European Commission

JRC TECHNICAL REPORTS

Revision of the EU Green Public Procurement Criteria for Transport

Technical report and criteria proposal (2nd draft)

JRC: Rocío Rodríguez Quintero, Hans Moons, Marzia Traverso, Miguel Gama Caldas
TEPR: Ian Skinner
CE Delft: Anouk van Grinsven, Maarten 't Hoen, Huib van Essen

May 2017

EUR xxxxx xx

Table of contents

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 has 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.

A detailed environmental and market analysis, as well as an assessment of potential improvement areas, were conducted within the framework of this project and presented in the Preliminary Report on EU Green Public Procurement Criteria for Transport. This report can be publicly accessed at the JRC website for Transport (http://susproc.jrc.ec.europa.eu/Transport/index.html). The main findings presented in the Preliminary Report are summarised in the next chapter.

Based on the findings resulting from the Preliminary report, a first draft of the Technical report and criteria proposal was produced and presented at the 1st ad-hoc working group meeting held in Seville on 23rd November 2016. Apart from the comments received at this meeting, written feedback was conveyed by means of a written consultation. This second draft of the Technical report and criteria proposal has been produced taking into account the input received in the course of this consultation process.

2 SUMMARY OF THE PRELIMINARY REPORT

2.1 Scope and definitions

The first stage of the revision of the EU GPP criteria for transport was to review the scope of the 2012 criteria (European Commission, 2012), i.e. the product groups covered by the criteria, and the definition of these product groups. This was informed by:

- An overview of existing legislation, standards and criteria. This included a review of relevant EU legislation, a review of national GPP criteria and relevant labels and a review of relevant standards and guidelines used by the private sector. These reviews were also used to inform the proposals for the revision of the criteria themselves, as presented in Sections 3 to 8 of this report.
- A review of potential definitions. This provided an overview of the statistical and technical categories, such as those in EU legislation, including the Common Procurement Vocabulary (CPV) codes, which could be used to define different product groups for the revised EU GPP criteria.
- A stakeholder survey. This asked stakeholders for their views on the scope of the 2012 criteria and the possible statistical or technical category that might be used to define the respective product groups. The survey also asked stakeholders for their views on revising the criteria, which was used to inform the proposals presented in Sections 3 to 8 of this report.

The 2012 EU GPP criteria for transport covered five products groups, i.e.:

- Passenger cars and light commercial vehicles (LCVs): Purchase or lease.
- Public transport vehicles (buses): Purchase or lease.
- Public transport services: Provision of bus services.
- Waste collection trucks: Purchase or lease.
- Waste collection services: Provision of waste collection services.

On the basis of the information reviewed and the feedback from stakeholders, it was concluded that these five product categories should be retained for the revised criteria, and that two additional product groups should be added.

For all five product categories in the 2012 criteria, no change of their coverage or definitions is needed, although the titles of the two 'public transport' product groups have been amended to explicitly refer to 'buses', as that is their focus rather than on rail-based public transport, for example.

It was concluded that the following definitions would be appropriate for each of these product groups:

1) 'Purchase, lease or rental of cars, LCV and L-category vehicles'.

The information available regarding short term renting services show 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'.

It is proposed a new service category covering mobility services involving cars, LCVs and L-category vehicles. As part of these criteria, the following definitions might be applied:

- 'Taxi services' as covered by CPV code 60120000-5.
- '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.

3) 'Buses'

- 'M_2 and M_3 vehicles, as defined by Directive 2007/46.
  - Category M2: 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 M3: 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 shall 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 shall 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), 60130000-8 (Special-purpose road passenger-transport services) and 60140000-1 (Non-scheduled passenger transport). This should cover the contracted public transport services (contracted public transport done by taxi companies, i.e. transport carried out for pupils/students who are not able travelling by themselves). 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

As part of the revision process, it was recommended to add two categories.

The first category that should be added is **'Mobility services'**. 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, Collado, Sarasini, & Williander, 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); neutral third-party, commercial such as UbiGo and MaaS.fi or otherwise, that offer a wide range of combined mobility options and offer it to users based on subscription and unified invoicing, possibly also with some form of repackaging of the included services. CMS is also 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.

The second category that should be added is **'post, courier and moving services'**. This was supported by those that responded to the stakeholder survey, while criteria for all of these services already exist in the Dutch GPP criteria. These services should also be defined with reference to the relevant CPV categories, i.e.:

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

In summary, the product groups covered by this report, in Sections 3 to 8, respectively, are:

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

2.2 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, 2016), while the size of the post and courier market is based on a dedicated report. 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: 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 (estimates)
Passenger cars	14.6 million vehicles (new registrations 2016)	3.4% (496 000 vehicles)
Light commercial vehicles	1.9 million vehicles (new registrations 2016)	2.8% (53 000 vehicles)
Buses and coaches (> 3.5t)	36 000 (new registrations 2016)	75% (27 000 vehicles)
Waste collection trucks	4 500 (estimated new registrations, 2013)	Nearly 100% (4 500 vehicles)
Post and courier services	€91 billion (2011)	No more than 5% (postal) No more than 1% (courier)
Moving services	No data	No more than 2%

Source: ACEA, Preliminary Report.

Even with the partial estimates provided in Table 1, it might be concluded that the public sector is responsible for procuring around 575 000 vehicles 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, while the fleets are dominated by vehicles that meet Euro emissions standards of Euro 4/IV or earlier. The proportion of Euro 5/V and Euro 6/VI vehicles in the car and LCV fleets is likely to increase at a faster rate than in the bus and waste collection vehicle fleets, as the former tend to have short lifespans.

2.3 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 reduction of the environmental impact of electric vehicles during the use phase, however, outweighs the negative environmental impacts of the additional emissions in the production phase (see section 3.5.1 of the Preliminary report).

3 CATEGORY 1: PURCHASE, LEASE OR RENTAL OF CARS, LCVS AND L-CATEGORY VEHICLES

3.1 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.

3.2 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 of cars and LCV					
		Current criterion	**Core**	**Compr**	**Revision**
TECHNICAL SPECIFICATIONS	1	CO_2 emissions	X	X	Updated
	2	Exhaust gas emissions	X	X	Updated
	3	Eco-driving	X	X	Updated
	4	Gear shift indicators (GSI)	---	X	Updated
	5	Tyre Pressure Monitoring Systems (TPMS)	---	X	Updated
	6	Fuel consumption display	---	X	Updated
	7	Air conditioning gases	---	X	Updated
	8	Lubricant oils	---	X	Updated
	9	Vehicle tyres – noise	---	X	Updated
	10	Vehicle tyres – rolling resistance	---	X	Updated
AWARD CRITERIA	1	Use of alternative fuels	X	X	Updated
	2	Noise emission levels	X	X	Updated
	3	Lower CO_2 emissions	X	X	Updated
	4	Vehicle materials	---	X	Updated
	5	Start and stop	---	X	Discarded

Purchase/lease/rental of cars, LCV and L-category vehicles				
		Proposed criterion	**Core**	**Compr**
TECHNICAL SPECIFICATIONS	1	CO_2 emissions and energy efficiency	X	X
	2	Air pollutant emissions	X	X
	3	Gear shift indicators (GSI)	X	
	4	Energy consumption displays	X	X
	5	Vehicle specific eco-driving information	X	X
	6	**Minimum warranty of the battery**		X
AWARD CRITERIA	1	Lower CO_2 emissions	X	X
	2	**Energy efficiency**		X
	3	**Improved air pollutant emissions performance**	X	X
	4	**Zero tailpipe emission capability**	X	X
	5	**Speed limiter**		X
	6	Extended warranty		X

3.3 Criteria proposal

3.3.1 CO_2 emissions and energy efficiency

3.3.1.1 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
Type approval CO_2 emissions of vehicles shall not exceed the following values:
<table>
<tr><th>Vehicle type</th><th>CO_2 g/km (NEDC)</th></tr>
<tr><td>Cars - Small (M1)</td><td>2018: 85
2019: 81
2020: 77
2021: 74</td></tr>
<tr><td>Cars - Mid-size (M1)</td><td>2018: 93
2019: 89
2020: 85
2021: 81</td></tr>
<tr><td>Cars - Large (M1)</td><td>2018: 106
2019: 101
2020: 96
2021: 92</td></tr>
<tr><td>LCV - Small (N1 class I)</td><td>2018: 94
2019: 92
2020: 90</td></tr>
<tr><td>LCV - Mid-size (N1 class II)</td><td>2018: 127
2019: 124
2020: 121</td></tr>
<tr><td colspan="2">LDV - Large (N1 class III) (two options for discussion)</td></tr>
<tr><td colspan="2">Option 1
2018: 158
2019: 155
2020: 151

Option 2
2018: 147 +0.096*(M – 1766.35)
2019: 0.95*147 +0.096*(M – 1766.35)
2020: 0.90*147 +0.096*(M – 1766.35)
Where M is the mass of the vehicle</td></tr>
</table>
Verification:
The tenderer shall provide the Certificate of Conformity of the vehicle.
</td><td>
TS1. Type-approval CO_2 value
Type-approval CO_2 emissions of vehicles shall not exceed the following values:
<table>
<tr><th>Vehicle type</th><th>CO_2 g/km (NEDC)</th></tr>
<tr><td>All M1 and N1 vehicles</td><td>2018: 45
2019: 40
2020: 35
2021: 30</td></tr>
</table>
L-category vehicles shall be battery electric.

Verification:
The tenderer shall provide the Certificate of Conformity of the vehicle.
</td></tr>
</table>

Core criteria	Comprehensive criteria
Award criteria	
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	
	AC2 Energy efficiency *If the public authority is requiring battery electric vehicles:* *P*oints will be awarded to those vehicles with higher energy efficiency expressed in kWh/100km NEDC test procedure[1)] **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle.
[1)] *A reduction of 1 kWh/km in the energy efficiency of a battery electric vehicle running an average of 10 000 km/year can save from €1 500 to €2 000 per year, depending on the electricity price.*	

3.3.1.2 Rationale

Incentives for improved internal combustion engine vehicles (ICEVs) and alternative powertrains

The use phase of the vehicles has by far the largest share in the GHG emissions of cars and LCVs. There are various technical options for reducing these emissions, ranging from more fuel efficient vehicles (including hybrids), plug-in hybrid vehicles to full electric or fuel-cell vehicles. For the electric vehicles, the emissions related with vehicle production and the emissions from electricity generation may partly offset the lower use phase emissions. However, when taking account the full lifecycle, GHG emissions of electric vehicles are still lower than those of petrol or diesel cars (see section 3.5.1 of the Preliminary report). These GHG emissions will further reduce in the next decades due to decarbonisation of the EU electricity mix (EEA, 2017)

Setting requirements for CO_2 type approval values in EU GPP criteria may incentivise the purchase of the following types of vehicles, depending on the CO_2 value:

- more fuel efficient ICEVs
- plug-in electric vehicles:
- zero emission vehicles (ZEVs): full electric and fuel cell electric vehicles perform 0 g CO_2/km (type approval).

Costs of improved ICEVs and alternative powertrains

Increasing the fuel-efficiency of petrol and diesel cars (including hybrids) generally increases the purchase price, but will also lower fuel costs over the lifetime of the vehicle. The analysis of the total cost of ownership as included in the Preliminary Report shows that the total energy cost savings over the entire lifetime exceed the additional vehicle purchase price for the top-10 non hybrid ICEVs in terms of lowest CO_2 values (except for large passenger cars with low annual mileages, e.g. 10 000 km/year) (see section 3.5.2 of the Preliminary report).).

For plug-hybrid and full electric vehicles the higher purchase cost is not compensated by the fuel cost savings over the vehicle lifetime. Based on data for the Volkswagen Golf, the total cost of ownership (TCO) (excluding taxes) of a full electric car is estimated to be around €0.02 per vehicle-kilometre higher (assuming 17 000 km/year), compared to a petrol car of the same size (see section 3.5.2 of the Preliminary report). The number of full electric and plug-in cars on the market will increase in the coming years and so will the electric range of EVs.

In the case of L-category vehicles (two and three wheelers and quadricycles), 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 2011.

2020 targets

The CO_2 emissions of new cars and LCVs need to decrease further because of the 2020/2021 targets set in the CO_2 emission regulations (Regulations (EC) No 443/2009 and (EU) No 510/2011). The requirements of those regulations should be taken into account in the EU GPP criteria; otherwise those criteria will be either too stringent for the short term or be outdated very soon. To take account of this 2020 target, the CO_2 values proposed in the criteria set are set in different tiers from 2018 to 2020/21.

On average the type approval CO_2 value of new passenger cars needs to decrease 21% between 2015 (119.6 g/km) and 2021 (95 g/km). For new vans, the NEDC emission values need to decrease 13% between 2015 (169.2 g/km) and 2020 (147 g/km). Therefore, the CO_2 type approval tiers for the years 2018 – 2020/21 have been set following these reductions rates (21% for cars and 13% for LCVs), as shown in Table 2:

Table 2: Different tiers for CO2 type approval of cars and vans

Fuel type	Size category	Average NEDC CO_2 emission (2015)	Highest NEDC CO_2 emission in top-10 most fuel efficient vehicles 2016	CO_2 emissions in 2018-2020/21 assuming equal reduction rates for best in class and average sales			
		In g/km	In g/km	2018	2019	2020	2021
CARS	Average	119.6					
Petrol	Small (segment A, B)	119	93	85	81	77	74
Petrol	Mid-size (segment C)	136	102	93	89	85	81
Petrol	Large (all other segments)	153	116	106	101	96	92
Diesel	Small (segment A, B)	102	88	80	77	73	70
Diesel	Mid-size (segment C)	110	89	81	78	74	71
Diesel	Large (all other segments)	130	99	90	86	82	79
LCVs	Average	169.2					
Diesel	Small (N1 class I)		103	94	92	90	
Diesel	Mid-size (N1 class II)		139	127	124	121	
Diesel	Large (N1 class III)		174	158	155	151	

The initial values on which the reduction rates have been applied come from the top-10 (cars) and top-5 (vans) of the most fuel efficient ICEVs available on the market in 2016. For cars the values proposed for each segment are based on the performance of the most efficient petrol vehicles available in the Netherlands (see section 3.5.2 of the Preliminary report). The values for vans are based on the performance of the most fuel efficient diesel vans available in the UK, as recommended by a stakeholder (source: http://vanfueldata.dft.gov.uk/vehicles.aspx). Choosing the threshold at the level of the top-10/top-5 ensures sufficient choice, as at least 10 car models (or 5 van models) meet the criterion proposal.

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). The thresholds have been lowered compared to the first proposal to ensure that the electric drive range is large enough also in real world conditions. As the number of

PHEV/REEV models on the market meeting tighter values is increasing and additional cost impacts are expected to be small, the threshold is lowered from 45 g/km in 2018 to 30 g/km in 2021. In the case of BEVs (battery electric vehicles) and fuel cell electric vehicles, tailpipe emissions are zero.

Worldwide harmonised Light vehicle Test Procedure (WLTP)

Currently, the type approval values are determined by the New European Driving Cycle (NEDC) test cycle. The 2021 CO_2 emission target for cars of 95 g/km and 2020 target for LCVs of 147 g/km are also both defined in terms of NEDC emissions.. In the near future (between 2017 and 2019) the type approval will change to the Worldwide harmonised Light vehicle Test Procedure (WLTP). From 2019 onward, only the CO_2 type approval measured with WLTP will be communicated to consumers. These will be translated into NEDC values by means of a simulation tool, just for the purpose of CO_2 target compliance and not for consumers' information. Therefore, the thresholds proposed in the technical specification for 2019 and onwards, which are based on the current type approval in force (NEDC) will have to be transformed into WLTP values as soon as reliable information on the WLTP/NEDC ratios becomes available.

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). The assessment made in the Preliminary report has shown that CO_2 criteria for cars and LCVs based on the WTW emissions would not significantly change the incentive to the market, as the WTW emissions for ICEVs are proportional to TTW emissions. The gap between ICEVs and BEVs would be smaller, but the latter would still have significantly lower emission values. The same is true with a complete lifecycle approach, i.e. when also considering the emissions from vehicle manufacturing and end-of-life processing. In that case, the GHG emissions of BEVs would still be lower than of a petrol car (see Section 3.5.3 of the Preliminary report).

Two options were proposed in the first version of the Technical report to be discussed with the stakeholders:

- Option 1: a technical specification based on NEDC CO_2 type approval, which would be equivalent to the most fuel efficient ICEV at the core level, and to semi and full electric vehicles at the comprehensive level. An additional award criterion based on energy efficiency would complement the comprehensive TS.
- Option 2: 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

Defining the GHG criteria in terms of WTW emissions would complicate the criteria: 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 has been confirmed by the public procurers that participated in the consultation. Option 1 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. 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. Some stakeholders argued that the TTW option was not able to reflect the environmental benefits of the use of biomethane in dedicated natural gas vehicles. However, the WTW approach would not solve this situation, since the pathway of the methane used in the refilling of the natural gas vehicles cannot be ensured. For these reasons, Option 1 is chosen as the preferable solution to facilitate the uptake of the EU GPP criteria by public procurers.

