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Accompanying the document

Report from the Commission

Commission report under Article 12(3) of Regulation (EU) 2019/631 on the evolution of the real-world CO2 emissions gap for passenger cars and light commercial vehicles and containing the anonymised and aggregated real-world datasets referred to in Article 12 of Commission Implementing Regulation (EU) 2021/392

{COM(2024) 122 final}

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Glossary

ABBREVIATION	DEFINITION
CD	‘Charge depleting operation’, meaning, for OVC-HEVs, the state of vehicle operation when the Rechargeable Electric Energy Storage System (REESS) state of charge (SOC) is higher than the charge sustaining target SOC value and the intent of the vehicle control system is to deplete the SOC from a higher level down to the charge sustaining target SOC value.
CI	'Driver-selectable charge increasing operation’, meaning, for OVC-HEVs, the operation condition in which the driver has selected a mode of operation, with the intention to increase the REESS state-of-charge.
CoC	‘Certificate of Conformity’.
CS	‘Charge Sustaining operation’, meaning, for OVC-HEVs, the state of vehicle operation when the REESS SOC may fluctuate but the intent of the vehicle control system is to maintain, on average, t he current state of charge.
E85	A mixture of petrol and ethanol up to an 85 per cent ethanol blend. Flex fuel ethanol vehicles can run on petrol, or E85.
FC	Fuel consumption.
FCEV	Fuel Cell Electric Vehicle, meaning a vehicle equipped with a powertrain containing exclusively fuel cell(s) and electric machine(s) as a propulsion energy converter.
ICEV	Internal Combustion Engine Vehicle.
NEDC	‘New European Driving Cycle’, a driving cycle designed to determine the emission levels of car engines and fuel economy of light duty vehicles.
NGVs	‘Natural Gas Vehicles’, an alternative fuel vehicle that uses compressed natural gas or liquefied natural gas.
NOVC-HEV	‘Not-Off-Vehicle Charging Hybrid Electric Vehicle’, meaning a hybrid electric vehicle that cannot be charged from an external source.
OBD	‘On-Board Diagnostics’ system on the vehicle.
OBFCM	‘On-Board Fuel and/or energy Consumption Monitoring’ devices, meaning any element of design, either software and/or hardware, which senses and uses vehicle, engine, fuel and/or electric energy parameters to determine and make available this information, and store the lifetime values on board the vehicle.
OTA	‘Over-the-air’ transmission or direct data transfer from vehicles.
OVC-HEV	‘Off-Vehicle Charging Hybrid Electric Vehicle’, also known as plug-in hybrid electric vehicle, meaning a hybrid electric vehicle that can be charged from an external source.
PEV	‘Pure electric vehicle’, also known as Battery Electric Vehicle (BEV).
PTI	‘Periodic Technical Inspection’.
REESS	‘Rechargeable Electric Energy Storage System’, is a battery or other system that provides electric energy for propulsion of vehicles.
SOC	‘State Of Charge’ of the REEESS
VIN	‘Vehicle Identification Number’.
WLTP	‘Worldwide harmonised Light vehicles Test Procedures’.

1. INTRODUCTION

Road transport is responsible for about one fifth of the European Union's (EU) greenhouse gas emissions. Within road transport emissions, light-duty vehicles (passenger cars and light commercial vehicles) are responsible for around 70% of the total ([1]).

In order to achieve the objective of a climate-neutral EU by 2050, the European Green Deal states that a 90% reduction in greenhouse gas emissions from transport compared to 1990 levels will be needed ([2]). Regulation (EU) 2019/631 setting out the CO_2 standards for new passenger cars and light commercial vehicles ([3]) is one of the key policy instruments to achieve this goal. It sets EU fleet-wide and manufacturer-specific targets for the average CO_2 emissions of new passenger cars (M1 vehicles) and new light commercial vehicles (N1 vehicles, i.e. vans) first registered in the EU. The effectiveness of the Regulation in reducing CO_2 emissions, as well as the robustness of the CO_2 emission monitoring system, depends on how well those official test values represent the 'real-world' emissions of vehicles out on the road. This representativeness is therefore important for the environmental integrity, transparency and reliability of the monitoring system, and therefore also for consumers' trust.

The official CO_2 emission and fuel consumption values of a car or a van, as indicated on its certificate of conformity ('CoC'), are based on the type-approval values determined through the Worldwide harmonised Light vehicles Test Procedure ('WLTP') set out in Regulation (EU) 2017/1151 ([4]) and in UN Regulation No 154 ([5]). Since 2017, the WLTP has replaced the New European Driving Cycle (NEDC) procedure ([6]), as the NEDC was found to be no longer adequately reflecting the emissions of vehicles used on the road ('real-world' emissions).

In the case of plug-in hybrid electric vehicles, the CO_2 emissions and fuel consumption values determined through the WLTP are weighted by a utility factor to reflect the share

([1]) Data viewer on greenhouse gas emissions and removals, sent by countries to UNFCCC and the EU Greenhouse Gas Monitoring Mechanism (EU Member States) (https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer)

([2]) Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions - The European Green Deal (COM(2019) 640 final).

([3]) Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO_2 emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011 (OJ L 111, 25.4.2019, p. 13).

([4]) Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008 (OJ L 175, 7.7.2017, p. 1).

([5]) UN Regulation No 154 – Uniform provisions concerning the approval of light duty passenger and commercial vehicles with regards to criteria emissions, emissions of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range (WLTP) [2021/2039] (OJ L 423, 26.11.2021, p. 1).

([6]) Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information (OJ L 199, 28.7.2008, p. 1).

of electric driving of the vehicle. Various studies ([7]) found that the utility factor as set out in Regulation (EU) 2017/1151 does not accurately reflect the current average real-world use and CO_2 emissions of those vehicles. Therefore, the Commission introduced changes to the calculation of the utility factor to bring it closer to real-world conditions ([8]), which will apply from 2025 onwards.

Under Article 7 of Regulation (EU) 2019/631, Member States are obliged to annually report to the Commission the official CO_2 emission values (hereafter referred to as **'**WLTP data') for all cars and vans newly registered in their territory in the preceding calendar year. Based on those data, the Commission calculates the average CO_2 emissions of each manufacturer and assesses whether it complies with its CO_2 emission targets, as set out under that Regulation.

Article 4a of Regulation (EU) 2017/1151 requires the following new M1 and N1 vehicles, which are registered as of 1 January 2021 ([9]), to be equipped with on-board fuel and energy consumption monitoring devices ('OBFCM devices') ([10]):

> (1) Pure Internal Combustion Engine vehicles (ICEVs) and Not-Off-Vehicle Charging Hybrid Electric vehicles (NOVC-HEVs) powered exclusively by mineral diesel, biodiesel, petrol, ethanol or any combination of these fuels, and
>
> (2) Off-Vehicle Charging Hybrid Electric Vehicles (OVC-HEVs) powered by electricity and any of the fuels mentioned in point (1).

Article 12 of Regulation (EU) 2019/631 requires the Commission to assess the real-world representativeness of the WLTP values using data from the OBFCM devices ('real-world data'). To this end, the Commission should process the reported data and publish anonymised and aggregated datasets, *inter alia* per manufacturer. By comparing the real-world data with the corresponding WLTP data, the Commission should monitor the size of the gap between the two values, with the aim of preventing this gap from growing, as that would undermine the effectiveness of the CO_2 emission standards in reducing vehicle CO_2 emissions. The Commission also should assess how these data may be used to ensure

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([7]) ICCT, *Real-world usage of plug-in hybrid electric vehicles: Fuel consumption, electric driving, and CO_2 emissions*, 2020, (International Council on Clean Transportation: https://theicct.org/publications/phev-real-world-usage-sept2020).

Plötz, P. and Jöhrens, J., *Realistic Test Cycle Utility Factors for Plug-in Hybrid Electric Vehicles in Europe*. Karlsruhe: Fraunhofer Institute for Systems and Innovation Research ISI, 2021.

Ktistakis, M.A., Tansini, A., Laverde Marín, A., Suarez Corujo, J., Komnos, D., Fontaras, G., *Understanding the fuel consumption of plug-in hybrid electric vehicles: a real-world case study*, in: Conference on Thermo-and Fluid Dynamics of Clean Propulsion Powerplants. Presented at the THIESEL 2022, Editorial Universitat Politècnica de València, Valencia, Spain, 2022.

Tansini, A., Pavlovic, J., Fontaras, G., *Quantifying the real-world CO_2 emissions and energy consumption of modern plug-in hybrid vehicles*, Journal of Cleaner Production, Volume 362, 2022, 132191, ISSN 0959-6526, https://doi.org/10.1016/j.jclepro.2022.132191.

([8]) Commission Regulation (EU) 2023/443 of 8 February 2023 amending Regulation (EU) 2017/1151 as regards the emission type approval procedures for light passenger and commercial vehicles (*OJ L 66, 2.3.2023, p. 1–237).*

([9]) For N1 class II and III vehicles, this obligation started from 1 January 2022.

([10]) The ICEVs and NOVC-HEVs will henceforth be referred to by their fuel type ('petrol, 'diesel', 'E85' or 'other fuels'), while the OVC-HEVs will also be referred to as 'plug-in hybrid electric vehicles'.

that the WLTP values remain representative of the real-world situation over time for each manufacturer.

The procedures for collecting and reporting the data read out from the OBFCM devices by Member States and vehicle manufacturers are set out in Commission Implementing Regulation (EU) 2021/392 ([11]). It requires vehicle manufacturers from 2022 onwards, and Member States from 2024 onwards, to report to the Commission by 1 April of each calendar year for each vehicle for which OBFCM data was collected the vehicle identification number (VIN) and the following 'lifetime' information from the OBFCM device recorded in the preceding year:

- Total fuel consumed (litres) – $fuel_{tot}$
- Total distance travelled (km) – d_{tot}

For plug-in hybrid electric vehicles, in addition:

- Distance travelled in charge depleting ('CD') operation with engine off (km) – $d_{CD,Eng,off}$
- Distance travelled in CD operation with engine running (km) – $d_{CD,Eng\ on}$
- Distance travelled in driver-selectable charge increasing ('CI') operation (km) – d_{CI}
- Fuel consumed in CD operation (litres) – $fuel_{CD}$
- Fuel consumed in driver-selectable CI operation (litres) – $fuel_{CI}$
- Total grid energy into the battery (kWh) – $grid_{tot}$

This real-world data should then be linked to the corresponding WLTP data reported for the calendar year when the new vehicles were first registered. This allows the Commission to publish each year anonymised and aggregated datasets for cars and vans, split according to their powertrain and fuel type, which include the following data per manufacturer:

- The average real-world fuel consumption (l/100km);
- The average real-world electric energy consumption (kWh/100km) (OVC-HEVs only);
- The average real-world CO_2 emissions calculated on the basis of fuel consumption data (gCO_2/km);

([11]) Commission Implementing Regulation (EU) 2021/392 of 4 March 2021 on the monitoring and reporting of data relating to CO_2 emissions from passenger cars and light commercial vehicles pursuant to Regulation (EU) 2019/631 of the European Parliament and of the Council and repealing Commission Implementing Regulations (EU) No 1014/2010, (EU) No 293/2012, (EU) 2017/1152 and (EU) 2017/1153 (OJ L 77, 5.3.2021, p. 8).

- The gap between the average real-world fuel consumption (l/100km) and CO_2 emissions (gCO_2/km) and the corresponding average WLTP fuel consumption and CO_2 emissions;

- The gap between the average real-world electric energy consumption and the corresponding average WLTP electric energy consumption (kWh/100km) (OVC-HEVs only).

This Staff Working Document accompanies the Report from the Commission ([12]), which fulfils the obligations of the Commission under Article 12(3) of Regulation (EU) 2019/631 and Article 12 of Implementing Regulation (EU) 2021/392. This Staff Working Document sets out the methodology used for processing and analysing the real-world data and contains more detailed results, including the anonymised and aggregated datasets per manufacturer in accordance with Article 12 of Implementing Regulation (EU) 2021/392.

It is based on data collected by vehicle manufacturers throughout 2021 and reported by them in the course of 2022 to the European Environment Agency (EEA), as set out in Article 9 of Regulation (EU) 2021/392. These real-world data were assessed against the 2021 WLTP dataset underlying Commission Decision (EU) 2023/1623 ([13]) on the CO_2 emission performance of manufacturers of passenger cars and light commercial vehicles for calendar year 2021, considering only those which had to be equipped with OBFCM devices.

2. DATA SOURCES

Over time, the real-world data reported should come from two primary sources: vehicle manufacturers (Article 9 of Implementing Regulation (EU) 2021/392) and Member States (Article 10 of that Regulation). In both cases, during the collection, vehicle owners have the possibility to refuse making this data available.

Manufacturers are required to collect real-world data either via over-the-air ('OTA') data transmission or through their authorised dealers or repairers when vehicles are brought in for service or repairs and data is read out from the on-board diagnostics ('OBD') interface. As of 1 April 2023, vehicle manufacturers will also have to report the reasons for not reporting real-world data and the number of vehicles affected. This could be due to vehicle owners refusing to give access to the data, technical failures in the read-out, or other reasons.

Member States will rely on their designated bodies and establishments for periodical technical inspections ('PTI') to collect real-world data through a read-out from the OBD during roadworthiness tests as required under Directive 2014/45/EU ([14]). The collection of

([12]) COM(2024) 122

([13]) Commission Implementing Decision (EU) 2023/1623 of 3 August 2023 specifying the values relating to the performance of manufacturers and pools of manufacturers of new passenger cars and new light commercial vehicles for the calendar year 2021 and the values to be used for the calculation of the specific emission targets from 2025 onwards, pursuant to Regulation (EU) 2019/631 of the European Parliament and of the Council and correcting Implementing Decision (EU) 2022/2087 (OJ L 111, 25.4.2019, p. 13.).

([14]) Directive 2014/45/EU of the European Parliament and of the Council of 3 April 2014 on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC (OJ L 127, 29.4.2014, p. 51).

real-world data by Member States is only required since 20 May 2023, i.e. the deadline under Directive 2014/45/EU for the PTI facilities to be equipped with the necessary devices, such as scan tools. While Member States had the option to submit data voluntarily in 2022, none of them did.

This Staff Working Document covers the data collected from vehicles first registered in 2021 and reported in 2022 and is based on real-world data collected and reported by vehicle manufacturers only.

For identifying the manufacturers falling under the real-world data reporting obligations, the Commission, supported by the European Environment Agency (EEA), relied on the information collected under Article 7 of Regulation (EU) 2019/631. The following manufacturers were considered not to be required to report real-world data in 2022:

- manufacturers having in 2021 only pure electric vehicles ('PEVs') newly registered, as such vehicles are not required to be equipped with OBFCM devices;
- manufacturers having in 2021 only N1 vehicles of class II & III registered, as for such vehicles the obligation to be fitted with OBFCM devices only applied from 1 January 2022;
- small-volume manufacturers as defined in Article 4(32) of Regulation (EU) 2017/1151.

As a result, 51 individual manufacturers (of M1 and/or N1 vehicles) were expected to report real-world data for their new vehicles registered in 2021.

In the course of 2022, the Commission received real-world data from 45 out of those 51 manufacturers and from one other manufacturer who reported data on a voluntary basis. Those manufacturers who did not report real-world data were contacted. Two of these manufacturers communicated that they were not in a position to identify which vehicles were registered in 2021, and as a result they would report the 2021 collected data in 2023. Two other manufacturers created an account in the reporting system but did not report any vehicles.

Real-world data was received for 988 292 vehicles out of a total of 9 821 479 vehicles (i.e. 10.1%) first registered in the EU, Iceland or Norway in 2021 ([15]).

The complete list of manufacturers and the number of vehicles reported per manufacturer are provided in Annex A.

3. DATA PROCESSING

The raw real-world data received in 2022 was processed into an aggregated dataset for further calculations through the following main steps:

(1) Basic quality checks on the submissions

(2) Linking unique real-world submissions with the 2021 WLTP data

([15]) The total number of new vehicles referred to here do not include pure electric vehicles, fuel cell electric vehicles, and natural gas vehicles.

(3) Removing unmatched data

(4) Removing inconsistencies between reported real-world and WLTP fuel types and fuel modes

(5) Removing vehicles with low mileage

(6) Removing remaining outliers from the real-world data set

(7) Removing incomplete WLTP data and discrepancies

(8) Calculating real-world CO_2 values and WLTP fuel consumption values

(9) Aggregating at manufacturer level

In general, a conservative data processing approach was taken, removing data for which the analysis revealed possible doubts over the accuracy or consistency. With this, high robustness was aimed for, while keeping a number of data points as statistically significant as possible. The trade-offs between data quality and quantity are explained in the following sections for each of the processing steps.

Manufacturers were requested to report the real-world data for all vehicles they had collected data from, including apparently implausible or extreme values. While most manufacturers responded positively to this request, it cannot be excluded that some manufacturers had removed vehicles or data points prior to the reporting, which might explain certain differences observed between manufacturers in terms of the share of vehicles removed in the data processing steps.

The detailed steps taken during the data processing procedure and the outcome of each of these steps as regards the composition of the 2021 real-world dataset are outlined in the following sections.

The approach taken may be revisited in the coming years depending on the data received. Additional steps may be required once Member States start reporting real-world data.

3.1. Basic quality checks on submission

Manufacturers reported their data on the EEA reporting platform Reportnet 3. The reporting platform includes automatic basic checks of the submitted data so that data reported complies with minimum standards. This ensures that mandatory parameters are filled in and that the values entered correspond to the expected parameter type ([16]).

Following these basic quality checks, which led to the removal of 61 duplicates, the real-world data covered 988 231 vehicles.

3.2. Linking with the 2021 WLTP data

In order to compare the real-world data received with the WLTP data for the same set of new vehicles registered in 2021, the two data sets were linked using the common Vehicle

([16]) It was found that one manufacturer had the wrong delimiter for the distance, and this has been corrected. For another manufacturer, the wrong variable was inserted for electric energy consumption. These vehicles have not been considered for the electric energy related calculations.

Identification Number (VIN). In that way, for each vehicle in the real-world dataset, the following parameters taken from the WLTP data could be identified:

- Country where the vehicle was first registered;
- Date of first registration;
- Manufacturer name;
- Vehicle type identifiers: interpolation family identifier, type approval number, type, variant, version, make and commercial name;
- Vehicle category (M1 or N1, as registered);
- Mass in running order, fuel type, fuel mode, engine capacity and engine power;
- WLTP CO_2 emissions, fuel consumption, and electric energy consumption.

Through linking the two datasets, out of the 988 231 unique vehicles in the real-world dataset, 916 216 M1 and 12 301 N1 vehicles ([17]) could be matched with the 2021 WLTP dataset. This represents 10.6% of the 2021 M1 first registrations (8 635 178) and 1.0% of the 2021 N1 first registrations (1 185 544) ([18]). For 59 714 vehicles reported as part of the real-world dataset, no match could be found in the 2021 WLTP dataset, mainly due to the majority of these vehicles being first registered in either 2020 or 2022, as described in *Section* 3.3.

The number of vehicles in this initial real-world dataset, split per fuel type as reported in the WLTP data ('Ft'), is shown in *Table 1*.

Table 1: Number of vehicles in the initial real-world dataset as compared to the total 2021 registrations, per WLTP fuel type

	M1 vehicles		N1 vehicles	
	Total 2021 first registrations	Initial real-world dataset (% of 2021 first registrations)	Total 2021 first registrations	Initial real-world dataset (% of 2021 first registrations)
Petrol	5 495 708	391 329 (7.1%)	44 475	1 891 (4.3%)
Diesel	2 229 388	301 995 (13.5%)	1 139 405	10 053 (0.9%)
E85	6 026	2 084 (34.6%)	159	0 (0%)

([17]) The vehicle category referred to in this report is the one under which the vehicles have been registered according to the 2021 WLTP data.

([18]) See note 15, page 8.

Other fuels [19]	-	697 (0.1%)	-	30 (0.1%)
Petrol/Electric	848 251	191 197 (22.5%)	1 501	326 (21.7%)
Diesel/Electric	55 805	28 914 (51.8%)	4	1 (25.0%)
Total	8 635 178	**916 216 (10.6%)**	1 243 873	**12 301 (1.0%)**

There is a very low quantity of N1 vehicles reported. This is primarily due to the fact that in 2021 the obligation for new N1 vehicles to be equipped with OBFCM devices only applied for N1 class I vehicles. For N1 class II and III vehicles, this requirement started to apply only from 2022 onwards. Therefore, it is expected that N1 vehicle coverage will improve substantially in the next years.

Linking with the WLTP data showed that the N1 real-world dataset included data for 1 020 Class I vehicles (3.8% of 2021 registrations), but also for 4 598 Class II (1.0%) and 6 683 Class III vehicles (0.9%). Overall, N1 vehicle data was only reported for 1.0% of new N1 vehicles registered in 2021.

In view of this, further data processing and analysis will focus mainly on M1 vehicles, while also providing results for N1 vehicles for each step.

3.3. Unmatched vehicles

For 59 714 vehicles reported as part of the real-world data set, the VIN could not be found in the 2021 WLTP data. These vehicles are therefore not included in the further analysis as the comparison with the 2021 WLTP data is not possible.

Looking into the reasons for the mismatch, apart from likely typing errors in the VINs, which are not easily verifiable for each individual case, it was found that the majority of the vehicles concerned were actually first registered in 2020 (18 129 vehicles) or in 2022 (15 264 vehicles). The vehicles first registered in 2020 will not be taken into consideration for calculating the real-world gap as they were not yet required to be fitted with OBFCM devices. Where relevant, the vehicles first registered in 2022 will be taken into account in the following year when the 2022 WLTP data becomes available.

3.4. Inconsistencies in fuel type/mode

3.4.1. Vehicles out of scope

For each of the records of the real-world dataset, the fuel type reported in the WLTP data was checked to identify vehicles which were not required to be equipped with an OBFCM device ([9]). Vehicles with reported fuel types ‘LPG’ (451 M1), ‘NG-BIOMETHANE’ (244

([19]) Fuel types other than those specified under Article 4a of Regulation (EU) 2017/1151. These vehicles are out of scope and will be removed in Section 3.4.1. The total number of first registrations of such vehicles in 2021 is therefore not presented in this table (and not included in the overall total shown).

M1 and 30 N1) or 'ELECTRIC' (1 M1) were excluded from the dataset for further analysis, as well as 1 M1 vehicle for which the fuel type was not reported.

Together, these excluded vehicles represent only 0.1% (697) of M1 vehicles and 0.2% (30) of N1 vehicles in the dataset. After this step, 915 519 M1 vehicles and 12 271 N1 vehicles remained in the dataset.

3.4.2. Inconsistencies in reported fuel types, fuel modes or OVC-HEV specific parameters

To allow the analysis for plug-in hybrid electric vehicles and other vehicles separately, the dataset was screened to ensure a correct assignment of the vehicles to one of these two groups.

In the WLTP data, both the vehicle fuel type and its fuel mode could be used for this purpose. As regards fuel mode, pure ICEVs should be reported as 'M' (monofuel), NOVC-HEVs as 'H', OVC-HEVs as 'P' and 'E85' as 'F' (flex-fuel). The relevant fuel types for ICEVs and NOVC-HEVs are 'Petrol', 'Diesel' or 'E85'. For OVC-HEVs, these are either 'Petrol/Electric' or 'Diesel/Electric'.

In the real-world dataset, OVC-HEVs can be identified on the basis of the additional parameters that have to be reported, related to their electric driving. Vehicles in the real-world dataset for which the specific OVC-HEV parameters were reported, are classified as 'OVC-HEV', all others as 'ICEV/NOVC-HEV'.

Table 2 summarizes the findings of this matching exercise for M1 vehicles. To ensure a high internal consistency of the data used for the calculations, the 50 995 M1 vehicles (5.6%) with inconsistencies in the reported fuel type/fuel mode were removed from the real-world dataset.

For the 864 524 other M1 vehicles (94.4% of the 915,519 M1 vehicles remaining after the previous step) remaining in the dataset after this step no such inconsistencies were observed.

Table 2: Inconsistencies between the vehicle type according to the real-world data and fuel type or fuel mode reported in the WLTP data (M1 vehicles only)

Vehicle type according to the real-world data	WLTP fuel type	WLTP fuel mode	Number of vehicles
ICEV/NOVC-HEV	Petrol/Electric	P	45 278
ICEV/NOVC-HEV	Diesel/Electric	P	7
OVC-HEV	Petrol	M	285
OVC-HEV	Petrol	H	5 230
OVC-HEV	Diesel	M	5
ICEV/NOVC-HEV	Petrol	B	190
Total number of inconsistencies			**50 995 (5.6%)**

The main inconsistency found concerns 45 285 vehicles classified as 'ICEV/NOVC-HEV'on the basis of the real-world data (OVC-HEV specific parameters not reported), which were marked as 'P' (OVC-HEV) in the WLTP data. This represents over 20% of the OVC-HEVs in the dataset. For the majority of these vehicles (89%), the manufacturer is Volvo. A reason for the missing OVC-HEV specific parameters in the real-world data of those vehicles may be their low mileage, due to which they either were not at all driven in electric mode during the first stages of their use, or not long enough for the parameters to be registered.

Applying the low-mileage filter of 500 km (see *Section 3.5)* to those 45 285 vehicles would anyway have left only 3 242 of them in the dataset. After also applying the other filters, the remainder of those vehicles would have had an impact of less than 1% on the average fuel consumption of OVC-HEVs. Therefore, removing them entirely from the calculations improves the consistency of the dataset without overly influencing the outcome.

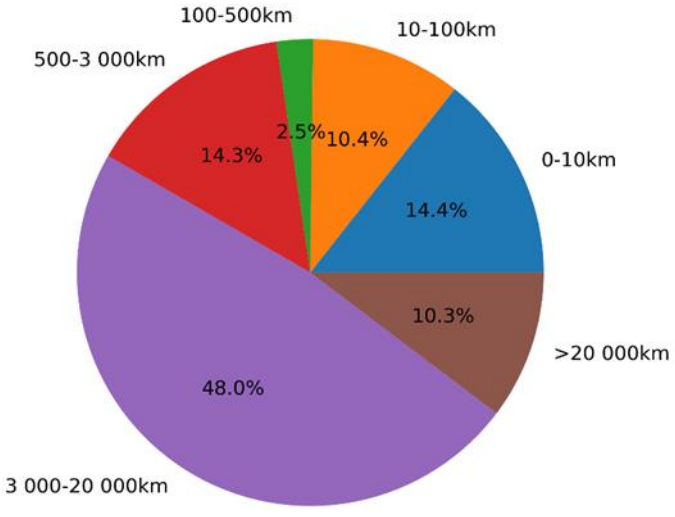
For 5 520 vehicles, mostly manufactured by Renault (95%), the opposite situation occurred. While one or more of the OVC-HEV specific parameters were reported in the real-world dataset, they had been marked as ICEVs or NOVC-HEVs in the WLTP data. Taking all other filters into account, removing these vehicles also had an impact of less than 1% on the average fuel consumption of petrol/diesel vehicles.

