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Guidance note – Reporting of electric and more resource-efficient transport equipment in EPEA and EGSS

Eurostat – Unit E2

Joint meeting of the working groups Environmental accounts and Monetary environmental statistics and accounts

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1 Purpose and overview

The task force on the classification of environmental activities (TF) identified in June 2018 the need to clarify the recording of *"electric and more resource-efficient transport equipment"*, an item listed in the indicative compendium of environmental goods and services[1].

This note recalls available guidance from EPEA and EGSS handbooks, summarises reporting practices, and presents proposals for a consistent and accurate recording of relevant products. It incorporates scientific evidence and seeks to balance the position of TF members with input from the 2019 Working Group on Monetary Environmental Statistics and Accounts (MESA WG), specifically its feedback during the written consultation on 24 July 2019.

The proposals in this note were endorsed in the TF meeting on 3 April 2020 and should ensure that EPEA and EGSS data meet the needs of users and remain comparable across the EU. The guidance note also sets out a timeline for its implementation and review and indicates products whose treatment in monetary environmental accounts might need to be re-discussed in the medium or long-term.

Key considerations and proposals

The primary purpose of transport equipment – understood here as vehicles and essential infrastructure - is not the protection of the environment but the carriage of persons and goods. In the context of monetary-environmental accounts[2,3], ***"electric and more resource efficient transport equipment"*** **represents** ***adapted goods*** that fulfil a non-environmental purpose, albeit in a cleaner and more efficient manner than conventional standard goods.

Given the diversity of *"electric and more resource efficient transport equipment"*, referred to here as *"electric transport equipment"*, TF members raised the question which equipment to include and how to value relevant products. Leaving the decision to countries might lead to divergent recording practices not always justified by country specificities. To harmonise the approach for important products and activities and, consequently, ensure cross-country comparability of EGSS data, this guidance note therefore proposes to:

- ***include*** the production and export of vehicles listed in Table 2 in the recording of monetary environmental accounts (note that Table 2 explicitly includes fuel-cell vehicles running on hydrogen);
- ***include*** infrastructure that is essential for the operation of electric vehicles (such as electric charging units and stations) and the production of technical components of electric vehicles (such as fuel cells, traction batteries, inverters, electric motors);

[1] Regulation (EU) 2015/2174 (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32015R2174).
[2]2016 EGSS handbook (https://ec.europa.eu/eurostat/documents/3859598/7700432/KS-GQ-16-008-EN-N.pdf/f4965221-2ef0-4926-b3de-28eb4a5faf47)
[3]2017 EPEA handbook (https://ec.europa.eu/eurostat/documents/3859598/7903714/KS-GQ-17-004-EN-N.pdf/7ea9c74b-eda4-4c23-b7bd-897358bfc990)

- ***examine*** whether vehicles listed in Table 3 replace to a significant degree other motorised transport; if so, include all such vehicles in monetary environmental accounts; if not, exclude these vehicles from EPEA and EGSS reporting;
- ***exclude*** vehicles without electric-only drive mode (such as conventional cars and mild hybrids; see definition on page 9);
- ***exclude*** conventional vehicles (equipped with an internal combustion engine only) that run on compressed natural gas, liquefied petroleum gas, biodiesel, bioethanol or other combustible fuels from EGSS if these do not classify as plug-in/non-plug-in hybrid vehicles (see Table 2);
- ***record*** in EGSS accounts the value of the entire electric vehicle/equipment (at basic prices); where ***information is unavailable, countries could consider reporting: 1) the costs related to electric powertrains and vehicle components*** (***instead of the full vehicle value) or 2) the additional costs of electric vehicles*** relative to standard vehicles and explain their approach in the quality report; if vehicles are not reported at full value, Eurostat should be provided alongside EGSS data submission with information to facilitate estimating full vehicle value for the data publication and calculation of the EU aggregates; corrected country data will be flagged as Eurostat estimate with footnote 's)' and relevant explanation will be provided to users in metadata for Eurobase tables with EGSS figures;
- ***record*** in EPEA the extra cost of electric vehicles/equipment (compared to the market value of conventional vehicles and equipment);
- ***record*** production and export of electric transport equipment under CEPA 1 (as recommended by the task force in June 2018 – see also the draft CEPA 1 description in the revised CEPA and CReMA explanatory notes).

The working group is invited to:

- **take note of the revised guidance note, specifically on the proposed products and valuation principles as endorsed on 3 April 2020 by the task force on the classification of environmental activities;**
- **endorse the guidance note, and if modifications are needed, propose changes taking into consideration the information needs of policy makers, the availability of source data and the necessity to ensure cross-country comparability of EPEA and EGSS data across the EU;**
- **express a view on including the products in Section 4.8 in monetary environmental accounts in the midterm.**

2 Reporting requirements

Regulation (EU) 691/2011 on European environmental economic accounts defines environmental products as goods and services that prevent, reduce or eliminate pollution and any other degradation of the environment or help managing natural resources in a sustainable manner. To delimit environmental goods and services in a uniform manner, Regulation (EC) 2015/2174 establishes an indicative compendium of the most relevant environmental goods, services, and production activities. The compendium is complemented by an operational list[4] that specifies how environmental products and activities should be classified according to CEPA (Classification of Environmental Protection Activities)[5] and CReMA (Classification of Resource Management Activities)[6] categories.

Both the indicative compendium and the operational list refer to *"electric and more resource-efficient transport equipment"* as an environmental product. The operational list suggests the following product groups are potentially relevant:

- motor vehicles, trailers and semi-trailers; other transport equipment listed under CPA[7] and NACE[8] Codes 29 and 30;
- vehicles other than railway or tramway rolling stock, and parts and accessories thereof; railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electromechanical) traffic as included under CN (2016) Codes 86 and 87.