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.

Number of vehicle segments distinguished

In the current EU GPP criteria, the number of vehicle segments that is distinguished is larger than what seems to be really necessary from a procurement perspective. Distinguishing three size segments provides sufficient differentiation to cover the variation in CO_2 emissions and the main different vehicle segments. Therefore, in the proposed set, the number of vehicle segments has been reduced. The definitions of the three vehicle segments for cars are provided in Table 3, as suggested by the stakeholders.

Table 3: Passenger car vehicle categories proposed for the GPP criteria and corresponding segments

Passenger car types used in GPP criteria	**Corresponding segments according to segmentation used by the European Commission**
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)

N1 Class III

N1 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 shrink the choices of LCVs, and thus it might hinder the purchase of the most appropriate vehicle for the needs of the public procurer. However, one stakeholder indicated that the values proposed for N1 vehicles in the first draft of the technical report were too lenient, and suggested stricter thresholds. This is why two options are proposed for discussion:

- Option 1: the thresholds stick to the initial approach based on one single figure for all N1 Class III vehicles.
- Option 2: the thresholds for N1 Class III vehicles are aligned with the CO_2 target based on mass. For 2019 and 2020, the threshold is proposed to decrease 5% per year.

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 shall 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.

3.3.1.3 Consultation questions

Which option would be the most appropriate for N1 class III vehicles?

3.3.2 **Air pollutant emissions**

3.3.2.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS2. Air pollutant emissions From September 2019 onwards, all new cars and LCVs shall comply with an RDE emission performance which is at most 0.5 times higher (= conformity factor of 1.5) than Euro 6 limit values for NOx and PN. From January 2021 onwards, all new cars and LCVs shall comply with an RDE emission performance which is at most equal to the Euro 6 limit values for NOx and PN (conformity factor of 1.0). *In case of the purchase of vehicles to be used in areas with air quality issues: V*ehicles shall 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 car that can run a minimum range without any tailpipe emissions. *The contracting authority will set the minimum zero tailpipe emissions range according to the expected use profiles in the call for tender (a proposed default range could be 40 km). From 2019 onward, the range without emitting any tailpipe emissions will be the electric range over WLTP* **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle.	**TS2. Air pollutant emissions** *In case of the purchase of vehicles to be used in areas with air quality issues: V*ehicles shall 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 car that can run a minimum range without emitting any tailpipe emissions. *The contracting authority will set the minimum zero tailpipe emissions range according to the expected use profiles in the call for tender (a proposed default range could be 40 km). From 2019 onward, the range without emitting any tailpipe emissions will be the electric range over WLTP* **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle.
Award criteria	
AC3. Improved air pollutant emissions performance (*Same for core and comprehensive)* Points will be awarded proportionally to the air polluting emissions performance to vehicles that have an RDE performance better than Euro 6d (Conformity factor of 1.5 or lower related to the NOx / PN limit value). Points will be awarded according to the following formula: $$Points = \left(1 - \frac{NOx}{NOx_{max}}\right) \times PNOx_{max} + \left(1 - \frac{PN}{PN_{max}}\right) \times PPN_{max}$$ Where • NOx_{max} is the highest NOx emissions in mg/km among the offers presented to the call for tender.	

- PN_{max} is the highest 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 shall provide the Certificate of Conformity of the vehicle.

AC4. Zero tailpipe emission capability (*Same for core and comprehensive)*
Points will be awarded to those vehicles that can demonstrate a minimum zero tailpipe emission capability, meaning the range the car can run 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)*.

Verification:
The tenderer shall provide the Certificate of Conformity of the vehicle.

Explanatory notes

NOx max/ PNmax limit values to qualify for EU GPP (light-duty vehicles covered by RDE)						
CF = 1	M and N1 Class I		N1 class 2		N1 class III	
	Diesel	Gasoline	Diesel	Gasoline	Diesel	Gasoline
NOx (mg/km)	80	60	105	75	125	82
PN (#/km)	$6\ 10^{11}$	$6\ 10^{11}$	$6\ 10^{11}$	$6\ 10^{11}$	$6\ 10^{11}$	$6\ 10^{11}$

CF = 1.5	M and N1 Class I		N1 class 2		N1 class III	
	Diesel	Gasoline	Diesel	Gasoline	Diesel	Gasoline
NOx (mg/km)	120	90	157.5	112.5	187.5	123
PN (#/km)	$9\ 10^{11}$	$9\ 10^{11}$	$9\ 10^{11}$	$9\ 10^{11}$	$9\ 10^{11}$	$9\ 10^{11}$

3.3.2.2 Rationale

All newly registered cars and LCVs (M1, M2, N1 class I, II and III, and N2) have to comply with the Euro 6 emissions standard. Therefore, all 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 a next step the not-to-exceed value will be 1.5 times higher than the Euro 6 limit value), taking into account of technical margins of error, by January 2020 for all new models (and by January 2021 for all new cars). The EU GPP criteria should clearly 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 brings forward the tier that new models will have to comply with by January 2020 to September

2019. By January 2021, a stricter tier is proposed, so the vehicle shall meet a RDE conformity factor of 1.0. The initial proposal was 1.1 in the previous version of the technical report; however, the latest experience on RDE testing shows that the error margin is narrowing over time so it is expected that the conformity factors will be able to attain 1.0 by January 2021.

Some stakeholders suggested not distinguishing between diesel and gasoline vehicles, and setting one only threshold to be met. In their view, this formulation would be a way to remove the advantage that the Euro standards give to diesel vehicles due to higher limit values. However, this approach would be a contradictory signal within the current European regulations, and would add complexity to the criteria. Manufacturers work on their vehicles towards the limits set by Euro standards, which make that differentiation between diesel and gasoline, and any improvement on the technologies will be achieved within this legal framework. Since the EU GPP criteria are aimed at selecting the technologies going beyond the mandatory limits, they need to converge with the Euro standards that rule the automotive industry and that are the main drivers currently pushing the market towards those better technologies. Nevertheless the award criterion should compare the performance of the vehicle in absolute terms on a competitive basis. Therefore, the formula to calculate the points is based on the performance of the vehicle in terms of emissions per km, and no points would be allocated to the vehicle with the highest air pollutant emissions.

Regarding gasoline engines, the gasoline direct-injection (GDI) technology generates more particles than traditional gasoline engines. Euro 6c requires all vehicles to meet uniform particle number (PN) standards, including those with spark-ignition GDI engines. According to ICCT (ICCT, 2015), it is expected that GDI vehicles will meet PN standards with relatively low-cost gasoline particulate filters. However, the criterion has been reworded to be based on conformity factors, which will be set also for PN by the third RDE package. This prevents the criterion from having to require a specific technology.

Once the Euro 6c becomes mandatory for all new vehicles from September 2019 onwards, the emission performance of new vehicles will be stated on the certificate of conformity. Hence, this document is the most suitable proof of compliance with this criterion proposal.

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 comprehensive 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 comprehensive level.

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 emission vehicles, if they are to be used in urban areas with poor air quality. In case of low availability of charging infrastructures or the need of large ranges, zero tailpipe emission capable vehicles would be allowed, which provides sufficient leeway to fit the different situations and driving needs of the public authority

3.3.3 Technical options to reduce GHG emissions

3.3.3.1 Proposed criteria

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">Technical Specification</td></tr>
<tr><td>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 shall be equipped with a gear shift indicator, meaning a visible indicator recommending that the driver shift gear.
Verification:
The tenderer shall provide the technical sheet of the vehicle where this information is stated.</td><td></td></tr>
<tr><td colspan="2">TS4. Energy consumption display (Same for core and comprehensive)
The vehicles shall be equipped with a mechanism to display to the driver fuel consumption figures.
Verification:
The tenderer shall provide the technical sheet of the vehicle where this information is stated.</td></tr>
<tr><td colspan="2">TS5. Vehicle specific eco-driving information (Same for core and comprehensive)
Cars/LCVs shall be equipped with information/ instructions on eco driving. In the case of ICEV, the user manual of the vehicle shall include guidelines on early shifting, maintaining a steady speed at low RPM and anticipating traffic flows. In case of hybrid and electric vehicles, they shall include information on the use of the regenerative braking in order to save energy. For Plug-in Hybrid Electric Vehicles and Range Extender Electric Vehicles, they shall provide specific instructions to maximize the kilometres driven electrically.
Verification:
The tenderer shall provide the technical sheet of the vehicle where this information is stated.</td></tr>
<tr><td>Award criteria</td><td></td></tr>
<tr><td></td><td>AC5. Speed limiter
Points will be awarded to those vehicles equipped with a speed limiting device, meaning an on-board device that automatically limit the speed of a vehicle to a certain maximum speed as set in the device.
Verification:
The tenderer shall present the technical sheet of the vehicle where this information is stated</td></tr>
</table>

3.3.3.2 Rationale

There are various measures to reduce fuel consumption of passenger cars and LCVs. The LCA-review carried out for LDVs and described in the Preliminary Report (Annex B) has shown that the emissions in the use phase of passenger cars also depend on driving style and driving behaviour. This implies that measures that help drivers to improve their

driving behaviour towards a more fuel-efficient driving style should be incentivised. These measures are described in section 3.5.3 of the Preliminary report.

Some stakeholders argued that 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.

Gear shift indicators (GSI)

Gear shift indicators (GSI) are monitoring tools that help a driver to adjust their behaviour and can reduce fuel consumption according to Regulation (EC) No 661/2009. Gear shift indicators (GSI) are mandatory for new passenger cars, but not for LCVs. Investment costs of gear shift indicators are very low (€0-15) and the cost-effectiveness is estimated to be -€113/tCO_2.

Because GSI are commercially available and cost-effective technologies, GSI should be included as core criteria for LCVs.

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 (see 3.53 of the Preliminary Report). 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'.

Vehicle specific eco-driving information

The Technical Specification to provide cars and LCVs with information/instructions is still seen as relevant and therefore should be maintained. To highlight that this information should be vehicle specific it is renamed to 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.

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 withdrawn

Start and stop systems

Start and stop systems are applied in more than 50% of all new sold cars and LCVs and can therefore be seen as a commonly available technology able to reduce fuel consumption by a few percent. However, start and stop systems are already promoted through the criteria on type approval CO_2 emissions. Therefore, the new proposed criteria do not longer include start and stop systems as a criterion.

Air conditioning gases

From 2017 onwards the GWP of air conditioning gases applied in mobile air conditioning systems should be below 150. This implies that the exceptions allowed under the current criterion will no longer be valid. Because the limit will become mandatory, the criterion will not provide an incentive for more environmentally-friendly refrigerant unless the criterion is changed into a more ambitious criterion. Alternative refrigerant options include CO_2 and the HFO refrigerant called R1234yf, which has been introduced in certain car models recently. These refrigerants have a GWP of 1 and 4, have a high energy efficiency, bring no or acceptable additional cost and are commercially available.

Given that the only currently available alternatives to meet the legal limit already have a very low GWP, an award criterion for lower GWP beyond that limit would be easily complied by all the vehicles and would not bring any added value. Therefore it is proposed to be deleted.

Traffic information and route optimisation

The literature reviewed showed that congestion in roads could 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 (see section 3.5.1 of the Preliminary report). Traffic information and route optimisation systems are already available in many models (connected cars) but would entail additional costs (see section 3.5.2 of the Preliminary report). The saving potentials will depend on each specific situation, and on the availability of intelligent traffic systems to provide the needed traffic data. Besides, these information systems are also available in mobile phones. For these reasons, the criterion is proposed to be removed.

3.3.4 Durability of the battery

3.3.4.1 Proposed criterion

Core criteria	Comprehensive criteria
Technical specification	
	TS6 Minimum warranty *If the contracting authority is requiring battery electric vehicles:* The tenderer shall provide a minimum warranty of the battery of 90 months in case of lease of the battery, or 150 000 km in case of purchase of the battery, against capacity loss below 75% according to EN 62660. **Verification:** The tenderers shall present a declaration with the warranty terms.
Award criteria	
	AC6 Extended warranty *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 TS

3.3.4.2 Rationale

The LCA literature review (see Annex B of the Preliminary report) shows that results are sensitive to assumptions regarding battery replacement ratios. One of the authors carried out a sensitivity analysis on the life of the lithium ion battery which showed that if the battery lifetime range were to increase so that only 1 battery was needed during the car lifetime instead of 1.5, (so no replacement was needed), the BEV would become 6.57% more energy efficient and produce 8.47% fewer emissions. The author also highlighted that this scenario is likely since the battery technology used in BEVs is constantly evolving and becoming more efficient. This is also supported by the data provided by a public procurer. VW, BMW and Renault offer 96 months of warranty, while KIA offers 84 months. Therefore, a criterion on warranty of the battery is proposed in order to reward those manufacturers improving the lifetime of batteries. The criteria are proposed at comprehensive level, in line with the technical specification on GHG emissions which selects BEV among other technologies, and also to shorten the core criteria set. The capacity loss covered by the warranty has been set at 75% in line with the information received in the stakeholder consultation.

3.4 Criteria proposals withdrawn

3.4.1 Vehicle manufacturing

The use phase dominates the environmental impact of the life cycle of vehicles; however the manufacturing phase is also relevant. In case of vehicles whose use phase emissions are strongly reduced, the manufacture can become the most relevant stage.

The stakeholder consultation has confirmed the complexity that the criteria on the manufacturing process might raise, mainly related to barriers to verification by the public procurer. Recycled materials go through a complex supply chain which hinders the traceability and the verification on the final product. For this reason, this criterion is withdrawn from the current criteria proposal for all categories.

3.4.2 Waste disposal

The requirements on waste fractions and tyres and on wash bays are quite relevant, but they are already mandatory. It is therefore proposed to withdraw these criteria since they would not bring any added value to the minimum legal requirements. This applies to all categories.

3.4.3 Reuse of the battery

On the disposal of the battery, some studies pointed out that batteries still retain some capacity at the end-of-life and thus can be reused on other applications, such as stationary energy storage, where the requirements are more flexible. This suggests that a part of the manufacturing emissions should be ascribed to the second-life application, which consequently lowers overall GHG emissions of an EV. However, this is evolving naturally towards a market for second hand batteries, and therefore, rewarding suppliers for offering take-back systems is not necessary. For this reason, the award criterion on reuse of batteries is proposed to be dropped. This applies to all categories.

4 CATEGORY 2: MOBILITY SERVICES

4.1 Scope of the category

This category covers the purchase of taxi services, car sharing services and combined mobility services, using the following vehicles:

- 'Cars': M_1 vehicles, as defined by Directive 2007/46;
- '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.

4.2 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**
TS	1	Air pollutant emissions	X	X
AWARD CRITERIA	1	CO_2 emissions	X	X
	2	Air pollutant emissions	X	X
	3	Zero tailpipe emission capability		X
	4	Combined mobility services	X	X

4.3 Criteria proposal

4.3.1 GHG emissions

4.3.1.1 Proposed criteria

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></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.

Points will be awarded to those tenders offering a service fleet whose average CO_2 type approval comply with
<table>
<tr><th>Vehicle type</th><th>CO_2 g/km (NEDC)</th></tr>
<tr><td>Small (M1)</td><td>85</td></tr>
<tr><td>Mid-size (M1)</td><td>93</td></tr>
<tr><td>Large (M1)</td><td>106</td></tr>
</table>
Points will be awarded proportionally to the average CO_2 type approval of the fleet.

Verification: the tenderer shall 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 the calculation of their average.
</td></tr>
</table>

4.3.1.2 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 2011.

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)). Figure 1 shows these data for different car sharing companies (BBL Belgium; et al, 2011):

Figure 1: Comparison of specific CO_2 emissions of car-sharing fleets with personal cars by country (BBL Belgium; et al, 2011)

C-S provider or country	Specific CO_2 emissions of C-S fleet	Number of vehicles in C-S fleet	specific CO_2 emissions of the national vehicle fleet	...% lower consumption	Comparison year	Source
Mobility, Switzerland	151 g/km	2,200	183 g/km (new cars only)	17.5% (total 1,510 t in year)	2008	Mobility 2009
various, Germany	148 g/km	1,042 (included in the study)	176 g/km (new cars only)	16%	2003	Knie, Canzler 2005
cambio, Germany	129 g/km	575	165 g/km (new cars only)	21.2%	2009	cambio Journal 19/2009; German Federal Bureau of Statistics 2009
cambio Belgium, Belgium	117 g/km (Flanders) 120 g/km (Brussels) 122 g/km Wallonia	248	155 g/km (new cars only)	21.3% - 24.5%	2008	Information by e-mail, Taxistop
4 providers, Italy	127 g/km	236			2008	momo survey
various, Great Britain	110 g/km		171 g/km (assuming the replacement of personal cars after 6 years)	36%	2007 (2001 in some cases)	Carplus 2007

It is therefore apparent that mobility services tend to use better performing cars than the average fleets. Some of them even offer the top models, for example, in Germany one of latest model of cambio cars in 2010 (Ford Fiesta ECOnetic) emitted only 98 g of CO_2/km (BBL Belgium; et al, 2011).