For N1 vehicles, 163 records (1.3% of 12 271 N1 vehicles) had to be removed as no OVC-HEV specific parameters were reported as part of the real-world data, while they had been marked as 'P' (OVC-HEV) in the WLTP data. This left 12 108 N1 vehicles in the dataset.

3.5. Vehicles with low mileage

As shown in *Figure 1*, the remaining M1 vehicles in the real-world dataset show a wide range of driven distances. Many vehicles had a very low mileage at the time of recording their real-world data: 124 299 vehicles (14.4%) had driven less than 10 km and nearly a quarter of the vehicles (24.8%) had driven less than 100 km. On the other side of the spectrum, 10% of the vehicles had driven more than 20 000 km. Such divergence was expected in the first year of data collection when all the vehicles monitored have been newly registered across the past year.

Figure 1: Distribution by total lifetime distance travelled of M1 vehicles in the real-world dataset



However, as can be seen from *Figure 2*, which is showing the relation between the fuel consumption (l/100km) and the total distance driven (km), including vehicles with a very low distance driven (< 100 km) into the further calculations and analysis would introduce a huge number of extremely high fuel consumption values (l/100 km).

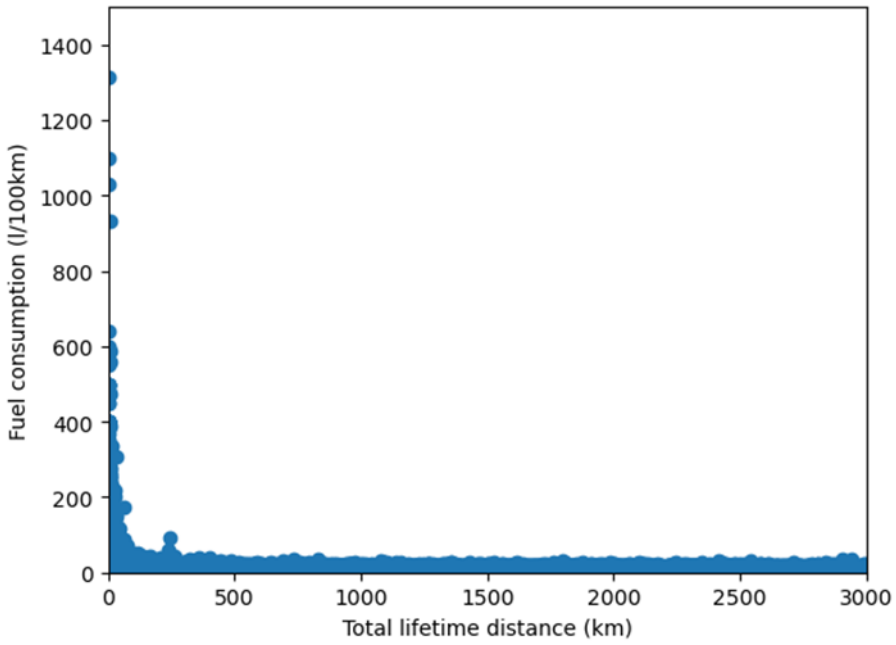
Based on the feedback received from manufacturers, several possible reasons for the presence of those outliers could be identified. In the case of some manufacturers, real-world data was already read-out immediately after manufacturing, when vehicles may be operated in unrepresentative ways. For example, for vehicles undertaking technical operations in logistics hubs, operated in idle mode during the production processes, or used for test drives or parking operations prior to being sold or registered, the recorded mileage could be (close to) zero, while the fuel consumption may already be relatively significant, resulting in extremely high calculated fuel consumption values in l/100 km.

Following these findings, several manufacturers have indicated that they have changed their data collection process and will no longer read out OBFCM data before the vehicle is registered.

However, there are also indications that OBFCM devices were reset right before the data was read out, as many manufacturers have a peak of registrations at 0 km mileage. Regulation (EU) 2017/1151 allows for the values of the lifetime counters to be reset only for those vehicles where the memory type of the engine control unit is unable to preserve data when not powered by electricity. In this case, or when the engine control unit is replaced, all values may be reset simultaneously, thereby preventing the introduction of a bias. This provision only applies for vehicles first registered in 2021, and values must be preserved for new vehicle types approved as of January 2022, and new vehicles as of 2023.

In this first dataset, all of these vehicles with a low mileage reported should be filtered out to perform the analysis based on representative values.

Figure 2: Total lifetime distance driven (km) and real-world fuel consumption (l/100 km) (only vehicles with up to 3 000 km driven and with finite calculated fuel consumption are shown)



Therefore, as a first step, the 214 496 vehicles (24.8%) with a lifetime distance driven of less than 100 km were removed from the dataset, leaving 650 028 vehicles.

As a next step, vehicles with a distance driven in the range 100-3 000 km ([20]) were considered in more detail. *Table 3* shows the changes in number of vehicles retained and their average fuel consumption when applying a low-mileage filter of 300, 500, 1 000 or 3 000 km. This shows that a more significant share of vehicles would be disregarded at higher mileage filters with a limited impact in terms of the 2021 registrations-wide average fuel consumption and CO_2 emissions.

Table 3: Influence of different low-mileage filters on the number of M1 vehicles (with a lifetime mileage over 100 km) retained and their average fuel consumption ([21])

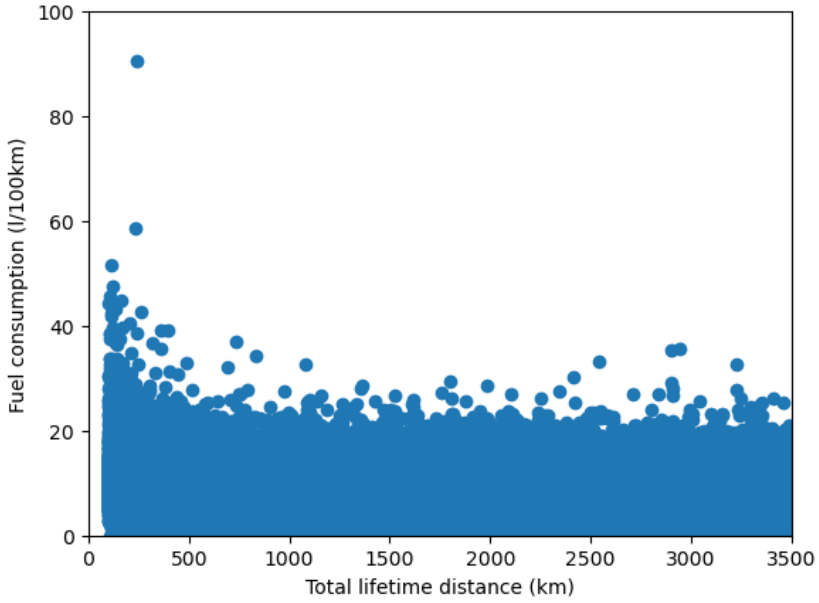
Low-mileage filter applied	< 300 km	< 500 km	< 1 000 km	< 3 000 km
Number of vehicles excluded (> 100 km)	11 057	21 753	47 434	145 727
% of vehicles excluded	1.7	3.4	7.3	22.4
Average fuel consumption of the additionally excluded vehicles (l/100km)	9.20	8.63	8.03	7.62
Average fuel consumption of the remaining vehicles (l/100km)	7.14	7.13	7.11	7.05

Figure 3 shows that most fuel consumption outliers occur for vehicles with a mileage below 300 km, while fuel consumption values up to 40 l/100km continue to exist even past 3 000 km. It should also be kept in mind that the situation differs between individual manufacturers depending on the mileage distribution of their reported 2021 newly registered vehicle fleet.

([20]) 3 000 km being the minimum mileage for vehicles to be granted WLTP emission type-approval.

([21]) Values in the table do not include the 214 496 vehicles with < 100 km lifetime driven distance.

Figure 3: Total lifetime distance driven and respective fuel consumption of M1 vehicles in the real-world dataset (only vehicles with a mileage from 100 to 3 500 km are shown)



To strike a balance between removing all significant mileage-based outliers and maintaining the largest possible data set, also taking into account the variations across manufacturers, it was decided to also exclude vehicles with a lifetime mileage from 100 to 500 km. This leads to the removal of a further 21 753 (3.4%) vehicles.

Overall, applying the low-mileage filter of 500 km removed 236 279 M1 vehicles (27.3% of the 864 524 vehicles remaining after the previous step), leaving 628 245 M1 vehicles in the real-world dataset.

Applying the same filter for N1 vehicles removes 5 307 vehicles (43.8% of the 12 108 vehicles remaining after the previous step), leaving 6 801 N1 vehicles in the dataset.

It is expected that the average distance driven by vehicles will increase over time, and thereby the low-mileage filter will have a less significant impact on the number of registrations in following years.

3.6. Removing remaining outliers from the real-world data set

As a next step, the real-world dataset was screened further for outliers, which may be indicative of erroneous data collection or transmission and would disproportionately affect the calculated average values and distort the comparison between real-world and WLTP data.

For this, the main focus was on the total fuel consumption and the total distance as these parameters directly affect the average real-world fuel consumption and CO_2 emissions. Three outlier cases were identified:

(1) implausibly high distance driven;

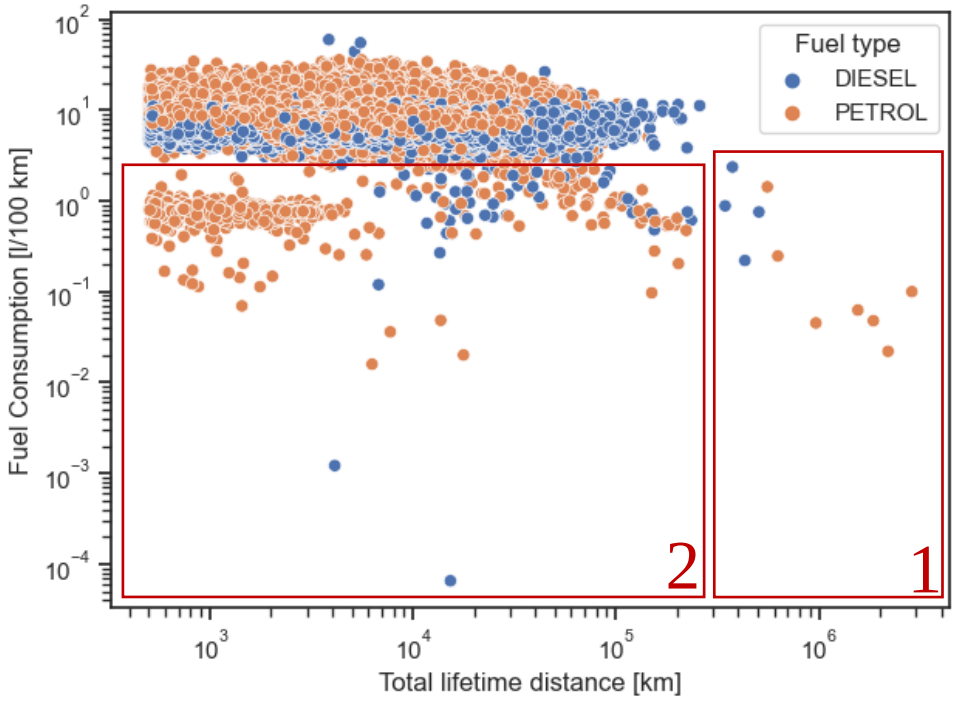
(2) very low fuel consumption (for ICEVs/NOVC-HEVs);

(3) extreme values of OVC-HEV specific parameters.

These three cases are described in the following Sections.

The first two cases are visualised in *Figure 4*, which shows the fuel consumption (l/100km) of petrol and diesel vehicles plotted against their total lifetime distance driven (km) (both on a logarithmic scale).

Figure 4: Distribution of the real-world fuel consumption (l/100km) against the lifetime distance driven (km) (M1 ICEVs/NOVC-HEVs)



3.6.1. Implausibly high distance driven

Extremely high mileages recorded can be a sign of a defective OBFCM device. Based on the data summarised in *Table 4*, a threshold of 300 000 km was chosen to filter out such outliers. This removed 12 M1 vehicles (including 1 OVC-HEV) and 3 N1 vehicles from the dataset, leaving 628 233 M1 and 6 798 N1 vehicles. Two of the four manufacturers of the M1 vehicles concerned had reported that the OBFCM devices in these vehicles were indeed found to be defunct.

Table 4: High distance thresholds and average fuel consumption per threshold (M1 vehicles)

Distance driven (1000 km)	≥ 100	≥ 200	≥ 300	≥ 400	≥ 500	≥ 1000
Number of vehicles	128	25	12	10	8	4
Average fuel consumption (l/100km)	4.92	2.12	0.52	0.30	0.34	0.06

In subsequent years, as vehicles will have driven higher mileages, this filter may have to be reconsidered to reflect the plausible driving distances, also considering differences between M1 and N1 vehicles.

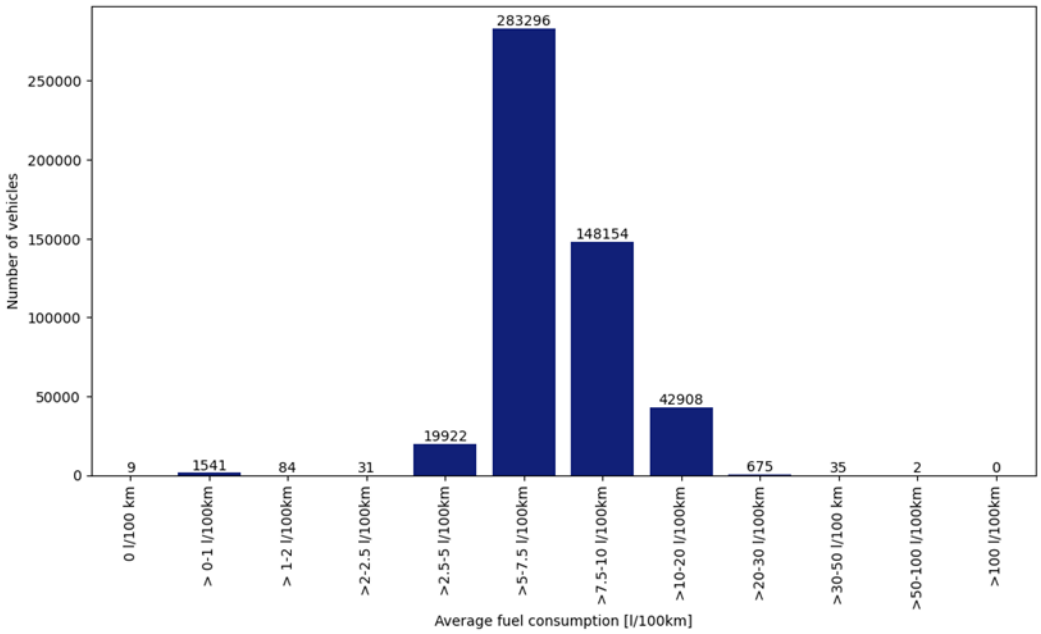
3.6.2. Very low or high fuel consumption (ICEVs/NOVC-HEVs)

Where either the total fuel consumption (l) or total distance driven (km) has not been recorded correctly by the OBFCM device, the calculated fuel consumption (l/100km) may be far higher or lower than theoretically possible.

The low fuel consumption filter was not applied for OVC-HEVs, as those vehicles may have a very low fuel consumption when primarily driving electrically.

Figure 5 shows that it is unlikely for ICEVs/NOVC-HEVs to have a fuel consumption of less than 2.5 l/100km. Applying this threshold removes 1 665 M1 vehicles (0.27%), leaving 626 568 M1 vehicles in the dataset. For N1 vehicles, this removes 19 vehicles (0.28%), leaving 6 779 N1 vehicles in the dataset ([22]).

Figure 5: Distribution of fuel consumption of M1 ICEVs/NOVC-HEVs



A small number of vehicles were found to have an unlikely high fuel consumption recorded by the OBFCM device. Apart from the cases where the vehicle had driven a short distance, which were already filtered out (see *Section 3.5)*, such high fuel consumption may occur when there is a fault in the recording, causing either the fuel consumption or total lifetime distance to be incorrect. The vehicles with a fuel consumption of more than 30 l/100km are predominantly luxury SUVs and sports cars from 9 different manufacturers. As it cannot be concluded in these cases that there was an error in the recording of the data, these vehicles are not filtered out from the dataset.

3.6.3. OVC-HEV parameter outliers

For OVC-HEV, the values reported for the distance and fuel consumption in the separate phases – charge-depleting (CD) and charge-increasing (CI) phases – were compared with the total lifetime values reported to check for inconsistencies. These variables are not subject to any accuracy testing under Regulation (EU) 2017/1151, and therefore may be

([22]) The percentage of exclusions in this section always are relative to the number of vehicles remaining in the previous step, as a step-wise exclusion approach has been followed.

less reliable. However, in principle it should not be the case that the values covering only part of the lifetime operation are greater than the total lifetime values.

The consistency checks compared the total lifetime fuel consumption (f_{tot}) and the total distance driven (d_{tot}) against the CD and CI phase values as well as against the sum of the CD and CI phase values. It has been considered that for OBFCM devices correctly recording all parameters, the following should be true:

$$d_{tot} \geq d_{CD,Eng\ on} + d_{CD,Eng\ off} + d_{CI}$$

$$f_{tot} \geq fuel_{CD} + fuel_{CI}$$

These checks revealed inconsistencies for 4 871 M1 OVC-HEV regarding distances driven and for 4 244 M1 OVC-HEV regarding reported fuel consumption values. By far most of the issues identified were related to the values reported for the CI phase. As some vehicles had both issues occurring, a total of 7 834 M1 vehicles (1.25% of remaining M1, corresponding to 6.0% of remaining OVC-HEVs) were concerned and removed from the dataset, leaving 618 734 M1 vehicles in the dataset.

Furthermore, some manufacturers indicated that an energy overflow could cause an error in the OBFCM device, leading to the recording of extremely high values for the grid energy. Only one such extreme outlier (> 100 000 kWh) could be identified in the remaining dataset and was removed, thus leaving 618 733 M1 vehicles in the dataset.

For N1 vehicles, given the very small share of OVC-HEV in the 2021 registered fleet, the abovementioned issues are minor (5 vehicles removed, 6 774 remaining).

3.7. Flex-fuel ethanol vehicles (E85)

New flex-fuel vehicles, powered by ethanol (E85), or a combination of ethanol and other fuels, must be equipped with OBFCM devices under Regulation (EU) 2017/1151 and as such real-world data must be reported under Regulation (EU) 2021/392. However, for the WLTP data monitoring, only the CO_2 emission values in petrol mode have to be reported for these vehicles, with fuel mode "F" and fuel type "E85".

E85 is less energy dense than petrol (E10), meaning that more fuel has to be consumed to provide the same amount of energy to propel the vehicle. This results in a higher amount of fuel consumed per km under the same conditions by E85 flex-fuel vehicles as compared to petrol vehicles. In terms of CO_2 emissions, this higher fuel consumption is compensated by the lower carbon content of E85. To confidently compare the real-world CO_2 emissions of these vehicles with their reported WLTP (petrol-based) CO_2 emission values, it would be necessary to know the ethanol content of the fuel used when they were driven. However, from the real-world dataset it is not possible to find out the quantity or share of E85 consumed by the flex-fuel vehicles on the road.

On average, the 1 534 E85 vehicles in the remaining dataset consumed 11.9 l/100 km, which is 50% more than the average for the 274 453 petrol vehicles (7.9 l/100 km). The average (petrol-based) WLTP emissions of the E85 vehicles are 188.3 g/km. When assuming that these vehicles are driven solely on E10, their average real-world CO_2 emissions would be 270.1 g/km, which means a gap of 43.5% (81.8 g CO_2/km). When considering them as purely using E85, their average real-world CO_2 emissions would be 196.1 g/km, so the gap is only 4.2% (7.8 g CO_2/km). Even if one could be confident that only E85 was used, the ethanol content of this fuel in the EU varies seasonally and

geographically between 50-85% and this variation by itself introduces a significant uncertainty into the gap calculations.

Therefore, it was decided to remove the 1 534 flex-fuel vehicles from the further analysis (0.2% of the 618 733 vehicles remaining in the previous step). This leaves 617 199 M1 vehicles in the dataset.

3.8. Missing WLTP emission values

After the previous data filtering steps, 5 M1 and 107 N1 vehicles for which no WLTP emission values were available remained in the real-world dataset.

After removing these vehicles, 617 194 M1 and 6 667 N1 vehicles vehicles remained.

With this, the real-world dataset was considered final.

3.9. Overview of data processing steps

The abovementioned data processing steps are summarized in *Table 5* and *Figure 6*. This underscores the impact of the low mileage driven by many vehicles, the importance of accurate reporting of WLTP fuel modes/types by Member States, and of the correct functioning of the OBFCM devices and reading out of the OBFCM data by manufacturers.

It is expected that over time vehicles are driven more so that the low-mileage filter in subsequent reporting years should have a smaller impact on the real-world data.

Table 5: Overview of vehicles removed and retained during each data processing step

Step	Vehicles removed	M1 vehicles removed	M1 vehicles retained	N1 vehicles removed	N1 vehicles retained
Unmatched vehicles	59 714		916 216		12 301
Inconsistencies scope	727	697	915 519	30	12 271
Inconsistencies fuel mode/type	51 158	50 995	864 524	163	12 108
Low-mileage	241 586	236 279	628 245	5 307	6 801
Outliers (high distance)	15	12	628 233	3	6 798
Outliers (low FC)	1 684	1 665	626 568	19	6 779
Outliers (OVC-HEV)	7 840	7 835	618 733	5	6 774
E85	1 534	1 534	617 199	0	6 774
WLTP missing	112	5	**617 194**	107	**6 667**

Figure 6: Overview of all data processing steps (M1 and N1 vehicles)

4. FINAL 2021 REAL-WORLD DATASET

Starting from a total of 988 231 unique vehicles, for which real-world data had been reported, of which 916 216 M1 vehicles and 12 301 N1 vehicles could be matched with the 2021 WLTP data, the processing led to a final dataset including 617 194 M1 vehicles and 6 667 N1 vehicles. Only this final dataset will be considered for the calculation of the average fuel/energy consumption and CO_2 emissions and the gap between the real-world and the WLTP figures.

Table 6 shows that in 2021 real-world data was collected for 9.8% of diesel passenger cars, 5.0% of petrol passenger cars, 44.6% of diesel plug-in hybrid electric vehicles ([23]) and 11.7% of petrol plug-in hybrid electric vehicles, which were first registered in that year. The final real-world dataset covers 7.2% of the 2021 first registered M1 vehicles.

([23]) This higher coverage results from Mercedes-Benz AG, who is the main supplier of diesel plug-in hybrid vehicles in 2021, providing good coverage of these vehicles.

Table 6: Overview of the data processing for M1 vehicles by fuel type ([24])

Powertrain/ fuel type	2021 registrations		Reported real-world dataset (before processing)		Final real-world dataset (after processing)	
	Vehicle registrations per fuel type	Number of vehicles	Share of total 2021 registrations	Number of vehicles	Percentage retained	Share of total 2021 registrations
Petrol	5 495 708	391 329	7.1%	274 451	70.1%	5.0%
Diesel	2 229 388	301 995	13.5%	219 003	72.5%	9.8%
Petrol/Electric	848 251	191 197	22.5%	98 847	51.7%	11.7%
Diesel/Electric	55 805	28 914	51.8%	24 893	86.1%	44.6%
TOTAL	**8 629 152**	***913 435***	***10.6%***	***617 194***	***67.4%***	***7.2%***

As shown in *Table 7*, real-world data for N1 vehicles is much more limited. The final real-world dataset covers less than 0.6% of the 2021 registered N1 vehicles. This can be explained by the fact that N1 Class II and III vehicles, which represent the vast majority of N1 vehicles, were not yet required to have OBFCM devices in 2021. As such, the real-world dataset for N1 vehicles cannot be considered representative of the 2021 EU fleet.

Table 7: Overview of data processing for N1 vehicles by fuel type ([25])

Powertrain/ fuel type	2021 registrations		Reported (before processing)		After processing	
	Vehicle registrations per fuel type	Number of vehicles	Share of total 2021 registrations	Number of vehicles	Percentage retained	Share of total 2021 registrations
Petrol	44 475	1 891	4.3%	988	52.3%	2.2%
Diesel	1 139 405	10 053	0.9%	5 593	55.6%	0.5%
Petrol/Electric	1 501	326	21.7%	86	25.8%	5.7%
Diesel/Electric	4	1	25.0%	0	0%	0%
TOTAL	***1 185 385***	***12 271***	***1.0%***	***6 667***	***54.2%***	***0.6%***

([24]) Total M1 registrations excluding those excluded from the analysis, i.e. pure electric vehicles (PEVs), fuel cell electric vehicles (FCEVs), E85 vehicles and natural gas vehicles (NGVs) (leaving a total of 8 629 152 vehicles in-scope).

([25]) Total N1 registrations excluding pure electric vehicles (PEVs), fuel cell electric vehicles (FCEVs), and natural gas vehicles (NGVs) (leaving a total of 1 185 385 vehicles in-scope).

5. CALCULATION OF AVERAGE REAL-WORLD FUEL CONSUMPTION AND CO_2 EMISSION VALUES AND COMPARISON WITH THE WLTP VALUES

Article 12 of Implementing Regulation (EU) 2021/392 requires the Commission to publish each year the anonymised and aggregated real-world datasets per manufacturer, split by vehicle category and type of powertrain, and including:

- the average CO_2 emissions;
- the average fuel consumption;
- the average electric energy consumption (for OVC-HEVs only).

Calculating the average electric energy consumption for OVC-HEV and the comparison with the WLTP values raised particular issues, due to which these average values have not been computed per manufacturer. These calculations and the associated issues will are presented separately in *Annex C,* together with considerations regarding the utility factor.