The EGSS and EPEA handbooks both emphasise the importance of an environmental purpose to distinguish environmental from non-environmental products. Environmental purpose might be understood as primary or secondary purpose, the latter is relevant for electric transport equipment whose primary purpose is not environmental but transporting people and goods, albeit in a cleaner and more energy efficient manner than done by conventional vehicles. The secondary environmental purpose can be identified through the technical nature of transport equipment and its presumed or actual environmental impacts. The EGSS and EPEA handbooks do not provide specific recommendations on how to evaluate environmental impacts but suggest taking into consideration auxiliary product information such as environmental labels. By this guidance, vehicles could be considered as environmental products, e.g., if they received the highest rating in the European car labelling scheme.

The EGSS and EPEA handbooks further recommend identifying adapted goods through a pairwise comparison of two product alternatives, namely one that is novel, supposedly cleaner and more efficient, and another representing the standard technology at the market.

[4]See: https://ec.europa.eu/eurostat/web/environment/methodology.
[5]See: https://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=LST_NOM_DTL&StrNom=CEPA_2000 &StrLanguageCode=EN&IntPcKey=&StrLayoutCode=HIERARCHIC.
[6]See: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Classification_of_Resource_Management_Activities_(CReMA)&oldid=471172.
[7]Statistical classification of products by activity in the European economic community, 2008 version. RAMON – Reference and Management of Nomenclatures. Eurostat.
[8]NACE Rev. 2. RAMON – Reference and Management of Nomenclatures. Eurostat.

Such a comparison neglects, however, that cleaner and more efficient technologies often provide several different features compared to their conventional counterparts. Electric cars, for example, are more efficient than conventional cars but they also have currently a shorter drive range, require longer re-charging times and face the inconvenience of a patchy re-charging infrastructure. Consumers tend to respond to changes in vehicle attributes by modifying their purchase decisions, vehicle use pattern and choices regarding their preferred mode of transport. Mode shifts are widespread and frequent in the transport sector and often occur multiple times in a single day (e.g., a commuter may use the tram to reach work but her bicycle or car to join evening sports).

To capture the environmental impacts of electric vehicles, thus requires understanding which vehicles and transport modes they replace in practice. A comparison of product alternatives could then include a wider range of vehicles and transport modes available to consumers. If vehicles are clean and efficient relative to the vehicles or transport mode they replace, then they should be considered in monetary environmental accounts. Taking such a holistic approach can make EGSS and EPEA accounts more robust in view of rebound effects, through which relatively efficient and clean vehicles cause the overall environmental impacts of transport to increase.

The handbooks suggest ***the full product value is to be considered when valuing EGSS output*** and ***extra cost relative to a conventional product is to be considered when valuing expenditures in EPEA***.

Based on the feedback from the October 2018 TF meeting, Eurostat noted that data compilers may require more specific guidance on which vehicles and equipment to include within the scope of their monetary environmental accounts. Stakeholders articulated a preference for applying technical criteria when assessing transport equipment. This approach is followed below, for example, when justifying the exclusion of conventional vehicles running on biofuels or other alternative fuels.

3 State of play

3.1 Data reporting

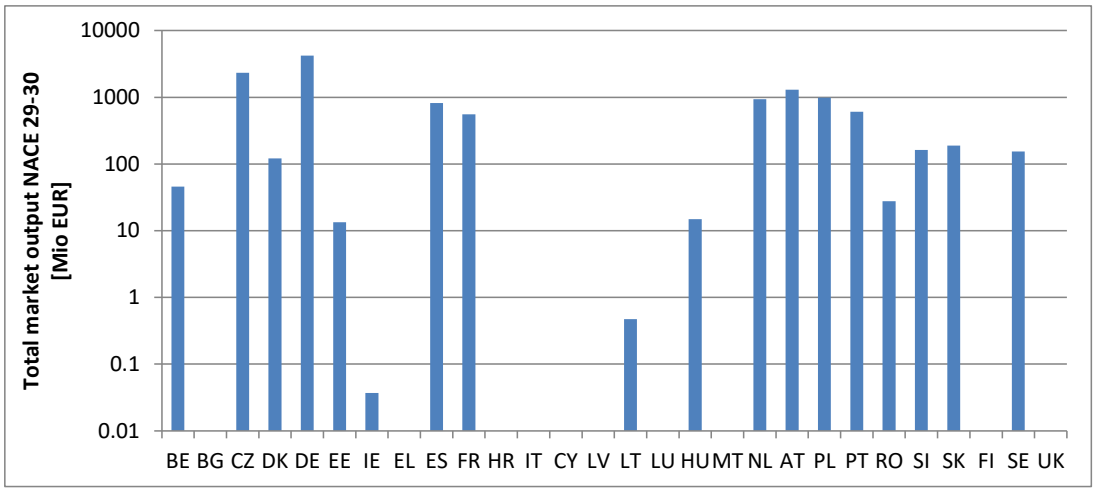
The results of the 2018 EGSS data reporting and the TF discussions suggest that countries differ in their recording of electric transport equipment, which raises issues of data comparability.

The reporting of transport equipment under NACE 29 and 30 is a voluntary item for EGSS. However, even if countries chose not to report data at this level of detail, they are obliged to include relevant products when reporting total production and exports under NACE C. Figure 1 provides an overview of EGSS market output for NACE 29 and 30 for reference year 2016. Most countries with a large automotive industry such as Germany, France, Czech Republic, and Poland report production activity.