The first version of the criteria proposal set 12% of the fleet compliant with the core TS1 for category 1 at core level, and 25% at comprehensive level. Stakeholders agreed that the substitution of vehicle purchases by mobility services entailed an environmental benefit itself, and therefore it should be encouraged over the purchase or lease. Too strict criteria would create a barrier for the development of these services, and the same would be true for too complex requirements. Thus, the criteria proposal has been reformulated as an award criterion that gives points to those service fleets whose average CO_2 type approval comply with the core TS1 for category 1. The criterion based on an average is more representative of the performance of the fleet as a whole, instead of setting percentages on the fleet compositions which would only ensure the performance of a share.

4.3.2 **Air pollutant emissions**

4.3.2.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS1. Air pollutant emissions *Note: the contracting authority will set in the call for tender what types of vehicles are required to provide service.* All cars used in carrying out the service shall meet at least Euro 5. 40% of cars and LCV shall meet at least Euro 6. All L-category vehicles used in carrying out the service shall meet at least Euro 3. 40% L-category vehicles shall meet Euro 4. **Verification:** the tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity	**TS1. Air pollutant emissions** *Note: the contracting authority will set in the call for tender what types of vehicles are required to provide service.* 1. All cars used in carrying out the service shall meet meeting at least Euro 5. 60% of cars shall meet at least Euro 6. All L-category vehicles used in carrying out the service shall meet at least Euro 3. 60% L-category vehicles shall meet Euro 4. 2. *In case of the mobility services to be used in areas with air quality issues:* Vehicles shall 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 car that can run the minimum range of 40 km without emitting any tailpipe emissions. *Note: TS2.1 will not apply in those tenders that offer combined mobility services according to AC4* **Verification:** the tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity
Award Criteria	
AC2. Air pollutant emissions (*Same for core and comprehensive)* Points will be awarded to those tenders offering a higher percentage than the one set by the TS3 for the fleet to be used under the contract, in proportion to the excess over the TS3. **Verification:** See above TS3	
	AC3. Zero tailpipe emission capability Points will be awarded to tenders offering a service fleet totally composed by zero emission capable vehicles, meaning with a minimum range of 40 km without emitting any tailpipe emissions. **Verification:** the tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity

4.3.2.2 Rationale

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 (see section 3.2.1 of the Preliminary report).

In the case of L-category vehicles, the shares of moped and motorcycles complying with Euro III in 2011 were 65% and 60% respectively (see section 3.2.1 of the Preliminary report).

There are also data available from a JRC study (Clairotte, Zardini, Haq, & Martini, 2015) in the framework of the Regulation 168/2013, which 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 are usually lower than the private ones.

Based on these facts, and given the market induced replacement of cars, a minimum percentage of 40% is proposed for core and 60% for comprehensive level. The first version of the criteria proposal set percentages of the fleet compliant with Euro 6 and Euro 6d-TEMP standard. In order to simplify the criteria set, the requirements on Euro 6d-TEMP have been withdrawn. However, the comprehensive level is more complex than the core, since it integrates some of the aspects of the air pollutants criteria of category 1. The criteria comprise an award criterion on zero tailpipe emissions capable vehicles, in line with the category 1, and the technical specification also includes a provision to request zero tailpipe emission vehicles in urban areas with poor air quality. 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). As explained in section 4.3.1, there are companies specialised in electric vehicles, and therefore, the mobility services can also help improve the air quality of urban areas where needed.

Mobility services can also offer a further level of environmental benefit by means of combined mobility services (see section 4.3.3). These include different transport modes and can be used to promote the modal shift towards public transport and non-motorised vehicles. This is reflected in the TS by an exemption of the obligation to provide zero tailpipe emission vehicles where there are air quality issues, which will help to encourage the offer of combined mobility services.

4.3.3 Combined mobility services

4.3.3.1 Proposed criteria

Core criteria	Comprehensive criteria
Award criteria	
AC4. Combined mobility services (*Same for core and comprehensive)* Option 1: Points will be awarded to those tenders that provide ad hoc solutions to each mobility need requested within the distance specified in the call for tender, taking into account the travel distance, the number of travellers, the purpose of the trip, the available infrastructures, and any other circumstance relevant to optimize the mobility solution. Option 2: Points will be awarded to those tenders that provide mobility packages adapted to the different travel categories included in the call for tender. Both options: 1) The tenderer shall ensure the prioritization of the non-motorised vehicles and public transport modes in the planning of the mobility solutions. 2) The tenderer shall offer a sufficient level of multi and intermodality to ensure 1). This will include a. In those cities where the topography and the urban infrastructure are suitable, cycles and cycle trailers, which may include electrically power assisted cycles b. public transport, c. ride-sharing, car sharing, taxi services, d. L-category vehicles. **Verification:** Option 1: the tenderer shall present a description of the planning and decision-making process to optimise the ad hoc solutions to different travel scenarios. Option 2: the tenderer shall present a description of the mobility packages offered. Both options: The tenderer will present the operations it has or will put in place to provide the services by itself or via different suppliers and partnerships with public transport operators and other fleet operators.	

4.3.3.2 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.

As key feature, the mobility service should be capable to meet a particular travel demand of its client using the most appropriate and efficient transport mode, or combination of modes. To this end, the mobility service should be able to provide, as much as possible, ad hoc solutions to each mobility need requested by the client, which should factor in the travel distance, the number of travellers, the purpose of the trip, the available infrastructures, etc. When case-by-case analysis is not feasible, the mobility packages for different types of travels are an option currently offered by some mobility service companies.

In some situations, the public procurer might have a staff travel plan in place, for which a provider of mobility services is required, and obviously the service shall be adapted to the plan's provisions. The EU GPP criteria for office buildings (European Commission,

2016) include a criterion on staff travel plan and infrastructure, which is worded as follows:

A staff travel plan shall be developed for the building in consultation with the contracting authority, the local planning authority and relevant infrastructure providers. The plan shall identify specific measures that, taking into account the local context, may reduce the need for commuting to the building by private car and promote the use of more sustainable modes of transport, to include cycling and walking, public transport, low emissions vehicles, and car sharing.

In some cities, this type of staff travel plans or company mobility plans are mandatory for big companies, for example, in Brussels it is mandatory for all companies with more than 200 employees since 2004 (City of Brussels).

The mobility solutions should be 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, Collado, Sarasini, & Williander, 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 2.

Figure 2: Summary of Integrated Mobility Services around the World (Kamargianni, Matyas, Li, & Schäfer, 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. 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, Matyas, Li, & Schäfer, 2015), (Holmberg, Collado, Sarasini, & Williander, 2016). Therefore, an award criterion is considered the most suitable way to be promoted. Nevertheless, the potential of this type of services to stimulate the modal shift is very relevant, 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.

4.4 Criteria proposal withdrawn

4.4.1 Technical measures to reduce GHG and noise emissions, vehicle-manufacturing and battery related measures

In general, many of the fuel and noise reducing measures described sections 10.1 and 10.2 are available on the market at low or no additional cost. In case of higher investment cost, this cost is easily compensated by the fuel savings reached as direct consequence of the application of these measures, or the criterion is proposed to be an award criterion.

The EV battery related measures (section 3.3.4) could also be requested to the electric vehicles included in the offer.

However, the verification process could turn into a burdensome task, since all the criteria should be verified for all vehicles of the fleet to be used under the contract.

Stakeholders pointed out that these criteria would add complexity to the mobility services procurement process. The substitution of vehicle purchases by mobility services entails an environmental benefit itself, and therefore it should be encouraged over the purchase or lease. Too many additional criteria would create a barrier for the development of these services. For this reason, it is proposed that these criteria sets are not required to mobility services.

5 CATEGORY 3: PURCHASE OR LEASE OF BUSES

5.1 Scope of the category

This category covers the purchase or lease of city buses and coaches defined as M2 and M3 vehicles by Directive 2007/46.

- Category M2: 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 M3: 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

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 buses'. The proposal is further described in the following sections. The common criteria for vehicle categories in section 10 also apply.

Purchase/lease of buses					
		Criterion	**Core**	**Compr**	**revision**
TECHNICAL SPECIFICATIONS	1	Exhaust gas emissions	X	X	discarded
	2	Exhaust pipes (location)	---	X	updated
	3	Lubricant oils	---	X	updated
	4	Tyres	---	X	updated
AWARD CRITERIA	1	Use of alternative fuels	X	X	updated
	2	Noise emission levels	X	X	updated
	3	Exhaust gas emissions	X	---	updated
	3	Tyre Pressure Monitoring Systems (TPMS)	---	X	updated
	4	Air conditioning gases	---	X	updated
	5	Vehicle materials	---	X	updated
	6	Start and stop	---	X	discarded

Purchase/lease of buses				
		Criterion	**Core**	**Compr**
TECHNICAL SPECIFICATIONS	1	**Technological options to reduce GHG emissions**	X	X
	2	Exhaust pipes	X	X
AWARD CRITERIA	1	**Technological options to reduce GHG emissions**	X	X
	2	Air conditioning gases		X
	3	**Improved air pollutant emissions performance**	X	X
	4	**Zero tailpipe emission capability**	X	X

5.3 Criteria proposal

5.3.1 GHG emissions

5.3.1.1 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>
TS1 Technological improvement options to reduce GHG emissions
The vehicle shall be equipped with at least one of the technologies within the Table 4 for city buses and Table 5 for coaches and inter-urban buses.

Table 4: List of eligible technologies for city buses
<table>
<tr><th>Technology</th><th>Class</th></tr>
<tr><td>Smart / clutched compressor</td><td>C</td></tr>
<tr><td>Smart alternator / improved alternator</td><td>C</td></tr>
<tr><td>Stop/start battery systems</td><td>C</td></tr>
<tr><td>Fuel cell vehicle</td><td>C</td></tr>
<tr><td>Mild hybrid</td><td>B</td></tr>
<tr><td>Flywheel hybrid</td><td>B</td></tr>
<tr><td>Full Series hybrid</td><td>A</td></tr>
<tr><td>Full Parallel hybrid</td><td>A</td></tr>
<tr><td>Full electric and plug-in vehicle</td><td>A</td></tr>
</table>
Table 5: List of eligible technologies for coaches
<table>
<tr><th>Technology</th><th>Class</th></tr>
<tr><td>Smart / clutched compressor</td><td>C</td></tr>
<tr><td>Smart alternator / improved alternator</td><td>C</td></tr>
<tr><td>Fuel cell vehicle</td><td>C</td></tr>
<tr><td>Active flow control</td><td>C</td></tr>
<tr><td>Boat tails/ extension panels</td><td>C</td></tr>
</table>
</td><td>
TS1 Technological improvement options to reduce GHG emissions
Note: This criterion is only applicable where there are technologies classified as B or A.
The vehicles shall be equipped with at least one of the technologies classified A or B within the Table 4 for city buses and Table 5 for coaches and inter-urban buses.

Table 4: List of eligible technologies for city buses
<table>
<tr><th>Technology</th><th>Class</th></tr>
<tr><td>Smart / clutched compressor</td><td>C</td></tr>
<tr><td>Smart alternator / improved alternator</td><td>C</td></tr>
<tr><td>Stop/start battery systems</td><td>C</td></tr>
<tr><td>Fuel cell vehicle</td><td>C</td></tr>
<tr><td>Mild hybrid</td><td>B</td></tr>
<tr><td>Flywheel hybrid</td><td>B</td></tr>
<tr><td>Full Series hybrid</td><td>A</td></tr>
<tr><td>Full Parallel hybrid</td><td>A</td></tr>
<tr><td>Full electric and plug-in vehicle</td><td>A</td></tr>
</table>
Table 5: List of eligible technologies for coaches
<table>
<tr><th>Technology</th><th>Class</th></tr>
<tr><td>Smart / clutched compressor</td><td>C</td></tr>
<tr><td>Smart alternator / improved alternator</td><td>C</td></tr>
<tr><td>Fuel cell vehicle</td><td>C</td></tr>
<tr><td>Active flow control</td><td>C</td></tr>
<tr><td>Boat tails/ extension panels</td><td>C</td></tr>
</table>
</td></tr>
</table>

Engine software management optimization	C

Note:

The contracting authorities may qualify dedicated natural gas vehicles as class C, B or A (see Table 4 and Table 5), if they have a supply of renewable methane meeting at least 10%, 15% or 25% of their demand, respectively.

Renewable methane means biomethane and synthetic methane produced with surplus of renewable electricity (power-to-gas).

Verification:

The tenderer shall present the technical sheet of the vehicle where these technologies are stated.

Engine software management optimization	C

Note:

The contracting authorities may qualify dedicated natural gas vehicles as class B or A (see Table 4 *and* Table 5*), if they have a supply of renewable methane meeting at least 15% or 25% of their demand, respectively.*

Renewable methane means biomethane and synthetic methane produced with surplus of renewable electricity (power-to-gas).

The contracting authorities may classify fuel cell electric vehicles as class B or A, if they have a supplier of hydrogen produced with renewable sources generated on-site, meeting at least 15% or 25% of their demand, respectively.

Verification:

The tenderer shall present the technical sheet of the vehicle where these technologies are stated.

Award criteria

AC1 Technological improvement options to reduce GHG emissions

Note: This criterion is only applicable where there are technologies classified as B or A in Table 4 and Table 5.

Points will be awarded to those vehicles equipped by one of the technologies classified A or B, within the Table 4 for city buses and Table 5 for coaches.

The contracting authorities may classify fuel cell electric vehicles as class B or A, if they have a supplier of hydrogen produced with renewable sources generated on-site, meeting at least 15% or 25% of their demand, respectively.

Verification: same as TS.

AC1 Technological improvement options to reduce GHG emissions

Note: This criterion is only applicable where there are technologies classified as A in Table 4 and Table 5.

Points will be awarded to those vehicles equipped by one of the technologies classified A within the Table 4 for city buses and Table 5 for coaches.

Verification: same as TS.

AC2. Air conditioning gases

Points will be awarded to those vehicles equipped with an air conditioning system that use a refrigerant with a global warming potential (GWP), related to CO_2 and a time horizon of 100 years, below 150.

Verification:

The tenderer shall 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 %. Information on the GWP of gases can be found at: http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/248.htm

5.3.1.2 Rationale

The first stakeholder consultation suggested that a technology-neutral approach based on GHG emissions could be explored as an option to revise the criterion on alternative fuels. Other views recommended the removal of the criterion arguing that the use of alternative fuels was not a consideration made in the course of purchasing, but part of a public transport authority's wider strategy. However, the EU GPP criteria would still be valid in those cases, as a way to assist the decision-making of the public procurers.

In the case of buses, there is currently a legal gap that hinders an EU-harmonised approach to formulate a CO_2 emissions criterion. The European Commission has already developed a simulation tool called VECTO (Vehicle Energy Consumption calculation Tool), which is aimed to support the certification, monitoring and reporting of CO_2 emissions from heavy duty vehicles (see section 4.6.2 of the Preliminary report). Five different driving cycles (mission profiles) have been developed and introduced into VECTO for buses and coaches. The regulation on monitoring and reporting of CO_2 emissions using VECTO is expected to be in force within the next years.

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)

This situation leads to a lack of comparable data on CO_2 emissions of buses per km, in contrast to the CO_2 labelling scheme for cars and LCVs. The possibility to set thresholds as proposed for cars and LCVs had to be ruled out, and alternative solutions needed to be explored.

Therefore, two options were presented for discussion in the first version of the technical report:

- Option 1 technology-neutral approach: the criterion would be based on a reduction of WTW GHG emissions compared to a reference vehicle, using default WTT factors for the different fuels and energy carriers.
- Option 2 technology-specific approach: the criterion would select directly the technologies that have been identified as improvement options.

Both options were discussed at the first Ad Hoc Working group meeting held on 23 November 2016 and at an interactive webinar on 16 March 2017.

It was agreed that in terms of fairness and level playing field, Option 1 is the preferable one; however its implementation is hindered by several limitations that cannot be overcome for the time being. The definition of the reference vehicle is identified as the

main obstacle. It would need enough data on consumption from VECTO to come up with distributions and averages to support the definition of the reference vehicles. Besides, the reference vehicles shall be set for different types of buses (12 m rigid, double-decker, articulated, etc.) and for different duty cycles: urban city, interurban, coaches, etc.

There was strong support to set just one test method, instead of letting the public procurer to choose it. One of the reasons is that the percentage of GHG emissions reduction might significantly vary as a function of test method used. Besides, it was argued that the manufacturers should not be challenged to test their vehicles with different test methods. VECTO is the most recommended option since there is a lot of work invested on the development of this tool by the different parties involved, and it will be the way to implement the future regulation on monitoring and reporting of CO_2.