The calculation of the other average values involves the following steps, based on the reported total fuel consumption (l) and total distance travelled (km):

(1) calculation of real-world fuel consumption (l/100 km) for each vehicle;

(2) calculation of the real-world CO_2 emissions (g/km) for each vehicle;

(3) calculation of the average real-world and WLTP fuel consumption (l/100 km) per manufacturer, split by powertrain/fuel type of the vehicles;

(4) calculation of the average real-world and WLTP CO_2 emissions (g/km) per manufacturer, split by powertrain/fuel type of the vehicles;

(5) comparison between the average real-world values and the average WLTP values: calculation of the "gap" per manufacturer, split by powertrain/fuel type of the vehicles.

For the fuel consumption and CO_2 emissions, two different averages are calculated, as follows:

(a) arithmetic average:

This average gives equal weight to each vehicle in the dataset, independently of the distance driven. It is calculated as the sum across all vehicles of the fuel consumption (l/100 km) or CO_2 emissions (g/km), divided by the number of vehicles concerned.

(b) km-weighted average:

This average takes into account the distance driven by the vehicles as reported in the real-world dataset. This should give a better picture of the impact of the real-world gap in terms of the total additional emissions it causes. However, the calculation is more sensitive to bias in the real-world vehicle sample in terms of their distance driven.

The calculations are set out in more detail in the next sub-sections and the results of the calculations are provided in Section 6.

5.1. Calculation of real-world fuel consumption (l/100 km) for each vehicle

Each vehicle's fuel consumption (*FC*) in l/100 km is calculated as follows:

$$FC = \frac{fuel_{tot}}{d_{tot}} \times 100 \quad (1)$$

where $fuel_{tot}$ (l) is the total amount of fuel consumed and d_{tot} (km) is the total distance travelled. Both of these values are readily available per vehicle as part of the reported data.

5.2. Calculation of the real-world CO_2 emissions (g CO_2/km) for each vehicle

The real-world CO_2 emissions (g CO_2/km) of the vehicles are not reported as such but, assuming complete combustion and ignoring other gases, they are directly proportional to the fuel consumption and can be calculated as follows:

$$CO_2 = FC \times EF \quad (2)$$

The emission factor EF depends on the properties of the fuel used by the vehicle. To compare the real-world emissions with the WLTP emissions, the EF has been set in accordance with the reference fuel ([26]) that was used for the emission testing, as detailed in *Annex B*:

– for petrol-fuelled vehicles: EF = 22.78 (100 g CO_2/l)

– for diesel-fuelled vehicles: EF = 26.31 (100 g CO_2/l)

5.3. Calculation of the average real-world and WLTP fuel consumption (l/100 km) for each manufacturer, split by powertrain/fuel type of the vehicles

For each manufacturer, the average real-world and WLTP fuel consumption of its M1 and N1 vehicles is calculated, split according to the following powertrain/fuel types:

- ICEV and NOVC-HEV – petrol
- ICEV and NOVC-HEV – diesel
- OVC-HEV – petrol
- OVC-HEV – diesel

Both an arithmetic average and a km-weighted average value is calculated.

The arithmetic average fuel consumption ($FC_{average}$) in l/100 km is calculated by dividing the sum of individual vehicle fuel consumptions (see Equation 1) by the number of vehicles for the powertrain/fuel type considered (n):

$$FC_{average} = \frac{\sum_{i=1}^{n} FC}{n} \quad (3)$$

([26]) In reality, the market fuel density may vary depending on the region, country, and ambient temperature, therefore this emission factor is a source of uncertainty in the calculation.

The km-weighted average fuel consumption ($FC_{km\text{-}weighted}$) in l/100 km is calculated by dividing the sum of the total amount of fuel consumed by all vehicles (l) by the sum of the total lifetime distance travelled by those vehicles (km) and multiplied by 100:

$$FC_{km-weighted} = \frac{\sum_{i=1}^{n} fuel_{tot}}{\sum_{i=1}^{n} d_{tot}} \times 100 \quad (4)$$

These km-weighted values is only calculated as an aggregated value, and not available for individual vehicles.

5.4. Calculation of the average real-world and WLTP CO_2 emissions (g/km) for each manufacturer, split by powertrain/fuel type

Similarly, as for the fuel consumption, for each manufacturer, the arithmetic and km-weighted averages of the real-world and WLTP CO_2 emissions of its vehicles are calculated, split according to the abovementioned powertrain/fuel types.

The arithmetic average CO_2 emissions are calculated by taking the sum of the individual vehicle CO_2 emissions (see Equation 2) in the given split, and dividing this by the number of vehicles of that same group:

$$CO_{2\,average} = \frac{\sum_{i=1}^{n} CO_2}{n} \quad (5)$$

The km-weighted average CO_2 emissions ($CO_{2\ km\text{-}weighted}$) are calculated by taking the sum across all vehicles of the products of their CO_2 emissions (g CO_2/km) multiplied by their total lifetime distance travelled (km) and dividing this by the sum of the total lifetime distances (km) of all vehicles, multiplied by 100. These values are therefore only available as an aggregated value, and not available per vehicle.

$$CO_{2\,km-weighted} = \sum_{i=1}^{n} \left(\frac{CO_2 \times d_{tot}}{\sum_{i=1}^{n} d_{tot}} \right) \times 100 \quad (6)$$

5.5. Comparison between real-world data and WLTP data and calculation of the "gap"

The data linkage between the real-world and WLTP data through the VINs allows comparing the average real-world performance of the vehicles in terms of fuel consumption and CO_2 emissions and their performance as determined through the WLTP. The excess fuel consumption and CO_2 emissions on the road as compared to the WLTP values are referred to as the real-world "gap".

The gap can be quantified in several ways. It may be calculated either as the average of all individual vehicle gaps or as the difference between the average real-world values and the average WLTP values ([27]).

As required under Article 12 of Regulation (EU) 2021/392, the second approach has been used for this analysis.

([27]) The averages can be calculated at different aggregation levels, e.g. at fleet-wide level, manufacturer level, manufacturer/powertrain type level, country level, etc.

The gap can be expressed either in absolute or relative (percentage) terms, as the difference between the average real-world and WLTP values:

$$Gap\ (\text{absolute}) = (\text{real-world value}) - (\text{WLTP value}) \quad (7)$$

$$Gap\ (\%) = \frac{(\text{real-world value}) - (\text{WLTP value})}{(\text{WLTP value})} \times 100 \quad (8)$$

5.6. Calculation of WLTP fuel consumption values

For the 2021 data, an issue arose as regards the calculation of the fuel consumption gap. Member States were required to report the WLTP fuel consumption as part of the annual monitoring exercise for vehicle registrations only as of 2022. In 2021, as reporting of this parameter was only optional, the value is missing for a quarter of the records in the final 2021 real-world dataset and a significant number of outliers were identified amongst the reported data.

Instead of the reported WLTP fuel consumption values, one could use the reported WLTP CO_2 emission values and convert them into their equivalent WLTP fuel consumption values. For this, fixed conversion factors can be applied based on the characteristics of the reference fuels used during type-approval in accordance with Regulation (EU) 2017/1151. These factors are summarised in *Table 8* and explained in more detail in *Annex B*.

Table 8: Factors used for converting WLTP CO_2 emission values into petrol (E10) and diesel (B7) WLTP fuel consumption values based on the reference fuels characteristics

Fuel type	Conversion factor ($\frac{l/100km}{gCO2/km}$)
Petrol (E10)	0.0439
Diesel (B7)	0.0380

For this year, it was decided to use those calculated values for all vehicles to determine the fuel consumption gap. This approach allows filling in the missing data as well as correcting the many outliers. This approach explains why the CO_2 gap and the fuel consumption gap are the same within the same powertrain/fuel types.

It should be noted that this approach does not take into consideration the characteristics of the market fuels used and how those vary across countries or seasons. Therefore, using reference fuels based conversion factors for all vehicles introduces an uncertainty in the calculations, in particular for countries where the fuel density deviates strongly from the average. On a fleet-wide level, as explained in *Annex B*, this uncertainty is limited.

6. RESULTS

The analysis is based on the final real-world dataset, which includes 617 194 M1 vehicles and 6 667 N1 vehicles.

In the next sections, the representativeness of the final real-world dataset with respect to the EU 2021 registrations is assessed, followed by a calculation of the average fuel consumption, average CO_2 emissions, and the gap between the real-world and WLTP average values, both at the level of the 2021 new vehicle fleet and for each manufacturer separately. In addition, an analysis at country-level is provided.

6.1. Fleet-level assessment

6.1.1. Representativeness of the vehicles in the final real-world dataset compared to the 2021 new vehicle fleet

The representativeness of the vehicles in the final real-world dataset depends on how well the dataset reflects those vehicles newly registered in 2021. This relates both to the coverage of the various manufacturers and models in the fleet, as well as the characteristics of those vehicles in the real-world dataset compared to the overall 2021 new vehicle fleet.

The data collected in this first year presents a number of limitations in terms of coverage, representativeness and quality. Nevertheless, while this first data is not yet broad or representative enough to draw firm conclusions or identify trends, it does provide valuable preliminary insights for car emissions.

The final real-world dataset represents 7.2% of the 2021 first registrations for M1 vehicles. By definition, vehicles reported in the first year had been on the road for less than one year. Thereby, except for manufacturers making extensive use of over-the-air transmission, data was only collected from the limited number of vehicles brought in for service or repairs.

As discussed in the manufacturer-level assessment in *Section 6.2*, some manufacturers only provided limited data while others had a far better representation. Therefore, the reported vehicles may not be fully representative at a fleet-wide level, as there is insufficient coverage of certain manufacturers. Further efforts will be required to significantly improve the fleet coverage in the coming year, to ensure representative data from all manufacturers.

For N1 vehicles, the final dataset contains data for only 0.6% of newly registered N1 vehicles. This very low reporting of N1 vehicles is primarily due to the fact that in 2021 the obligation for new N1 vehicles to be applied with OBFCM devices only applied for N1 class I vehicles. For N1 class II and III vehicles (with a mass greater than 1 305 kg), which make up the majority of N1 vehicles, this requirement only started to apply from 2022 onwards. Therefore, it is expected that N1 coverage will improve substantially in the next years.

In order to assess the representativeness of the characteristics of the vehicle sample covered by the final real-world dataset as compared to the entire 2021 new vehicle fleet ([28]) (per powertrain/fuel type), their average WLTP CO_2 emissions and mass are compared, as shown in *Table 9*. For this comparison, only those vehicles that should be equipped with

([28]) New vehicles first registered in the EU, Norway or Iceland in 2021.

OBFCM are considered, which means that pure electric vehicles, fuel cell electric vehicles and gas-fuelled vehicles have been left out from the analysis ([29]).

Table 9: Representativeness of the real-world dataset compared to the vehicles first registered in 2021 (M1 vehicles) ([30]) based on the average WLTP data per fuel type

Powertrain / fuel type	Average WLTP CO_2 emissions (gCO_2/km)		Average mass in running order (kg)		Share of 2021 registrations per powertrain/ fuel type
	real-world dataset	**2021 first registrations**	**real-world dataset**	**2021 first registrations**	
Petrol	145.0	134.8	1 404	1 317	5.0%
Diesel	153.0	144.7	1 747	1 627	9.8%
Petrol + Diesel	**148.5**	**137.7**	**1 554**	**1 407**	**6.4%**
Plug-in hybrid (petrol)	40.3	37.7	1 955	1 899	11.7%
Plug-in hybrid (diesel)	37.2	37.2	2 281	2 291	44.6%
Plug-in hybrid (all)	**39.6**	**37.7**	**2 021**	**1 923**	**13.7%**
All vehicles	***126.9***	***127.2***	***1 651***	***1 461***	**7.2%**

This comparison shows that the average WLTP CO_2 emissions of all M1 vehicles in the real-world dataset are similar to those of the 2021 registrations. However, their average mass in running order is nearly 200 kg higher, which indicates that heavier vehicles are somewhat overrepresented in the real-world data. The fact that this does not lead to an equivalent increase in average CO_2 emissions is explained by the far higher share of plug-in hybrid vehicles in the real-world dataset (20%) compared to the share of plug-in hybrid vehicles in the 2021 registrations (9%).

In view of the higher share of diesel vehicles in the real-world dataset (9.8% of the 2021 registrations of diesel vehicles) compared to the share of petrol vehicles in that dataset (5% of the 2021 registrations of petrol vehicles), as was shown in *Table 9*, these two groups of vehicles should be looked at separately. This is also the case for plug-in hybrid electric vehicles, as diesel plug-in hybrids (44.6% of the 2021 registrations) are far better represented in the dataset than petrol plug-in hybrids (11.7% of the 2021 registrations).

([29]) E85 vehicles were also excluded based on high uncertainty as described in *Section 3.7*.

([30]) Excluding E85 vehicles, PEVs, FCEVs and gas-fuelled vehicles.

For all vehicle types in the real-world data, except for diesel plug-in hybrid vehicles ([31]), the average WLTP emissions are 6-8% higher and mass around 7% higher than for the average 2021 registrations. While during the WLTP the vehicle mass is taken into consideration, the higher mass of the real-world dataset could introduce some bias in the comparison between the final real-world data and respective WLTP values, as the relative and absolute gaps may differ per weight category.

In the 2021 N1 real-world dataset, there are only 6 581 petrol/diesel vans and 86 petrol plug-in hybrid vehicles. This represents less than 1% of the 2021 N1 registrations. The analysis undertaken is therefore limited and will focus on the conventional vans.

Looking at the representativeness of these vans in *Table 10*, the mass in running order of the vans in the real-world dataset is 4% lower and these vans have 15% lower emissions than the average 2021 newly registered fleet of vans. This indicates that some bias may be introduced in the N1 real-world dataset, and relates to the vans not being representative of the entire N1 new registered fleet in 2021. Based on this, in the first year only preliminary insights can be attained from analysing the N1 vehicles.

Table 10: Comparison between the real-world dataset and the 2021 registrations (N1 vehicles) ([32]) based on the average WLTP data per fuel type

Powertrain/fuel type	Average WLTP CO_2 emissions (gCO_2/km)		Average mass in running order (kg)		Share of 2021 registrations per powertrain/fuel type
	real-world dataset	2021 registrations	real-world dataset	2021 registrations	
Petrol	137.5	153.1	1 203	1 272	2.2%
Diesel	178.8	202.1	1 916	1 905	0.5%
Petrol + Diesel	172.6	200.1	1 809	1 881	0.6%
Plug-in hybrid (petrol)	41.4	55.5	1 845	2 081	5.7%
All vehicles	170.9	200.0	1 809	1 881	0.6%

6.1.2. Comparison for M1 vehicles

6.1.2.1.Fuel Consumption

Table 11 provides a comparison between the average real-world fuel consumption and the average WLTP fuel consumption, calculated as set out in Section *5*. Both the arithmetic average and km-weighted average values are shown.

([31]) All diesel plug-in hybrid vehicles in the real-world were reported by Mercedes-Benz AG, and contribute 45% of the new diesel plug-in hybrid registrations, as such these are representative of the 2021 registrations, but do not provide information on manufacturer variability.

([32]) As N1 Class II and III vehicles were present, the comparison is performed based on N1 Class I, II and III vehicles which will be required to have OBFCM devices

Table 11: Average real-world and WLTP fuel consumption (FC) ([33]) and % gap (M1 vehicles)

	real-world FC (l/100km)	WLTP FC (l/100km)	gap (%)	real-world FC (l/100km)	WLTP FC (l/100km)	gap (%)
	arithmetic average			**km-weighted average**		
Petrol	7.89	6.38	**23.7**	7.90	6.56	**20.4**
Diesel	6.88	5.82	**18.1**	6.69	5.73	**16.7**
Petrol + Diesel	*7.44*	*6.13*	***21.4***	*7.16*	*6.05*	***18.3***
Petrol plug-in hybrid	5.97	1.76	**238**	6.37	1.81	**251**
Diesel plug-in hybrid	5.83	1.41	**312**	5.94	1.42	**318**
All plug-in hybrid	*5.94*	*1.69*	***251***	*6.25*	*1.71*	***266***

In the first year, the average fuel consumption gap was found to be 23.7% (1.51 l/100km) for petrol vehicles and 18.1% (1.06 l/100km) for diesel vehicles. For plug-in hybrid electric vehicles the gap is much higher: 238% (4.21 l/100km) for petrol OVC-HEV and 312% (4.42 l/100km) for diesel OVC-HEV. The significance of these gaps, and difference between ICEV/NOVC-HEVs and OVC-HEVs, will be reflected on with regards to their CO_2 emissions in the following section.

The km-weighted average fuel consumption gap is lower than the arithmetic average gap for petrol and diesel vehicles. For petrol vehicles, this gap appears to be reduced as the average km-weighted WLTP value is higher, while the real-world fuel consumption remains the same. For diesel vehicles, both the km-weighted WLTP and real-world values are lower.

For both petrol and diesel plug-in hybrid electric vehicles, the km-weighted average fuel consumption gap is slightly higher than the arithmetic average gap. This indicates that overall OVC-HEV with a higher mileage driven have a higher real-world fuel consumption. This confirms what could be expected: that higher mileage is associated with an increased use of the internal combustion engine.

The distribution of the real-world and WLTP fuel consumption across the M1 fleet is shown in *Figure 7* for petrol and diesel vehicles, and in *Figure 8* for petrol and diesel plug-in hybrid electric vehicles.

([33]) WLTP fuel consumption calculated from the WLTP CO_2 emissions.

Figure 7: Distribution of real-world (blue) and WLTP (orange) fuel consumption (l/100km) for petrol (left) and diesel (right) M1 vehicles

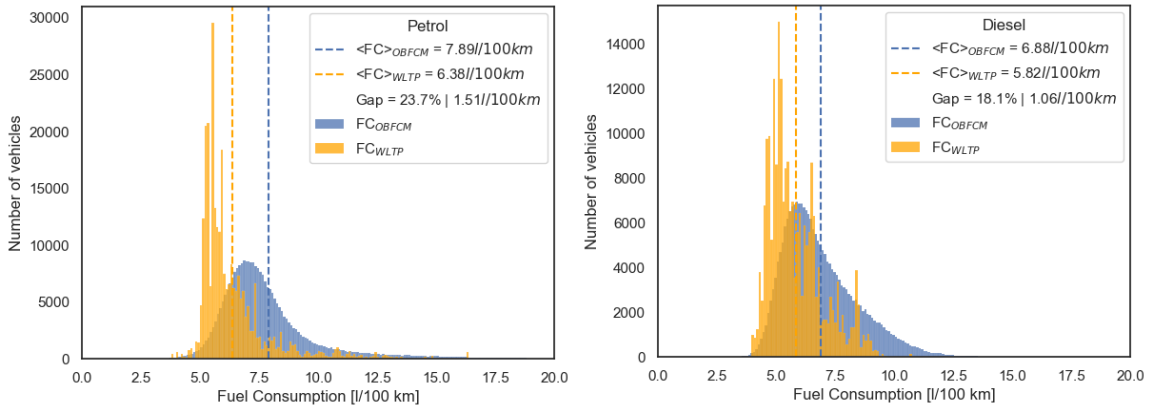
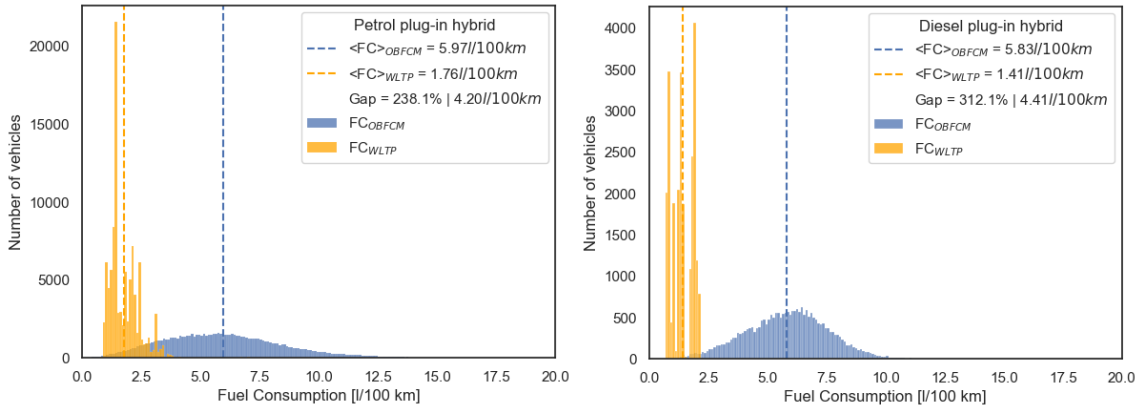
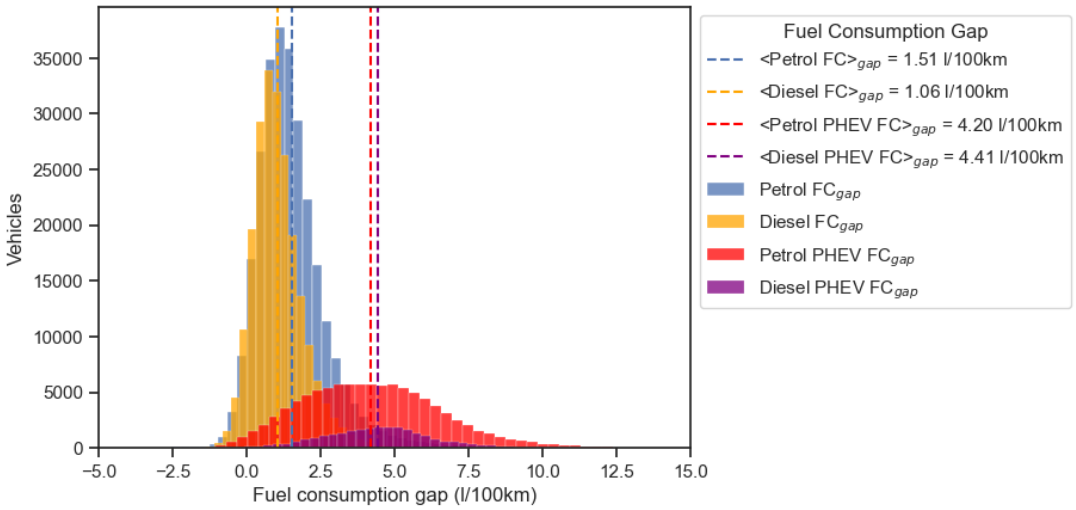


Figure 8: Distribution of real-world (blue) and WLTP (orange) fuel consumption (l/100km) for petrol (left) and diesel (right) plug-in hybrid electric M1 vehicles



The distribution of the absolute fuel consumption gap per M1 vehicle (l/100 km) can be seen in *Figure 9.* This shows that the gap values for petrol and diesel vehicles fall within a far smaller range than those for plug-in hybrid electric vehicles. This also shows that only a very limited number of petrol plug-in hybrid electric vehicles (2%) have lower real-world emissions than under WLTP, while the majority have far higher emission gaps. This indicates that, when vehicles are driven primarily electrically, it is possible to achieve the emission reductions under WLTP.

Figure 9: Distribution of the absolute fuel consumption gap (l/100km) for M1 vehicles



6.1.2.2.CO_2 emissions

Table 12 provides a comparison between the average real-world CO_2 emissions, calculated as set out in Section 5, and the WLTP CO_2 emissions. Both the arithmetic average and km-weighted average values are shown.

Table 12: Average real-world and WLTP CO_2 emissions (gCO_2/km) and CO_2 emissions gap (M1 vehicles)

	real-world CO_2 emissions (g/km)	WLTP CO_2 emissions (g/km)	gap (%)	real-world CO_2 emissions (g/km)	WLTP CO_2 emissions (g/km)	gap (%)
	arithmetic average			**km-weighted average**		
Petrol	179.8	145.3	**23.7**	179.9	149.5	**20.4**
Diesel	181.0	153.2	**18.1**	176.0	150.7	**16.7**
Petrol + Diesel	**180.3**	**148.8**	**21.2**	177.5	150.2	**18.1**
Petrol plug-in hybrid	135.9	40.2	**238.1**	145.0	41.4	**250.5**
Diesel plug-in hybrid	153.3	37.2	**312.1**	156.4	37.4	**317.8**
Plug-in hybrids	**139.4**	**39.6**	**252.1**	148.1	40.3	**267.3**

This shows that the average real-world gap is 23.7% (34.5 g CO_2/km) for new petrol cars and 18.1% (27.8 g CO_2/km) for new diesel cars first registered in 2021, giving a combined average gap for ICEV/NOVC-HEV of 21.2% (31.6 g CO_2/km) for the vehicles covered by the real-world dataset.

The km-weighted average gaps are somewhat lower: 20.4% (30.4 g CO_2/km) for petrol cars and 16.7% (25.3 g CO_2/km) for diesel cars.

This observed gap for 2021 registrations indicates that the switch from the old NEDC (New European Driving Cycle) to the new WLTP testing procedure has about halved the gap between the real-world emissions and those measured through laboratory testing. By 2017, the gap between real-world CO_2 emissions and CO_2 emissions measured under the NEDC type-approval procedure had grown to around 40% ([34]). This rising gap motivated the switch from NEDC to WLTP, and the requirement to fit vehicles with OBFCM devices.

For the Impact Assessments ([35]) underpinning the revision of the CO_2 emission performance standards for cars and vans, the Commission assumed that the WLTP CO_2 emissions of combustion engine cars were on average 21% higher than those calculated with the NEDC, which was later confirmed by a JRC study ([36]). This ratio implies an emissions gap of about 16% between the real-world emissions and the WLTP ones. For the year 2021, the gap observed is compatible with the 2021 gap assumed for the Impact Assessment underlying the CO_2 standards. Such a gap was anticipated as there are different factors affecting real-world emissions which cannot all be fully replicated in a laboratory test.

The observed gap also means that the real-world fuel consumption experienced by drivers remains on average 1-1.5 l/100km higher, and CO_2 emissions are on average 25-35 g CO_2/km higher than what is indicated on the official documents.

