of the Council. In the case of vehicles using liquid biofuels, synthetic and paraffinic fuels, those fuels shall not be blended with conventional fossil fuels;

Points (1) and (2) of Article 2 of Alternative Fuels Directive:

Article 2 Definitions

For the purpose of this Directive, the following definitions apply:

(1) 'alternative fuels' means fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector. They include, inter alia:

- electricity,
- hydrogen,
- **biofuels** as defined in point (i) of Article 2 of Directive 2009/28/EC,
- **synthetic and paraffinic fuels**,
- natural gas, including biomethane, in gaseous form (compressed natural gas (CNG)) and liquefied form (liquefied natural gas (LNG)), and
- **liquefied petroleum gas** (LPG);

(2) 'electric vehicle' means a motor vehicle equipped with a powertrain containing at least one non-peripheral electric machine as energy converter with an electric rechargeable energy storage system, which can be recharged externally;

	The Directive sets minimum procurement targets for the share of clean heavy-duty vehicles in the total number of heavy-duty vehicles covered by contracts. **Half of the minimum target for the share of clean buses has to be fulfilled by procuring zero-emission buses** as defined in point 5 of Article 4. This requirement is lowered to one quarter of the minimum target for the first reference period if more than 80 % of the buses covered by the aggregate of all contracts referred to in Article 3, awarded during that period in a Member State, are double-decker buses 5) "zero-emission heavy duty vehicle" means a clean vehicle as defined in point 4(b) of this Article without an internal combustion engine, or with an internal combustion engine that emits less than 1 g CO2/kWh as measured in accordance with Regulation (EC) No 595/2009 of the European Parliament and of the Council and its implementing measures, or that emits less than 1 g CO2/km as measured in accordance with Regulation (EC) No 715/2007 of the European Parliament and of the Council and its implementing measures.

14 Annex II: Example of Certificate of Conformity

EC CERTIFICATE OF CONFORMITY

1.	Number of axles / wheels:	2/4
2.	Powered axles:	1
3.	Wheelbase:(mm)	2640
5.	Axle(s) track - 1/ 2:(mm)	1535-1545 / 1531-1541
6.1.	Length:(mm)	4468-4597
7.1.	Width:(mm)	1839
8.	Height:(mm)	1471-1537
11.	Rear overhang:(mm)	962-1082
12.1.	Mass of the vehicle with bodywork in running order:(kg)	1391
14.1.	Technically permissable maximum laden mass:(kg)	1885
14.2.	Distribution of this mass among the axles -1 / 2:(kg)	880-995/890-1005
14.3.	Technically perm. max mass on each axle - 1/ 2:(kg)	995 /1005
16.	Maximum permissible roof load:(kg)	75
17.	Maximum mass of trailer - braked / unbraked:(kg)	1300 /695
18.	Maximum mass of combination:(kg)	3185
19.1.	Maximum vertical load at the coupling point for a trailer:(kg)	75
20.	Engine manufacturer:	PSA Peugeot Citroen/FORD
21.	Engine code as marked on the engine:	G8DB
22.	Working principle:	4 stroke,compression ign.
22.1.	Direct injection:	Yes
23.	Number and arrangement of cylinders:	4,in-line
24.	Capacity:(cm ^{3})	1560
25.	Fuel:	Diesel
26.	Maximum net power:(kW/min $^{-1}$)	80.0/4000
27.	Clutch (type):	Single plate dry
28.	Gearbox (type):	manual
29.	Gear ratios:	1. 3.800 2. 2.048 3. 1.345 4. 0.921 5. 0.705 6. -
30.	Final drive ratio:	3.41
32.	Tyres and wheels:	tyres on wheels
	Axle 1:	205/55 R16 86 U 6.5Jx16H2OS50.0
	Axle 2:	205/55 R16 86 U 6.5Jx16H2OS50.0