The stakeholders agreed on Option 2 as interim solution, and developing Option 1 once VECTO is fully implemented and data are available. Option 2 should distinguish at least between city buses and coaches, and if possible inter-urban. However, no information has been found about specific technologies suitable for inter-urban buses, so it is proposed that the list of technologies for coaches is also applicable to inter-urban buses.

Option 2: technology-specific approach

The EU GPP is aimed at incentivising the purchase of the best technologies currently in the market. The Preliminary report (see sections 4.6.2. and 4.6.3 of the Preliminary report) showed the following options and their potential savings compared to a Euro VI bus (see Table 6):

Table 6: WTW GHG savings and abatement costs for different technologies and powertrains

Technology	**WTW CO_2 savings (compared to Euro VI)**	**Abatement cost €/kg CO_2 eq.**
CNG and LNG bus	4% (2020 projections)	0.6 (2020 projections)
Hybrid bus	18 – 24%	Maximum 0.4-0.5
Biofuel	50%	0.25 – 0.75
Full Electric Vehicle and Plug-in Hybrid Electric Vehicle	40% - 100%	0.2 – 0.7
Fuel Cell Electric Vehicle	11% - 100%	1 - 16
NG bus running on biomethane from maize	30% - 40%	not available
NG bus running on biomethane from landfill	100%	not available

Other sources of information have been analysed to come up with the lists of technologies for city buses and coaches. These have demonstrated at least 5% GHG emissions reduction compared to a conventional diesel vehicle. Table 7 gathers the information from the literature reviewed (JRC, 2016), (Ricardo, 2013), 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 7. List of technologies for city buses and coaches (Ricardo, 2013), (JRC, 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	40
Hybridisation	Full Parallel hybrid	yes	no due to constant speed operation	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
Engine	Engine software management optimization	No information	yes	2 - 5

As shown above, there are technology types suitable for each duty cycle: hybridisation for city buses and aerodynamics for coaches. Within the city bus list, different levels of CO_2 reduction are apparent: some technologies show modest CO_2 reductions, as smart ancillaries, other ones range from 10 to 20%, as mild hybridisation technologies, and there are some of them that 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 7 shows the classification for the proposed criterion, where technologies that can reach up to 10% would be class C, up to 20% would be B and more than 20% A.

Table 8. List of technologies for city buses 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	A
Hybridisation	Full Parallel hybrid	A
Alternative fuels	Full electric and plug-in vehicle	A

There are not the same variations of CO_2 reduction in the technologies for coaches, which range 3 – 10%, so there would be only class C technologies, as shown in Table 9.

Table 9: List of technologies for coaches 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
Alternative fuels	Fuel cell vehicle	C
Aerodynamics	Active flow control	C
Aerodynamics	Boat tails/ extension panels	C
Engine	Engine software management optimization	C

Higher reductions are only possible if the pathway to produce certain fuels is taken into account, as explained below.

Technologies classification according to fuels pathway

The relation between vehicles and fuels has been discussed during the stakeholder consultation, and many public procurers agreed that 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 (Ricardo, 2013). 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.

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.

5.3.1.3 Consultation questions

- Do you agree with the technologies and classification system proposed?

5.3.2 Air pollutant emissions

5.3.2.1 Criterion proposal

Core criteria	Comprehensive criteria
Award criteria	
AC3. Improved air pollutant emissions performance (*Same for core and comprehensive)* Points will be awarded to vehicles that have an emission performance better than Euro VI, proportionally to the air pollutant emissions reduction. **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle. 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.	
AC4. Zero tailpipe emission capability (*Same for core and comprehensive)* Points will be awarded to those vehicles that are capable of running with zero tailpipe emissions of air pollutants, i.e. plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV), and fuel cell electric vehicles (FCEV). **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle. For those vehicles where technical upgrade has achieved the abovementioned standard the measures must be documented and included in the tender, and this must be verified by an independent third party.	

5.3.2.2 Rationale

All new buses placed on the market shall 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).

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. Therefore, it is proposed to set award criteria to promote those vehicles able to emit below Euro VI limits and without emitting any air pollutant, i.e. zero tailpipe emission capable. This definition would include plug-in hybrid, pure electric and hydrogen buses. Given that there is not a harmonised test method to measure the zero tailpipe emissions capability of buses expressed in distance, the criterion is proposed to directly select the technologies.

5.3.3 Exhaust pipe location

5.3.3.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specification	
TS2. Exhaust pipes (location) (*Same for core and comprehensive)* Vehicles' exhaust pipes shall be located on the opposite side as the passenger door, at the rear of the vehicle. **Verification:** The tenderer shall provide the technical sheet of the vehicle.	

5.3.3.2 Rationale

The stakeholder consultation showed that there is enough support to keep this criterion. The only update proposed is including this requirement as both a core criterion and comprehensive criterion.

5.4 Criteria proposal withdrawn

5.4.1 Durability of the battery

The report *ZeEUS eBus Report An overview of electric buses in Europe* (ZeEUS project, 2016) 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.

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 market not yet mature. The criterion proposal is therefore removed due to the lack of data and the counterproductive effects that a wrong market signal would entail. This would also apply to waste collection vehicles

6 CATEGORY 4: BUS SERVICES

6.1 Scope of the category

This category covers the purchase of buses services using M2 and M3 vehicles by Directive 2007/46. They comprise:

- Public road transport services,
- Special-purpose road passenger-transport services
- Non-scheduled road passenger transport services

6.2 Overview of the revision of the EU GPP criteria

In the case of bus 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 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.

Bus services					
		Current criterion	**Core**	**Compr**	**Revision**
TECHNICAL SPECIFICATIONS	1	Exhaust gas emissions	X	X	updated
	2	Noise emissions	X	X	updated
	3	Lubricant oils	---	X	updated
	4	Tyres	---	X	updated
AWARD CRITERIA	1	Exhaust gas emissions	X	X	updated
	2	Use of alternative fuels	X	X	updated
	3	Tyre Pressure Monitoring Systems (TPMS)	---	X	updated
	4	Air conditioning gases	---	X	updated
	5	Vehicle materials	---	X	updated
	6	Start and stop	---	X	updated
CONBTRACT PERFORMANCE CLAUSES	1	New vehicles	X	X	updated
	2	Fuel consumption data	X	X	updated
	3	Training of drivers	X	X	updated
	4	Disposal of lubricant oils and tyres	X	X	discarded
	5	Wash bays	---	X	discarded

	Bus services			
		Proposed criterion	**Core**	**Compr**
TECHNICAL SPECIFICATIONS	1	**Technological options to reduce GHG emissions**	X	X
	2	Tyres - rolling resistance	X	X
	3	Tyre Pressure Monitoring Systems (TPMS)	X	X
	4	Fuels	X	X
	5	Air pollutant emissions	X	X
AWARD CRITERIA	1	Technological options to reduce GHG emissions	X	X
	2	Air pollutant emissions	X	X
	3	Noise emissions		X
CPC	1	New vehicles	X	X

6.3 Criteria proposal

6.3.1 GHG emissions

6.3.1.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specification *(These criteria apply only if the operators owns or leases the service fleet)*	
TS1. Technological options to reduce GHG emissions *Note: This criterion is not applicable to special-purpose and non-scheduled passenger transport services* 12% of the fleet to be used under the contract shall be vehicles equipped with one the eligible technologies set by the core TS1 of category 3. **Verification:** Same as TS1 of category 3 together with the list and technical sheets of the whole fleet.	**TS1. Technological options to reduce GHG emissions** *Notes: This criterion is not applicable to special-purpose and non-scheduled passenger transport services* 25% of the fleet to be used under the contract shall be vehicles equipped with one the eligible technologies set by the core TS1 of category 3. **Verification:** Same as TS1 of category 3 together with the list and technical sheets of the whole fleet.
TS2. Vehicle tyres – rolling resistance (*Same for core and comprehensive)* All the vehicles shall be equipped with tyres compliant with TS on vehicle tyres as defined in the section 11.1 of Common criteria for vehicle categories. **Verification:** Same as TS2 of category 3 together with the list and technical sheets of the whole fleet	
TS3. Tyre Pressure Monitoring Systems (TPMS) (*Same for core and comprehensive)* All the vehicles shall be equipped with tyres compliant with TS on TPMS as defined in the section 11.1 of Common criteria for vehicle categories. **Verification:** Same as TS3 of category 3 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 dedicated natural gas vehicles as A, B or C and the tenderer offers dedicated natural gas vehicles to comply with TS2* At least 25% for class A, 15% for class B or 10% for class C of the methane supply shall be renewable methane. **Verification:** The tenderer shall provide the contract(s) with 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 owns or leases the service fleet)*	
AC1. Technological options to reduce GHG emissions (*Same for core and comprehensive)* **A) For public transport services** Points will be awarded to the fleet to be used under the contract with proportion of vehicles (%) larger than TS2, in proportion to the excess over the TS2. If the fleet is composed by technologies of different classes, triple points than class C will be granted to class A, and double points to class C.	

B) For special-purpose and non-scheduled passenger transport services

Points will be awarded to those tenders offering a service fleet totally composed by vehicles equipped with one the eligible technologies set by the TS1 of Category 3.

Verification:

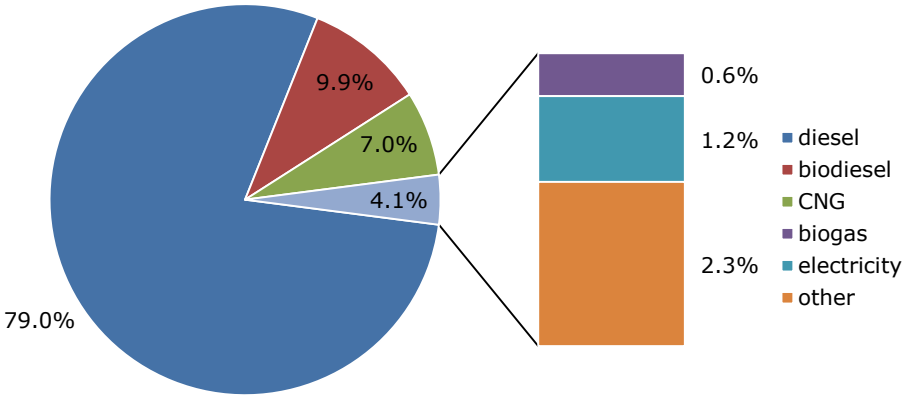
See above TS2

6.3.1.2 Rationale

The Preliminary report showed that the hybrid technologies are all commercially available and should be seen as a first stage of electrification of the EU fleet, with payback times up to 1.5 years (see section 4.2.1 of the Preliminary report). 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%) (JRC, 2016).

The current fleet composition is represented in Figure 3:

Figure 3: Shares of fuel type in current public transport bus fleet in the European Union (3iBS, 2013)



The stakeholders indicated that the criteria should better reflect the different types of services that this category encompasses:

- Public road transport services
- Special-purpose road passenger-transport services
- Non-scheduled passenger transport services

In the case of public road transport services, they are usually contracted to provide a public service to citizens within a network, setting stops, frequencies and fares. Therefore, it would be feasible to request fleet compositions since all the vehicles are to be providing the service contracted. On the contrary, for special-purpose road passenger-transport services and non-scheduled passenger transport, the operation would be similar to mobility services, and thus the same arguments related to fleet composition can be raised. For these services, an award criterion is proposed to promote those fleets equipped with the technologies covered by the TS1 of the category 3.

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.

6.3.2 Air pollutant emissions

6.3.2.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specification *(These criteria apply only if the operators owns or leases the service fleet)*	
TS5. Air pollutant emissions All vehicles used in carrying out the service shall meet at least Euro V. 40% of vehicles shall meet Euro VI. **Verification:** The tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity. For those vehicles having achieved above-mentioned 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.	**TS5. Air pollutant emissions** All vehicles used in carrying out the service shall meet at least Euro V. 60% of vehicles shall meet Euro VI. **Verification:** The tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity. For those vehicles having achieved above-mentioned standard 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.
Core criteria	**Comprehensive criteria**
Award Criteria *(These criteria apply only if the operators owns or leases the service fleet)*	
AC2. Air pollutant emissions Points will be awarded to the fleet to be used under the contract with proportion of vehicles used in carrying out the service (%) larger than TS6, in proportion to the excess over the TS6, or if the vehicles have an emission performance better than Euro VI or are capable to run with zero tailpipe emissions, i.e. plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV), and fuel cell electric vehicles (FCEV). **Verification:** See above TS3	**AC2. Air pollutant emissions** Points will be awarded to the fleet to be used under the contract with proportion of vehicles used in carrying out the service (%) larger than TS6, in proportion to the excess over the TS6, or if the vehicles have an emission performance better than Euro VI or are capable to run with zero tailpipe emissions, i.e. plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV), and fuel cell electric vehicles (FCEV). **Verification:** See above TS3

6.3.2.2 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 (see 4.2.1 of the Preliminary Report).

It is proposed that all vehicles comply with Euro V at core level, in order to prevent the use of low performance vehicles. A minimum percentage of 40% of Euro VI is proposed for core and 60% for comprehensive level. This will stimulate the acceleration of the replacement rate to increase the share of Euro VI buses. These technical specifications are complemented with award criteria to promote a better performance of the fleet in line with the criteria of category 3.

6.3.3 Noise emissions

6.3.3.1 Proposed criteria

Core criteria	Comprehensive criteria
Award Criteria *(These criteria apply only if the operators owns or leases the service fleet)*	
	AC3. Noise emissions Points will be awarded to those tenders offering a service fleet totally composed by vehicles compliant with the AC on vehicle noise emissions set in the section 10.2 of the common criteria for vehicle categories. **Verification:** The tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity.

6.3.3.2 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.

6.3.4 New vehicles

6.3.4.1 Proposed criteria

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

6.3.4.2 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.

6.4 Criteria proposals withdrawn

6.4.1 Integrated public transport systems

Integrated public transport systems are aimed 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 (2014-2015) (Smile-einfachmobil) encompasses 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). The usage of SMILE led to changes in the choice which mode of transport to use. 48% respondents increased usage of public transportation (PT) (urban PT 26%, regional PT 22%). 10% increased the use of bikesharing offers while 4% increased the usage of e-carsharing as well as another 4% increased the usage of e-bike/pedelec. 21% of the surveyed pilot users stated to have reduced the usage of their private car.

However, the stakeholders indicated that these integration platforms are not part of call for tenders but they are within the mobility planning and other urban and transport strategies developed by local and national authorities. For this reason, this proposal is withdrawn.

6.4.2 Durability of the battery

The contracts of public transport service usually include provisions on service quality performance such as reliability, minimum frequencies, etc. In the case of battery electric vehicles, these quality requirements can trigger the adoption of warranty contracts between the contractor and the battery supplier. As explained in section 5.4.1 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. For this reason, it is proposed that no criteria on battery warranty are within the service categories.

7 CATEGORY 5: PURCHASE OR LEASE OF WASTE COLLECTION VEHICLES

7.1 Scope of the category

This category covers the purchase or lease of N2 and N3 vehicles, as defined by Directive 2007/46, that are designed to provide waste collection services and waste transport services.

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 waste collection trucks'. The proposal is further described in the following sections. The common criteria for vehicle categories in section 10 also apply.

Purchase/lease of waste collection trucks					
		Current criterion	**Core**	**Compr**	**Revision**
TECHNICAL SPECIFICATIONS	1	Exhaust gas emissions	X	X	discarded
	2	Noise emission levels	X	X	updated
	3	Pollutant emissions	---	X	updated
	4	Lubricant oils	---	X	updated
	5	Tyres	---	X	updated
AWARD CRITERIA	1	Use of alternative fuels	X	X	updated
	2	Exhaust gas emissions	X	---	updated
	2	Tyre Pressure Monitoring Systems (TPMS)	---	X	updated
	3	Vehicle materials	---	X	updated

	Purchase/lease of waste collection vehicles			
		Criterion	**Core**	**Compr**
TECHNICAL SPECIFICATIONS	1	**Technological options to reduce GHG emissions**	X	X
	2	Air pollutant emissions from auxiliary units	X	X
AWARD CRITERIA	1	**Technological options to reduce GHG emissions**	X	X
	2	Air conditioning		X
	3	**Improved air pollutant emissions performance**	X	X
	4	**Zero tailpipe emission capability**	X	X
	5	Electrification of auxiliary units		X

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 colspan="2">TS1. Technological options to reduce GHG emissions (Same for core and comprehensive)
The vehicle shall be equipped by one of the following technologies demonstrating WTW GHG emissions reduction
• Hybrid vehicles, both diesel and natural gas
• Vehicles equipped with energy accumulation/recovery systems
• Vehicles equipped with load-sensing hydraulic system
• Vehicles equipped with electric bin lifts
• Plug-in hybrid: Vehicle equipped with a battery pack which can be charged from the grid and provides the energy for the electrical drive of the body and lifter
• Full Electric vehicles
• Fuel Cell Electric vehicles.
Note: The contracting authorities may include dedicated natural gas vehicles if they have a supply of renewable methane meeting at least 10% of their demand.