However, countries tend to differ in their allocation of production output to specific CEPA and CReMA categories (Figure 2). Part of the cross-country differences could be explained

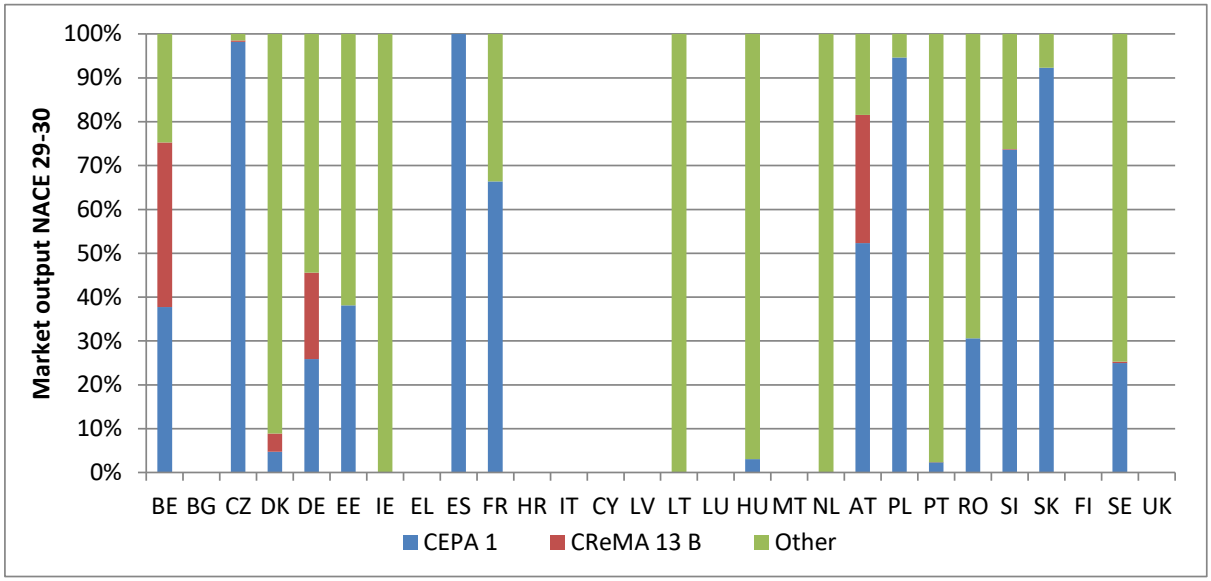
by secondary activities of the automotive industry but clarification of allocation practices is still needed.

Figure 1: Total market output under NACE 29 and 30, by country, 2016 (logarithmic scale)



Source: 2018 EGSS country reporting; confidential data are excluded

Figure 2: Total market output under NACE 29 and 30 allocated per CEPA-CReMA category, by country, 2016



Source: 2018 EGSS country reporting; confidential data are excluded

Following the TF meeting on 15 October 2018, most countries identify electric transport equipment based on technical characteristics. One country addresses relevant products in a survey as part of energy efficient propulsion technologies, including turbines. The country is currently redefining the EGSS survey, and plans to account for electric, hybrid, and fuel cell vehicles under the umbrella of e-mobility.

4 Proposals

4.1 Scope of the proposals

The proposals in this section shall ensure electric transport equipment is recorded in EPEA and EGSS accounts: (i) ***consistently*** across countries and in line with Regulations (EC) 691/2011 and (EC) 2015/2174, (ii) ***accurately*** regarding technical characteristics and environmental impacts, (iii) in a ***robust*** manner regarding future technological developments, market trends, and mode shifts, and (iv) in a ***practical*** manner that does not imply excessive burden for data collection.

The proposals concern ***transport equipment*** - commonly understood as machinery and trailer intended for moving persons and objects (including livestock). As road vehicles are responsible for the largest part of transport-related greenhouse gas emissions and local air pollution, the proposals focus on this type of transport equipment but include also other vehicles such as non-road machinery and ships (Table 1). An outlook of other transport equipment and related transactions that are potentially relevant in the context of monetary-environmental accounts is provided in section 4.8.

This note does not address *"exhaust pipes and their parts"*, particle filters, and catalytic converters. Such vehicles components should be: (i) considered environmental products according to the indicative compendium in Regulation (EU) 2015/2174 and (ii) reported under CEPA 1 according to the operational list of environmental products and activities.

Table 1: Scope of the proposals

Type of transport equipment	Included	Excluded
Vehicles	Motor vehicles for passenger and freight transport on the road, non-road machinery, other vehicles such as ships	Rolling railroad products, airplanes, other aerospace equipment as well as parts thereof
Vehicle components	Technical components of electric vehicles (such as batteries, fuel cells, electric motors)	Electric equipment not installed in electric vehicles
Infrastructure	Infrastructure that is necessary and specific to the operation of electric vehicles (such as recharging units and stations)	Other transport infrastructure

4.2 Relevant electric transport equipment

To identify electric transport equipment, Eurostat considered the technical characteristics of vehicles and infrastructure in conjunction with their absolute and relative environmental impacts. Road vehicles were considered as environmental products if they are ***electric and clean relative to:***

- ***their direct conventional counterparts (i.e., vehicles offering comparable utility);***
- ***any motorised vehicles or transport equipment they may replace in practice***.

Following these criteria, Eurostat identified in Tables 2 and 3 relevant ***transport equipment for EPEA and EGSS accounts***. The proposals in both tables follow the concept of adapted goods and are justified in detail below.

General considerations – fully electric vehicles

The explicit reference of the indicative compendium to *"electric transport equipment"* implies ***fully electric vehicles are per se considered as environmental products in Regulation (EU) 2014/2174.***[9] Eurostat proposes to ***define fully electric vehicles as any vehicles equipped with one or multiple electric motor(s), drawing their energy solely from an electric battery, a fuel cell, or another energy storage or supply device such as solar panels or overhead power cables***. This definition includes fuel-cell vehicles but it excludes equipment propelled or equipped with combustion engine(s) (such as plug-in and non-plug in hybrid vehicles) that are addressed separately below.

Fully electric passenger cars

Eurostat proposes to record first and foremost the production and export of ***fully electric cars (Table 2)*** as these do not show tail-pipe emissions and can thus decrease local air pollution, specifically in densely populated urban areas. The reduction of local air pollution - which exceeds in many cities the regulatory limits for the concentration of particulate matter and nitrogen dioxide[10] - could thus be considered the main environmental benefit of electric cars and electric vehicles in general, leading to the proposal to report them under CEPA 1 (see section 4.6).