EC CERTIFICATE OF CONFORMITY

34.	Steering, method of assistance:	Hydraulic
35.	Brief description of the braking system:	Service-/Secondary-Brake 2 circuits,diagonal split Disc-/Disc-Brake ABS
37.	Type of body:	AC Station wagon
38.	Colour of vehicle:	Grey
41.	Number and configuration of doors:	4;2,2
42.1.	Number and position of seats:	5 ; 2/ 3
43.1.	EC type approval mark of coupling device if fitted:	-
44.	Maximum speed:(km/h)	188
45.	Sound level: Stationary (dB(A)) at engine speed (min $^{-1}$) Drive-by (dB(A)):	70/157; R51.02 78 at 3000 / 70
46.1.	Exhaust emissions:	70/220; R83.05 RII

1. Test procedure	Diesel			2. Test procedure	Diesel	Gaseous	
CO:	0.186	-	g/km	CO:	-	-	g/kWh
HC:	-	-	g/km	NO_x:	-	-	g/kWh
NO_x:	0.188	-	g/km	NMHC:	-	-	g/kWh
HC+NO_x:	0.208	-	g/km	THC :	-	-	g/kWh
k - value :	0.600	-	m^{-1}	CH_4:	-	-	g/kWh
Particulates:	0.002	-	g/km	Particulates:	-	-	g/kWh

46.2. CO_2 emissions / fuel consumption: 80/1268; R101.00

	Diesel			
	CO_2 (g/km)	Fuel consumption (l/100km)	CO_2 (g/km)	Fuel consumption (l/100km)
urban conditions:	152.0	5.8	-	-
extra-urban conditions:	100.0	3.8	-	-
combined:	119.0	4.5	-	-

47. Fiscal power or national code number(s) if applicable:

Italy:	-	France:	6	Sweden:	-
Greece:	-	Netherlands:	-	Austria:	-
Spain:	-	Denmark:	-	Norway:	-
Belgium:	-	United Kingdom:	-	Turkey:	-
Ireland:	-	Germany:	0463	Cyprus:	-
Portugal:	-	Luxembourg:	-	Estonia:	-
Finland:	-	Switzerland:	-	Latvia:	-
Malta:	-	Hungary:	-	Slovakia:	-
Poland:	-	Czech Republic:	-	Lithuania:	-
Solvenia:	-	Bulgaria:	-	Romania:	-

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16 List of abbreviations

AC – Award criterion/a

CPC – Contract Performance Clause

CNG - Compressed Natural Gas

CO_2 - Carbon dioxide

CPV - Common Procurement Vocabulary

CVD - Clean Vehicle Directive

dB - decibels

DG - Directorate General

EEV - Enhanced environmentally friendly vehicle

EU - European Union

GHG – Green House Gas

GPP - Green Public Procurement

GSI - Gear Shift Indicator

GWP - Global Warming Potential

HDV - Heavy duty vehicle

ICEV – Internal Combustion Engine Vehicle

ITS - Intelligent Transport System

LCV - Light commercial vehicle

LDV - Light duty vehicle, i.e. a car or an LCV

M_1 - Cars

M_2 - Small buses

M_3 - Large buses

NACE - Nomenclature statistique des activités économiques dans la Communauté européenne

N_1 - LCVs

N_2 - Heavy commercial vehicles

N_3 - Heavy commercial vehicles

NEDC – New European Driving Cycle

NMHC - non-methane hydrocarbons

NO_x - Oxides of nitrogen

NRMM - Non-road mobile machinery

PM - Particulate matter

PRODCOM - PRODuction COMmunautaire

REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals

RES – Renewable Energy Source

RDE - Real driving emission

SC – Selection criterion/a

SORT – Standardised On-Road Test cycles

TCO – Total Cost of Ownership

TPMS - Tyre Pressure Monitoring System

TS - Technical Specification

TTW – Tank to Wheel

WTT – Well to Tank

WTW – Well To Wheel

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