Verification:
The tenderer shall present the technical sheet of the vehicle where these technical or fuel technology specifications are stated.</td></tr>
<tr><td colspan="2">Award criteria</td></tr>
<tr><td></td><td>AC1. Air conditioning gases
Points will be awarded to those vehicles equipped with an air conditioning system that use a refrigerant with a global warming potential (GWP), related to CO_2 and a time horizon of 100 years, < 150.
Verification:
The tenderer shall 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 %.
Information on the GWP of gases can be found at:
http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/248.htm</td></tr>
</table>

7.3.1.2 Rationale

The stakeholder consultation suggests that a technology-neutral approach based on GHG emissions could be explored as an option to revise the criterion on alternative fuels in waste collection trucks. Most comments were very similar to the ones on buses, and the

rationale for the criterion proposed on GHG emissions (see section 5.3.1) is almost fully applicable to waste collection trucks.

There is the same lack of robust and comparable data on energy consumption of waste collection trucks, but with additional hindrances. The VECTO tool is aimed at measuring and reporting CO_2 emissions from heavy vehicles, but it will not include waste collection duty cycles in the mid-term.

For these reasons, the only possible option is Option 2 technology-specific approach: the criterion is proposed to promote directly the technologies that have been identified as improvement options.

Option 2: technology-specific approach

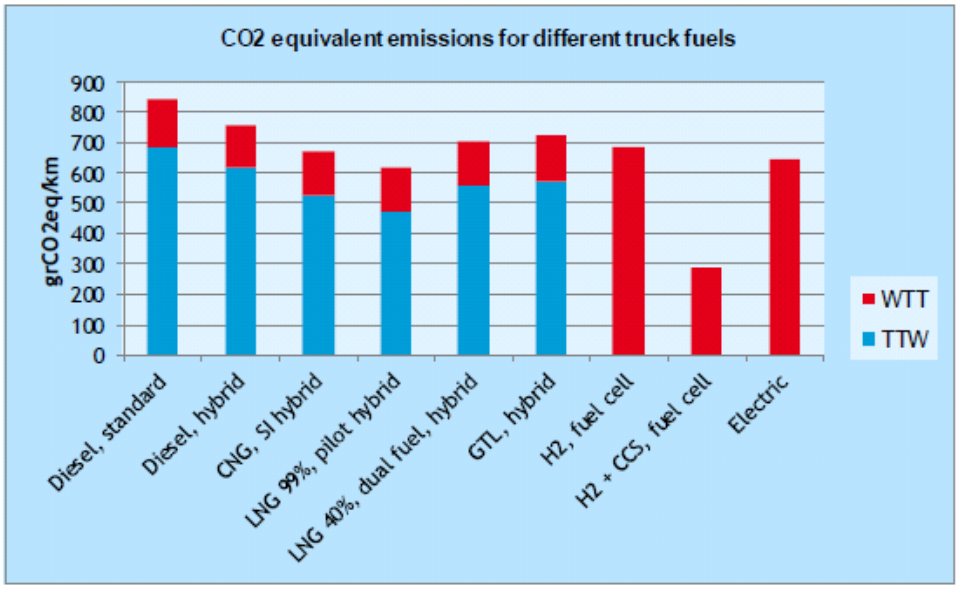
The EU GPP criteria should promote the best technologies currently in the market. The report *Opportunities to overcome the barriers to uptake of low emission technologies for each commercial vehicle duty cycle* (Ricardo AEA, 2012) identified the following options and their potential savings for refuse collection trucks, based on a literature review and interviews with fleet operators, industry bodies, vehicle manufacturers, technology providers and fuel suppliers (see Table 10):

Table 10: WTW GHG savings and payback periods for different technologies and powertrains (Ricardo AEA, 2012)

Technology	**WTW CO_2 savings (compared to Euro VI)**	**Payback periods (years)**
Hybrid electric / hydraulic hybrid vehicles	25% / 15%	4 - 16
Dedicated natural gas vehicles	5% - 16% (CNG) 61% - 65% (Biomehatne)	6 - 18

The results for hybrid vehicles are confirmed by the outcomes of the report *Natural gas in transport: an assessment of different routes* (CE Delft, TNO and ECN, 2013), as shown in Figure 4.

Figure 4: WTW GHG emissions for different NG-based energy carriers – rigid trucks (CE Delft, TNO and ECN, 2013)



However, the improvement potential of dedicated natural gas vehicles is not so clear, and additional sources of data are needed to evaluate their environmental performance. A recent report from LowCVP, *Emissions Testing of Gas-Powered Commercial Vehicles,* (LowCVP, 2017) gathers the results of a test programme carried out on dedicated and dual fuel natural gas trucks, on three driving cycles: long haul, regional delivery and urban delivery. According to these tests, the dedicated natural gas rigid truck achieved a reduction of 4 – 5% for regional and urban delivery, and just 1% for long haul, compared to a similar Euro VI diesel truck. Overall, dual fuel trucks performed worse than the diesel counterparts due to the methane slips. Another source of information is the report delivered by Cenex and Atkins for the Department for Transport (DfT) in relation to the Low Carbon Truck and Refuelling Infrastructure Demonstration Trial Evaluation (Cenex and Atkins, 2016). The Low Carbon Truck Trial (LCTT) consists of 12 consortia projects with 35 participating companies (including fleets, emission testing companies, station providers, universities and product developers). A sample of 371 vehicles under different duty cycles was tested. The report concluded that the dedicated gas vehicles attained WTW emissions savings of up to 10% when the vehicle run on a biomethane blend of 15%. This would have resulted in an increase of 3% in WTW emissions without the biomethane blend, due to a lower efficiency compared to the diesel engines. The information available does not clearly identify dedicated natural gas vehicles running on fossil gas as a better technology than new diesel trucks, in terms of GHG emissions. Applying the same solution as for buses, it is proposed that the contracting authority is allowed to include dedicated natural gas vehicles in the list of eligible technologies provided they have a supply of biomethane meeting at least 10% of their fuel demand.

Specific technologies for waste collection vehicles have been identified by the European Association of Municipal Equipment Manufacturers (EUnited Municipal Equipment, 2014). They include both drivetrain and compaction and lifting technologies. Apart from hybrid vehicles, the following technical improvements are identified in this report:

- Energy accumulation/recovery system with hydraulic accumulators: a group of hydraulic accumulators transforms into potential hydraulic energy the kinetic energy of the vehicle during the braking phase and the stationary phase when the vehicle is idling. The stored energy can be used during operational phases like bin emptying and compaction.
- Electric bin lift range; this electric drive technology eliminates the need for increased engine rev during operation; it can even operate while the engine is off.
- Plug-in vehicles: the vehicle is equipped with a battery pack which can be charged overnight at low power consumption times provides the energy for the electrical drive of the body and lifter. The vehicle is still driven by the truck's diesel engine.
- Load-sensing-hydraulic system: the flow-capacity of the pump will be regulated through the load-sensing-pressure.

Unfortunately, the information available is very scarce, and there are not enough data of CO_2 reductions that enable the classification of technologies which is necessary to formulate a combination of technical specification and award criterion.

Air conditioning

The rationale would be the same as for buses (see section 5.3.1)

7.3.2 **Auxiliary units**

7.3.2.1 Proposed criteria

Core criteria	**Comprehensive criteria**
Technical Specification	
TS2. Air pollutant emissions(*Same for core and comprehensive)* The vehicle's emissions from the separate engines for auxiliary units meet the exhaust emission limits below according to Regulation (EU) No 2016/1628, Stage V. **Verification:** The tenderer shall 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, in order to reduce noise and air pollutant emissions during stationary processes. **Verification:** The tenderer shall present the technical sheet of the vehicle where this information is stated.

7.3.2.2 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 will be 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 new NRMM Regulation shall apply as of 1 January 2017. 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, but not for all models placed in the market. Therefore it is proposed as technical specification at core and comprehensive levels.

An award criterion is added for the electrification of the auxiliary engines. According to section 5.6 of the Preliminary report, electrification of the stationary phases of operation could reduce the need to turn on the main engine significantly and thus reduce both air pollutant and noise emissions.

.

7.3.3 **Air pollutant emissions**

7.3.3.1 Criterion proposal

Core criteria	**Comprehensive criteria**
Technical specification	
Award criteria	
AC3. Improved air pollutant emissions performance (*Same for core and comprehensive)* Points will be awarded to vehicles that have an emission performance better than Euro VI, proportionally to the air pollutant emissions reduction. **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle. For those vehicles having achieved above-mentioned 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.	
AC4. Zero tailpipe emission capability Points will be awarded to those vehicles that are capable to run with zero air pollutant emissions, i.e. plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV), and fuel cell electric vehicles (FCEV). **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle.	

7.3.3.2 Rationale

The rationale is the same as for buses.

8 CATEGORY 6: WASTE COLLECTION SERVICES

8.1 Scope of the category

This category covers the purchase of waste collection services.

8.2 Overview of the revision of the EU GPP criteria

In the case of waste collection services, various types of measures exist for improving the environmental performance. First of all, the whole criteria set proposed for Category 5 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.

Waste collection services					
		Current criterion	**Core**	**Compr**	**revision**
TECHNICAL SPECIFICATIONS	1	Exhaust gas emissions	X	X	updated
	2	Noise emissions	X	X	updated
	3	Pollutant emissions	---	X	updated
	4	Lubricant oils	---	X	updated
	5	Tyres	---	X	updated
AWARD CRITERIA	1	Exhaust gas emissions	X	X	updated
	2	Use of alternative fuels	X	X	updated
	3	Tyre Pressure Monitoring Systems (TPMS)	---	X	updated
	4	Vehicle materials	---	X	updated
CONBTRACT PERFORMANCE CLAUSES	1	New vehicles	X	X	updated
	2	Fuel consumption data	X	X	updated
	3	Training of drivers	X	X	updated
	4	Disposal of lubricant oils and tyres	X	X	discarded
	5	Wash bays	---	X	discarded

	Waste collection services			
		Proposed criterion	**Core**	**Compr**
TECHNICAL SPECIFICATIONS	1	**Technological options to reduce GHG emissions**	X	X
	2	Tyres - rolling resistance	X	X
	3	Tyre Pressure Monitoring Systems (TPMS)	X	X
	4	Air pollutant emissions	X	X
AWARD CRITERIA	1	**Technological options to reduce GHG emissions**	X	X
	2	Air pollutant emissions	X	X
	3	Auxiliary units	X	X
	4	Route optimisation		X
CPC	1	New vehicles	X	X

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 owns or leases the service fleet)*	
TS1. Technological options to reduce GHG emissions 12% of the fleet to be used under the contract shall be vehicles equipped with one of the eligible technologies set by the TS1 of category 5. **Verification:** same as the core TS1 of category 5 together with the list and technical sheets of the whole fleet.	**TS1. Technological options to reduce GHG emissions** 25% of the fleet to be used under the contract shall be vehicles with one of the eligible technologies set by the TS1 of category 5. **Verification:** same as the TS1 of category 5 together with the list and technical sheets of the whole fleet.
TS2. Vehicle tyres – rolling resistance (*Same for core and comprehensive)* All the vehicles shall be equipped with tyres compliant with TS on vehicle tyres as defined in the section 11.1 of Common criteria for vehicle categories Verification: Same as TS2 of category 5 together with the list and technical sheets of the whole fleet.	
TS3. Tyre Pressure Monitoring Systems (TPMS) (*Same for core and comprehensive)* All the vehicles shall be equipped with systems compliant with TS on TPMS as defined in the section 10.1 of Common criteria for vehicle categories **Verification:** Same as TS3 of category 5 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 dedicated natural gas vehicles as eligible technology and the tenderer offers dedicated natural gas vehicles to comply with TS2.* At least 10% of the methane supply shall be renewable methane. **Verification:** The tenderer shall provide the contract(s) with 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 owns or leases the service fleet)*	
AC1. Technological options to reduce GHG emissions (*Same for core and comprehensive)* Points will be awarded to the fleet to be used under the contract with proportion of vehicles (%) larger than the TS2, in proportion to the excess over the TS2. **Verification:** See above TS2	

8.3.1.2 Rationale

Similar to of public road transport services, waste collection services are usually contracted to provide a public service to citizens within a network over a contract period. Therefore, it would be feasible to request a fleet composition since all the vehicles are to be providing the service contracted.

In terms of alternative fuels Eurostat statistics show that the share of electrical energy in trucks is still very limited (<1%) and the biggest growth is caused by the application of

natural gas in vehicles with a load capacity <1500 kg. Natural gas in vehicles >1500 kg are also limited (see section 6.2.1 of the Preliminary report).

Therefore, the criteria proposal should reflect this market situation, setting a higher percentage at the comprehensive level.

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 owns or leases the service fleet)*	
TS5. Air pollutant emissions All vehicles used in carrying out the service shall meet at least Euro V. 40% of vehicles shall have engines meeting 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. **Verification:** The tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity. For those vehicles having achieved above-mentioned 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.	**TS5. Air pollutant emissions** All vehicles used in carrying out the service shall meet at least Euro V. 60% of vehicles shall meet 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. **Verification:** The tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity. For those vehicles having achieved above-mentioned 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.
Award Criteria *(These criteria apply only if the operators owns or leases the service fleet)*	
AC3. Air pollutant emissions (*Same for core and comprehensive)* Points will be awarded to the fleet to be used under the contract with proportion of vehicles (%) larger than the TS6, in proportion to the excess over the TS6, or if the vehicles have an emission performance better than Euro VI or are capable to run with zero tailpipe emissions, i.e. plug in hybrid electric vehicles (PHEV), battery electric vehicles (BEV), and fuel cell electric vehicles (FCEV).. **Verification:** See above TS6	
AC4. Auxiliary units (*Same for core and comprehensive)* Points will be awarded based on the proportion of vehicles that comply with the TS2 of category 5. **Verification:** See TS2 of category 5.	

8.3.2.2 Rationale

The rationale is the same as for buses used in public transport services. An award criterion for auxiliary units compliant with the criteria of category 5 is also proposed.

8.3.3 **Noise emissions**

8.3.3.1 Proposed criteria

Award Criteria *(These criteria apply only if the operators owns or leases the service fleet)*	
	AC5. Noise emissions Points will be awarded to those tenders offering a service fleet totally composed by vehicles compliant with the AC on vehicle noise emissions set in the section 10.2 of the common criteria for vehicle categories. **Verification:** The tenderer shall present the list of the vehicles of the service fleet and their certificates of conformity

8.3.3.2 Rationale

Tyre noise

The same Regulations as for passenger cars/LCVs are relevant for trucks as well, although buses use C2 or C3 tyres, while passenger/cars/ LCVs use C1 tyres. This makes the same rationale can be followed as for these light duty vehicles: allowing only the top class of the Tyre Labelling Directive of 3 dB less than prescribed by Regulation 661/2009.

The criterion is proposed to be a TS at comprehensive level and a core award criterion at core level.

Vehicle noise

The current EU GPP criteria are based on the Blue Angel standard 'Low-Noise and Low-Pollutant Municipal Vehicles and Buses'. This document has been updated in April 2014 and set a limit of 98 dB for operating noise.

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 in line with the other categories.

8.3.4 Route optimisation

8.3.4.1 Proposed criteria

Core criteria	Comprehensive criteria
Award criteria	
	AC6. Route optimisation *Note: this criterion only applies if the tenderer owns or lease the elements of the waste collection system where the devices of the route optimisation system are to be installed (control centre, waste collection vehicles, and in some cases, bins)* Points will be awarded to those tenders offering route optimization systems incorporating Computerised Vehicle Routing and Scheduling (CVRS) technology. The route optimization shall comply with the minimum collection frequency required by the type of waste (e.g. bio-waste). **Verification:** the tenderer shall present a description of the system, including the way to collect the data to feed the model.

8.3.4.2 Rationale

According to the information gathered in the Preliminary report (see section 5.6.3), there are commercially available software tools incorporating Computerised Vehicle Routing and Scheduling (CVRS) technology that could improve the modelling and optimisation of collection operations. This report also describes 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%.

Therefore an award criterion at comprehensive level is proposed to promote the use of these systems.

8.3.4.3 Consultation questions

- Are these systems usually part of the call for tenders of waste collection services, or are they purchased by the municipalities and operated by the contractors?
- In the case they are part of the call for tenders, is the tenderer free to offer those systems, or does the municipality require them as technical specification?

8.3.5 New vehicles

8.3.5.1 Proposed criteria

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

8.3.5.2 Rationale

The same rationale as for buses applies for this category.