Hybrid passenger cars

Eurostat also proposes to record plug-in hybrid and non-plug-in hybrid cars. These vehicles possess a traction battery and an electric motor as two technical features that differ distinctly from conventional cars and serve the main purpose of enhancing powertrain efficiency, thus decreasing fuel consumption and CO_2 emissions. Plug-in and non-plug-in hybrid cars can also decrease pollutant emissions, specifically when operated in electric drive mode. Under real-world operation, their emissions performance vary depending on the design of after-treatment systems and the recharging frequency of plug-in hybrids.

If plug-in hybrid and non-plug-in hybrid cars are to be considered environmental products, how can they be differentiated from conventional cars? Following the TF meeting on 15 October 2018, ***Eurostat suggests identifying plug-in hybrid and non-plug-in hybrid vehicles***

[9]Electric vehicles are clean during use as they do not emit pollutants at the tail-pipe. However, their production is relatively energy-intensive and their overall climate benefits are sensitive to the carbon intensity of the electricity mix. A recent study suggests electric cars in Europe emit less greenhouse gases along their life cycle than diesel cars even when powered by carbon-intensive electricity (https://www.transportenvironment.org/press/electric-cars-emit-less-co2-over-their-lifetime-diesels-even-when-powered-dirtiest-electricity). An increasing share of renewables in the electricity mix as envisaged by the Europe 2030 energy strategy will continue to increase the climate benefits of electric cars.

[10]See report by the European Environmental Agency (https://www.eea.europa.eu/highlights/air-pollution-still-too-high).

based on the capability to drive solely by means of the electric motor. In the absence of such detailed information, passenger cars can be considered as environmental products if they are classified as clean vehicles[11], emitting not more than 50 gCO_2/km. ***This criterion is consistent with policy documents promoting clean vehicles but it excludes non-plug-in hybrids.***

Eurostat proposes to exclude so-called mild-hybrid cars, that is, cars equipped with a small electric motor for dynamic start and stop of the combustion engine during driving that enables prolonged coasting. Such cars facilitate only to a very limited extent regenerative breaking. Their efficiency and emission benefits are small, and their technical characteristics similar with those of conventional car.

Other electrified road vehicles and machinery

Eurostat proposes to record fully electric, plug-in hybrid, and non-plug-in hybrid light-commercial vehicles, heavy-duty vehicles (such as buses and trucks), tractors, forestry equipment, and non-road machinery as environmental products. These vehicles could be differentiated from their conventional counterparts by the same technical criteria as proposed for passenger cars. At present, fully electric and hybridised heavy-duty vehicles, tractors, and non-road mobile machinery (including bulldozers and excavators) are still in an experimental stage or represent niche applications. However, by accounting for them, EPEA and EGSS accounts could accommodate future developments.[12] ***Eurostat also proposes to include electric ships*** as a niche application to mitigate CO_2 emissions and local air pollution from water transport.

Infrastructure and electric vehicle components

Following the TF meeting on 15 October 2018 and the MESA WG on 16 May 2019, ***Eurostat also proposes the recording of:***

- ***essential infrastructure - such as electric charging units and stations - that are specific to the operation of electric vehicles;***
- ***the production and export of technical powertrain components of electric vehicles such as electric batteries, fuel cells, inverters and electric motors).***

Table 2 provides an overview of relevant infrastructure and components. Whereas charging units are considered specific and essential for the operation of electric vehicles, rental and sharing stations are not and should therefore not be considered environmental activities. It is undisputed that such stations increase the availability of electric vehicles to users but not in a fundamentally different way than bike or car sharing increases the availability of bicycles and conventional passenger cars to users. The exclusion of sharing and renting stations is consistent with the guidance in the EGSS and EPEA handbooks and with the exclusion of

[11]According to Directive (EU) 2019/1161 amending Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019L1161&from=EN).

[12]See, e.g., the increasing popularity of the StreetScooter light-commercial vehicle in Germany.

wholesale and retail operations of environmental products that likewise is not considered an environmental activity.

The inclusion of technical components raises the issue of potential double-counting of production activity, for example, when electric motors produced by company A, are integrated by company B into a powertrain, that is then installed into a vehicle by company C. Overall, Eurostat regards it consistent with the EGSS handbook to report environmental products used as intermediate input for the production of other environmental products. The reported production output may double count activity but gross value added and employment still represent environmental production activities in a consistent manner.

Other electric passenger vehicles

E-bikes, electric kick scooters, and other light-weight electric vehicles designed for passenger transport do not emit NO_X, particulate matter, and other pollutants at the tail-pipe and can therefore help mitigating air pollution when replacing conventional motorised vehicles. Electric light-weight vehicles are by far more efficient - in terms of energy use per person-kilometre driven - than both electric and conventional passenger cars. To illustrate the case, electric cars are typically powered by 80-300 kW motors that consume under real-world driving conditions 15-25 kWh/100 km. The equivalent fuel consumption of conventional gasoline and diesel cars may range around 40-100 kWh/100 km (assuming an energy density of 10 kWh/l diesel and 8.9 kWh/l gasoline). With 40-100 kWh, some 60-140 e-bikes (250 W motor; 0.7 kWh/100 km electricity consumption) could be operated the same distance. Even when accounting for an average occupancy rate of 1.45 persons per car and considering that e-bikes could also replace electric cars, the on-road energy consumption of e-bikes and electric kick scooters is still factor 1:15-90 lower than that of cars; the energy consumption of electric motorcycles/step-through scooters can be a factor 1:5-30 lower than that of cars.[13]

Yet, light-weight electric vehicles could also increase traffic and replace bicycles that are the cleanest and most resource-efficient mode of transport. Depending on climate, orography, and infrastructure conditions, mode-shift to light-weight electric vehicles may vary between countries, regions, and cities.