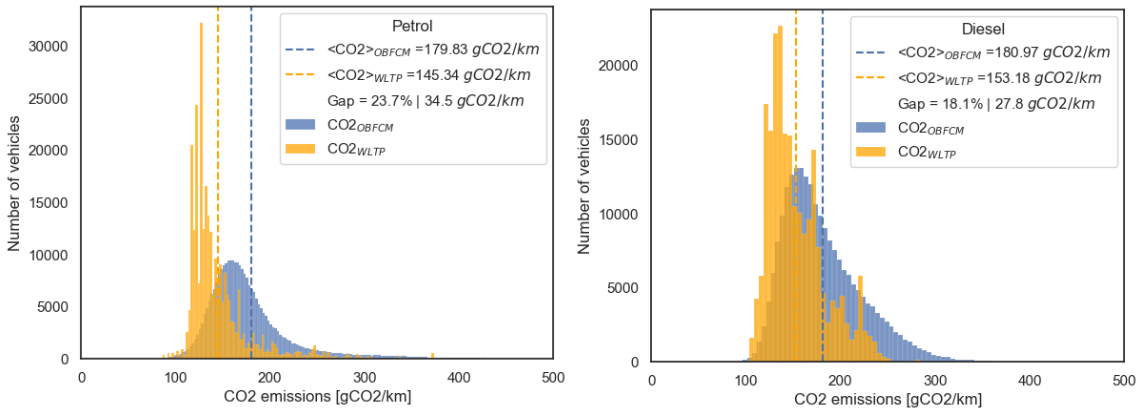
The distribution of the WLTP CO_2 emissions and the real-world CO_2 emissions of the M1 real-world vehicles after data processing are depicted in *Figure 10* for petrol and diesel vehicles, and in *Figure 11* for plug-in hybrid petrol and diesel vehicles.

([34]) Pavlovic, J., Clairotte, M., Anagnostopoulos, K., Arcidiacono, V., Fontaras, G. and Ciuffo, B., Characterisation of real-world CO_2 variability and implications for future policy instruments, EUR 28734 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-72096-3, doi:10.2760/839690, JRC107796.

([35]) SWD(2017)650 final and SWD(2021)613 final.

([36]) Chatzipanagi, A., Pavlovic, J., Ktistakis, M., Komnos, D. and Fontaras, G., Evolution of European light-duty vehicle CO2 emissions based on recent certification datasets, Transportation Research Part D-Transport and Environment, ISSN 1361-9209, 107, 2022, p. 103287, JRC127295.

Figure 10: Distribution of real-world CO_2 emissions (blue) and WLTP emissions (orange) for petrol (left) and diesel (right) M1 vehicles



For the new plug-in hybrid electric cars (OVC-HEVs) registered in 2021, the average real-world CO_2 emissions were on average 3.5 times (100 g CO_2/km) higher than their WLTP CO_2 emissions (39.5 g CO_2/km). The emissions of new plug-in hybrid electric cars (139.5 g CO_2/km) were on average only 23% lower than for petrol and diesel vehicles (180.3 gCO_2/km).

For those vehicles, the calculation of their WLTP fuel consumption and CO_2 emissions takes into account a Utility Factor. In the WLTP, the determination of the Utility Factor, which is a measure of the expected proportion of electrified distance driven compared to total distance and used for calculating the CO_2 emissions of OVC-HEVs, is based on the following assumptions: 1) the vehicle starts the travel day with a fully charged battery, 2) OVC-HEVs are charged once per day on the days driven, at the end of the last trip, 3) additional intra-day charging and vehicles not being charged at the end of the day offset each other, 4) specific travel patterns and vehicle use is made depending on the electric range ([37]).

On the road, the CO_2 emissions of those vehicles will depend to a great extent on the real share of distance driven electrically, which in turn depends on the actual recharging and use patterns.

Therefore, the gap observed now makes it clear that the OVC-HEV currently on the road are not being used in accordance with those assumptions under WLTP, as they are charged and driven in electric mode much less than how they were expected to be used, which leads to a significant underestimation of the CO_2 emissions by the WLTP. This confirms findings from previous studies ([38]), following which the Commission has taken action and amended ([39]) the Utility Factor calculation, which will apply in two consecutive steps, from 2025

([37]) Seshadri S. R., Gil T., Plug-in hybrid electric vehicle observed utility factor: Why the observed electrification performance differ from expectations, International Journal of Sustainable Transportation, Volume 16, Issue 2, 2022.

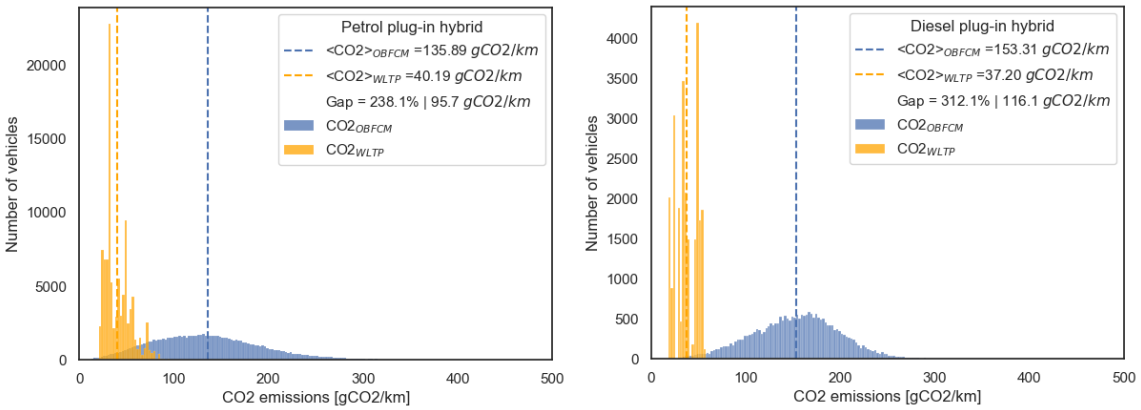
([38]) ICCT (2020): Real-world usage of plug-in hybrid electric vehicles: Fuel consumption, electric driving, and CO_2 emissions, (International Council on Clean Transportation: https://theicct.org/publications/phev-real-world-usage-sept2020).

([39]) Commission Regulation (EU) 2023/443 of 8 February 2023 amending Regulation (EU) 2017/1151 as regards the emission type approval procedures for light passenger and commercial vehicles (Text with EEA relevance), C/2023/843, OJ L 66, 2.3.2023, p. 1–237.

and 2027 onwards. Furthermore, by the end of 2024 and based on the real-world data collected by then, the Commission will review the factor for the second step.

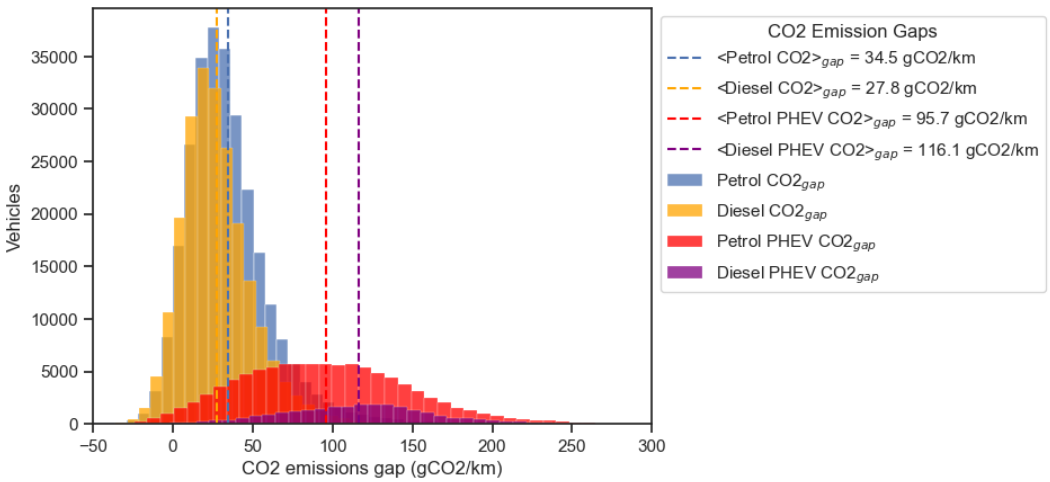
Figure 11 shows the distribution of the real-world and WLTP CO_2 emissions for plug-in hybrid electric M1 vehicles, which confirms the disconnect between both values.

Figure 11: Distribution of real-world CO_2 emissions (blue) and WLTP CO_2 emissions (orange) for petrol (left) and diesel (right) plug-in hybrid electric M1 vehicles



As seen in the distribution of CO_2 emission gaps in *Figure 12*, only very few plug-in hybrid electric vehicles (1.8% of petrol OVC-HEV and 0.3% of diesel OVC-HEV) were driven more efficiently than what their WLTP values indicate.

Figure 12: Distribution of the CO_2 emission absolute gap (g CO_2/km) for M1 vehicles per powertrain/fuel type



6.1.2.3.Vehicle mass

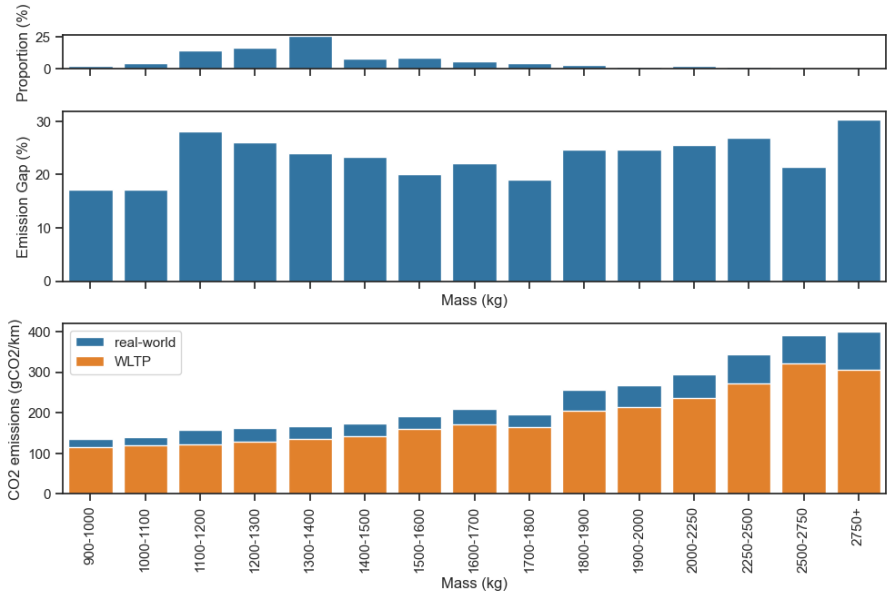
In *Figure* 13 (petrol vehicles) and *Figure 14* (diesel vehicles) the average CO_2 emissions and gap are shown for groups of vehicles with a similar mass. As expected, vehicles with higher mass have increasingly higher emissions, both under WLTP and on the road.

However, from the real-world data it appears that petrol vehicles have an absolute emissions gap which is relatively stable at lower weights at around 20-40 g CO_2/km. From 1 800 kg onwards, the absolute gap appears to grow, with heavier petrol vehicles having

CO_2 emissions and a gap in CO_2 emissions which is 1.5-2.5 times greater than lighter petrol vehicles.

For diesel vehicles, the absolute emissions gap also grows with weight. However, the relative emissions gap (%) is relatively constant for diesel vehicles.

Figure 13: Distribution of CO_2 emissions (bottom), gap (middle) and proportion (top) of vehicles based on vehicle mass for petrol cars (ICEVs/NOVC-HEVs)

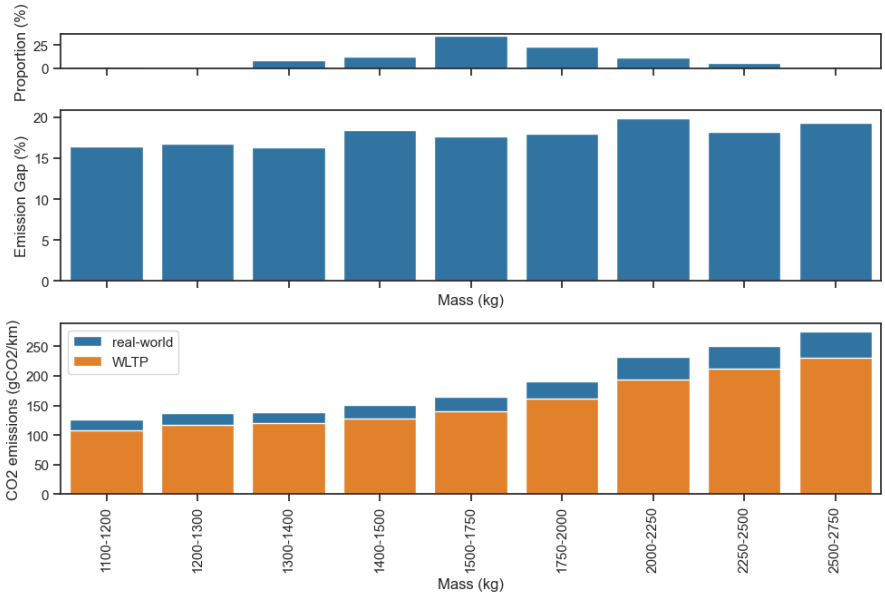


While the heavier mass is accounted for in the WLTP, it should be noted that real-world vehicle energy consumption is affected by a multitude of factors ([40]). Hence it is difficult to pinpoint the exact causes of the real-world discrepancies observed in the case of heavier gasoline and diesel vehicles. Further investigation is necessary.

([40]) Ktistakis, M.A., Tansini, A., Laverde Marín, A., Suarez Corujo, J., Komnos, D., Fontaras, G., 2022. Understanding the fuel consumption of plug-in hybrid electric vehicles: a real-world case study, in: Conference on Thermo-and Fluid Dynamics of Clean Propulsion Powerplants. Presented at the THIESEL 2022, Editorial Universitat Politècnica de València, Valencia, Spain. https://doi.org/10.4995/Thiesel.2022.632801.

Pavlovic, J., Fontaras, G., Ktistakis, M. et al. Understanding the origins and variability of the fuel consumption gap: lessons learned from laboratory tests and a real-driving campaign. Environ Sci Eur 32, 53, 2020. https://doi.org/10.1186/s12302-020-00338-1.

Figure 14: Distribution of CO_2 emissions (bottom), gap (middle) and proportion (top) of vehicles based on vehicle mass for diesel cars (ICEVs/NOVC-HEVs)



6.1.3. N1 vehicles: Fuel Consumption and CO_2 emissions

The 2021 final real-world dataset included 6 581 ICEV/NOVC-HEV vans and 86 OVC-HEV vans. As there was no obligation for N1 Class II and III vehicles to have an OBFCM device equipped in 2021, and as there are fewer than 1% of N1 vehicles for which data was reported, the results in this section are merely indicative and cannot be considered as representative for the N1 fleet.

As can be seen in *Table 13*, the average fuel consumption and CO_2 emissions gap for petrol and diesel vans was 18.6% (1.13 l/100km, 25.5 g/km) and 16.5% (1.12 l/100km, 29.4 g/km) respectively.

In the limited sample of N1 petrol plug-in hybrids, the fuel consumption gap and CO_2 emissions gap appears to follow a similar trend as in M1 vehicles, with the average real-world fuel consumption and CO_2 emissions of these vehicles being three times greater (207%) than the tested emissions.

Table 13: Average real-world and WLTP fuel consumption (FC), CO_2 emissions and gap for N1 vehicles

	average real-world FC (l/100km)	average WLTP ([41]) FC (l/100km)	average real-world CO_2 emissions (gCO_2/km)	average WLTP CO_2 emissions (gCO_2/km)	arithmetic average gap (%)	km-weighted average gap (%)
Petrol	7.16	6.03	163.0	137.5	18.6	14.8
Diesel	7.92	6.80	208.2	178.8	16.5	14.0
Petrol + Diesel	**7.80**	**6.68**	**201.5**	**172.6**	**16.7**	**14.0**
Petrol plug-in hybrid	**5.58**	**1.82**	**127.1**	**41.4**	**207.3**	**201.1**

6.2. Manufacturer-level assessment

In accordance with Article 12 of Regulation (EU) 2021/392, the Commission must publish anonymised and aggregated datasets per manufacturer, split between passenger cars and light commercial vehicles powered by internal combustion engines (ICEV/NOVC-HEV), and off-vehicle charging hybrid electric vehicles (OVC-HEV). These datasets for the 2022 reporting year, covering vehicles first registered in the EU in 2021, are provided in *Annex D*.

6.2.1. Coverage of the vehicle manufacturers 2021 fleet in the final real-world dataset

The number of vehicles reported per manufacturer and retained in the final real-world dataset after data processing, as well as the coverage of the 2021 registrations for each manufacturer are shown in *Figure 15*. A table with the underlying data is provided in *Annex A*.

This illustrates the significant variability in coverage amongst manufacturers. This also shows that in this first reporting year and after data processing only a few manufacturers achieved meaningful coverage of their fleet of vehicles registered in 2021, in particular Jaguar Land Rover Limited (43%), Ford Werke GMBH (34%), Ford Motor Company (27%), Mercedes-Benz AG (27%), and Volvo (24%).

The variability can in part be explained by the different degree to which the available data collection options were used, with only a few manufacturers making comprehensive use of over-the-air data transmissions.

As can be seen in *Figure 16*, which shows how many manufacturers reported a certain percentage of their fleet, over half of manufacturers (26) reported fewer than 5% of their

([41]) WLTP fuel consumption converted from the WLTP CO_2 emissions.

vehicles first registered in 2021, and nine manufacturers even reported less than 1% of their vehicles.

While certain manufacturers had higher initial coverage before data processing, the low-mileage filter reduced a significant number of vehicles. This was the case for Volvo and Jaguar Land Rover, which had the highest initial coverage, but a large portion (70% for Volvo and 31% for JLR) of the reported vehicles had driven less than 500 km.

Figure 15: Number of vehicles reported per manufacturer (left) and coverage (%) of 2021 registrations covered by the real-world dataset (right) before (blue) and after (red) data processing

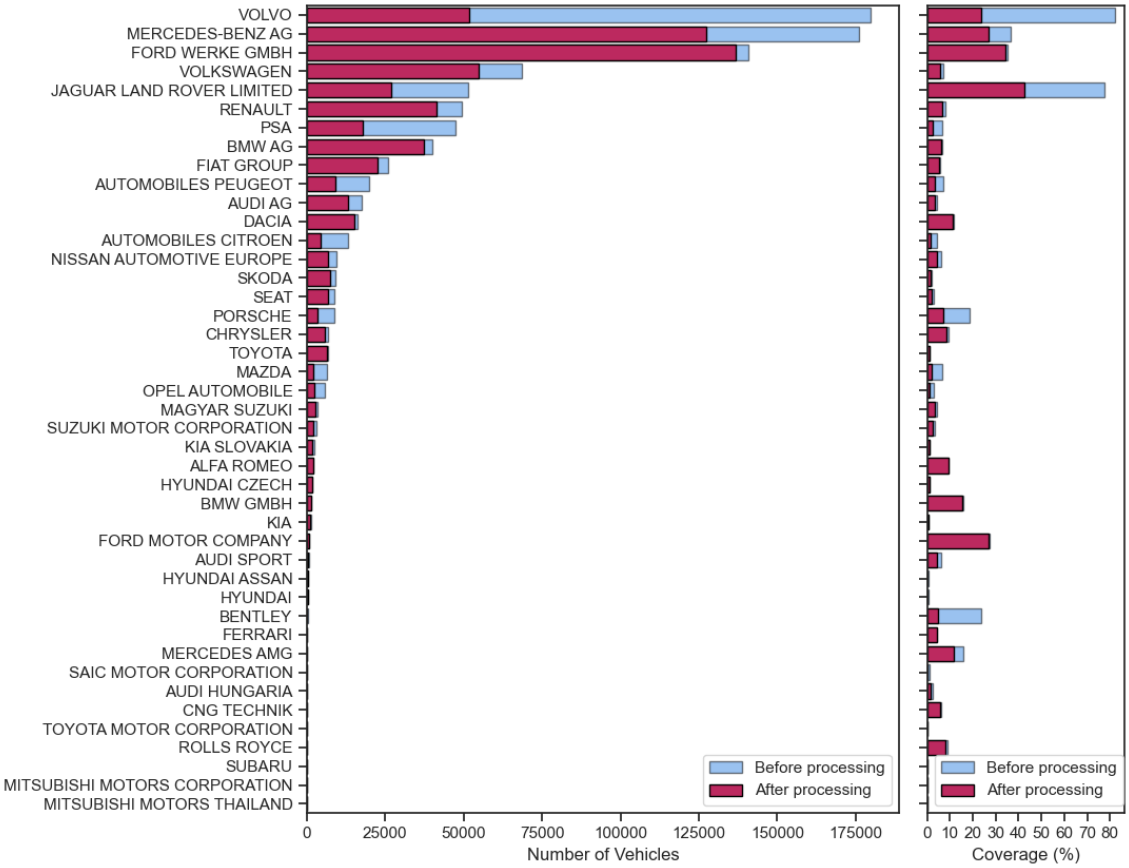
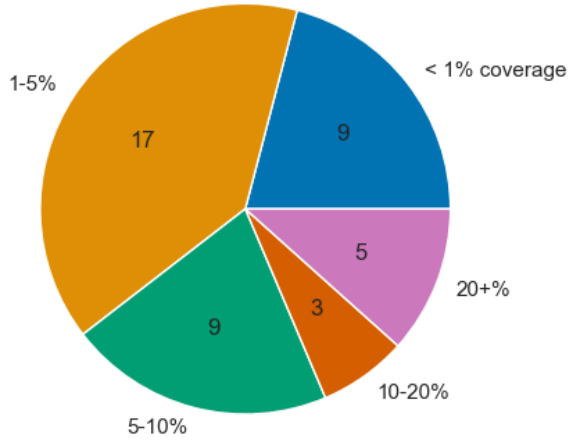


Figure 16: Vehicle fleet coverage in the final 2021 real-world dataset (%) per manufacturer



After data processing, the real-world dataset consists mainly of vehicles by Ford Werke GMBH (23%) and Mercedes-Benz AG (21%). Together with Volvo (9%), Volkswagen (9%) Renault (7%), BMW AG (6%), these 6 manufacturers make up three quarters of the real-world data.

For plug-in hybrid electric vehicles, the real-world data is dominated by five manufacturers: Mercedes-Benz AG (40%), Volvo (20%), Ford Werke GMBH (16%), BMW AG (6%), and Volkswagen (5%), who contribute 88% of the real-world OVC-HEV data. For the diesel plug-in hybrid vehicles, these were all reported by Mercedes-Benz AG, the only manufacturer which registered diesel plug-in hybrids in 2021.

When interpreting and comparing the results of the manufacturer level calculations for this first reporting year, these differences in fleet coverage across manufacturers should be duly taken into account, in particular for those cases where very few vehicles were reported.

Several manufacturers had communicated issues with the retrieval of data, in particular with relation to vehicles not returning to dealership within the first year and implementation of the reporting requirements, causing only a low share of their 2021 registrations to be reported. Following discussions with certain manufacturers who faced severe delays in implementing OBFCM devices and collecting data from these devices, these were advised to report data in the following year to ensure a more comprehensive coverage.

Overall, for most manufacturers, the fleet coverage was below expectations and further steps should be taken to significantly improve this in the coming years, both for cars and vans. To ensure a more comprehensive dataset, and understanding the reasons why data is missing, as of April 2023 it will be mandatory for all manufacturers to report the reasons why data was not reported for vehicles registered in 2021.

6.2.2. CO_2 emissions and fuel consumption gap

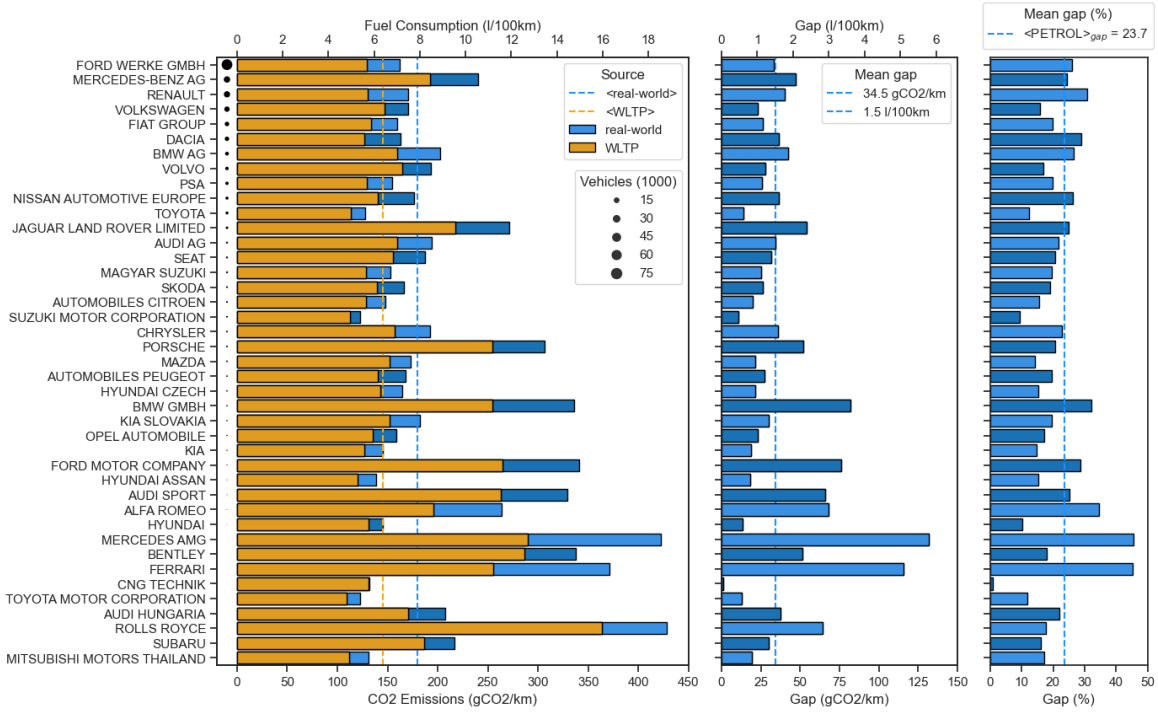
6.2.2.1.ICEVs and NOVC-HEVs

The average CO_2 emissions, fuel consumption, and gaps per manufacturer are provided in *Figure 17* for petrol vehicles.

While the fleet-wide average gap is 23.7% (34.5 g CO_2/km or 1.51 l/100km), the manufacturer-specific gaps range from 1% (1 g CO_2/km or 0.04 l/100km) to 45% (132 g CO_2/km or 5.8 l/100km). The highest and lowest gaps are observed for manufacturers with few vehicles reported, causing higher uncertainties.

Considering only manufacturers with over 500 petrol vehicles in the final dataset, the gaps range from 9% (11 gCO_2/km or 0.5 l/100km) to 32% (82 gCO_2/km or 3.6 l/100km).