9 CATEGORY 7: POST, COURIER AND MOVING SERVICES

9.1 Scope of the category

This category covers the procurement 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**
TS	1	Cyclelogistics		X
	2	Air pollutant emissions	X	X
AWARD CRITERIA	1	CO_2 emissions	X	X
	2	Cyclelogistics	X	X
	3	Air pollutant emissions	X	X
	4	Zero tailpipe emission capability	X	X

9.3 Criteria proposal

9.3.1 GHG emissions

9.3.1.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical specification	
	TS1. Cyclelogistics *Note: this TS will apply to vehicles used in post and courier urban deliveries.* (*in cities where the topography and the urban infrastructure are suitable, and there are sufficient cyclelogistics operators*). The tenderer shall offer a service fleet that include cycles and cycle trailers, which may be electrically power assisted cycles. The cycles and cycle trailers will be aimed at addressing last mile issues, according to the emissions reduction plan set by the TS1 Environmental management practices within the common criteria for service categories. **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)* *Note: the application of AC1 does not exclude tenders offering cyclelogistics as defined in AC2.* Points will be awarded to those tenders offering a service fleet that - For LCVs: the average CO_2 type approval shall comply with core TS1 of Category 1, tier corresponding to the year of the call for tender. Points will be awarded proportionally to the average CO_2 type approval of the fleet. - For L-category vehicles: all the L-category vehicles used in the service shall be electric. **Verification:** the tenderer shall 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.	
AC2. Cyclelogistics (*Same for core and comprehensive)* *Note: this AC will apply to vehicles used in urban deliveries in postal and courier services.* *(in cities where the topography and the urban infrastructure are suitable)* Points will be awarded to tenders offering a service fleet that include cycles and cycle trailers, which may be electrically power assisted cycles. The cycles and cycle trailers will be aimed at addressing last mile issues, according to the emissions reduction plan set by the TS1 Environmental management practices. **Verification:** The tenderer will present the specifications of the service fleet, and where applicable the partnership agreement with the urban consolidation centre.	

9.3.1.2 Rationale

The rational for this criterion proposal can be extracted from the different sections addressing LCV and L-category vehicles, together with a fleet performance approach. The first version of the technical report proposed a criterion based on fleet composition. However, setting requirements on a share of the fleet 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 consists of a limited number of individual deliveries. Therefore, the criteria proposal has been reformulated as an award criterion that gives points to those service fleets whose average CO_2 type approval comply with the core TS1 for category 1. This approach will give the companies enough flexibility to plan the fleet replacements. Another option would be requiring all vehicles to meet a threshold, but it would be too strict and unrealistic according to the common fleet management practices. The criterion based on an average is more representative of the performance of the fleet as a whole, instead of setting percentages on the fleet compositions which would only ensure the performance of a share. As described in sections 5.3.1 and 7.3.1, there is not a comparable monitoring and reporting system for CO_2 emissions of heavy duty vehicles yet in force, so these criteria apply only to LCVs.

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. However, a criterion formulated as a technical specification could raise difficulties in those cities with few cyclelogistics operators; hence it is proposed as an award criterion at core level. Only in those cases where there are enough operators, it is proposed as technical specification at comprehensive level, 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.

9.3.2 Air pollutant emissions

9.3.2.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specification	
TS2. Air pollutant emissions All HDV used in carrying out the service shall meet at least Euro V. 40% of HDV shall 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. All LCV used in carrying out the service shall meet at least Euro V. 40% of LCV shall meet Euro VI. All L-category vehicles used in carrying out the service shall meet at least Euro 3. 40% L-category vehicles shall comply with Euro 4. **Verification:** The tenderer shall provide the technical sheets of the vehicles where emission standards are defined. For those vehicles having achieved above-mentioned 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.	**TS2. Air pollutant emissions** 1. All HDV used in carrying out the service shall meet at least Euro V. 60% of HDV shall 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. All LCV used in carrying out the service shall meet at least Euro V. 60% of LCV shall meet Euro 6. 10% of LCV shall comply with the Euro 6d-TEMP standard. All L-category vehicles used in carrying out the service shall meet at least EURO 3. 60% L-category vehicles shall comply with EURO 4. 2. *In case of post and courier deliveries in urban areas with air quality issues:* Vehicles shall 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 run the minimum range of 40 km without emitting any tailpipe emissions. **Verification:** The tenderer shall 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 above-mentioned 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.
Award Criteria	
AC3. Air pollutant emissions (*Same for core and comprehensive)* Points will be awarded to those tenders offering a higher percentage than the one set by the TS3 for the fleet to be used under the contract, in proportion to the excess over the TS3. **Verification:** See above TS3	
AC4. Zero emission capability (*Same for core and comprehensive)* Points will be awarded to tenders offering a service fleet totally composed of vehicles that can	

demonstrate at least 40 km of zero tailpipe emission capability, in proportion to the excess over this threshold. **Verification:** See above TS3

9.3.2.2 Rationale

The rational for this criterion proposal can be extracted from the different sections addressing LCV, HDV and L-category vehicles, and the same as for mobility services (see section 4.3.2). However, mobility services are able to provide an environmental benefit just for replacing the purchase of a vehicle, while this is not the case for post, courier and moving services. Hence, there is no need of simplified criteria that encourage the choice of these services over other ones, and that brings enough room at core level for more criteria, and more complexity at comprehensive level. This is why the criteria comprise an award criterion on zero emission capability are proposed at both core and comprehensive levels. It is also proposed a percentage of vehicles complying with Euro 6d-TEMP standard at comprehensive level, to incentivise the penetration of the Euro 6d stage.

10 COMMON CRITERIA FOR VEHICLE CATEGORIES

10.1 Technical options to reduce GHG emissions

10.1.1 Proposed criteria

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">Technical Specification</td></tr>
<tr><td colspan="2">TS1. Tyre Pressure Monitoring Systems (TPMS) (Same for core and comprehensive)
LCVs and heavy duty vehicles shall be equipped with tyre pressure monitoring systems (TPMS) or with sensors that enable the monitoring at the operator site.

Verification:
The tenderer shall provide the technical sheet of the vehicle where this information is stated.</td></tr>
<tr><td></td><td>TS2. Low viscosity lubricant oils
Unless the manufacturer recommends other type of lubricant, the vehicles shall use low viscosity engine lubricant oils (LVL). LVL are those corresponding to SAE grade number 0W30 or 5W30 or equivalent.
Verification: The tenderer shall provide the technical sheet of the vehicle where the proposed lubricants are recommended.</td></tr>
<tr><td colspan="2">TS3. Vehicle tyres – rolling resistance (Same for core and comprehensive)
The vehicles shall 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. This requirement shall not prevent the public authority from purchasing tyres with the highest wet grip class where justified by safety.
OR
b) Retreaded tyres

Verification:
The tenderer shall 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)</td></tr>
</table>

10.1.2 Rationale

Tyre pressure monitoring systems (TPMS)

Tyre pressure monitoring systems (TPMS) are monitoring tools that help a driver to adjust their behaviour and can reduce fuel consumption by a few percent. Tyre pressure monitoring systems (TPMS) are mandatory for new passenger cars, but not for LCVs and heavy duty vehicles. TPMS can result in an average fuel consumption reduction of 1%

(see section 3.5.3 of the Preliminary report) at relative low cost (€220 without shipping and installation). TPMS have a cost-effectiveness of -€39 and -€64/tCO_2).

Lubricant oils

This criterion related to low viscosity lubricants (LVL) is relevant to improve the engine performance. According to the Preliminary report (see section 3.5.2 of the Preliminary report), the use of LVL is a cost effective option. However, the type of lubricant of the vehicle is seldom included in the technical sheets, and sometimes it is not a technical feature offered to the consumers. Some stakeholders pointed out that this criterion would be more effective as part of the maintenance activities. Therefore, it is proposed to be set at comprehensive level, and also as part of the maintenance criteria of the service categories.

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 (see also 3.5.3 of the Preliminary Report). 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, shall: …

..- 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 shall 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 shall 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.

Same comments as for lubricants are also valid for tyres, and for this reason, this criterion is also part of the maintenance criteria of the service categories.

10.2 Noise emissions

10.2.1 Proposed criteria

Core criteria	Comprehensive criteria
Technical Specifications	
	TS4. Tyre noise The vehicles shall be equipped with a) tyres with external rolling noise emission levels 3dB below the maximum established in Regulation (EC) No 661/2009 Annex II Part C. This is equivalent to the top category (of the three available) of the EU tyre label external rolling noise class. OR b) retreaded tyres The external rolling noise emissions will be tested according to the Annex I of Regulation (EC) No 1222/2009. **Verification:** The tenderer shall 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 the vehicles with noise emissions compliant with the Phase 3 limits of Regulation (EU) No 540/2014. The noise emissions will be tested according to the Annex II of Regulation (EU) No 540/2014. **Verification:** The tenderer shall provide the Certificate of Conformity of the vehicle.

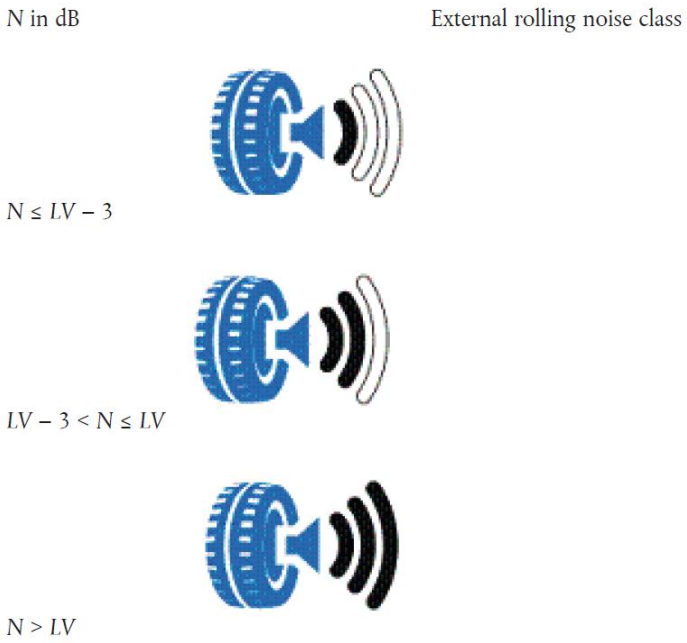
10.2.2 Rationale

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

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 5: External rolling noise classes (LV = Limit Values)



The Regulation (EC) No 1222/2009 does not apply to retreaded tyres, which shall 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 incentive. In Table 11 the limits 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.

Table 11: 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 will focus on GHG and air pollutant emissions.

Vehicle noise

As described in the Preliminary Report (see section 3.5.4 of the Preliminary report), 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.

So 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 shall have relevant experience in each of the following areas: - identifying, evaluating and implementing the available technologies and measures to reduce the WTW 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 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 shall 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, shall 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 at least once a year. The service provider shall 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 shall receive regularly information on their fuel efficiency performance (at least once per month). The yearly staff training records shall 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 uptake best available technologies. The selection criteria proposal sets a minimum experience on identifying, evaluating and implementing technologies and measures to reduce the GHG emissions 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 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 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 12.4.3)

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. As one of the stakeholders indicated, this mandatory qualification fits the requirements of the criteria proposed in the first version of the technical report, so that proposal is dropped to avoid a duplication of the training

11.2 Environmental management measures

11.2.1 Proposed criteria

Technical specification
TS1. Environmental management measures (*Same for core and comprehensive)* Over the contract period, the tenderers shall: 1. monitor and record the GHG and air pollutant emissions of the service. The indicator used shall be emissions and energy consumption of the service both in total per year and per passenger/tonne/unit transported-kilometer 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 the evolution of indicators and the implementation of the measures of the plan in real practice. 4. in case of deviations from the plan or of increase of the indicator, implement the necessary actions to correct those deviations, and if possible prevent them in the future. **Verification:** The tenderer shall provide: 1. the procedure for monitoring and recording the indicator pointed out in section 1) 2. the emissions reduction plan. 3. the evaluation procedure to ensure the 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 shall 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 shall 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 the verification of the TS1 Environmental management measures These reports shall 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 real practice. Their requirements are so general that their interpretation may be difficult for the non-expert users. In addition, 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></td><td>CPC3. Low viscosity lubricant oils
Unless the manufacturer of the vehicle recommends other type of lubricant, the contractor shall 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 shall be made available to the contracting authority. The contracting authority may set rules for penalties for non-compliance.</td></tr>
<tr><td colspan="2">CPC4. Vehicle tyres – rolling resistance (Same for core and comprehensive)
Note: This CPC does not apply to retreaded tyres.
The contractor shall 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. This contract performance clause shall not prevent the use of tyres with the highest wet grip class where justified by safety.
OR
b) retreaded tyres
The contractor will keep records which shall be made available to the contracting authority. The contracting authority may set rules for penalties for non-compliance</td></tr>
<tr><td></td><td>CPC5. Tyre noise
Note: This CPC does not apply to retreaded tyres.
The contractor shall replace the worn tyres of vehicles providing the service with new tyres with external rolling noise emission levels 3dB below the maximum established in Regulation (EC) No 661/2009 Annex II Part C. This is equivalent to the top category (of the three available) of the EU tyre label external rolling noise class.
The external rolling noise emissions will be tested according to the Annex I of Regulation (EC) No 1222/2009.
The contractor will keep records which shall be made available to the contracting authority. The contracting authority may set rules for penalties for non-compliance</td></tr>
<tr><td colspan="2">Award criteria</td></tr>
</table>

	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 - 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 shall not be more than 0.1% (w/w). **Verification:** The tenderer shall provide the technical sheets of lubricants and hydraulic fluids and greases. Hydraulic fluids and greases that are compliant with EU Ecolabel or equivalent type 1 ecolabel 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 vehicles maintenance services, however these criteria just cover a small part of the maintenance activities and cannot be considered as EU GPP criteria for vehicles maintenance services

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 shall 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, please 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.

11.3.2 Rationale

Sections 10.1 and 10.2 describe the requirements on rolling resistance and noise proposed for tyres, and low viscosity of lubricants used in new purchased vehicles. Both tyres and lubricants 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 and lubricants 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 current criteria 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 current EU Ecolabel of Lubricants (Commission Decision 2011/381/EU), which is being revised and new criteria are expected to be published by the end of 2018.

The current EU Ecolabel for lubricants covers different categories of products, and it focuses on the ones that are totally released into the environment during their use phase, or that are highly likely to be emitted to water and soil (so call loss and high risk lubricants). With this approach, the scope does not cover four-stroke oils, but two-stroke oils, which are mixed with the fuel, and therefore, emitted in the exhaust gases. According to the Preliminary report for the revision of EU Ecolabel for lubricants (EC JRC, 2016), 20-30% of the fuel and the added oil used two-stroke engines of boats was emitted unburned directly into the environment. Two-stroke engines are no longer used in vehicles in the EU and US markets, due to the air emissions standards. The scope of the EU Ecolabel for lubricants also includes hydraulic fluids and greases, which are very relevant for the product categories within the scope of EU GPP. Table 12 shows the requirements on the current EU GPP criteria set, and the proposal for revision.

Table 12: Lubricants requirements within the current EU GPP criteria set, and the proposal for revision.

Current EU GPP criteria	Is it part of EU Ecolabel criteria set for lubricants?	Proposal for revision
a. Vehicles must use low viscosity engine lubricant oils (LVL) or regenerated lubricant oils, with a minimum of 25% regenerated base oils, in vehicle maintenance. LVL are those corresponding to SAE grade number 0W30 or 5W30 or equivalent 3.	NO	This criterion related to LVL is relevant to improve the engine performance. According to the Preliminary report, the use of LVL is a cost effective option. Regarding regenerated oils, the recycling of oils is a waste treatment practice that can reduce the use of raw materials in mineral oils, and it is in line with the principles of Circular Economy. The term has been switched to re-refined, since re-refining is the process that returns the oil to a quality suitable for its original use. Regeneration does not necessarily mean that the lubricant is suitable for its original use.
b. Hydraulic fluids and greases should 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).	YES	It is proposed to be kept, as both products are part of the EU Ecolabel scope and they are considered high risk and loss products.
c. No derogation from the exclusion in Article 6(6) of Regulation (EC) No. 66/2010	YES	This is a provision of the EU Ecolabel Regulation about derogation requests for certain hazardous substances. It is proposed

may be given concerning substances identified as substances of very high concern and included in the list foreseen in Article 59 of Regulation (EC) No. 1907/2006, when present in mixtures, in concentrations higher than 0.010% (w/w).		to be removed.
d. Carbon content should be ≥45% derived from renewable raw materials.	yes	Synthetic plant based lubricants are common in the automotive industry; however, this criterion comes from the EU Ecolabel for lubricants which does not cover automotive oils. It is proposed to be removed since there is not enough evidence that the threshold proposed is suitable for automotive oils.
e. The cumulative mass percentage of substances present that are both nonbiodegradable and bioaccumulative shall not be more than 0.1% (w/w).	yes	In the automotive sector, this criterion would be relevant just for hydraulic fluids and greases.