Countries should therefore examine whether electric light-weight mono-, two-, three-, and four-wheel vehicles as listed in Table 3 replace to a significant extent other motorised transport equipment; if so, all such vehicles should be included as electric transport equipment in EPEA and EGSS accounts; if not, all such vehicles can be excluded from EPEA and EGSS accounts. Choices should be explained in the quality report and verified by Eurostat for plausibility and consistency. Eurostat notes that the value of related output, GVA, employment, and exports is relatively small for EU Member States. For this reason, the choice left to the compiler will permit fully taking into account a country specificity without unduly affecting the cross-country comparability of the EGSS data.

[13]For the energy consumption of electric scooters, see, for example: https://www.autobild.de/artikel/elektroroller-test-13693043.html.

Boundary cases

Eurostat proposes to <u>exclude</u> (next to mild-hybrid vehicles) conventional vehicles that are exclusively propelled by a spark-ignition or compression-ignition engine, even if they run on alternative fuels such as CNG, LPG, biofuel, or synthetic fuel.

The production of biofuels is considered as a resource management activity in EGSS, i.e., means to preserve non-renewable fossil resources. However, the vehicles and engines combusting such fuels should, by themselves, not be considered as environmental products for four reasons:

- First, the combustion of alternative fuels causes tail-pipe emissions. The benefits of biofuels and other alternative fuels for local air quality are ambiguous[14] when compared to conventionally-fueled vehicles and they are negative when compared to electric vehicles (that show zero tail-pipe emissions). The climate benefits of biofuels are case-specific and can become negative when accounting for indirect land-use change and when taking renewable electricity as reference product.

- Second, the combustion of biofuels and alternative fuels in internal combustion engines is more or less as efficient, from an energetic point of view, as the combustion of conventional fuels. Vehicles running on biofuels and other alternative fuels lack distinct technical features that generate efficiency benefits.

- Third, and related, the technical characteristics of vehicles running on alternative fuels, including biofuels, are largely similar to those of conventional vehicles. Modern diesel vehicles do not require modifications of engine or after-treatment systems to run on biodiesel. Bio-ethanol can be combusted in conventional spark-ignition engines after rubber sealants are replaced to resist the corrosive effects of ethanol.

- Fourth, the exclusion of vehicles running on biofuels is consistent with the treatment of down-stream manufacturing processes that are, likewise, not considered as environmental activities unless they either serve a direct environmental purpose or produce specifically designed products whose use serve an environmental purpose. In analogy, neither fuel combustion itself serves the environment *directly* nor does the transport of passengers and goods produce an environmental service.

Likewise, vehicles running on CNG and LPG are technically similar to conventional gasoline vehicles; the main differences are limited to a pressure tank, pressure regulator, and secondary fuel injectors that accommodate methane as fuel but are not linked, in our opinion, to an obvious environmental purpose. The exclusion of vehicles running on alternative fuels is broadly consistent with the definition of environmental cars in the proposal for the

[14]See, for example: Martini et al. (2009): Effect of fuel ethanol content on exhaust emissions of a flexible fuel vehicle. Report EUR 24011 EN. Ispra, Italy; Edwards, R. et al. (2014): Well-to-wheels report version 4.a, JEC well-to-wheels analysis. JRC Technical Report EUR 26236 EN. Ispra, Italy; Ashnani, M. H. M., et al. (2015): Environmental impact of alternative fuels and vehicle technologies: A life cycle assessment perspective. Procedia Environmental Sciences 30, pp. 205-210; Kollamthodi, S. et al. (2016): The role of natural gas and biomethane in the transport sector. Final Report ED 61479. Ricardo Energy & Environment.

amendment of Directive 2009/33/EU that considers clean vehicles as those emitting *at the tailpipe* not more than 50 gCO_2/km[11].

4.3 Data sources

Business surveys could be used as the primary data source to identify relevant production activity. If unavailable, PRODCOM and trade statistics could be consulted (see Tables 2 and 3), but product codes typically include environmental and non-environmental products. Available data therefore need to be combined with additional information from governmental subsidy schemes or business reports of producers or producer associations to identify relevant product shares. The latter data sources could also be used to directly obtain information on the number and value of produced vehicles, vehicle components, and charging stations.

4.3 Valuation principles

Eurostat proposes to ***report for EGSS the entire value of vehicles, electric components, and essential infrastructure (at basic prices)***. This proposal is consistent with SEEA-CF[15] and the 2016 EGSS handbook, stating that "EGSS measures the output of adapted products at their total value (at basic prices)". It also considers that state-of-the art electric powertrains are no longer modular but highly integrated into the rolling chassis of vehicles, affecting the design of wheels and the breaking system (that accommodate wheel-hub motors and regenerative breaking) and the chassis itself (that accommodates battery packs).

Where necessary information is unavailable, countries should consider reporting the costs related to electric powertrain and vehicle components[16] instead of the full vehicle value or the additional costs of electric transport equipment. If either of the two latter approaches is chosen: 1) the reporting method has to be explained in detail in the quality report and 2) instruction and information should be provided, e.g., on costs shares and cost differentials so that Eurostat is in the position to re-calculate EGSS estimates to the full vehicle value. If corrections are made, data will be flagged prior to publication as Eurostat estimate with footnote 's)'.

As electric transport equipment does not serve a primary environmental purpose, ***data compilers should not report in EPEA the expenditure on vehicles and components at full value. Instead the extra costs of electric transport equipment should be reported.*** This proposal is consistent with the 2017 EPEA handbook, stating that: "only the 'environmental protection share' should be accounted for, which can be measured by the extra cost of the cleaner product compared to an equivalent normal product." ***For practicality, the full value of essential infrastructure should be considered as an environmental expenditure in EPEA.***

[15]See: https://seea.un.org/sites/seea.un.org/files/seea_cf_final_en.pdf.

[16] This approach implies a more stringent definition of adapted goods, namely that electric powertrains rather than entire vehicle are considered the cleaner and adapted products.