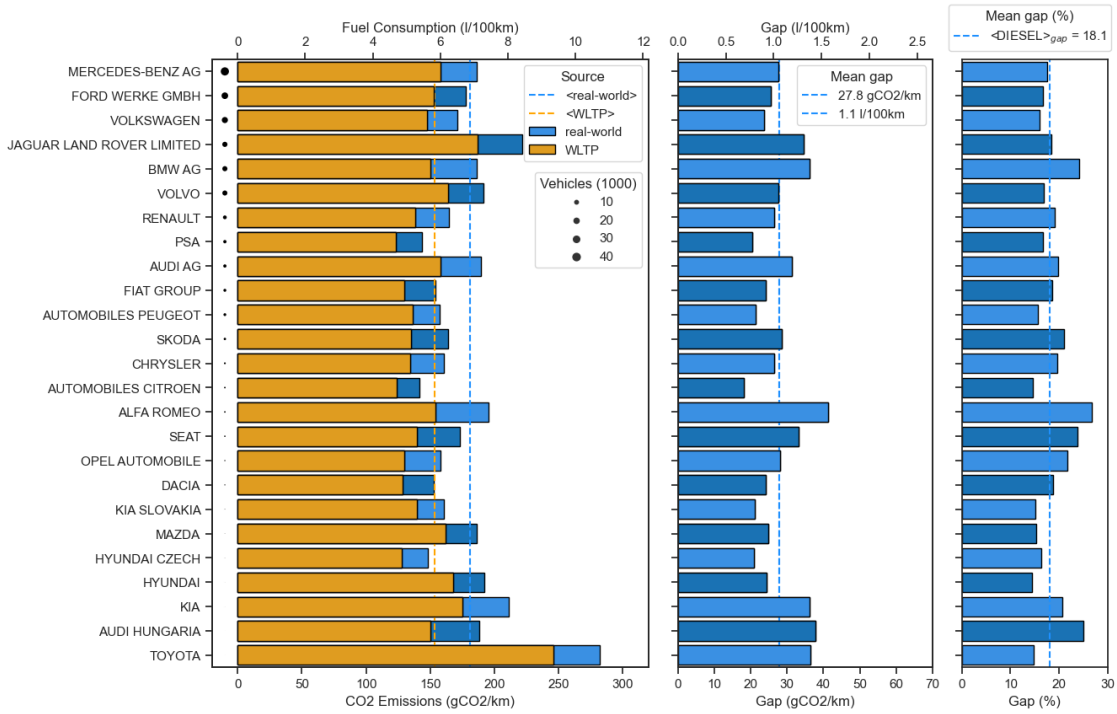
Figure 17: Petrol M1 vehicles average real-world (blue) and WLTP (orange) CO_2 emissions and fuel consumption (left), absolute real-world gap (middle), and relative real-world gap (right) per manufacturer ([42])



For diesel vehicles, the fleet-wide average CO_2 emissions and fuel consumption gap is 18.1% (27.8 gCO_2/km or 1.06 l/100km). As shown in *Figure 17*, the manufacturer-level gaps range from 14% (18 gCO_2/km or 0.7 l/100km) and 27% (41 gCO_2/km or 1.6 l/100km). Similar to petrol vehicles, the highest and lowest CO_2 emissions gaps are observed for manufacturers with few vehicles reported. The gap for diesel vehicles varies less across manufacturers.

([42]) Ordered by number of vehicle registrations reported and retained in the final dataset.

Figure 19: Diesel M1 vehicles average real-world (blue) and WLTP (orange) CO_2 emissions and fuel consumption (left), absolute gap (middle) and relative gap (right) per manufacturer



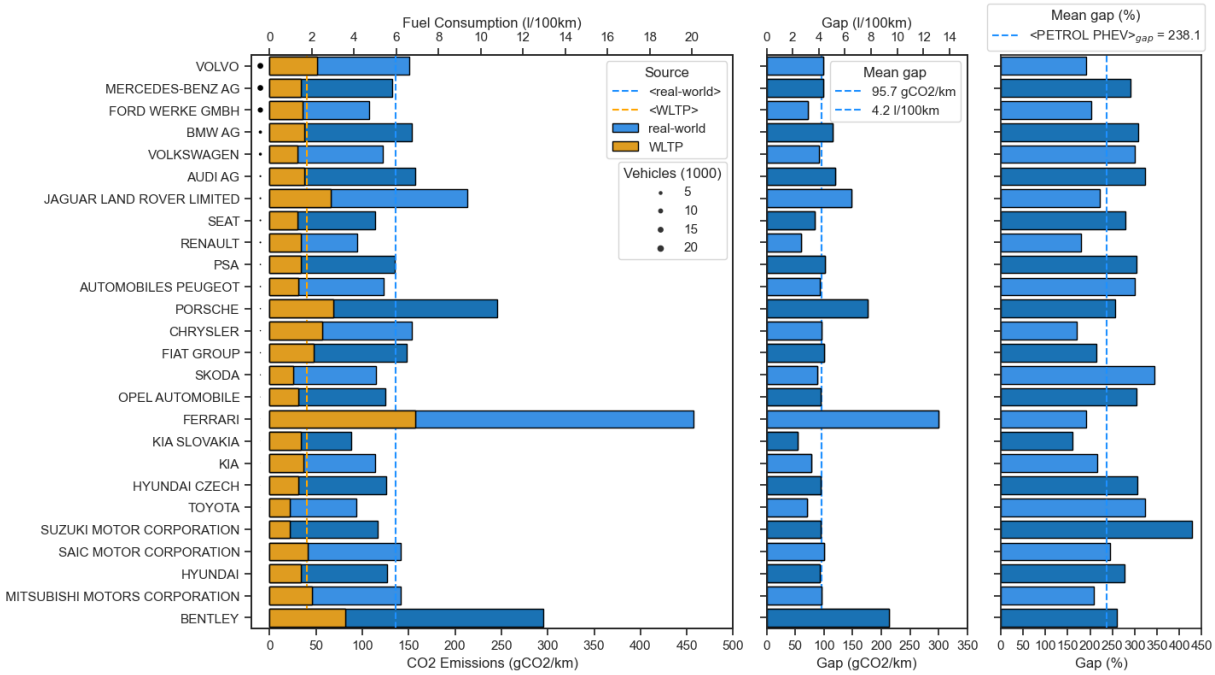
6.2.2.2.OVC-HEVs

The average CO_2 emissions, average fuel consumption and gap per manufacturer are shown in *Figure 21* for petrol plug-in hybrid electric vehicles.

This indicates that the average gap per manufacturer for petrol plug-in hybrid vehicles ranges from 161% to 428%, compared to the average fleet-wide gap of 238%. The absolute gap ranges between 2.4 l/100km and 13.2 l/100km (average fleet-wide is 4.2 l/100km), or 54 gCO_2/km and 300 gCO_2/km (average fleet-wide is 95.7 gCO_2/km). Most manufacturers have a gap between 190-320%, and with an absolute gap between 3-5 l/100km or 70-120 gCO_2/km.

This indicates that, irrespective of the manufacturer, the current use of plug-in hybrid electric vehicles does not correspond to what was assumed under the WLTP. However, there are still large discrepancies between manufacturers.

Figure 21: Petrol plug-in hybrid vehicles (M1) average real-world (blue) and WLTP (orange) CO_2 emissions and fuel consumption in l/100km (left), absolute real-world gap (middle) and relative real-world gap (right) per manufacturer



6.3. Country-level assessment

In this Section, the real-world data is assessed at country level, to find out whether geographical differences between the gaps can be observed. Differences may exist due to differing landscapes, ambient temperatures, driving habits, fuel densities, and, in the case of plug-in hybrid electric vehicles, enabling policies and frameworks and the availability of charging infrastructure.

For this analysis, the countries referred to are those in which the vehicle had been first registered, as reported in the WLTP dataset. It may of course be the case that the vehicles are (also) driven in another country during their lifetime, but this can not be found out from the data.

6.3.1.1.ICEVs and NOVC-HEVs

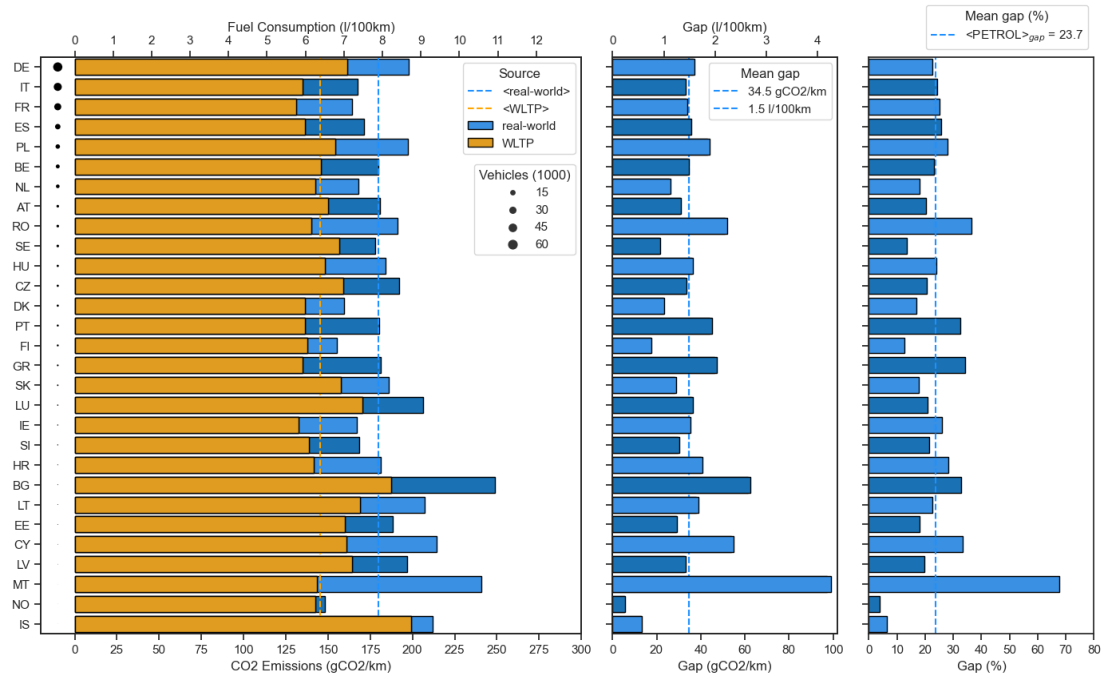
Figure 23 shows the average real-world CO_2 emissions and fuel consumption and the gap per country for petrol M1 vehicles. Leaving apart the countries with a very low number of vehicles in the dataset, which show very low (Iceland, Norway), or very high (Malta) gaps due to the specifics of the fleet or a few outliers, the findings are as follows.

For the four countries with the highest number of petrol vehicles in the real-world dataset the gap ranges from 23% to 26%.

Countries with the highest relative gap are Romania (36%, 5 738 vehicles), Greece (34%, 2 578 vehicles), Cyprus (33%, 296 vehicles), Bulgaria (33%, 533 vehicles) and Portugal (32%, 3 592 vehicles), followed by Croatia (28%, 632 vehicles) and Poland (28%, 16 435 vehicles).

The countries with the lowest relative gap are Finland (13%, 3 361 vehicles), Sweden (14%, 5 482 vehicles), Denmark (17%, 4 048 vehicles), Slovakia (18%, 1 957 vehicles), Estonia (18%, 435 vehicles), and the Netherlands (18%, 11 126 vehicles).

Figure 23: Petrol M1 vehicles average real-world (blue) and WLTP (orange) CO_2 emissions and fuel consumption (left), absolute and relative real-world gap (middle and right) per country of first registration

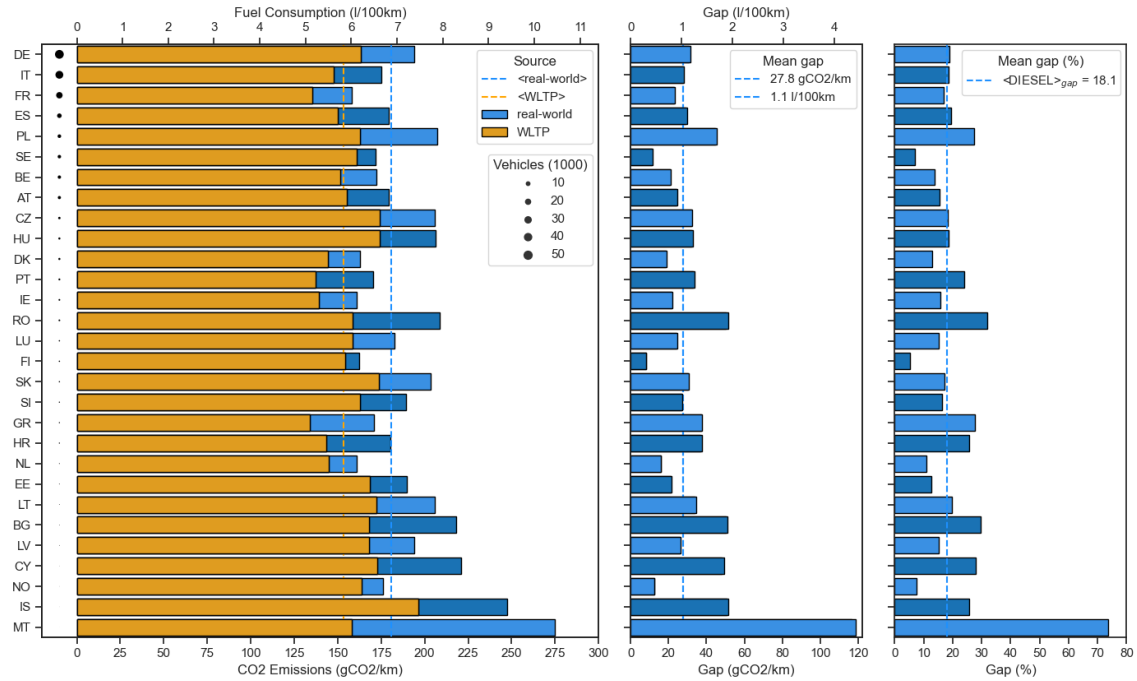


For diesel vehicles, the results are presented in *Figure 25*, which shows a similar pattern as for petrol cars, with lower gaps observed in Finland, Sweden, Denmark, Estonia, and the Netherlands, and higher gaps for Poland, Romania, Bulgaria, Greece, Cyprus, and Croatia ([43]).

The variations observed for petrol and diesel vehicles seem to point at lower gaps found for northern countries, and higher gaps for southern or eastern countries. Various other elements could play a role in this, including ambient temperature (affecting the use of air conditioning and heating systems), fleet composition, driving behaviour and vehicle use patterns (speed, trip distance, etc.). There are also differences between the average fuel density of market fuels in northern countries and southern countries, as described in Annex B, which add uncertainty to the results. In particular, the average market fuel density in Finland and Sweden is lower throughout the year than other countries, which may in part explain the lower gap when a conversion is performed using reference fuels. Further analysis is needed to better understand whether the WLTP representativeness really is country-dependent and what could be the underlying drivers.

([43]) Leaving out the countries with very few (less than 100) diesel vehicles in the real-world dataset, i.e. Malta (12 vehicles), Iceland (55 vehicles), and Norway (88 vehicles).

Figure 25: Diesel M1 vehicles average real-world CO_2 emissions and fuel consumption (left) and real-world gap (right) per country of first registration



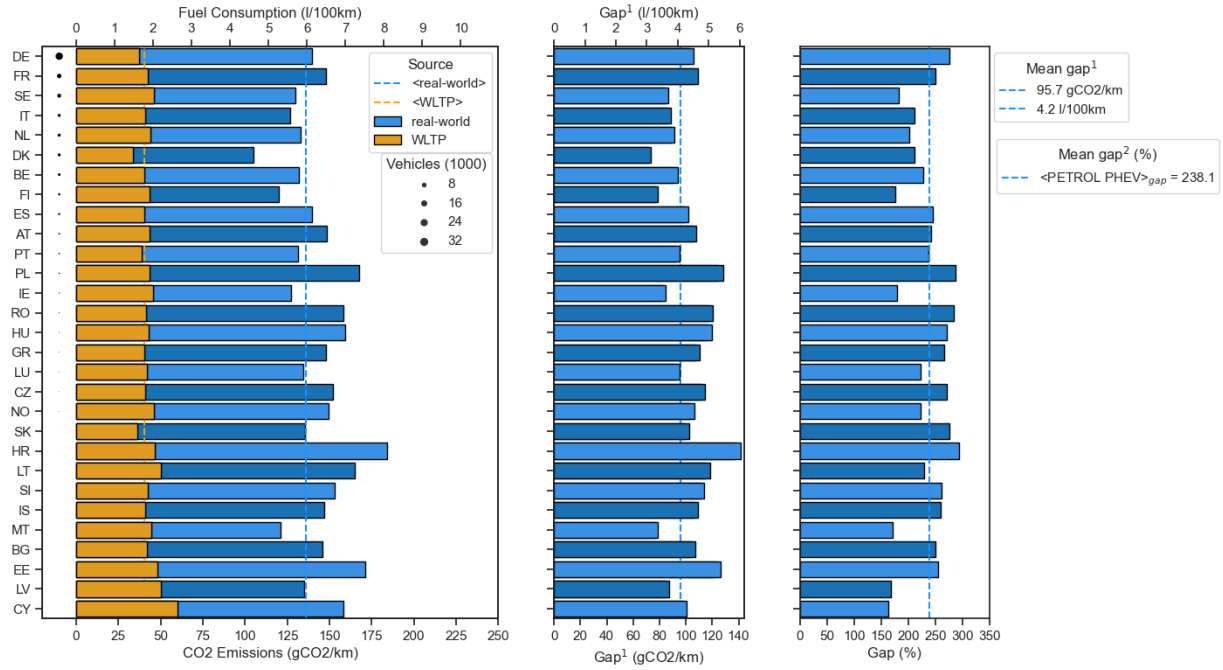
6.3.1.2.OVC-HEVs

The average real-world CO_2 emissions and fuel consumption as well as the real-world gap per country of first registration for petrol plug-in hybrid electric vehicles are shown in *Figure 27*. An analysis of CO_2 emisisons of plug-in hybrids per country can provide an indication of how well countries promote the electric driving and charging of these vehicles

For the countries with more than 500 vehicles in the real-world dataset, the gap ranges from 176% (75 g CO_2/km) for Finland to 287% (124 gCO_2/km) for Poland. High gaps were also found for vehicles first registered in Romania (284%, 117 g CO_2/km), Germany (276%, 103 g CO_2/km), Hungary (271%, 116 g CO_2/km), and France (250%, 106 g CO_2/km).

For only three countries the gap was below 200%: Finland (176%, 76 g CO_2/km), Ireland (180%, 82 g CO_2/km) and Sweden (183%, 84 g CO_2/km).

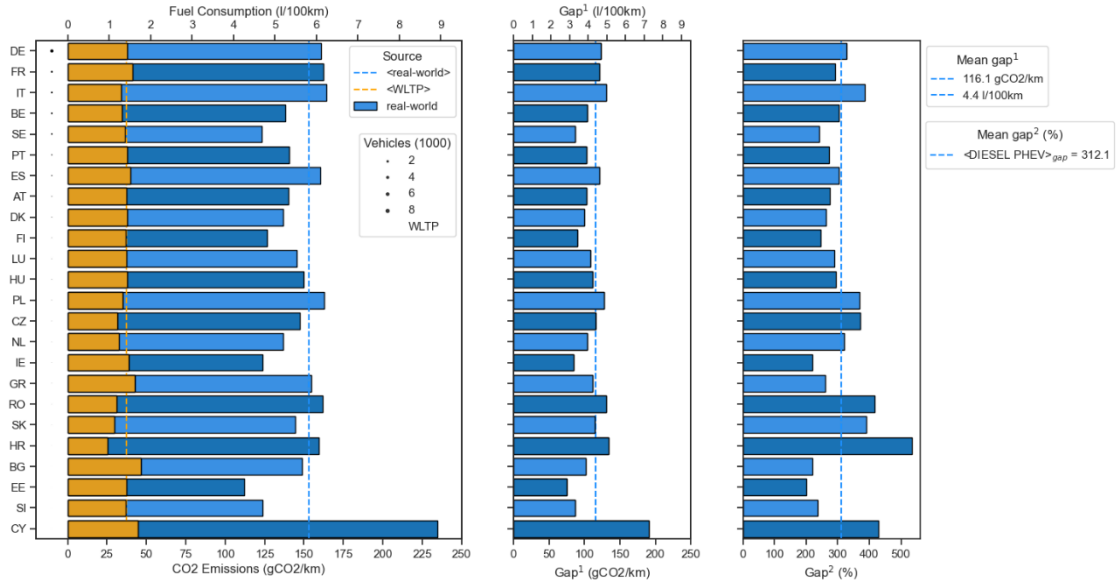
Figure 27: Petrol plug-in hybrid electric M1 vehicle average real-world CO_2 emissions and fuel consumption (bottom) and real-world gap (top) per country of first registration



The average real-world CO_2 emissions and fuel consumption as well as the real-world gap per country of first registration for diesel plug-in hybrid electric vehicles are shown in *Figure 29*.

For countries with more than 500 vehicles in the real-world dataset, the gap ranges from 240% (87 g CO_2/km) for Sweden to 385% (131 gCO_2/km) for Italy. No country had a gap below 200%.

Figure 29: Diesel plug-in hybrid electric M1 vehicles average real-world CO_2 emissions and fuel consumption (bottom) and real-world gap (top) per country of first registration



Annex A List of manufacturers

Manufacturers that were expected to report real-world data in 2022

Manufacturer	Reported vehicles (M1)	Final (M1)	Percentage reported of 2021 M1 registrations	Percentage final of 2021 M1 registrations	Reported N1 vehicles	Final N1
ALFA ROMEO	2 185	2 147	9.4	9.3	48	46
AUDI AG	17 670	13 347	4.4	3.3	0	0
AUDI HUNGARIA	71	44	2.4	1.5	0	0
AUDI SPORT	683	464	6.2	4.2	0	0
AUTOMOBILES CITROEN	12 418	4 324	4.3	1.5	800	43
AUTOMOBILES PEUGEOT	18 670	9 191	6.9	3.4	1 189	38
BENTLEY	359	71	23.8	4.7	0	0
BMW AG	39 899	37 432	6.7	6.3	2	2
BMW GMBH	1 577	1 519	16.1	15.5	0	0
CHRYSLER	6 699	5 804	10.0	8.3	202	195
DACIA	16 073	15 248	12.0	11.4	0	0
DFSK	0	0	0	0	0	0
FERRARI	151	149	4.6	4.5	0	0
FIAT GROUP	25 429	22 657	5.9	5.3	688	629
FORD MOTOR COMPANY	831	811	27.6	26.9	0	0
FORD WERKE GMBH	139 888	136 633	35.0	34.2	971	963
GENERAL MOTORS HOLDINGS LLC	0	0	0	0	0	0
HYUNDAI	361	328	0.5	0.4	0	0
HYUNDAI ASSAN	543	527	0.5	0.5	0	0
HYUNDAI CZECH	1 819	1 792	1.0	1.0	0	0
HONDA MOTOR CO LTD	0	0	0	0	0	0
IVECO	0	0	0	0	5	0
JAGUAR LAND ROVER LIMITED	49 262	27 101	77.7	42.7	2 253	1 691
KIA	1 481	1 137	0.8	0.6	9	9
KIA SLOVAKIA	2 288	1 781	1.3	1.0	0	0
MAGYAR SUZUKI	3 628	2 798	4.6	3.6	0	0
MAHINDRA	0	0	0	0	0	0
MAN	0	0	0	0	30	24
MAZDA	6 418	2 116	6.5	2.1	3	0
MERCEDES AMG	129	95	16.0	11.8	0	0

MERCEDES-BENZ AG	175 633	127 517	36.8	26.7	524	115
MITSUBISHI MOTORS CORPORATION	6	6	0.02	0.02	0	0
MITSUBISHI MOTORS THAILAND	3	3	0.01	0.01	0	0
NISSAN AUTOMOTIVE EUROPE	9 541	6 872	6.2	4.5	56	32
OPEL AUTOMOBILE	5 599	2 457	3.0	1.3	74	10
PORSCHE	8 726	3 402	18.7	7.3	0	0
PSA	46 459	17 944	6.6	2.6	836	119
RENAULT	49 288	41 524	7.9	6.7	16	16
ROLLS ROYCE	22	20	9.1	8.3	0	0
SAIC MOTOR CORPORATION	88	29	1.0	0.3	0	0
SEAT	8 947	6 712	2.9	2.1	4	4
SKODA	9 278	7 646	2.0	1.7	0	0
SSANGYONG MOTOR COMPANY	0	0	0	0	0	0
SUBARU	13	10	0.08	0.06	0	0
SUZUKI MOTOR CORPORATION	2 928	2 263	3.2	2.5	273	110
TOYOTA	6 806	6 386	1.1	1.0	55	42
TOYOTA MOTOR CORPORATION	61	52	0.3	0.2	0	0
VOLKSWAGEN	65 219	54 993	7.0	5.9	3 399	2 487
VOLVO	179 006	51 784	82.2	23.8	864	92
ZHEJIANG GEELY AUTOMOBILE CO LTD	0	0	0	0	0	0

Manufacturer(s) voluntarily reporting 2021 real-world data

Manufacturer	**Reported vehicles (M1)**	**Final (M1)**	**Percentage reported of 2021 M1 registrations**	**Percentage final of 2021 M1 registrations**	**Reported N1 vehicles**	**Final N1**
CNG TECHNIK	63	58	6.2	5.7	0	0

Annex B Conversion from real-world fuel consumption to CO_2 emissions and from WLTP CO_2 emissions to fuel consumption

As the OBFCM devices record the fuel consumption of the vehicles, their corresponding real-world CO_2 emissions have to be calculated. The CO_2 emissions of a vehicle are directly proportional to its fuel consumption according to the following formula:

$$CO_2\ \left[\frac{g}{km}\right] = FC\ \left[\frac{l}{100\ \text{km}}\right] \times EF$$

where the conversion factor EF depends on two parameters:

– the density of the fuel (g/l)

– the carbon content of the fuel (kg CO_2 /kg fuel)

To determine these two parameters, different approaches were considered, using specifications of either reference fuels or market fuels. The results of those approaches showed limited variability.

For new vehicles registered in 2021, fuel consumption was an optional parameter under the WLTP data reporting. This caused many records to be missing this entry and, for many of the values reported, there were doubts about their accuracy. Therefore, in order to allow comparison with the real-world fuel consumption values, it was decided not to rely on the reported fuel consumption values, but to calculate the 2021 WLTP fuel consumption values from the reported WLTP CO_2 emissions. As of 2022, it is mandatory to report the fuel consumption parameter as part of the WLTP data reporting.