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 passenger cars with strict CO_2 emissions
- Case study 2: purchase of electric buses instead of diesel buses for a share of the vehicle fleet
- Case study 3: 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.

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

12.2.1 Passenger cars with lower CO_2 emissions

The first case concerns a ministry owning 100 large-size petrol vehicles. This contracting authority will renew their fleet, but instead of purchasing average vehicles in the market, the TS1 criterion is applied, stating that the type approval CO_2 emissions (according to the vehicle's technical sheet) for the vehicles shall not exceed values between 106 CO_2 g/km (2018) and 92 CO_2 g/km (2021). The case study is summarised in Table 13

Table 13: Case study 1 Passenger cars with strict CO2 emissions

Definition	**Explanation**
Category	CATEGORY 1: PURCHASE, LEASE OR RENTAL OF CARS, LCVS AND L-CATEGORY VEHICLES
Vehicle	Passenger cars, large-size, petrol
Criterion type	Technical specification, GHG emissions
Criterion	TS1. Type-approval CO_2 value
Public procurer	Ministry (100 vehicles)
Case	The department will purchase new cars, but instead of the average CO_2 of the cars (149 g/km according to the market analysis of the Preliminary report), the TS1 criterion is applied. The cars to be replaced are large-size petrol cars

The cars with low CO_2 emissions will be more expensive, but also more fuel efficient, which has a positive impact on the fuel costs and externalities. Calculations will show the life cycle cost for cars purchased between 2018 and 2021.

Assumptions

Table 14 presents the main assumptions that are used for the LCC calculation for this case study.

Table 14: Assumptions case study 1

Variable	Assumption	Source / explanation
Acquisition costs excl tax	€31 000	Preliminary report table 16
Registration tax	4.3%	Preliminary report p63
Average VAT	22%	Preliminary report p116
Mileage	3 scenarios: - 10 000 km/year - 20 000 km/year - 30 000 km/year	Preliminary report table 17
Fuel price incl tax	€1.25 / liter	Preliminary report table 16
Lifetime	15 years	Preliminary report table 16
Maintenance	3.6 EUR cent/km	Preliminary report table 16
Insurance	557 €/year	Preliminary report table 16
Circulation taxes	245 €/year	Preliminary report table 16

Source preliminary report: (EC JRC, 2016a)

The CO_2 values are taken accordingly to the criterion as defined in the technical report, as displayed in Table 15.

Table 15: GPP criterion TS1. Type-approval CO_2 value

Year	Baseline (Preliminary report, table 16)	EU GPP requirement
2018	149 g/km	106 g/km
2019	149 g/km	101 g/km
2020	149 g/km	96 g/km
2021	149 g/km	92 g/km

Source technical report: (JRC Technical reports, 2016) p14

The extra costs according to the Preliminary report (p92) are €91 per gram CO_2.

12.2.2 Electric buses

The second 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 shall 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 as described in the Preliminary report. The case study is summarised in Table 16.

Table 16: Case study 2 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 electric buses. Every year, 15 new electric buses are purchased instead of diesel buses.

Assumptions

Table 17 presents the main assumptions that are used for the LCC calculation for this case.

Table 17: Assumptions case 2

Variable	**Assumption**	**Source / explanation**
Acquisition costs baseline excl tax	€208 000	Preliminary report table 48
Registration tax	4.3%	(CE Delft, 2016)
Average VAT	22%	(CE Delft, 2016)
Fuel consumption	0.36 l/km	Preliminary report table 45
Mileage	3 scenarios: - 50 000 km/year - 60 000 km/year - 70 000 km/year	Preliminary report table 46
Fuel price	€1.04 / liter diesel	Preliminary report table 45
Electricity price	€0.10 / kWh	Preliminary report p133 (Ricardo, 2013)
Lifetime	14 years	Preliminary report table 45
Maintenance	15.5 EUR cent /km	Preliminary report table 45

Insurance	2 117 €/year	Preliminary report table 45
Circulation taxes	517 €/year	Preliminary report table 45

Source Preliminary report: (EC JRC, 2016a)

Additionally, the following assumptions were made:

- The investment cost for the electric bus is 82% higher compared to the diesel bus (EC JRC, 2016a).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 the electric bus does not pay circulation taxes. In total the electric bus costs €475 000 (only vehicle).
- Infrastructure cost opportunity charging: €10 000 per bus (EC JRC, 2016a).
- Electric bus energy efficiency: 44% of the diesel bus comparator (EC JRC, 2016a), (table 71).
- Assumption for maintenance: 20% of the diesel bus comparator however, a sensitivity analysis has been carried out due to the large range found in the technical literature. The maintenance costs are potentially 40% lower for electric buses (Olsson, Grauers, & Petterson, 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.

12.2.3 Staff training on ecodriving in post and courier services

The third 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 shall ensure adequate training, with a minimum duration of 16 hours, shall 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 16.

Table 18: Case study 3 10.2.3 Staff training on ecodriving in post and courier services

Definition	**Explanation**
Category	CATEGORY 2: 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 19 presents the main assumptions that are used for the LCC calculation for this case.

Table 19: Assumptions case 3

Variable	Assumption	Source / explanation
Acquisition costs incl tax	€42 000	Preliminary report table 22
Registration tax	4.3%	(CE Delft, 2016)
Average VAT	22%	(CE Delft, 2016)
Mileage	3 scenarios: - 10 000 km/year - 20 000 km/year - 30 000 km/year	Preliminary report table 23
Fuel price	€1.04 / liter	Preliminary report table 22
Lifetime	15 years	Preliminary report table 22
Maintenance	3.0 EUR cent /km	Preliminary report table 22
Insurance	557 €/year	Preliminary report table 22
Circulation taxes	89 €/year	Preliminary report table 22
CO_2 emissions test	190 g CO_2 /km	Preliminary report table 22

Source Preliminary report: (EC JRC, 2016a)

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. According to (EC JRC, 2016a), an estimated the costs of the driving course is €50-100, which does not cover the loss in man hours. 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% (EC JRC, 2016a), (CE Delft, 2012) sustained through yearly repeated training.
- Setting up a monitoring and feedback system, and the 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 20.

Table 20 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): electricity, Preliminary report p16: CO_2 electricity.

Regarding the electricity, the share of renewable energy sources in gross final energy demand is projected to increase over time to reach 14.8% in 2020 and 18.4% in 2030, according to the EU projections (European Commission, 2010). The report 'EU Reference Scenario 2016 Energy, Transport and GHG Emissions Trends to 2050' (European Commission, 2016) also support this evolution of the generation mix, which will lead to a steady decrease in carbon intensity of power generation. . For that reason, it is proposed to apply the average carbon intensity over the period 2010 - 2020 recommended by the Methodology for Ecodesign of Energy-related Products, which is based on those projections (COWI; VHK, 2011)

The cost factors used for externalities are taken from (DG MOVE, 2014) and shown in Table 21, after converting to 2015 prices using GDP at market prices (PPS per capita).

Table 21 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 every case, the life cycle costs have been estimated in € per vehicle and km with and without taxes. The same approach was used as in the Preliminary Report, with the addition of 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 Passenger cars with lower CO_2 emissions

In the first case, the acquisition costs of the cars with lower CO_2 emissions will be higher. However, the fuel costs are lower due to lower fuel consumption. The external costs also decrease due to lower CO_2 emissions. There are no other external cost savings, because for pollutants the same Euro 6 limits apply. Figure 6 and Figure 7 show the life cycle costs with and without taxes per vkm for large petrol cars with and without strict CO_2 norms.

*Figure 6 Life cycle costs **with taxes** per vkm for large petrol cars with and without strict CO_2 norms*

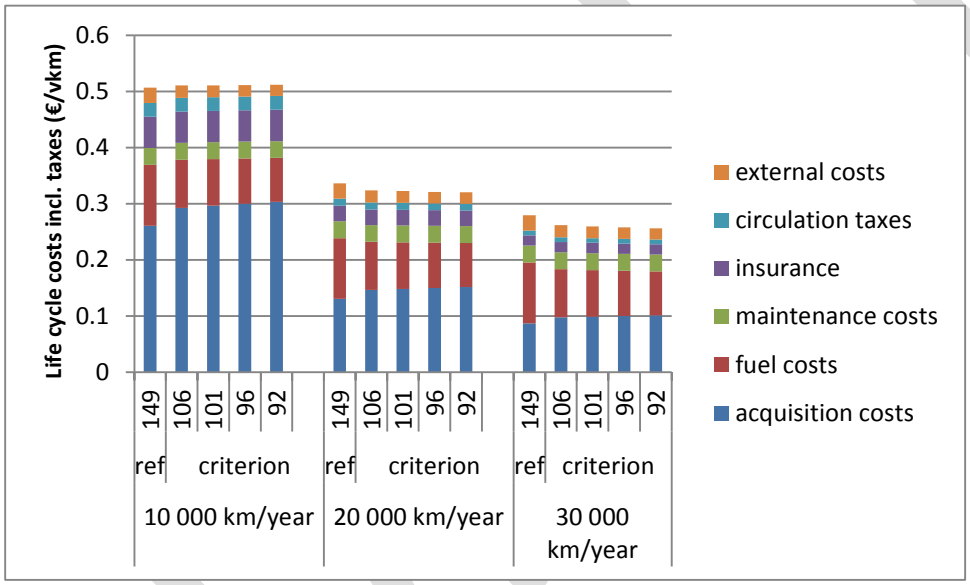
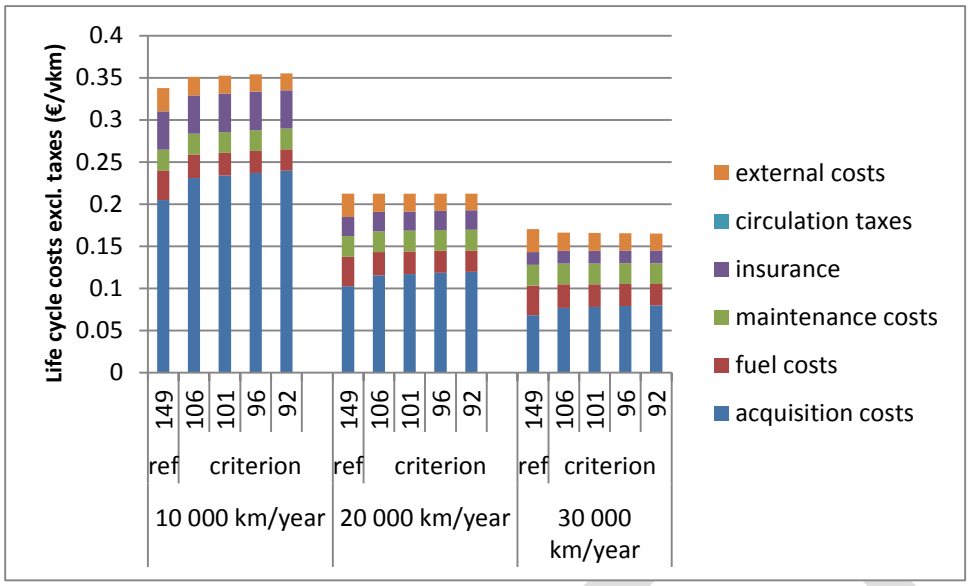


*Figure 7 Life cycle costs **without taxes** per vkm for large petrol cars with and without strict CO_2 norms*



The figures clearly show that acquisition costs are higher for the more fuel efficient cars, but also that fuel costs are lower. The external costs are much lower for more fuel efficient cars. If taxes are taken into account, the additional cost would be paid off in terms of fuel and external cost savings if the mileage is above 20 000 km/year, which is a likely mileage for large cars.

Table 22 and Table 23 present the total social cost savings for a municipality with 100 cars, which is planning to renew their fleet applying the EU GPP criterion. When they invest in large petrol cars with lower CO_2 emissions, the fuel costs will be lower on a yearly basis. From these tables it can be concluded that for higher mileage the cost savings are higher. As can be observed, taxation is a very powerful market driver to increase the uptake of fuel efficient vehicles.

Table 22 Total cost savings strict CO_2 criterion (106 g/km) for 100 large petrol cars for total life cycle including taxes (€)

Parameter	**Scenario**		
	10 000 km/year	**20 000 km/year**	**30 000 km/year**
Total investment costs (106 g/km) (€)	€ -477 000	€ -477 000	€ -477 000
Fuel cost savings in 15 years (€)	€ 337 000	€ 675 000	€ 1 012 000
External cost savings in 15 years (€)	€ 83 000	€ 166 000	€ 249 000
Total (€)	€ -57 000	€ 364 000	€ 784 000

Table 23 Total cost savings strict CO_2 criterion (106 g/km) for 100 large petrol cars for total life cycle excluding taxes (€)

Parameter	**Scenario**		
	10 000 km/year	**20 000 km/year**	**30 000 km/year**
Total investment costs (106 g/km) (€)	€ -391 000	€ -391 000	€ -391 000
Fuel cost savings in 15 years (€)	€ 109 000	€ 218 000	€ 328 000
External cost savings in 15 years (€)	€ 83 000	€ 166 000	€ 249 000
Total (€)	€ -199 000	€ -7 000	€ 185 000

12.4.2 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 8 and Figure 9 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.

Figure 8 Life cycle costs with taxes per vkm for diesel and electric buses

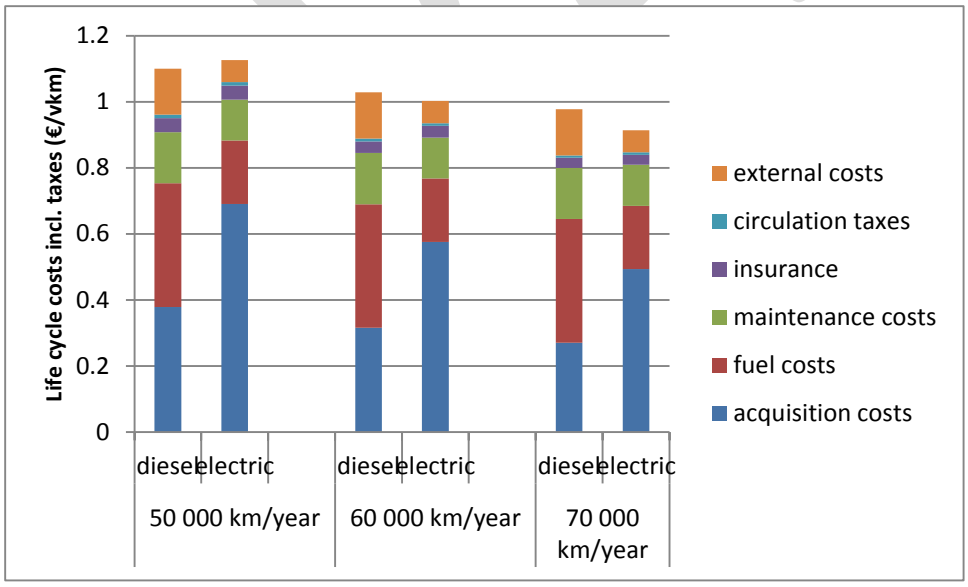


Figure 9 Life cycle costs without taxes per vkm for diesel and electric buses

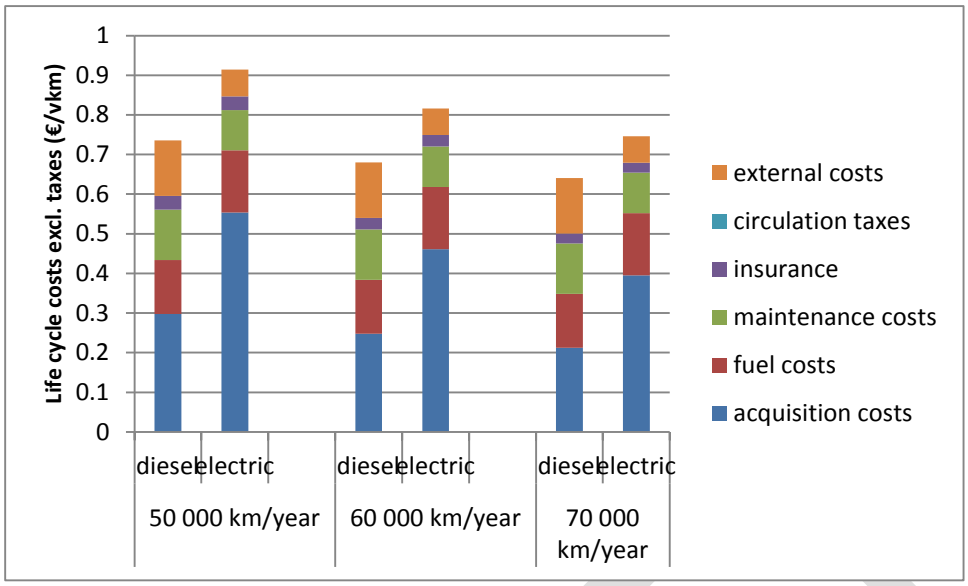


Table 24 and Table 25 show the cost savings per bus, and also for the bus fleet composed by 12% and 25% electric buses. The results show that the investment costs are relatively high in comparison to the cost and maintenance savings, and external costs savings can add up to about a third of the investment costs. However, it is worth to highlight that the air pollutants released upstream by the power plants are usually emitted at considerable heights. 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.