Table 2: Electric transport equipment for reporting in EPEA and EGSS accounts; PRODCOM codes are indicative and may include non-environmental products

Equipment	**Description**	**PRODCOM code**	**CN code**	**Environmental impacts**	**Distinct technical features**	**Rationale for reporting as environmental product**
Fully electric cars	M1 vehicles[17] designed primarily for passenger transport, having no more than eight seats next to the driver's seat, and being powered exclusively by an electric motor supplied by a rechargeable battery, fuel cell, or any other electric energy storage system	29.10.24.50	87 03 80-90	Energy intensive production; energy efficient and no tail-pipe emissions during use; can mitigate local air pollution; climate benefits, that are, however, sensitive to mode shift and the carbon intensity of electricity; renewable electricity and second-life battery use decrease climate impacts	Electric motor, inverter, traction battery or fuel cell	Electric transport equipment; no tail-pipe emissions; more energy efficient than conventional cars
Plug-in hybrid cars	M1 vehicles[15] designed primarily for passenger transport, having no more than eight seats next to the driver's seat, and being equipped by at least two different motors, of which one is an electric motor, and two different propulsion energy storage systems, of which one can be recharged from an external electricity source	29.10.24.30	87 03 60-70	Energy intensive production; energy efficient during use; benefits for local air quality depend on charging frequency and emissions after-treatment; climate benefits sensitive to user behaviour and carbon intensity of electricity; renewable electricity and second-life battery use decrease climate impacts	Electric motor, inverter, relatively small traction battery	More efficient and potentially less-polluting than conventional cars

[17]According to Regulation (EU) 2018/858 on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles. Official Journal of the European Union L151, p. 1-218.

Table 2 (cont.): Electric transport equipment for reporting in EPEA and EGSS accounts; PRODCOM codes are indicative and may include non-environmental products

Equipment	**Description**	**PRODCOM code**	**CN code**	**Relevant environmental impacts**	**Distinct technical features**	**Rationale for reporting as environmental product**
Non-plug-in hybrid cars	M1 vehicles[15] designed primarily for passenger transport, having no more than eight seats next to the driver's seat, and being equipped with at least two different motors, of which one is an electric motor capable of electric-only mode of propulsion, and two different propulsion energy storage systems, which cannot be recharged from an external electricity source	29.10.24.10	87 03 40-50	Relatively energy intensive production; energy efficient during use; pollutant emissions ambiguous and dependent on emissions after-treatment; climate benefits relatively small and sensitive to efficiency trade-offs	Electric motor, inverter, relatively small traction battery	More efficient and potentially less-polluting than conventional cars
Fully electric, plug-in hybrid, and non-plug-in hybrid busses	M2 and M3 vehicles[15] designed primarily for passenger transport, having more than eight seats next to the driver's seat, and being equipped with similar powertrain technologies as passenger cars listed above	29.10.30	87 02 20; 87 02 30; 87 02 40	Analogous to fully electric, plug-in hybrid, and non-plug-in hybrid cars	Analogous to fully electric, plug-in hybrid, and non-plug-in hybrid cars	Analogous to passenger cars
Fully electric, plug-in hybrid, and non-plug-in hybrid light-commercial vehicles, heavy-duty trucks, and other vehicles	N vehicles[15] designed primarily for goods and freight transport and being equipped with comparable powertrain technologies as passenger cars listed above	29.10.41.10-40; 29.10.42; 29.19.43; 29.10.51; 29.10.59.30-90	87 01 20; 87 03 40; 87 03 50 00; 87 03 60-80; 87 04 10 90; 87 04 21-23 87 04 31-90 87 05 10-90 87 09 11 90			

Table 2 (cont.): Electric transport equipment for reporting in EPEA and EGSS accounts; PRODCOM codes are indicative may include non-environmental products

Equipment	**Description**	**PRODCOM code**	**CN code**	**Relevant environmental impacts**	**Distinct technical features**	**Rationale for reporting as environmental product**
Other electric, plug-in hybrid, and non-plug-in hybrid non-road mobile machinery	Non-road mobile machinery such as caterpillars, excavators[18] with or without wheels and not intended for road transport being equipped with distinct technical features that increase efficiency and decrease tail-pipe emissions	29.10.52	84 29 11-59; 84 30 10-69 87 03 10 18	Analogous to electric, plug-in hybrid and non-plug-in hybrid cars	Analogous to electric, plug-in hybrid and non-plug-in hybrid cars	Analogous to passenger cars
Electric, plug-in hybrid, and non-plug-in hybrid tractors and other agricultural and forestry machinery	T and C vehicles[19] designed as agricultural or forestry vehicles with at least two axles for pulling, pushing, carrying, or actuating equipment being equipped with similar powertrain technologies as the M1 vehicles listed above	28.30.10-23; 28.30.39-59	84 32 10-80 84 33 11 10; 84 33 40-59 87 01 00; 87 01 30 00; 87 01 91-95;	Analogous to electric, plug-in hybrid and non-lug-in hybrid cars	Analogous to electric, plug-in hybrid and non-plug-in hybrid cars	Analogous to passenger cars
Electric ships	Motorboats and larger ships propelled by one or multiple electric motors drawing their energy from an electric battery or fuel cell	30.11; 30.12	89 01; 89 02 00; 89 03; 89 04; 89 05; 89 06	No exhaust emissions; can mitigate local air pollution; climate benefits sensitive to carbon intensity of electricity	Electric motor, battery, fuel cell	Electric transport equipment; clean adapted technology

[18]According to Regulation (EU) 2016/1628 on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery. Official Journal of the European Union L252, pp. 53-117.
[19]According to Regulation (EU) No 167/2013 on the approval and market surveillance of agricultural and forestry vehicles. Official Journal of the European Union L60, pp. 1-51.