In order to ensure consistency between the WLTP and real-world data, it was also decided to use the reference fuels characteristics as the basis for both for the conversion from real-world fuel consumption to CO_2 emissions and for the conversion of WLTP CO_2 emissions to fuel consumptions.

UN Regulations Nos. 83 ([44]) and 101 ([45]) provide the specifications for the density and carbon content of the reference fuels to be used at type-approval. Based on the average fuel density values from those Regulation, the EF values shown in *Table 14* have been calculated.

([44]) Regulation No 83 of the Economic Commission for Europe of the United Nations (UN/ECE) – Uniform provisions concerning the approval of vehicles with regard to the emission of pollutants according to engine fuel requirements (OJ L 375 27.12.2006, p. 223)

([45]) Regulation No 101 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of passenger cars equipped with an internal combustion engine with regard to the measurement of the emission of carbon dioxide and fuel consumption and of categories M1 and N1 vehicles equipped with an electric power train with regard to the measurement of electric energy consumption and range (OJ L 95 31.03.2004, p. 89)

Table 14: Emission factors of petrol (E10) and diesel (B7)

Fuel	Density range (g/l)	Average density (g/l)	Carbon content (100 kg/kg)	EF
E10	743.0 – 756.0	749.5	0.03039	22.78
B7	833.0 – 837.0	835.0	0.03151	26.31

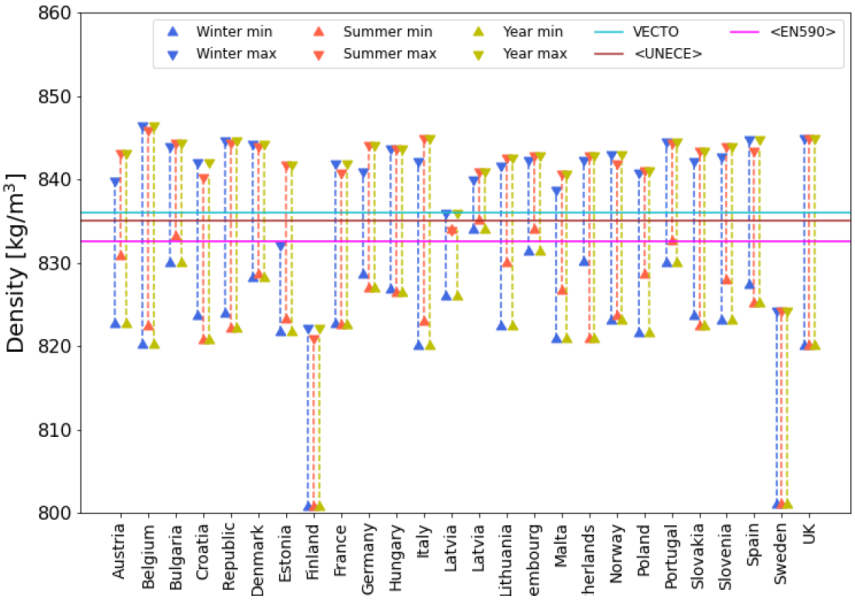
These EF have been used for the conversion of the real-world fuel consumption into CO_2 emissions. For the conversion of the WLTP CO_2 emissions into fuel consumption values, the inverse of these EF values (1/EF) are applied.

A drawback of this simplified approach is that the emission factors are determined assuming a specific blend, while the real-world data is reported on a vehicle lifetime basis, during which different market fuel blends might have been used.

Insight on the fuels actually put on the market in the EU can be found in the *Technical Assessment of Transport Fuel Quality Parameters* report ([46]), which summarises ranges of densities for petrol and diesel respectively according to standards EN 228 and EN 590, and in the EEA *Quality and greenhouse gas intensities of transport fuels in the EU in 2017* report ([47]), which provides fuel density values depending on countries/regions and seasons (winter/summer/whole year).

As shown in Figure 31, the density of the reference diesel fuel falls within the range observed in most Member States, across all seasons, except for Estonia (winter), Finland and Sweden (both winter and summer).

Figure 31: Density distribution of diesel per country



([46]) *Technical Assessment of Transport Fuel Quality Parameters* – Final report – Study contract no. 340201/2019/815556/ETU/CLIMA.C4: https://op.europa.eu/en/publication-detail/-/publication/0dd983bf-ee82-11eb-a71c-01aa75ed71a1/language-en

([47]) https://www.eea.europa.eu/publications/quality-and-greenhouse-gas-intensities-1/at_download/file

Annex C Electric energy consumption and utility factor (plug-in hybrid electric vehicles)

For OVC-HEVs, next to the calculations regarding CO_2 emissions and fuel consumption, Implementing Regulation (EU) 2021/392 also foresees the calculation of the average real-world electric energy consumption (kWh/100km) and a comparison with the WLTP electric energy consumption recorded in the certificate of conformity. This analysis would seek to understand the efficiency of the vehicle's electric powertrain when operated in charge depleting mode, i.e. when the electric engine is contributing to the driven distance.

However, in undertaking this analysis, a number of issues have arisen, in particular as regards the calculation of the electric energy consumption value in the real-world, and which WLTP value to compare this to.

A first question is how to compare the real-world electric energy consumption calculated on the basis of the data read out from the OBFCM devices with the electric energy consumption value recorded in the certificate of conformity. The latter is a utility factor-weighted value, which only provides an indication of the expected average electric consumption per km (Wh/km) over the lifetime of a vehicle if it were to be driven as assumed under the WLTP conditions, i.e. with the same charging and electric driving behaviour. Meanwhile, calculating the electric energy consumption gap on the basis of the real-world data is not straightforward, as there are various methods to do so, and because OVC-HEVs having multiple operating modes (charge depleting with the engine on, charge depleting without the engine on, charge increasing, and charge sustaining).

In relation to this, a second question arises on how to calculate a "real-world" utility factor (share of charge depleting driving), which could usefully be compared with the utility factor determined during type-approval.

These issues are elaborated on in the following Sections of this Annex.

1. REAL-WORLD AND COC ELECTRIC ENERGY CONSUMPTION VALUES

As it is not possible to know at type-approval to what degree a vehicle will be driven in charge depleting mode throughout its lifetime, an assumption has to be made to allow to the calculation of combined values covering all of the driving modes. This is the aim of the 'utility factor', which assigns the charge depleting and charge sustaining operation with a meaningful lifetime statistical significance (i.e. weight), to obtain a likely real-world performance based on the WLTP test cycles.

The determination of the utility factor in type-approval (WLTP) is based on the vehicle's electric range, as well as a number of assumptions regarding its use, in particular the charging pattern (starting everyday from a full charge) and the daily driven distance (probability of driving short versus long distances, as specified in standard SAE J2841 ([48])). Through the utility factor weighting, the overall OVC-HEV fuel consumption, CO_2 and pollutants emissions and electric energy consumption are calculated.

([48]) Hybrid-EV Committee, 2010, Utility Factor Definitions for Plug-In Hybrid Electric Vehicles Using Travel Survey Data, J2841_201009.

In the certificate of conformity of OVC-HEVs there is only one value reported for electric energy consumption: $EC_{AC,weighted}$. This is the utility factor-weighted electric energy consumption, based on the electric energy from the mains (Wh/km). It represents the expected lifetime average electric energy consumption from driving with a certain mix of charge depleting and charge sustaining modes. This means that this value does not provide an indication of the average electrical consumption of the battery when the electric engine is engaged. It is only a representative value under the same charging frequency and driving habits as assumed at type-approval. Therefore, in order to provide a meaningful comparison with the average real-world electric consumption, this value would have to be decoupled from the utility factor. Otherwise, vehicles which have been driven electrically minimally would have a lower value for the electric consumption in kWh/100km than $EC_{AC,weighted}$, only reflecting the utility of the vehicle rather than the efficiency of the electric powertrain.

The electric energy consumption of OVC-HEVs on the road can be calculated from the data read-out from the OBFCM devices in different ways.

One way to do so is to divide the total lifetime amount of grid energy into the battery ($grid_{tot}$) in kWh by the total lifetime distance travelled (d_{tot}):

$$EC_{AC,RW}\ [kWh/100\ km] = \frac{grid_{tot}[kWh]}{d_{tot}[km]} \times 100$$

When using this approach, it should be taken into account that the value $grid_{tot}$ does not include the losses taking place during a charging event between the mains and the vehicle's battery. It therefore represents the energy recharged at the level of the battery, which is lower than the energy supplied by the mains.

The value $EC_{AC,RW}$ gives an indication of the electric energy consumption consumed over the lifetime of the vehicle. However, it does not give an indication of how efficient the electric engine has been running. To meaningfully compare this value with the electric energy consumption ($EC_{AC,\ weighted}$) recorded in the certificate of conformity, the real-world charging behaviour and driving habits (i.e. real-world utility factor) should be taken into account. Otherwise, the comparison between $EC_{AC,weighted}$ and $EC_{AC,RW}$ would mostly provide an indication of the laboratory-to-real-world difference in utility factor rather than of the difference in the electric energy consumption of the vehicle in charge depleting mode.

A second option for comparing the electric energy consumption in WLTP and real-world conditions could be to use the Equivalent All-Electric Range (EAER) ([49]). In the WLTP this is defined as the portion of the total charge-depleting actual range (R_{CDA}) attributable to the use of the electricity from the Rechargeable Electric Energy Storage System (REESS) over the charge-depleting range test. Similarly, the EAER in the real-world could be determined by taking the distance in charge-depleting mode that can be attributed to the use of the electric motor. While this would decouple the electric energy consumption from the utility factor, the calculation of the electric energy consumption based on the EAER determined in the WLTP requires further information specific to charge sustaining and charge depleting driving during the WLTP, which is not readily available.

([49]) ICCT, Plug-in hybrid vehicle CO_2 emissions: How they are affected by ambient conditions and driver mode selection, 2021

One way to determine the real-world EAER is by using the calculated average fuel consumption in charge sustaining mode (FC_{CS}), the average fuel consumption while the vehicle is in charge depleting mode with the engine running ($FC_{CD,Engine\ on}$), and the total distance driven in the charge depleting modes ($d_{CD,Eng\ off}$ and $d_{CD,Eng\ on}$), as suggested by the ICCT in their 2021 White Paper ([50]):

$$EAER_{real-world} = d_{CD,Eng\ off} + \left(\frac{FC_{CS} - FC_{CD,Engine\ on}}{FC_{CS}}\right) \times d_{CD,Eng\ on}$$

The average real-world electric consumption could then be calculated as follows:

$$EC_{ICCT}\left[\frac{kWh}{100km}\right] = \frac{grid_{tot}}{EAER_{real-world}}$$

The key condition for applying this approach is that the average charge-depleting fuel consumption with the engine running ($FC_{CD,Engine\ on}$) is lower than the average charge sustaining fuel consumption (FC_{CS}). While this would generally be expected to be the case, as the charge-depleting operation would use energy stored in the battery with the aim of reducing fuel consumption, analysis of OBFCM data showed that this only applies when taking both the distance in charge depleting operation with the engine off and with the engine on into consideration for the calculation of the average charge-depleting fuel consumption (FC_{CD}). Possible reasons for this are being further investigated.

An approximation of the real-world EAER could be made if the majority of the charge-depleting driving occurred with the engine off, i.e. fully electric. This would simplify the equation by only dividing the total grid energy ($grid_{tot}$) by the distance in charge depleting with the engine off ($d_{CD,Eng\ off}$). However, based on the real-world data, such approximation is often not possible as the aforementioned condition is not met.

Because of the elements described above, it is concluded that the calculation of the charge depleting electric energy consumption on a per-vehicle basis is currently not possible without combining the real-world data with other datasets. Given that the conditions for this analysis are not met, alternative ways for assessing the energy consumption of OVC-HEVs need to be explored further to provide a meaningful comparison between the real-world and WLTP.

2. UTILITY FACTOR (%)

2.1. Calculation methodologies

The concept of the utility factor ('UF') is defined in UN Regulation 154, based on driving statistics, as the ratio between the range achieved in charge-depleting conditions and the total driven distance, and is used to weigh the charge-depleting and charge sustaining exhaust emissions and fuel consumption for OVC-HEVs. The utility factor determination under type-approval follows a UF curve based on driving statistics as described in SAE J2841, and is calculated based on equations set out in Annex XXI to Regulation (EU) 2017/1151.

([50]) ICCT, Plug-in hybrid vehicle CO_2 emissions: How they are affected by ambient conditions and driver mode selection, 2021.

The utility factor is a necessary assumption to generalise the vehicle's charging and driving behaviour over a vehicle's lifetime and assign meaningful certified values. This is the case as there is no a priori information of the vehicle charging and driving behaviour over the lifetime. However, overestimating the utility factor in the WLTP test, meaning that vehicles are not recharged and driven electrically as regularly as assumed, results in a significant underestimation of the real-world CO_2 emissions. Therefore, it is important to calculate a meaningful real-world utility factor and use the results to modify the existing utility factor determination.

There are multiple approaches possible based for deriving a "utility factor" based on real-world data, which could be compared to the one defined in Regulation (EU) 2017/1151.

In real-world conditions, the utility factor concept most directly translates to the share (%) of distance travelled in CD mode (i.e. with the electric motor running):

$$UF_{CD}\ (\%) = 100 \times \frac{d_{CD,Eng\ on} + d_{CD,Eng\ off}\ [km]}{d_{tot}\ [km]}$$

However, this approach gives equal weighting to the distances travelled with and without operating the combustion engine. This means that vehicles could in theory have a high utility factor while driving mainly in charge-depleting mode with the engine on, i.e. still consuming fuel, while making little use of the electric battery. Therefore, this would only give an upper-bound estimation of the utility factor.

The real-world data as it is currently recorded and collected does not allow differentiating between the power provided by the electric engine or the combustion engine, hence it does not give a clear indication of the utility of the electric engine and the corresponding electrified distance.

A utility factor reflecting only the pure electric driving would give a better indication of the effective electrified distance. This can be calculated by only considering the distance driven in charge depleting mode without the combustion engine on, as a lower-bound estimation of the utility factor:

$$UF_{Pure\ Electric}\ (\%) = 100 \times \frac{d_{CD,Eng\ off}\ [km]}{d_{tot}\ [km]}$$

These first two approaches are distance-based. An energy-based approach to the real-world utility factor could also be considered. This would take the contribution of work delivered by the electric engine from the energy from the grid and comparing it to the total energy consumed by the vehicle over its lifetime.

This energy-based utility factor can be calculated by taking the ratio of the usable grid energy as follows:

$$UF_{Energy-based}\ (\%) = 100 \times \frac{grid_{tot} * Eff_{electric}}{grid_{tot} \times f_{charging} \times Eff_{electric} + fuel_{tot} \times \rho_{fuel} \times LHV_{fuel} \times Eff_{ICE}}$$

This approach takes into account the electric powertrain's efficiency to convert battery energy into propulsion work ('$Eff_{Electric}$'), and the total usable energy as sum of the usable grid energy and usable energy from the internal combustion engine (ICE).

Here $grid_{tot}$ and $fuel_{tot}$ are the OBFCM parameters from the real-world dataset. The former is adjusted by a factor to account for battery charging losses ($f_{charging}$) by assuming a generic charging efficiency of 85% to reflect the actual grid energy that was used to support the real-world charge depleting operation. The average fuel density and LHV, together with the engine efficiencies ($Eff_{electric}$ and Eff_{ICE}) were derived using WLTP test data from the DICE dataset.

The process followed to derive these efficiencies consisted in the calculation of the energy at wheels that each vehicle in the dataset delivered during the charge-sustaining test cycle according to SAE J2951 and using the specific vehicle's road loads. This has been later divided by the energy contained in the fuel consumed. In such operating mode the energy for propulsion is coming primarily from fuel and the contribution from the battery can be neglected, especially if the fuel consumption corrected for battery balance is used. The average of the resulting efficiencies was therefore calculated for gasoline and diesel OVC-HEVs separately. Efficiencies per vehicle type will differ, therefore, these results primarily apply at a fleet-wide level.

Table 15: Parameters used for converting grid energy into the battery and fuel consumption into usable energy ([51])

Parameter	Definition	Value
$f_{charging}$	Charging efficiency to go from 'grid energy into the battery' to 'total grid energy', factoring in the charging losses.	1/0.85
$Eff_{electric}$ (%)	Energy conversion efficiency from electric energy to kinetic energy.	85
$Eff_{ICE, petrol}$ (%)	Conversion efficiency of chemical potential energy in the fuel (petrol) to kinetic energy.	30.7
$Eff_{ICE, diesel}$ (%)	Conversion efficiency of chemical potential energy in the fuel (diesel) to kinetic energy.	36.9
ρ_{petrol} (kg/l)	Density of petrol.	0.7475
ρ_{diesel} (kg/l)	Density of diesel.	0.8325
LHV_{petrol} (kWh/kg)	Lower heating value for petrol.	41.5/3.6
LHV_{diesel} (kWh/kg)	Lower heating value for diesel.	42.7/3.6

2.2. Calculation methodology results

The results for the utility factor calculation are provided for the three utility factor calculation methodologies as previously described. This calculation was performed on the processed real-world data, with an additional quality check where vehicles were excluded

([51]) Prussi, M., Yugo, M., De Prada, L., Padella, M. and Edwards, R., JEC Well-To-Wheels report v5, EUR 30284 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-20109-0, doi:10.2760/100379, JRC121213.

for which the utility factor could not be calculated due to missing specific data regarding the total grid energy into battery or charge-depleting distances ([52]).

Therefore, these results are based on 115 587 plug-in hybrid vehicles, and provide a first indication of the results obtained by the three methodologies. The arithmetic and km-weighted average utility factor value for each of the methodology are provided *Table 16.*

Table 16: Calculated real-world fleet-wide utility factors for 2021 plug-in hybrid electric vehicles

	Distance-based Utility Factor (UF_{CD})		**Pure electric distance based utility factor ($UF_{Pure\ Electric}$)**		**Energy-based utility factor ($UF_{Energy\text{-}based}$)**	
	Arithmetic average	Km-weighted average	Arithmetic average	Km-weighted average	Arithmetic average	Km-weighted average
Utility Factor (%)	42.0	37.9	31.3	26.3	27.6	22.2

The results show that there is a large variability between the different utility factors obtained with the three calculation methods.

The distance-based utility factors provide more optimistic results on the utility, ranging from 42% for the charge-depleting utility factor to 31% for the pure electric utility factor. The lower utility factors found when using a km-weighted average show that for vehicles which have driven further distances, the electric engine is used less proportionally to the combustion engine, likely due to increased energy demand (e.g. higher average vehicle speed) and/or less charging with respect to the driven distance.

The energy-based approach gives a lower estimation of 27.6% for the utility factor, with the km-weighted approach indicating this to be as low as 22.2%.

An initial comparison between these results and the real-world CO_2 emissions gap indicates that the energy-based utility factor approach provides the strongest correlation.

Further investigation of the three approaches will be required in the context of the review of the utility factor.

([52]) Volkswagen plug-in hybrid vehicles (3 049) were also excluded, as they did not correctly report the 'grid energy into battery' parameter, alongside the other (5 104) excluded vehicles missing relevant parameters.

Annex D Aggregated data per manufacturer

The aggregated data per manufacturer is provided, split between passenger cars and light commercial vehicles powered by internal combustion engines and off-vehicle charging hybrid electric vehicles (OVC-HEVs) of the same categories as required under Regulation (EU) 2021/392, ordered by the share of 2021 first registrations reported.

Results may not be representative for manufacturers with a low share of reported registrations. For light commercial vehicles, as N1 Class II and III vehicles were not required to be fitted with OBFCM devices in 2021, the first year results are not considered as representative for N1 registrations.

1. M1 VEHICLES

The order of the manufacturer tables based on the reported share of 2021 M1 registrations, after the processing steps.

Table 17: Manufacturer order

Manufacturer	Share reported of 2021 M1 registrations (%) - before processing	Share reported of 2021 M1 registrations (%) - after processing
JAGUAR LAND ROVER LIMITED	77.65	42.72
FORD WERKE GMBH	35.04	34.23
FORD MOTOR COMPANY	27.61	26.94
MERCEDES-BENZ AG	36.79	26.71
VOLVO	82.23	23.79
BMW GMBH	16.11	15.52
MERCEDES AMG	16	11.79
DACIA	11.96	11.35
ALFA ROMEO	9.41	9.25
CHRYSLER	9.6	8.32
ROLLS ROYCE	9.09	8.26
PORSCHE	18.74	7.31
RENAULT	7.91	6.66
BMW AG	6.69	6.28
VOLKSWAGEN	6.99	5.89
CNG TECHNIK	6.17	5.68
FIAT GROUP	5.9	5.26
BENTLEY	23.82	4.71

Manufacturer	Share reported of 2021 M1 registrations (%) - before processing	Share reported of 2021 M1 registrations (%) - after processing
FERRARI	4.58	4.52
NISSAN AUTOMOTIVE EUROPE	6.22	4.48
AUDI SPORT	6.17	4.19
MAGYAR SUZUKI	4.6	3.55
AUTOMOBILES PEUGEOT	6.93	3.41
AUDI AG	4.41	3.33
PSA	6.61	2.55
SUZUKI MOTOR CORPORATION	3.24	2.5
MAZDA	6.47	2.13
SEAT	2.85	2.13
SKODA	2.03	1.67
AUTOMOBILES CITROEN	4.33	1.51
AUDI HUNGARIA	2.4	1.49
OPEL AUTOMOBILE	3.01	1.32
TOYOTA	1.12	1.05
KIA SLOVAKIA	1.3	1.01
HYUNDAI CZECH	1	0.99
KIA	0.79	0.6
HYUNDAI ASSAN	0.46	0.45
HYUNDAI	0.46	0.42
SAIC MOTOR CORPORATION	0.97	0.32
TOYOTA MOTOR CORPORATION	0.25	0.21
SUBARU	0.08	0.06
MITSUBISHI MOTORS CORPORATION	0.02	0.02
MITSUBISHI MOTORS THAILAND	0.01	0.01

1.1. Manufacturers reporting over 20% of registered vehicles

Table 18: JAGUAR LAND ROVER LIMITED

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (53.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	4 918	11.91	11.81	9.54	9.73	2.38	2.08	24.91%	21.37%
	Diesel	19 663	8.41	8.31	7.10	7.10	1.31	1.21	18.46%	17.04%
	Petrol+Diesel	**24 581**	**9.11**	**8.71**	**7.59**	**7.40**	**1.52**	**1.31**	**20.08%**	**17.70%**
CO2 emissions (g/km)	Petrol	4 918	271.41	268.93	217.28	221.58	54.13	47.35	24.91%	21.37%
	Diesel	19 663	221.34	218.52	186.84	186.70	34.50	31.82	18.46%	17.04%
	Petrol+Diesel	**24 581**	**231.35**	**224.34**	**192.93**	**190.72**	**38.42**	**33.61**	**19.92%**	**17.62%**
OVC-HEVs (16.8% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	2 520	9.38	9.71	2.91	2.99	6.47	6.72	222.20%	224.68%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 520**	**9.38**	**9.71**	**2.91**	**2.99**	**6.47**	**6.72**	**222.20%**	**224.68%**
CO2 emissions (g/km)	Petrol/Electric	2 520	213.57	221.12	66.28	68.10	147.28	153.02	222.20%	224.68%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 520**	**213.57**	**221.12**	**66.28**	**68.10**	**147.28**	**153.02**	**222.20%**	**224.68%**

Table 19: FORD WERKE GMBH

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (33.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	84 828	7.13	7.00	5.66	5.68	1.47	1.32	25.96%	23.34%
	Diesel	31 986	6.76	6.67	5.79	5.75	0.97	0.92	16.73%	16.04%
	Petrol+Diesel	**116 814**	**7.03**	**6.85**	**5.70**	**5.71**	**1.33**	**1.13**	**23.39%**	**19.84%**
CO2 emissions (g/km)	Petrol	84 828	162.53	159.50	129.03	129.32	33.50	30.18	25.96%	23.34%
	Diesel	31 986	177.94	175.62	152.44	151.34	25.50	24.28	16.73%	16.04%
	Petrol+Diesel	**116 814**	**166.75**	**167.17**	**135.44**	**139.80**	**31.31**	**27.37**	**23.12%**	**19.58%**
OVC-HEVs (44.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	19 819	4.72	4.84	1.56	1.61	3.16	3.23	202.99%	200.12%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**19 819**	**4.72**	**4.84**	**1.56**	**1.61**	**3.16**	**3.23**	**202.99%**	**200.12%**
CO2 emissions (g/km)	Petrol/Electric	19 819	107.55	110.26	35.50	36.74	72.06	73.52	202.99%	200.12%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**19 819**	**107.55**	**110.26**	**35.50**	**36.74**	**72.06**	**73.52**	**202.99%**	**200.12%**

Table 20: FORD MOTOR COMPANY

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (26.9% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	811	14.95	14.60	11.61	11.57	3.34	3.03	28.75%	26.18%
	Diesel	0								
	Petrol+Diesel	**811**	**14.95**	**14.60**	**11.61**	**11.57**	**3.34**	**3.03**	**28.75%**	**26.18%**
CO2 emissions (g/km)	Petrol	811	340.60	332.50	264.55	263.52	76.05	68.99	28.75%	26.18%
	Diesel	0								
	Petrol+Diesel	**811**	**340.60**	**332.50**	**264.55**	**263.52**	**76.05**	**68.99**	**28.75%**	**26.18%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 21: MERCEDES-BENZ AG

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (23.1% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	29 995	10.53	10.68	8.46	8.67	2.07	2.01	24.45%	23.12%
	Diesel	49 124	7.06	6.81	6.01	5.90	1.05	0.90	17.52%	15.32%
	Petrol+Diesel	**79 119**	**8.38**	**7.98**	**6.94**	**6.75**	**1.44**	**1.24**	**20.73%**	**18.37%**
CO2 emissions (g/km)	Petrol	29 995	239.83	243.30	192.71	197.61	47.13	45.68	24.45%	23.12%
	Diesel	49 124	185.87	179.05	158.16	155.27	27.72	23.78	17.52%	15.32%
	Petrol+Diesel	**79 119**	**206.33**	**198.60**	**171.25**	**168.15**	**35.07**	**30.45**	**20.48%**	**18.11%**
OVC-HEVs (35.9% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	23 506	5.80	6.30	1.49	1.56	4.31	4.74	290.21%	303.73%
	Diesel/Electric	24 892	5.83	5.94	1.41	1.42	4.41	4.52	312.11%	317.81%
	Petrol+Diesel Electric	**48 398**	**5.81**	**6.08**	**1.45**	**1.47**	**4.36**	**4.60**	**301.20%**	**312.20%**
CO2 emissions (g/km)	Petrol/Electric	23 506	132.12	143.49	33.86	35.54	98.26	107.95	290.21%	303.73%
	Diesel/Electric	24 892	153.30	156.40	37.20	37.43	116.10	118.97	312.11%	317.81%
	Petrol+Diesel Electric	**48 398**	**143.02**	**151.53**	**35.58**	**36.72**	**107.44**	**114.81**	**301.99%**	**312.67%**