Table 24 Cost savings of electric buses criterion per bus and for 12/25% of the 200 bus fleet including taxes (€/year)

Parameter	**Scenario**		
	50 000 km/year	**60 000 km/year**	**70 000 km/year**
Total investment costs per bus (€/year)	€ -15 500	€ -15 500	€ -15 500
Fuel cost savings per bus (€/year)	€ 9 250	€ 11 000	€ 12 750
Maintenance cost savings per bus (€/year)	€ 1 500	€ 1 750	€ 2 250
External cost savings per bus (€/year)	€ 3 500	€ 4 250	€ 5 000
Total cost savings per bus (€/year)*	€ -1 250	€ 1 500	€ 4 500
Total for 12% fleet (€/year)	€ -31 250	€ 37 500	€ 106 250
Total for 25% fleet (€/year)	€ -62 250	€ 75 000	€ 212 250

*cost savings are very dependent on assumptions:

- % maintenance savings (now used: 20%)
- electricity tax (now used: no energy tax)

Table 25 Cost savings of electric buses criterion per bus and for 12/25% of the 200 bus fleet excluding taxes (€/year)

Parameter	**Scenario**		
	50 000 km/year	**60 000 km/year**	**70 000 km/year**
Total investment costs per bus (€/year)	€ -12 750	€ -12 750	€ -12 750
Fuel cost savings per bus (€/year)	€ -1 000	€ -1 250	€ -1 500
Maintenance cost savings per bus (€/year)	€ 1 250	€ 1 500	€ 1 750
External cost savings per bus (€/year)	€ 3 500	€ 4 250	€ 5 000
Total cost savings per bus (€/year)	€ -9 000	€ -8 250	€ -7 500
Total for 12% fleet (€/year)	€ -214 750	€ -196 250	€ -177 750
Total for 25% fleet (€/year)	€ -429 500	€ -392 500	€ -355 500

Sensitivity analysis for maintenance costs

As can be derived from Table 26, 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.

Table 26 Total cost savings of electric buses criterion per bus including taxes and external cost (€/year) for different maintenance cost assumptions

Parameter	**Scenario**		
	50 000 km/year	**60 000 km/year**	**70 000 km/year**
Total cost savings (€/year): 40% lower maintenance costs	€ 250	€ 3 500	€ 6 500
Total cost savings (€/year): 20% lower maintenance costs	€ -1 250	€ 1 500	€ 4 500
Total cost savings (€/year): 0% lower maintenance costs	€ -2 750	€ -250	€ 2 250

12.4.3 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 10 and Figure 11 show the LCC results with and without taxes per vkm for the service with and without strict CO_2 norms.

Figure 10 Life cycle costs with taxes per vkm for LCVs with and without ecodriving training

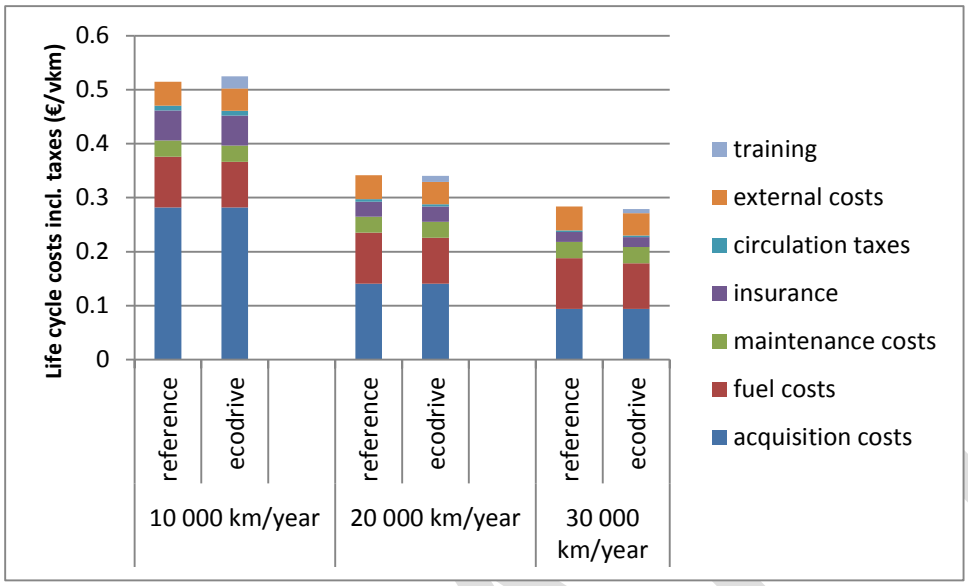


Figure 11 Life cycle costs without taxes per vkm for LCVs with and without ecodriving training

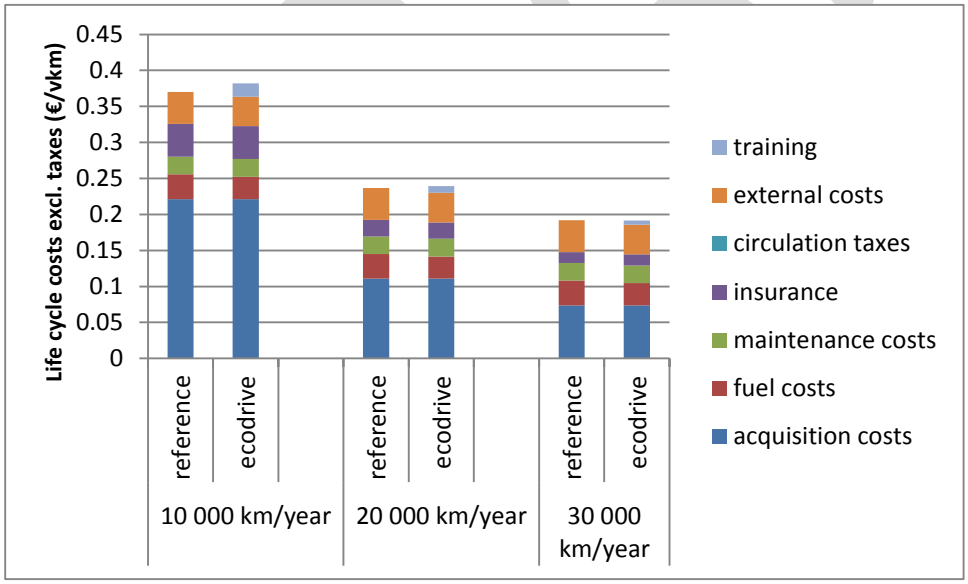


Table 27 and Table 28 show the cost savings of the ecodriving criterion per driver including and excluding taxes in different scenarios. The analysis shows that the training is relatively expensive compared to the cost savings, but for a higher mileage, the criterion is more favourable.

Table 27 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 28 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.

ANNEX: TABLE OF COMMENTS FROM THE STAKEHOLDERS

See separated document 'Annex: Table of comments from the stakeholders on the 1st draft of Technical report and criteria proposal'

References

3iBS. (2013). *Bus systems in Europe: current fleets and future trends.*

ACEA. (2016). *Consolidated Registration Figures.*

Amsterdam Roundtable Foundation and McKinsey & Company. (2014). *Electric vehicles in Europe: gearing up for a new phase?*

BBL Belgium; et al. (2011). *momo Car-Sharing: More options for energy efficient mobility through Car-Sharing.*

BMW Group. (2014). Environmental Report BMW i3 BEV.

BMW Group. (2015). Environmental Report BMW 740Li.

Cambio carsharing . (2016). *cambio carsharing* . Retrieved from http://www.cambio.be/cms/carsharing/en/2/cms_f8_2/cms?cms_knuuid=08b631fb-eb1b-43e6-90e7-5ccbc955f936

Cambio carsharing. (2016). *Cambio carsharing*. Retrieved from http://www.cambio-carsharing.de/?l=en

CE Delft. (2008). *Handbook on Estimation of External Costs in the Transport Sector, Report for the European Commission.* Delft.

CE Delft. (2012). *Behavioural Climate Change Mitigation Options- Domain report Transport.* Delft.

CE Delft. (2012). *Behavioural Climate Change Mitigation Options- Domain report Transport.* Delft: CE Delft.

CE Delft. (2014). *STREAM Passenger transport 2014, Study on Transport Emissions from All Transportation modes.*

CE Delft. (2015). *Pilot projects for innovative public transport buses.*

CE Delft. (2016). *Road taxation and spending in the EU.* Delft.

CE Delft. (2016). *STREAM Freight transport 2016, Study on Transport Emissions from All Transportation modes.*

CE Delft, TNO and ECN. (2013). *Natural gas in transport : an assessment of different routes.* Delft: CE Delft.

CE Delft, TNO and ECN. (2013). *Natural gas in transport : an assessment of different routes.*

CEN. (2012). Retrieved March 3, 2016, from http://standards.cen.eu/dyn/www/f?p=204:110:0::::FSP_PROJECT,FSP_ORG_ID:32935,6301&cs=135D47751B5FB5269F007FDCEDA13E4B1

Cenex and Atkins. (2016). *Low Carbon Truck and Refuelling Infrastructure Demonstration Trial Evaluation.*

Chiffi, & Galli. (2014a). *A guide to effective strategies for introducing and supporting Cyclelogistics in urban areas.*

City of Brussels. (n.d.). *City of Brussels - staff mobility plans*. Retrieved from http://www.brussels.be/artdet.cfm/5821

Clairotte, Zardini, Haq, & Martini. (2015). *Stocktaking and data mining - Phase 1 of Euro 5.*

Connekt. (2010). Retrieved March 3, 2016, from http://lean-green.nl/en-gb/toolbox/107/green-tender.html

Connekt. (2016). Retrieved March 3, 2016, from http://lean-green.nl/en-GB/

COWI; VHK. (2011). *Methodology for Ecodesign of Energy-related Products.*

DG MOVE. (2014). *Update of Handbook on external costs of Transport, report MOVE/D3/2011/5.*

DU. (2013). *Sustainable mobile airconditioning for Buses.* Berlin: Deutsche Umwelthilfe (DU) e.V.

EC JRC. (2016). *Revision of European Ecolabel Criteria for Lubricants.*

EC JRC. (2016a). *Preliminary report (Draft): Revision of the EU Green Public Procurement Criteria for Transport.*

ECO Stars. (2016). Retrieved March 3, 2016, from http://www.ecostars-uk.com/about-eco-stars/what-is-it/

Edwards, R., Mulligan, D., & Marelli, L. (2010). *Indirect Land Use Change From Increased Biofuels Demand - Comparison of Models and Results for Marginal Biofuels Production from Different Feedstocks.* Luxembourg: Publications Office of the European Union.

EEA. (2017). *Electric vehicles and the energy sector - impacts on Europe's future emissions*. Retrieved from https://www.eea.europa.eu/themes/transport/electric-vehicles/electric-vehicles-and-energy

Energy Saving Trust. (2013). *Understand how daily rental vehicles can benefit your business.*

EPOMM. (2012, December). *Cycle Logistics- Moving goods by cycle : e-update .* Retrieved 2016, from http://www.civitas.eu/sites/default/files/1212_epomm_enews_cyclelogistics.pdf

EUnited Municipal Equipment. (2014). *Innovative Solutions for the Waste Collection from the members of EUnited Municipal Equipment.*

European Biogas Association. (2014). *Biogas production in Europe.*

European Commission. (2010). *EU energy trends to 2030.*

European Commission. (2012). *EU GPP Criteria for Transport.*

European Commission. (2016). *Buying green! A handbook on green public procurement, 3rd edition, 2016.*

European Commission. (2016). *EU GPP Criteria for Office Buildings.*

European Commission. (2016). *EU Reference Scenario 2016 Energy, Transport and GHG Emissions Trends to 2050.*

FLEAT. (2010). *Intelligent Energy Europe : D5.3 Report on monitoring pilot actions.*

FORS. (2016). Retrieved March 3, 2016, from https://www.fors-online.org.uk/cms/what-is-fors/

GFE. (2016). Retrieved March 3, 2016, from http://www.greenfreighteurope.eu/

Holmberg, Collado, Sarasini, & Williander. (2016). *Mobility as a Service- MaaS - Describing the framework.*

ICCT. (2014).

ICCT. (2014). *Real-world exhaust emissions from modern diesel cars.*

ICCT. (2014). *The WLTP: How a new test procedure for cars will affect fuel consumption values in the EU.*

ICCT. (2015). *Accelerating progress from Euro4/IV to Euro 6/VI vehicle emissions standards.*

ICCT. (2016b). *European Vehicle Market Statistics Pocketbook 2015/16.* Berlin: The International Council on Clean Transportation.

IEA. (2012). *Status of Advanced Biofuels Demonstration Facilities.*

IEEP. (2010). *Anticipated Indirect Land Use Change Associated with Expanded Use of Biofuels and Bioliquids in the EU – An Analysis of the National Renewable Energy Action Plans.* London: Institute European Environmental Policy (IEEP).

ISO. (2015). Retrieved March 3, 2016, from https://www.iso.org/obp/ui/#iso:std:iso:iwa:16:ed-1:v1:en

JEC - Joint Research Centre-EUCAR-CONCAWE collaboration. (2014). *JEC WELL-TO-WHEELS ANALYSIS.*

Johansson. (2016). The effect of dynamic scheduling and routing in a solid waste management system. *Waste Management*.

JRC. (2016). *Report on VECTO technology simulation capabilities and future outlook.*

JRC Technical reports. (2016). *Technical report and criteria proposal (1st draft): Revision of the EU Green Public Procurement Criteria for Transport.*

Kamargianni, Matyas, Li, & Schäfer. (2015). *Feasibility Study for "Mobility as a Service" concept in London.*

LowCVP. (2016). *HGV Accreditation Scheme*. Retrieved from http://www.lowcvp.org.uk/projects/commercial-vehicle-working-group/hgv-accreditation-scheme.htm

LowCVP. (2016). *Low Emission Buses*. Retrieved from http://www.lowcvp.org.uk/initiatives/leb/Home.htm

LowCVP. (2016). *Low Emission Buses Certificates*. Retrieved from http://www.lowcvp.org.uk/initiatives/leb/LEBCertificates.htm

LowCVP. (2017). *Emissions Testing of Gas-Powered Commercial Vehicles.*

Mercedes-Benz. (2014, October). Life Cycle Environmental Certificate Mercedes-Benz B-Class Electric Drive.

Miyagawa. (2016). Trip lenght and sufficient number of alternative fuel stations. *Urban and regional planning review*.

Nissan Motor . (2016). Corporation Sustainability Report.

Olsson, O., Grauers, A., & Petterson, S. (2016). Method to analyze cost effectiveness of different electric bus systems, EVS29 Symposium,. *EVS29 Symposium, June 19-22.* Montréal.

RECODRIVE. (2010). Retrieved March 3, 2016, from http://www.recodrive.eu/index.phtml?id=1013&ID1=&sprache=en

Ricardo. (2013). *Preparing a low CO2 technology roadmap for buses.*

Ricardo. (2013). *Preparing a low CO2 technology roadmap for buses, s.l.: Ricardo.*

Ricardo. (2016). *Improving understanding of technology and costs for CO2 reductions from cars and LCVs in the period to 2030 and.*

Ricardo AEA. (2012). *Opportunities to overcome the barriers to uptake of low emission technologies for each commercial vehicle duty cycle.*

Roland Berger. (2015). *Fuel Cell Electric Buses – Potential for Sustainable Public Transport in Europe.* Fuel Cells and Hydrogen Joint Undertaking (FCH JU).

Smile-einfachmobil. (n.d.). *smile-einfachmobil*. Retrieved from http://smile-einfachmobil.at/index_en.html

TNO (CIVITAS WIKI). (2013). *Clean Buses for your city : Smart choices for cities.* TNO.

TNO (CIVITAS WIKI). (2016, 2 27). *Smart choices for cities - Clean buses for your city.* Retrieved 2016

TNO. (2012). *Reduction of vehicle noise emission - Technological potential and impacts.*

Transport & Environment. (n.d.). *Transport & Environment*. Retrieved from https://www.transportenvironment.org/news/meps-call-mandatory-eco-driving-meters

UITP. (2015). Bus Systems in Europe : Towards a Higher Quality of Urban Life and a Reduction of Pollutants and CO2 Emissions. Brussels: The International Association of Public Transport (UITP).

UNECE. (2014). *Consolidated Resolution on the Construction of Vehicles.*

ZeEUS project. (2016). *ZeEUS eBus Report An overview of electric buses in Europe.*

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 - Heavier 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

List of figures

List of tables

JRC Mission

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.

Serving society
Stimulating innovation
Supporting legislation