Table 2 (cont.): Electric transport equipment for reporting in EPEA and EGSS accounts; PRODCOM codes are indicative may include non-environmental products

Equipment	**Description**	**PRODCOM code**	**CN code**	**Relevant environmental impacts**	**Distinct technical features**	**Rationale for reporting as environmental product**
Essential infrastructure						
Recharging infrastructure	Charging stations and other essential infrastructure for recharging electric transport equipment	27.12.40 27.90.44	85 04	Improving urban air quality and potentially decreasing CO_2 emissions from transport	Specific design (e.g., plug) to charge electric vehicles	Essential for electric transport equipment
Technical components of electric vehicles						
Fuel cells*	see PRODCOM/CN code	27.90.42.00	85 01 31-34	(see fully electric cars)	Electric equipment	Essential for electric vehicles
Batteries*	see PRODCOM/CN code	27.20.11-24	85 06; 85 07	(see fully electric cars)	Electric equipment	Essential for electric vehicles
Electric motors*	see PRODCOM/CN code	27.11.10; 27.11.21.00; 27.11.25.30	85 01 10; 85 01 20 00; 85 01 31 00; 85 01 32 00; 85 01 33 00; 85 01 34 00; 85 01 40; 85 01 51 00; 85 01 52; 85 01 53 50	(see fully electric cars)	Electric equipment	Essential for electric vehicles
Other electric equipment*,**	see PRODCOM/CN code	27.90.41; 27.90.45; 29.31.10; 29.31.30; 29.32.30	85 35-36; 85 44	(see fully electric cars)	Electric equipment	Essential for electric vehicles

* Only components of electric, plug-in and non-plug-in hybrid vehicles are relevant; components used for other purposes, e.g., in manufacturing or for stationary applications in households are to be excluded from the reporting of electric transport equipment. **The listed PRODCOM and CN codes are indicative; other electric equipment may be included if it is specific to and installed in electric, plug-in and non-plug-in hybrid vehicles.

Table 3: Electric transport equipment to be included in or excluded from EPEA and EGSS accounts depending on whether they replace non-motorised or motorised vehicles; PRODCOM codes are indicative may include non-environmental products

Equipment	**Description**	**PRODCOM code[20] (numbers in parentheses to be verified)**	**CN code[21]**	**Relevant environmental impacts**	**Distinct technical features**	**Rationale for reporting as environmental product**
Electric unicycles	Vehicles touching the ground with only one wheel and driven by an electric motor	(30.91.13.00)		Relatively energy intensive production; highly energy efficient and no tail-pipe emissions during use; mitigate local air pollution and exposure to NO_X, particles, hydrocarbons; large climate benefits, that are, however, sensitive to mode shift and the carbon intensity of electricity; renewable electricity and second-life battery use can decrease climate impacts considerably	Electric motor, inverter, and small traction battery	Electric transport equipment; no tail-pipe emissions
Electric scooters	Stand-up rollers/scooters with a large deck in the centre driven by an electric motor	30.91.13.00	87 11 20 10			
Pedal assisted e-bikes, e-tricycles, and e-quadricycles	Powered cycles categorised as L1e-A vehicles[22] with an electric motor of a maximum rated power of 250 W, whose operations does not require a driver's licence	30.91.13.00	87 11 60 10			
Small electric scooters and mopeds	Two-wheelers categorised as L1e-B vehicles[14] without pedal assistance, having a maximum speed of 45 km/h, and being propelled solely by electric motor(s) of a maximum rated power of >0.25–4 kW	30.91.13.00	87 11 60 00; 87 11 60 90			
Large electric scooters and motorcycles	Two-wheelers categorised as L3e and L4e vehicles[14] with a maximum speed of >45 km/h, being propelled solely by electric motor(s) of a maximum continuous rated power of >4 kW	30.91.13.00	87 11 60 00; 87 11 60 90			
Electric three- and four-wheelers	Three- and four-wheelers designed for passenger transport or utility purposes, categorised as L2e, L5e, L6e, L7e vehicles[14], being solely propelled by electric motor(s)	29.10.24.50	87 11 60 00; 87 11 60 90			

[20]Regulation (EU) 2017/2119 establishing the 'Prodcom list' of industrial products provided for by Council Regulation (EEC) NO 3924/91. Official Journal of the European Union L325, pp. 1-214.
[21]Regulation (EU) 2018/1062 amending Annex I to Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff. Official Journal of the European Union L273, pp. 1-960.
[22]According to Regulation (EU) No 168/2013 on the approval and market surveillance of two- or three-wheel vehicles and quadricycles. Official Journal L53, pp. 1-117.

4.5 Additional guidance

Trade in electric transport equipment

Consistent with the exclusion of retail and wholesale from environmental accounts, only export of domestically produced new electric transport equipment should be reported in EGSS. Export of second-hand cars is to be excluded.

For EPEA, transactions related to the use of electric transport equipment are relevant, specifically their final consumption by households, which is a voluntary reporting item in the data collection. In EPEA final consumption of cleaner environmental protection goods are valued at extra cost. Consequently the extra cost of new equipment should be reported. Pertinent information could be obtained from market surveys and online car trading platforms. It is assumed that domestic transactions in second-hand equipment will remain without impact on NEEP and cross-border transactions in goods are not covered in the value of EPEA exports and imports at this stage. Thus, there is no need to measure the transactions in second-hand equipment for this specific MEA account.

For EPEA, transactions related to the use of electric transport equipment are relevant, specifically their final consumption by households, which is a voluntary reporting item in the data collection. Thus, both imports and exports of second-hand electric transport equipment should be considered. As *EPEA captures the extra cost of adapted goods*, the extra cost of new and second-hand electric equipment should be reported. Information could be obtained from market surveys and online car trading platforms.

Estimating total value of vehicles for EGSS

Countries recording only costs related to electric powertrain components of vehicles should consider estimating the full value of electric vehicles by multiply their data with a correction factor. In the absence of specific information, a default factor of 2.5 could be applied, which assumes that the costs of electric powertrains account for around 40% of the basic price of electric vehicles.[23]

Estimating extra costs of vehicles for EPEA

The extra costs of electric vehicles could be approximated based on their price difference relative to conventional vehicles. ***In the absence of detailed information, such as country-specific price differences, the following approaches can be applied:***

- Tier I: Assuming that electric vehicles are 30% more expensive than their conventional counterparts.
- Tier II: Assuming specific price differences for each vehicle type as given in (Table 4).