Table 22: VOLVO

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (22.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	8 988	8.47	8.24	7.24	7.25	1.23	0.99	16.96%	13.70%
	Diesel	18 674	7.28	7.05	6.23	6.19	1.05	0.86	16.85%	13.82%
	Petrol+Diesel	**27 662**	**7.66**	**7.32**	**6.56**	**6.43**	**1.11**	**0.89**	**16.89%**	**13.79%**
CO2 emissions (g/km)	Petrol	8 988	192.86	187.82	164.89	165.19	27.97	22.62	16.96%	13.70%
	Diesel	18 674	191.48	185.51	163.86	162.98	27.62	22.53	16.85%	13.82%
	Petrol+Diesel	**27 662**	**191.93**	**186.02**	**164.20**	**163.48**	**27.73**	**22.55**	**16.89%**	**13.79%**
OVC-HEVs (25.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	24 121	6.62	6.76	2.26	2.26	4.35	4.50	192.18%	199.02%
	Diesel/Electric	1	10.47	10.47	1.82	1.82	8.65	8.65	474.00%	474.00%
	Petrol+Diesel Electric	**24 122**	**6.62**	**6.76**	**2.26**	**2.26**	**4.35**	**4.50**	**192.19%**	**199.02%**
CO2 emissions (g/km)	Petrol/Electric	24 121	150.71	154.00	51.58	51.50	99.13	102.50	192.18%	199.02%
	Diesel/Electric	1	275.52	275.52	48.00	48.00	227.52	227.52	474.00%	474.00%
	Petrol+Diesel Electric	**24 122**	**150.72**	**154.01**	**51.58**	**51.50**	**99.14**	**102.50**	**192.19%**	**199.02%**

1.2. Manufacturers reporting 10-20% of registered vehicles

Table 23: BMW GMBH

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (15.5% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1 519	14.76	14.80	11.17	11.26	3.59	3.55	32.15%	31.51%
	Diesel	0								
	Petrol+Diesel	**1 519**	**14.76**	**14.80**	**11.17**	**11.26**	**3.59**	**3.55**	**32.15%**	**31.51%**
CO2 emissions (g/km)	Petrol	1 519	336.28	337.22	254.47	256.42	81.81	80.80	32.15%	31.51%
	Diesel	0								
	Petrol+Diesel	**1 519**	**336.28**	**337.22**	**254.47**	**256.42**	**81.81**	**80.80**	**32.15%**	**31.51%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 24: MERCEDES AMG

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (11.8% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	95	18.53	18.13	12.74	12.73	5.79	5.40	45.48%	42.43%
	Diesel	0								
	Petrol+Diesel	**95**	**18.53**	**18.13**	**12.74**	**12.73**	**5.79**	**5.40**	**45.48%**	**42.43%**
CO2 emissions (g/km)	Petrol	95	422.06	412.89	290.11	289.90	131.95	122.99	45.48%	42.43%
	Diesel	0								
	Petrol+Diesel	**95**	**422.06**	**412.89**	**290.11**	**289.90**	**131.95**	**122.99**	**45.48%**	**42.43%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 25: DACIA

Year of first registration: 2021		Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (11.3% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	14 415	7.16	6.92	5.55	5.54	1.61	1.38	28.92%	24.90%
	Diesel	833	5.81	5.85	4.89	4.88	0.92	0.98	18.78%	20.03%
	Petrol+Diesel	**15 248**	**7.08**	**6.81**	**5.52**	**5.48**	**1.57**	**1.34**	**28.43%**	**24.46%**
CO2 emissions (g/km)	Petrol	14 415	163.04	157.72	126.46	126.28	36.57	31.44	28.92%	24.90%
	Diesel	833	152.74	153.98	128.59	128.28	24.15	25.69	18.78%	20.03%
	Petrol+Diesel	**15 248**	**162.47**	**157.34**	**126.58**	**126.48**	**35.89**	**30.85**	**28.36%**	**24.39%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

1.3. Manufacturers reporting 5-10% of registered vehicles

Table 26: ALFA ROMEO

Year of first registration: 2021		Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (9.3% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	396	11.59	11.14	8.60	8.52	2.99	2.62	34.70%	30.80%
	Diesel	1 751	7.42	7.31	5.85	5.84	1.57	1.46	26.81%	25.06%
	Petrol+Diesel	**2 147**	**8.19**	**7.80**	**6.36**	**6.19**	**1.83**	**1.61**	**28.78%**	**26.08%**
CO2 emissions (g/km)	Petrol	396	264.00	253.75	195.99	194.00	68.01	59.76	34.70%	30.80%
	Diesel	1 751	195.11	192.29	153.86	153.76	41.25	38.53	26.81%	25.06%
	Petrol+Diesel	**2 147**	**207.82**	**200.20**	**161.63**	**158.94**	**46.19**	**41.26**	**28.57%**	**25.96%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 27: CHRYSLER

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (8.5% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 216	8.46	8.21	6.89	6.88	1.57	1.33	22.79%	19.32%
	Diesel	2 468	6.10	6.00	5.10	5.10	1.00	0.90	19.64%	17.64%
	Petrol+Diesel	**4 684**	**7.22**	**6.84**	**5.95**	**5.78**	**1.27**	**1.06**	**21.37%**	**18.40%**
CO2 emissions (g/km)	Petrol	2 216	192.73	187.02	156.96	156.74	35.77	30.28	22.79%	19.32%
	Diesel	2 468	160.49	157.76	134.14	134.11	26.35	23.66	19.64%	17.64%
	Petrol+Diesel	**4 684**	**175.74**	**168.94**	**144.94**	**142.75**	**30.81**	**26.19**	**21.26%**	**18.34%**
OVC-HEVs (7.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1 120	6.72	6.50	2.49	2.38	4.23	4.12	169.74%	173.26%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 120**	**6.72**	**6.50**	**2.49**	**2.38**	**4.23**	**4.12**	**169.74%**	**173.26%**
CO2 emissions (g/km)	Petrol/Electric	1 120	153.05	148.11	56.74	54.20	96.31	93.91	169.74%	173.26%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 120**	**153.05**	**148.11**	**56.74**	**54.20**	**96.31**	**93.91**	**169.74%**	**173.26%**

Table 28: ROLLS ROYCE

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (8.3% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	20	18.79	17.63	15.97	15.97	2.82	1.65	17.66%	10.36%
	Diesel	0								
	Petrol+Diesel	**20**	**18.79**	**17.63**	**15.97**	**15.97**	**2.82**	**1.65**	**17.66%**	**10.36%**
CO2 emissions (g/km)	Petrol	20	428.10	401.54	363.85	363.84	64.25	37.69	17.66%	10.36%
	Diesel	0								
	Petrol+Diesel	**20**	**428.10**	**401.54**	**363.85**	**363.84**	**64.25**	**37.69**	**17.66%**	**10.36%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 29: PORSCHE

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (6.5% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 192	13.45	13.06	11.16	11.15	2.30	1.91	20.57%	17.14%
	Diesel	0								
	Petrol+Diesel	**2 192**	**13.45**	**13.06**	**11.16**	**11.15**	**2.30**	**1.91**	**20.57%**	**17.14%**
CO2 emissions (g/km)	Petrol	2 192	306.50	297.55	254.21	254.01	52.28	43.55	20.57%	17.14%
	Diesel	0								
	Petrol+Diesel	**2 192**	**306.50**	**297.55**	**254.21**	**254.01**	**52.28**	**43.55**	**20.57%**	**17.14%**
OVC-HEVs (9.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1 210	10.79	10.80	3.03	3.02	7.76	7.78	256.01%	257.58%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 210**	**10.79**	**10.80**	**3.03**	**3.02**	**7.76**	**7.78**	**256.01%**	**257.58%**
CO2 emissions (g/km)	Petrol/Electric	1 210	245.71	246.06	69.02	68.81	176.69	177.25	256.01%	257.58%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 210**	**245.71**	**246.06**	**69.02**	**68.81**	**176.69**	**177.25**	**256.01%**	**257.58%**

Table 30: RENAULT

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (6.7% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	28 846	7.48	7.29	5.72	5.72	1.76	1.57	30.74%	27.50%
	Diesel	10 434	6.25	6.05	5.25	5.15	1.00	0.89	19.14%	17.30%
	Petrol+Diesel	**39 280**	**7.15**	**6.81**	**5.60**	**5.50**	**1.56**	**1.31**	**27.85%**	**23.81%**
CO2 emissions (g/km)	Petrol	28 846	170.42	166.16	130.35	130.32	40.07	35.84	30.74%	27.50%
	Diesel	10 434	164.46	159.06	138.03	135.60	26.42	23.46	19.14%	17.30%
	Petrol+Diesel	**39 280**	**168.83**	**163.41**	**132.39**	**132.36**	**36.44**	**31.05**	**27.53%**	**23.46%**
OVC-HEVs (6.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	2 244	4.13	4.20	1.47	1.48	2.66	2.72	180.77%	184.33%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 244**	**4.13**	**4.20**	**1.47**	**1.48**	**2.66**	**2.72**	**180.77%**	**184.33%**
CO2 emissions (g/km)	Petrol/Electric	2 244	94.13	95.67	33.53	33.65	60.61	62.02	180.77%	184.33%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 244**	**94.13**	**95.67**	**33.53**	**33.65**	**60.61**	**62.02**	**180.77%**	**184.33%**

Table 31: BMW AG

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (6.3% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	10 876	8.89	8.84	7.02	7.12	1.86	1.72	26.49%	24.14%
	Diesel	19 035	7.08	6.96	5.71	5.66	1.38	1.31	24.10%	23.07%
	Petrol+Diesel	**29 911**	**7.74**	**7.46**	**6.19**	**6.04**	**1.55**	**1.41**	**25.09%**	**23.40%**
CO2 emissions (g/km)	Petrol	10 876	202.40	201.33	160.01	162.18	42.39	39.15	26.49%	24.14%
	Diesel	19 035	186.40	183.15	150.20	148.82	36.20	34.34	24.10%	23.07%
	Petrol+Diesel	**29 911**	**192.22**	**187.95**	**153.77**	**152.34**	**38.45**	**35.60**	**25.01%**	**23.37%**
OVC-HEVs (6.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	7 521	6.73	6.95	1.65	1.63	5.08	5.32	308.65%	327.54%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**7 521**	**6.73**	**6.95**	**1.65**	**1.63**	**5.08**	**5.32**	**308.65%**	**327.54%**
CO2 emissions (g/km)	Petrol/Electric	7 521	153.29	158.33	37.51	37.03	115.78	121.29	308.65%	327.54%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**7 521**	**153.29**	**158.33**	**37.51**	**37.03**	**115.78**	**121.29**	**308.65%**	**327.54%**

Table 32: VOLKSWAGEN

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (5.6% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	21 296	7.49	7.43	6.47	6.53	1.02	0.90	15.82%	13.83%
	Diesel	27 374	6.50	6.35	5.60	5.53	0.90	0.82	16.09%	14.86%
	Petrol+Diesel	**48 670**	**6.93**	**6.67**	**5.98**	**5.82**	**0.95**	**0.85**	**15.96%**	**14.52%**
CO2 emissions (g/km)	Petrol	21 296	170.71	169.20	147.39	148.65	23.32	20.55	15.82%	13.83%
	Diesel	27 374	170.97	167.13	147.27	145.50	23.70	21.62	16.09%	14.86%
	Petrol+Diesel	**48 670**	**170.85**	**167.73**	**147.32**	**146.42**	**23.53**	**21.31**	**15.97%**	**14.56%**
OVC-HEVs (10.8% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	6 323	5.34	5.65	1.33	1.37	4.01	4.28	300.51%	311.31%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**6 323**	**5.34**	**5.65**	**1.33**	**1.37**	**4.01**	**4.28**	**300.51%**	**311.31%**
CO2 emissions (g/km)	Petrol/Electric	6 323	121.73	128.76	30.39	31.30	91.33	97.45	300.51%	311.31%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**6 323**	**121.73**	**128.76**	**30.39**	**31.30**	**91.33**	**97.45**	**300.51%**	**311.31%**

Table 33: CNG TECHNIK

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (5.7% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	58	5.81	5.81	5.76	5.75	0.04	0.06	0.78%	1.01%
	Diesel	0								
	Petrol+Diesel	**58**	**5.81**	**5.81**	**5.76**	**5.75**	**0.04**	**0.06**	**0.78%**	**1.01%**
CO2 emissions (g/km)	Petrol	58	132.28	132.39	131.26	131.08	1.02	1.32	0.78%	1.01%
	Diesel	0								
	Petrol+Diesel	**58**	**132.28**	**132.39**	**131.26**	**131.08**	**1.02**	**1.32**	**0.78%**	**1.01%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 34: FIAT GROUP

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (5.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	15 126	7.01	6.80	5.85	5.89	1.17	0.92	19.93%	15.57%
	Diesel	6 470	5.85	5.64	4.93	4.88	0.92	0.76	18.67%	15.65%
	Petrol+Diesel	**21 596**	**6.66**	**6.37**	**5.57**	**5.51**	**1.09**	**0.86**	**19.60%**	**15.59%**
CO2 emissions (g/km)	Petrol	15 126	159.72	154.97	133.18	134.09	26.55	20.88	19.93%	15.57%
	Diesel	6 470	153.96	148.48	129.74	128.39	24.22	20.09	18.67%	15.65%
	Petrol+Diesel	**21 596**	**158.00**	**152.54**	**132.15**	**131.96**	**25.85**	**20.58**	**19.56%**	**15.60%**
OVC-HEVs (6.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1 061	6.49	6.48	2.07	2.07	4.42	4.41	213.97%	212.73%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 061**	**6.49**	**6.48**	**2.07**	**2.07**	**4.42**	**4.41**	**213.97%**	**212.73%**
CO2 emissions (g/km)	Petrol/Electric	1 061	147.81	147.64	47.08	47.21	100.73	100.43	213.97%	212.73%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 061**	**147.81**	**147.64**	**47.08**	**47.21**	**100.73**	**100.43**	**213.97%**	**212.73%**

1.1. Manufacturers reporting 1-5% of registered vehicles

Table 35: BENTLEY

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (5.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	70	14.82	14.57	12.56	12.71	2.25	1.86	17.95%	14.66%
	Diesel	0								
	Petrol+Diesel	**70**	**14.82**	**14.57**	**12.56**	**12.71**	**2.25**	**1.86**	**17.95%**	**14.66%**
CO2 emissions (g/km)	Petrol	70	337.54	331.86	286.19	289.42	51.36	42.43	17.95%	14.66%
	Diesel	0								
	Petrol+Diesel	**70**	**337.54**	**331.86**	**286.19**	**289.42**	**51.36**	**42.43**	**17.95%**	**14.66%**
OVC-HEVs (0.9% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1	12.97	12.97	3.60	3.60	9.37	9.37	260.37%	260.37%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1**	**12.97**	**12.97**	**3.60**	**3.60**	**9.37**	**9.37**	**260.37%**	**260.37%**
CO2 emissions (g/km)	Petrol/Electric	1	295.50	295.50	82.00	82.00	213.50	213.50	260.37%	260.37%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1**	**295.50**	**295.50**	**82.00**	**82.00**	**213.50**	**213.50**	**260.37%**	**260.37%**

Table 36: FERRARI

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (2.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	58	16.28	15.33	11.20	11.20	5.08	4.13	45.35%	36.86%
	Diesel	0								
	Petrol+Diesel	**58**	**16.28**	**15.33**	**11.20**	**11.20**	**5.08**	**4.13**	**45.35%**	**36.86%**
CO2 emissions (g/km)	Petrol	58	370.91	349.19	255.19	255.14	115.72	94.04	45.35%	36.86%
	Diesel	0								
	Petrol+Diesel	**58**	**370.91**	**349.19**	**255.19**	**255.14**	**115.72**	**94.04**	**45.35%**	**36.86%**
OVC-HEVs (21.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	91	20.06	19.59	6.88	6.88	13.18	12.72	191.51%	184.92%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**91**	**20.06**	**19.59**	**6.88**	**6.88**	**13.18**	**12.72**	**191.51%**	**184.92%**
CO2 emissions (g/km)	Petrol/Electric	91	457.03	446.34	156.78	156.66	300.25	289.69	191.51%	184.92%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**91**	**457.03**	**446.34**	**156.78**	**156.66**	**300.25**	**289.69**	**191.51%**	**184.92%**

Table 37: NISSAN AUTOMOTIVE EUROPE

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (4.5% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	6 872	7.76	7.55	6.15	6.15	1.61	1.40	26.15%	22.76%
	Diesel	0								
	Petrol+Diesel	**6 872**	**7.76**	**7.55**	**6.15**	**6.15**	**1.61**	**1.40**	**26.15%**	**22.76%**
CO2 emissions (g/km)	Petrol	6 872	176.77	172.07	140.13	140.17	36.64	31.90	26.15%	22.76%
	Diesel	0								
	Petrol+Diesel	**6 872**	**176.77**	**172.07**	**140.13**	**140.17**	**36.64**	**31.90**	**26.15%**	**22.76%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 38: AUDI SPORT

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (4.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	464	14.44	14.23	11.54	11.77	2.91	2.46	25.18%	20.87%
	Diesel	0								
	Petrol+Diesel	**464**	**14.44**	**14.23**	**11.54**	**11.77**	**2.91**	**2.46**	**25.18%**	**20.87%**
CO2 emissions (g/km)	Petrol	464	329.00	324.21	262.82	268.23	66.18	55.98	25.18%	20.87%
	Diesel	0								
	Petrol+Diesel	**464**	**329.00**	**324.21**	**262.82**	**268.23**	**66.18**	**55.98**	**25.18%**	**20.87%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 39: MAGYAR SUZUKI

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (3.5% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 798	6.72	6.64	5.63	5.70	1.10	0.94	19.49%	16.48%
	Diesel	0								
	Petrol+Diesel	**2 798**	**6.72**	**6.64**	**5.63**	**5.70**	**1.10**	**0.94**	**19.49%**	**16.48%**
CO2 emissions (g/km)	Petrol	2 798	153.12	151.24	128.15	129.83	24.98	21.40	19.49%	16.48%
	Diesel	0								
	Petrol+Diesel	**2 798**	**153.12**	**151.24**	**128.15**	**129.83**	**24.98**	**21.40**	**19.49%**	**16.48%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 40: AUTOMOBILES PEUGEOT

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (3.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1 817	7.37	7.35	6.17	6.23	1.20	1.12	19.45%	17.96%
	Diesel	5 940	5.99	5.92	5.18	5.14	0.81	0.77	15.65%	15.07%
	Petrol+Diesel	**7 757**	**6.31**	**6.13**	**5.41**	**5.30**	**0.90**	**0.83**	**16.66%**	**15.57%**
CO2 emissions (g/km)	Petrol	1 817	167.96	167.35	140.60	141.87	27.35	25.48	19.45%	17.96%
	Diesel	5 940	157.53	155.69	136.22	135.30	21.31	20.39	15.65%	15.07%
	Petrol+Diesel	**7 757**	**159.97**	**157.40**	**137.25**	**136.26**	**22.73**	**21.14**	**16.56%**	**15.51%**
OVC-HEVs (3.7% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1 434	5.40	5.65	1.35	1.34	4.05	4.30	301.04%	320.15%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 434**	**5.40**	**5.65**	**1.35**	**1.34**	**4.05**	**4.30**	**301.04%**	**320.15%**
CO2 emissions (g/km)	Petrol/Electric	1 434	122.95	128.70	30.66	30.63	92.29	98.07	301.04%	320.15%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 434**	**122.95**	**128.70**	**30.66**	**30.63**	**92.29**	**98.07**	**301.04%**	**320.15%**

Table 41: AUDI AG

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (3.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 978	8.53	8.58	7.01	7.15	1.52	1.43	21.65%	19.92%
	Diesel	7 766	7.20	7.07	6.01	5.96	1.19	1.11	19.83%	18.56%
	Petrol+Diesel	**10 744**	**7.57**	**7.35**	**6.29**	**6.19**	**1.28**	**1.17**	**20.39%**	**18.85%**
CO2 emissions (g/km)	Petrol	2 978	194.35	195.43	159.76	162.96	34.59	32.47	21.65%	19.92%
	Diesel	7 766	189.45	186.02	158.11	156.90	31.35	29.12	19.83%	18.56%
	Petrol+Diesel	**10 744**	**190.81**	**187.78**	**158.57**	**158.03**	**32.25**	**29.75**	**20.34%**	**18.82%**
OVC-HEVs (3.8% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	2 603	6.90	7.20	1.63	1.66	5.27	5.53	323.06%	333.06%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 603**	**6.90**	**7.20**	**1.63**	**1.66**	**5.27**	**5.53**	**323.06%**	**333.06%**
CO2 emissions (g/km)	Petrol/Electric	2 603	157.28	163.93	37.18	37.85	120.11	126.07	323.06%	333.06%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 603**	**157.28**	**163.93**	**37.18**	**37.85**	**120.11**	**126.07**	**323.06%**	**333.06%**

Table 42: PSA

Year of first registration: 2021		Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (2.5% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	8 357	6.80	6.69	5.68	5.70	1.12	0.99	19.77%	17.37%
	Diesel	8 116	5.46	5.45	4.68	4.67	0.78	0.77	16.69%	16.53%
	Petrol+Diesel	**16 473**	**6.14**	**5.89**	**5.19**	**5.04**	**0.95**	**0.85**	**18.40%**	**16.87%**
CO2 emissions (g/km)	Petrol	8 357	155.00	152.36	129.41	129.81	25.59	22.55	19.77%	17.37%
	Diesel	8 116	143.55	143.27	123.02	122.95	20.53	20.32	16.69%	16.53%
	Petrol+Diesel	**16 473**	**149.36**	**146.51**	**126.26**	**125.39**	**23.09**	**21.11**	**18.29%**	**16.84%**
OVC-HEVs (4.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1 471	5.94	6.07	1.47	1.48	4.47	4.59	303.83%	309.29%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 471**	**5.94**	**6.07**	**1.47**	**1.48**	**4.47**	**4.59**	**303.83%**	**309.29%**
CO2 emissions (g/km)	Petrol/Electric	1 471	135.42	138.28	33.53	33.79	101.88	104.49	303.83%	309.29%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1 471**	**135.42**	**138.28**	**33.53**	**33.79**	**101.88**	**104.49**	**303.83%**	**309.29%**

Table 43: SUZUKI MOTOR CORPORATION

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (2.5% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 231	5.40	5.27	4.94	4.96	0.47	0.31	9.43%	6.34%
	Diesel	0								
	Petrol+Diesel	**2 231**	**5.40**	**5.27**	**4.94**	**4.96**	**0.47**	**0.31**	**9.43%**	**6.34%**
CO2 emissions (g/km)	Petrol	2 231	123.06	120.15	112.46	112.98	10.61	7.17	9.43%	6.34%
	Diesel	0								
	Petrol+Diesel	**2 231**	**123.06**	**120.15**	**112.46**	**112.98**	**10.61**	**7.17**	**9.43%**	**6.34%**
OVC-HEVs (1.7% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	32	5.10	5.10	0.97	0.97	4.14	4.14	428.25%	428.19%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**32**	**5.10**	**5.10**	**0.97**	**0.97**	**4.14**	**4.14**	**428.25%**	**428.19%**
CO2 emissions (g/km)	Petrol/Electric	32	116.22	116.20	22.00	22.00	94.22	94.20	428.25%	428.19%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**32**	**116.22**	**116.20**	**22.00**	**22.00**	**94.22**	**94.20**	**428.25%**	**428.19%**

Table 44: MAZDA

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (2.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1 950	7.61	7.61	6.66	6.81	0.94	0.80	14.16%	11.78%
	Diesel	166	7.09	6.80	6.15	6.14	0.94	0.67	15.34%	10.88%
	Petrol+Diesel	**2 116**	**7.57**	**7.53**	**6.62**	**6.74**	**0.94**	**0.79**	**14.24%**	**11.70%**
CO2 emissions (g/km)	Petrol	1 950	173.28	173.41	151.79	155.14	21.49	18.27	14.16%	11.78%
	Diesel	166	186.51	178.98	161.70	161.42	24.81	17.56	15.34%	10.88%
	Petrol+Diesel	**2 116**	**174.32**	**173.96**	**152.57**	**155.75**	**21.75**	**18.20**	**14.25%**	**11.69%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 45: SEAT

Year of first registration: 2021		Real-world data			WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (1.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 934	8.21	8.10	6.81	6.85	1.40	1.25	20.57%	18.27%
	Diesel	1 495	6.57	6.47	5.30	5.29	1.26	1.18	23.81%	22.28%
	Petrol+Diesel	**4 429**	**7.65**	**7.32**	**6.30**	**6.10**	**1.35**	**1.22**	**21.49%**	**19.93%**
CO2 emissions (g/km)	Petrol	2 934	186.99	184.61	155.09	156.09	31.90	28.52	20.57%	18.27%
	Diesel	1 495	172.79	170.11	139.55	139.12	33.23	30.99	23.81%	22.28%
	Petrol+Diesel	**4 429**	**182.19**	**177.68**	**149.85**	**147.97**	**32.35**	**29.70**	**21.59%**	**20.07%**
OVC-HEVs (5.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	2 283	4.98	5.09	1.31	1.31	3.66	3.79	279.47%	290.09%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 283**	**4.98**	**5.09**	**1.31**	**1.31**	**3.66**	**3.79**	**279.47%**	**290.09%**
CO2 emissions (g/km)	Petrol/Electric	2 283	113.34	116.02	29.87	29.74	83.47	86.28	279.47%	290.09%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2 283**	**113.34**	**116.02**	**29.87**	**29.74**	**83.47**	**86.28**	**279.47%**	**290.09%**