[23]Sources: https://www.theicct.org/sites/default/files/publications/EV_cost_2020_2030_20190401.pdf; https://www. investors.com/news/electric-car-teardown-tesla-model3-chevy-bolt-bmw-i3/.

Table 4: Price premium of electrified vehicles over comparable conventional vehicles, by type; data represent default estimates as of 2020 and should be updated as part of the regular review of this guidance note

Vehicle type	Price premium per vehicle	Comment
Fully electric cars	12 000 EUR or 250 EUR/kWh battery capacity	Estimate of average price premium; large case-specific variability depending on market positioning of vehicles
Plug-in hybrid cars	6 000 EUR	
Non-plug-in hybrid cars	0 EUR	The price of non-plug in hybrid cars is comparable to that of efficient conventional cars with state-of-the-art after-treatment systems.
Fully electric, plug-in hybrid, and non-plug-in hybrid busses	200 000 EUR or 1 000 EUR/kWh battery capacity	Rough estimate for a large electric city bus; price levels volatile and subject to battery capacity and demand for electric busses; for non-plug-in hybrid busses a price premium of zero should be assumed.
Electric, plug-in hybrid, and non-plug-in hybrid light-commercial vehicles, heavy-duty trucks	1 000 EUR/kWh battery capacity	Rough estimate as electrified trucks are just about to enter the market; price levels are likely volatile and subject to battery capacity and demand for electric trucks.
Electric, plug-in hybrid, and non-plug-in hybrid tractors and other agricultural and forestry machinery	1 000 EUR/kWh battery capacity	Rough estimate; most electric equipment is still test phase.
Other electric, plug-in hybrid, and non-plug-in hybrid non-road mobile machinery	500 EUR/kWh battery capacity	Estimate based on electric forklifts; most electric equipment is still test phase.
Stand-up scooters, e-bikes	400 EUR	Estimate of mean price premium; case-specific variability depending on market positioning and specifications of vehicles.
Small electric scooters and mopeds	1 500 EUR	
Electric three- and four-wheelers	1 500 EUR	
Large electric scooters and motorcycles	4 000 EUR or 250 EUR/kWh battery capacity	

The proposals in this section do not account for country-specific subsidies that tend to decrease the purchaser's price of electric vehicles rather than the overall environmental expenditure. Instead, subsidies shift the burden of environmental expenditure from the purchasers of vehicles to the government and should thus be considered in the related EPEA reporting.

The proposals provide only a rough estimate for the price premium of electrified vehicles but still are considered an acceptable approach in the absence of the detailed information in data

sources. Values can span a wide value range and are likely to decrease over time depending on the rate of technological learning and the strategic pricing policy of manufacturers.

4.6 Classification of electric transport equipment

Consistent with the TF position, Eurostat proposes to ***report electric transport equipment unanimously under CEPA 1 as a measure of protecting ambient air and climate.*** Specifically relevant is category CEPA 1.1.1 – *"Prevention of pollution through in-process modifications for the protection of ambient air"*. The proposal to report all relevant transport equipment under CEPA 1 ensures coherence with the current reporting practice and captures the substantial benefits of e-mobility for local air quality. The proposal also helps recording plug-in and non-plug in hybrid vehicles in a practical manner even if it may not capture the nuances of all benefits of these vehicles that tend to be more efficient but not necessarily cleaner than conventional cars.[24]

4.7 Implementation of the guidance note

This guidance note should be applied on a voluntary basis for the 2020 data collection and on a mandatory basis for the EPEA and EGSS reporting from 2021-onwards. It should be applied, as far as feasible, to the whole mandatory reference period from 2014-onwards.

The electrification of (road) transport is still in its infancy. To accommodate new technological developments and changing policy priorities, the guidance shall be reviewed every two years with the first review taking place in 2022.

4.8 Products for further consideration

This guidance note does not address dedicated driveways, road infrastructure (such as bike lanes) and rental stations (e.g., for e-bikes and e-scooters). These items are relevant for the transition towards clean and sustainable transport but they are not specific to electric vehicles and therefore outside of the scope of the 'electric transport equipment' addressed here.

The reporting of electric transport equipment in EPEA and EGSS accounts faces the challenge of rapid technological change. Country-specific developments should be monitored by national compilers and information on major new products and technologies shared with Eurostat. For further discussion and a potential inclusion in monetary environment accounts in the midterm after the 2022 revisions, the MESA WG is asked to express views on the reporting of the following electric transport equipment:

- production and transactions related to new electric tramways, metro, and other railway equipment (including trains, track fixtures and fittings) that replace standard and more polluting transport modes;
- provision of public transport services that are fully electrified and without tail-pipe emissions and replace standard and more polluting public transport;

[24]See Franco et al. (2016): Evaluation of exhaust emissions from three Diesel-hybrid cars and simulation of after-treatment systems for ultralow real-world NO_X emissions. Environmental Science & Technology 50, pp. 13151-13159.

- production and transactions related to electric air planes;
- construction of dedicated bike lanes and drive ways for light-weight vehicles such as bicycles and e-bikes for consideration as environmental activity under NACE F.

Abbreviations and acronyms

CEPA	-	Classification of Environmental Protection Activity
CN	-	Combined Nomenclature
CNG	-	Compressed Natural Gas
CO_2	-	carbon dioxide
CPA	-	Statistical classification of Products by Activity
CReMA	-	Classification of Resource Management Activity
EGSS	-	Environmental Goods and Services Sector
EPEA	-	Environmental Protection Expenditure Accounts
km	-	kilometre
LPG	-	Liquefied Petroleum Gas
MESA WG	-	Monetary Environmental Statistics and Accounts Working Group
NO_X	-	Nitrogen oxides
SEEA-CF	-	System of Environmental-Economic Accounting 2012 – Central Framework
TF	-	task force
W	-	watt