Table 46: SKODA

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (1.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 494	7.29	7.16	6.13	6.12	1.16	1.03	18.96%	16.90%
	Diesel	4 295	6.22	6.12	5.14	5.09	1.08	1.03	21.03%	20.25%
	Petrol+Diesel	**6 789**	**6.61**	**6.38**	**5.50**	**5.35**	**1.11**	**1.03**	**20.18%**	**19.30%**
CO2 emissions (g/km)	Petrol	2 494	166.07	163.03	139.60	139.45	26.47	23.57	18.96%	16.90%
	Diesel	4 295	163.69	161.14	135.25	134.01	28.44	27.13	21.03%	20.25%
	Petrol+Diesel	**6 789**	**164.57**	**161.61**	**136.85**	**135.36**	**27.72**	**26.25**	**20.25%**	**19.39%**
OVC-HEVs (3.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	857	5.04	5.21	1.13	1.14	3.91	4.07	345.26%	357.83%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**857**	**5.04**	**5.21**	**1.13**	**1.14**	**3.91**	**4.07**	**345.26%**	**357.83%**
CO2 emissions (g/km)	Petrol/Electric	857	114.86	118.76	25.80	25.94	89.07	92.82	345.26%	357.83%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**857**	**114.86**	**118.76**	**25.80**	**25.94**	**89.07**	**92.82**	**345.26%**	**357.83%**

Table 47: AUTOMOBILES CITROEN

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (1.5% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2 457	6.49	6.35	5.63	5.64	0.87	0.72	15.44%	12.76%
	Diesel	1 867	5.39	5.35	4.70	4.68	0.69	0.68	14.65%	14.47%
	Petrol+Diesel	**4 324**	**6.02**	**5.74**	**5.23**	**5.04**	**0.79**	**0.69**	**15.14%**	**13.74%**
CO2 emissions (g/km)	Petrol	2 457	147.95	144.75	128.15	128.37	19.79	16.38	15.44%	12.76%
	Diesel	1 867	141.78	140.88	123.67	123.08	18.12	17.80	14.65%	14.47%
	Petrol+Diesel	**4 324**	**145.29**	**142.36**	**126.22**	**125.10**	**19.07**	**17.26**	**15.11%**	**13.80%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 48: AUDI HUNGARIA

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (1.5% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	34	9.13	8.97	7.47	7.52	1.65	1.45	22.09%	19.26%
	Diesel	10	7.15	7.08	5.71	5.63	1.43	1.45	25.10%	25.67%
	Petrol+Diesel	**44**	**8.68**	**8.28**	**7.07**	**6.83**	**1.60**	**1.45**	**22.64%**	**21.18%**
CO2 emissions (g/km)	Petrol	34	207.88	204.26	170.26	171.28	37.61	32.99	22.09%	19.26%
	Diesel	10	188.03	186.20	150.30	148.16	37.73	38.03	25.10%	25.67%
	Petrol+Diesel	**44**	**203.37**	**197.71**	**165.73**	**162.89**	**37.64**	**34.82**	**22.71%**	**21.37%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 49: OPEL AUTOMOBILE

Year of first registration: 2021		**Real-world data**			**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (1.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1 146	6.97	6.91	5.95	5.99	1.02	0.92	17.10%	15.32%
	Diesel	994	6.00	6.01	4.92	4.93	1.07	1.08	21.75%	21.86%
	Petrol+Diesel	**2 140**	**6.52**	**6.33**	**5.47**	**5.31**	**1.04**	**1.02**	**19.05%**	**19.20%**
CO2 emissions (g/km)	Petrol	1 146	158.73	157.32	135.54	136.42	23.18	20.90	17.10%	15.32%
	Diesel	994	157.74	158.03	129.56	129.69	28.18	28.34	21.75%	21.86%
	Petrol+Diesel	**2 140**	**158.27**	**157.78**	**132.76**	**132.11**	**25.50**	**25.66**	**19.21%**	**19.43%**
OVC-HEVs (3.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	317	5.47	5.53	1.36	1.36	4.12	4.18	303.31%	308.11%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**317**	**5.47**	**5.53**	**1.36**	**1.36**	**4.12**	**4.18**	**303.31%**	**308.11%**
CO2 emissions (g/km)	Petrol/Electric	317	124.71	126.00	30.92	30.87	93.79	95.13	303.31%	308.11%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**317**	**124.71**	**126.00**	**30.92**	**30.87**	**93.79**	**95.13**	**303.31%**	**308.11%**

Table 50: TOYOTA

Year of first registration: 2021		**Real-world data**			**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (1.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	6 338	5.60	5.67	4.99	5.05	0.61	0.62	12.27%	12.30%
	Diesel	8	10.73	10.41	9.34	9.37	1.38	1.04	14.82%	11.05%
	Petrol+Diesel	**6 346**	**5.60**	**5.68**	**4.99**	**5.06**	**0.61**	**0.62**	**12.27%**	**12.30%**
CO2 emissions (g/km)	Petrol	6 338	127.52	129.15	113.59	115.00	13.93	14.14	12.27%	12.30%
	Diesel	8	282.18	273.78	245.75	246.55	36.43	27.23	14.82%	11.05%
	Petrol+Diesel	**6 346**	**127.72**	**129.38**	**113.75**	**115.22**	**13.96**	**14.17**	**12.27%**	**12.30%**
OVC-HEVs (0.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	40	4.09	3.88	0.97	0.97	3.13	2.91	323.68%	301.38%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**40**	**4.09**	**3.88**	**0.97**	**0.97**	**3.13**	**2.91**	**323.68%**	**301.38%**
CO2 emissions (g/km)	Petrol/Electric	40	93.21	88.30	22.00	22.00	71.21	66.30	323.68%	301.38%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**40**	**93.21**	**88.30**	**22.00**	**22.00**	**71.21**	**66.30**	**323.68%**	**301.38%**

Table 51: KIA SLOVAKIA

Year of first registration: 2021		Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (1.2% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1 391	8.01	7.93	6.69	6.63	1.32	1.30	19.72%	19.66%
	Diesel	308	6.11	6.08	5.30	5.27	0.81	0.81	15.23%	15.42%
	Petrol+Diesel	**1 699**	**7.66**	**7.47**	**6.44**	**6.29**	**1.23**	**1.18**	**19.05%**	**18.79%**
CO2 emissions (g/km)	Petrol	1 391	182.40	180.62	152.36	150.94	30.04	29.68	19.72%	19.66%
	Diesel	308	160.64	160.08	139.41	138.69	21.23	21.39	15.23%	15.42%
	Petrol+Diesel	**1 699**	**178.45**	**175.56**	**150.01**	**147.92**	**28.44**	**27.64**	**18.96%**	**18.68%**
OVC-HEVs (0.3% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	82	3.87	2.82	1.48	1.44	2.39	1.38	161.38%	95.43%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**82**	**3.87**	**2.82**	**1.48**	**1.44**	**2.39**	**1.38**	**161.38%**	**95.43%**
CO2 emissions (g/km)	Petrol/Electric	82	88.13	64.21	33.72	32.86	54.41	31.35	161.38%	95.43%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**82**	**88.13**	**64.21**	**33.72**	**32.86**	**54.41**	**31.35**	**161.38%**	**95.43%**

1.1. Manufacturers reporting < 1% of registered vehicles

Table 52: HYUNDAI CZECH

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (1.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1 592	7.22	7.09	6.26	6.23	0.95	0.86	15.23%	13.83%
	Diesel	141	5.64	5.55	4.84	4.77	0.80	0.78	16.42%	16.46%
	Petrol+Diesel	**1 733**	**7.09**	**6.88**	**6.15**	**6.03**	**0.94**	**0.85**	**15.30%**	**14.12%**
CO2 emissions (g/km)	Petrol	1 592	164.36	161.59	142.64	141.95	21.72	19.63	15.23%	13.83%
	Diesel	141	148.39	146.02	127.45	125.39	20.93	20.64	16.42%	16.46%
	Petrol+Diesel	**1 733**	**163.06**	**159.41**	**141.41**	**139.64**	**21.66**	**19.77**	**15.31%**	**14.16%**
OVC-HEVs (0.3% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	59	5.53	5.68	1.36	1.36	4.17	4.31	306.55%	317.06%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**59**	**5.53**	**5.68**	**1.36**	**1.36**	**4.17**	**4.31**	**306.55%**	**317.06%**
CO2 emissions (g/km)	Petrol/Electric	59	126.03	129.29	31.00	31.00	95.03	98.29	306.55%	317.06%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**59**	**126.03**	**129.29**	**31.00**	**31.00**	**95.03**	**98.29**	**306.55%**	**317.06%**

Table 53: KIA

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1 025	6.39	6.33	5.56	5.60	0.82	0.72	14.78%	12.93%
	Diesel	37	8.03	8.16	6.66	6.69	1.38	1.47	20.68%	22.00%
	Petrol+Diesel	**1 062**	**6.44**	**6.47**	**5.60**	**5.69**	**0.84**	**0.78**	**15.03%**	**13.76%**
CO2 emissions (g/km)	Petrol	1 025	145.50	144.17	126.76	127.66	18.74	16.51	14.78%	12.93%
	Diesel	37	211.38	214.62	175.16	175.91	36.22	38.70	20.68%	22.00%
	Petrol+Diesel	**1 062**	**147.80**	**149.66**	**128.45**	**131.42**	**19.35**	**18.24**	**15.06%**	**13.88%**
OVC-HEVs (0.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	75	5.00	3.12	1.59	1.49	3.42	1.63	215.53%	109.88%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**75**	**5.00**	**3.12**	**1.59**	**1.49**	**3.42**	**1.63**	**215.53%**	**109.88%**
CO2 emissions (g/km)	Petrol/Electric	75	114.01	71.10	36.13	33.87	77.88	37.22	215.53%	109.88%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**75**	**114.01**	**71.10**	**36.13**	**33.87**	**77.88**	**37.22**	**215.53%**	**109.88%**

Table 54: HYUNDAI ASSAN

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (0.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	527	6.09	6.02	5.28	5.28	0.81	0.74	15.25%	14.09%
	Diesel	0								
	Petrol+Diesel	**527**	**6.09**	**6.02**	**5.28**	**5.28**	**0.81**	**0.74**	**15.25%**	**14.09%**
CO2 emissions (g/km)	Petrol	527	138.69	137.10	120.34	120.17	18.35	16.93	15.25%	14.09%
	Diesel	0								
	Petrol+Diesel	**527**	**138.69**	**137.10**	**120.34**	**120.17**	**18.35**	**16.93**	**15.25%**	**14.09%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 55: HYUNDAI

Year of first registration: 2021		Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.4% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	258	6.36	5.90	5.77	5.61	0.59	0.29	10.28%	5.21%
	Diesel	48	7.31	6.73	6.38	6.52	0.92	0.22	14.45%	3.31%
	Petrol+Diesel	**306**	**6.51**	**6.11**	**5.87**	**5.84**	**0.64**	**0.27**	**10.99%**	**4.67%**
CO2 emissions (g/km)	Petrol	258	144.93	134.46	131.43	127.80	13.50	6.66	10.28%	5.21%
	Diesel	48	192.23	177.11	167.96	171.44	24.27	5.67	14.45%	3.31%
	Petrol+Diesel	**306**	**152.35**	**145.34**	**137.16**	**138.93**	**15.19**	**6.41**	**11.08%**	**4.61%**
OVC-HEVs (0.3% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	22	5.55	3.05	1.47	1.32	4.08	1.74	277.21%	132.21%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**22**	**5.55**	**3.05**	**1.47**	**1.32**	**4.08**	**1.74**	**277.21%**	**132.21%**
CO2 emissions (g/km)	Petrol/Electric	22	126.36	69.59	33.50	29.97	92.86	39.62	277.21%	132.21%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**22**	**126.36**	**69.59**	**33.50**	**29.97**	**92.86**	**39.62**	**277.21%**	**132.21%**

Table 56: SAIC MOTOR CORPORATION

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (0.0% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	0								
	Diesel	0								
	Petrol+Diesel	**0**								
CO2 emissions (g/km)	Petrol	0								
	Diesel	0								
	Petrol+Diesel	**0**								
OVC-HEVs (0.3% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	29	6.21	6.33	1.80	1.80	4.41	4.53	245.23%	251.91%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**29**	**6.21**	**6.33**	**1.80**	**1.80**	**4.41**	**4.53**	**245.23%**	**251.91%**
CO2 emissions (g/km)	Petrol/Electric	29	141.54	144.28	41.00	41.00	100.54	103.28	245.23%	251.91%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**29**	**141.54**	**144.28**	**41.00**	**41.00**	**100.54**	**103.28**	**245.23%**	**251.91%**

Table 57: TOYOTA MOTOR CORPORATION

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (0.2% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	52	5.37	5.26	4.80	4.76	0.57	0.50	11.91%	10.55%
	Diesel	0								
	Petrol+Diesel	**52**	**5.37**	**5.26**	**4.80**	**4.76**	**0.57**	**0.50**	**11.91%**	**10.55%**
CO2 emissions (g/km)	Petrol	52	122.26	119.87	109.25	108.43	13.01	11.44	11.91%	10.55%
	Diesel	0								
	Petrol+Diesel	**52**	**122.26**	**119.87**	**109.25**	**108.43**	**13.01**	**11.44**	**11.91%**	**10.55%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 58: SUBARU

Year of first registration: 2021		Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.1% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	10	9.50	9.23	8.18	8.22	1.32	1.01	16.15%	12.28%
	Diesel	0								
	Petrol+Diesel	**10**	**9.50**	**9.23**	**8.18**	**8.22**	**1.32**	**1.01**	**16.15%**	**12.28%**
CO2 emissions (g/km)	Petrol	10	216.50	210.19	186.40	187.20	30.10	22.98	16.15%	12.28%
	Diesel	0								
	Petrol+Diesel	**10**	**216.50**	**210.19**	**186.40**	**187.20**	**30.10**	**22.98**	**16.15%**	**12.28%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 59: MITSUBISHI MOTORS CORPORATION

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (0.0% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	0								
	Diesel	0								
	Petrol+Diesel	**0**								
CO2 emissions (g/km)	Petrol	0								
	Diesel	0								
	Petrol+Diesel	**0**								
OVC-HEVs (< 0.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	6	6.22	6.60	2.02	2.02	4.20	4.58	207.80%	226.63%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**6**	**6.22**	**6.60**	**2.02**	**2.02**	**4.20**	**4.58**	**207.80%**	**226.63%**
CO2 emissions (g/km)	Petrol/Electric	6	141.59	150.25	46.00	46.00	95.59	104.25	207.80%	226.63%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**6**	**141.59**	**150.25**	**46.00**	**46.00**	**95.59**	**104.25**	**207.80%**	**226.63%**

Table 60: MITSUBISHI MOTORS THAILAND

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (< 0.1% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	3	5.76	5.33	4.92	4.92	0.84	0.42	17.08%	8.45%
	Diesel	0								
	Petrol+Diesel	**3**	**5.76**	**5.33**	**4.92**	**4.92**	**0.84**	**0.42**	**17.08%**	**8.45%**
CO2 emissions (g/km)	Petrol	3	131.13	121.47	112.00	112.00	19.13	9.47	17.08%	8.45%
	Diesel	0								
	Petrol+Diesel	**3**	**131.13**	**121.47**	**112.00**	**112.00**	**19.13**	**9.47**	**17.08%**	**8.45%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

2. N1 VEHICLES

Given the limited representativeness of the dataset for vans, the manufacturer-specific information below is presented in alphabetical order.

Table 61: ALFA ROMEO

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (12.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1	10.41	10.41	8.65	8.65	1.76	1.76	20.40%	20.40%
	Diesel	45	7.37	7.23	5.57	5.54	1.80	1.70	32.32%	30.61%
	Petrol+Diesel	**46**	**7.43**	**7.31**	**5.63**	**5.62**	**1.80**	**1.70**	**31.92%**	**30.22%**
CO2 emissions (g/km)	Petrol	1	237.18	237.18	197.00	197.00	40.18	40.18	20.40%	20.40%
	Diesel	45	193.80	190.32	146.47	145.72	47.33	44.60	32.32%	30.61%
	Petrol+Diesel	**46**	**194.74**	**191.49**	**147.57**	**147.00**	**47.18**	**44.49**	**31.97%**	**30.27%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 62: AUTOMOBILES CITROEN

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (0.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	6	5.70	5.86	5.43	5.41	0.27	0.45	5.05%	8.36%
	Diesel	37	6.63	5.77	5.39	4.43	1.24	1.33	23.04%	30.03%
	Petrol+Diesel	**43**	**6.50**	**5.78**	**5.39**	**4.62**	**1.11**	**1.17**	**20.52%**	**25.23%**
CO2 emissions (g/km)	Petrol	6	129.91	133.44	123.67	123.15	6.24	10.29	5.05%	8.36%
	Diesel	37	174.42	151.72	141.76	116.68	32.67	35.03	23.04%	30.03%
	Petrol+Diesel	**43**	**168.21**	**148.26**	**139.23**	**117.91**	**28.98**	**30.35**	**20.81%**	**25.74%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 63: AUTOMOBILES PEUGEOT

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (< 0.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	0								
	Diesel	37	7.23	5.86	6.38	5.26	0.85	0.60	13.38%	11.42%
	Petrol+Diesel	**37**	**7.23**	**5.86**	**6.38**	**5.26**	**0.85**	**0.60**	**13.38%**	**11.42%**
CO2 emissions (g/km)	Petrol	0								
	Diesel	37	190.35	154.15	167.89	138.34	22.46	15.80	13.38%	11.42%
	Petrol+Diesel	**37**	**190.35**	**154.15**	**167.89**	**138.34**	**22.46**	**15.80**	**13.38%**	**11.42%**
OVC-HEVs (3.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1	6.48	6.48	1.36	1.36	5.11	5.11	375.84%	375.84%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1**	**6.48**	**6.48**	**1.36**	**1.36**	**5.11**	**5.11**	**375.84%**	**375.84%**
CO2 emissions (g/km)	Petrol/Electric	1	147.51	147.51	31.00	31.00	116.51	116.51	375.84%	375.84%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1**	**147.51**	**147.51**	**31.00**	**31.00**	**116.51**	**116.51**	**375.84%**	**375.84%**

Table 64: BMW AG

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (8.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1	8.30	8.30	6.50	6.50	1.81	1.81	27.81%	27.81%
	Diesel	1	6.96	6.96	6.04	6.04	0.92	0.92	15.18%	15.18%
	Petrol+Diesel	**2**	**7.63**	**7.25**	**6.27**	**6.14**	**1.36**	**1.11**	**21.72%**	**18.08%**
CO2 emissions (g/km)	Petrol	1	189.16	189.16	148.00	148.00	41.16	41.16	27.81%	27.81%
	Diesel	1	183.13	183.13	159.00	159.00	24.13	24.13	15.18%	15.18%
	Petrol+Diesel	**2**	**186.14**	**184.44**	**153.50**	**156.61**	**32.64**	**27.82**	**21.27%**	**17.77%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 65: CHRYSLER

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (9.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	5	8.29	8.05	6.59	6.59	1.69	1.46	25.68%	22.20%
	Diesel	188	9.91	9.28	8.46	8.12	1.45	1.16	17.08%	14.28%
	Petrol+Diesel	**193**	**9.86**	**9.26**	**8.41**	**8.09**	**1.45**	**1.16**	**17.25%**	**14.40%**
CO2 emissions (g/km)	Petrol	5	188.77	183.33	150.20	150.03	38.57	33.31	25.68%	22.20%
	Diesel	188	260.63	244.11	222.61	213.61	38.02	30.50	17.08%	14.28%
	Petrol+Diesel	**193**	**258.77**	**242.99**	**220.74**	**212.44**	**38.04**	**30.55**	**17.23%**	**14.38%**
OVC-HEVs (7.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	2	6.31	6.13	2.19	2.19	4.11	3.93	187.38%	179.13%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2**	**6.31**	**6.13**	**2.19**	**2.19**	**4.11**	**3.93**	**187.38%**	**179.13%**
CO2 emissions (g/km)	Petrol/Electric	2	143.69	139.56	50.00	50.00	93.69	89.56	187.38%	179.13%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**2**	**143.69**	**139.56**	**50.00**	**50.00**	**93.69**	**89.56**	**187.38%**	**179.13%**

Table 66: FIAT GROUP

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (0.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	320	6.55	6.45	5.81	5.79	0.74	0.66	12.80%	11.32%
	Diesel	308	8.05	7.54	7.00	6.49	1.05	1.05	14.98%	16.21%
	Petrol+Diesel	**628**	**7.28**	**6.77**	**6.39**	**6.00**	**0.89**	**0.77**	**13.97%**	**12.90%**
CO2 emissions (g/km)	Petrol	320	149.20	146.90	132.27	131.96	16.93	14.94	12.80%	11.32%
	Diesel	308	211.75	198.41	184.16	170.74	27.59	27.68	14.98%	16.21%
	Petrol+Diesel	**628**	**179.88**	**162.28**	**157.72**	**143.53**	**22.16**	**18.74**	**14.05%**	**13.06%**
OVC-HEVs (2.4% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	1	2.93	2.93	1.98	1.98	0.96	0.96	48.51%	48.51%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1**	**2.93**	**2.93**	**1.98**	**1.98**	**0.96**	**0.96**	**48.51%**	**48.51%**
CO2 emissions (g/km)	Petrol/Electric	1	66.83	66.83	45.00	45.00	21.83	21.83	48.51%	48.51%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**1**	**66.83**	**66.83**	**45.00**	**45.00**	**21.83**	**21.83**	**48.51%**	**48.51%**

Table 67: FORD WERKE GMBH

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.7% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	337	6.95	6.67	5.28	5.28	1.67	1.39	31.59%	26.29%
	Diesel	594	6.36	6.17	5.42	5.30	0.94	0.87	17.40%	16.33%
	Petrol+Diesel	**931**	**6.57**	**6.27**	**5.37**	**5.30**	**1.21**	**0.97**	**22.45%**	**18.25%**
CO2 emissions (g/km)	Petrol	337	158.27	152.03	120.28	120.39	38.00	31.64	31.59%	26.29%
	Diesel	594	167.33	162.31	142.53	139.53	24.80	22.78	17.40%	16.33%
	Petrol+Diesel	**931**	**164.05**	**160.32**	**134.48**	**135.82**	**29.58**	**24.50**	**21.99%**	**18.03%**
OVC-HEVs (3.6% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	32	5.18	5.19	1.34	1.36	3.84	3.83	287.69%	280.92%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**32**	**5.18**	**5.19**	**1.34**	**1.36**	**3.84**	**3.83**	**287.69%**	**280.92%**
CO2 emissions (g/km)	Petrol/Electric	32	118.00	118.16	30.44	31.02	87.57	87.14	287.69%	280.92%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**32**	**118.00**	**118.16**	**30.44**	**31.02**	**87.57**	**87.14**	**287.69%**	**280.92%**

Table 68: JAGUAR LAND ROVER LIMITED

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (60.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	2	18.37	18.17	12.97	12.49	5.40	5.68	41.64%	45.51%
	Diesel	1 689	8.88	8.70	7.55	7.50	1.33	1.20	17.66%	16.01%
	Petrol+Diesel	**1 691**	**8.89**	**8.71**	**7.55**	**7.50**	**1.34**	**1.20**	**17.71%**	**16.01%**
CO2 emissions (g/km)	Petrol	2	418.55	413.91	295.50	284.46	123.05	129.45	41.64%	45.51%
	Diesel	1 689	233.58	229.00	198.53	197.40	35.05	31.60	17.66%	16.01%
	Petrol+Diesel	**1 691**	**233.80**	**229.02**	**198.64**	**197.41**	**35.16**	**31.61**	**17.70%**	**16.01%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 69: KIA

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (1.5% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	8	6.00	6.01	5.00	5.00	1.00	1.01	19.98%	20.23%
	Diesel	1	7.78	7.78	5.55	5.55	2.23	2.23	40.19%	40.19%
	Petrol+Diesel	**9**	**6.20**	**6.38**	**5.06**	**5.11**	**1.14**	**1.26**	**22.44%**	**24.72%**
CO2 emissions (g/km)	Petrol	8	136.78	136.96	114.00	113.91	22.78	23.05	19.98%	20.23%
	Diesel	1	204.67	204.67	146.00	146.00	58.67	58.67	40.19%	40.19%
	Petrol+Diesel	**9**	**144.32**	**151.00**	**117.56**	**120.57**	**26.77**	**30.43**	**22.77%**	**25.24%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 70: MAN

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.3% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	0								
	Diesel	24	10.51	10.12	9.94	9.81	0.57	0.31	5.76%	3.14%
	Petrol+Diesel	**24**	**10.51**	**10.12**	**9.94**	**9.81**	**0.57**	**0.31**	**5.76%**	**3.14%**
CO2 emissions (g/km)	Petrol	0								
	Diesel	24	276.53	266.32	261.46	258.20	15.07	8.12	5.76%	3.14%
	Petrol+Diesel	**24**	**276.53**	**266.32**	**261.46**	**258.20**	**15.07**	**8.12**	**5.76%**	**3.14%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 71: MERCEDES-BENZ AG

Year of first registration: 2021		**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (0.1% of vehicles registered)									
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1	15.12	15.12	10.84	10.84	4.28	4.28	39.49%	39.49%
	Diesel	114	9.35	9.30	8.15	8.24	1.20	1.06	14.69%	12.81%
	Petrol+Diesel	**115**	**9.40**	**9.35**	**8.17**	**8.27**	**1.22**	**1.08**	**14.98%**	**13.10%**
CO2 emissions (g/km)	Petrol	1	344.54	344.54	247.00	247.00	97.54	97.54	39.49%	39.49%
	Diesel	114	245.91	244.68	214.41	216.90	31.50	27.78	14.69%	12.81%
	Petrol+Diesel	**115**	**246.77**	**245.53**	**214.70**	**217.15**	**32.07**	**28.37**	**14.94%**	**13.06%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 72: NISSAN AUTOMOTIVE EUROPE

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	32	8.57	8.31	6.28	6.25	2.30	2.06	36.57%	32.92%
	Diesel	0								
	Petrol+Diesel	**32**	**8.57**	**8.31**	**6.28**	**6.25**	**2.30**	**2.06**	**36.57%**	**32.92%**
CO2 emissions (g/km)	Petrol	32	195.26	189.34	142.97	142.44	52.29	46.90	36.57%	32.92%
	Diesel	0								
	Petrol+Diesel	**32**	**195.26**	**189.34**	**142.97**	**142.44**	**52.29**	**46.90**	**36.57%**	**32.92%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 73: OPEL AUTOMOBILE

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (< 0.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	4	8.02	7.90	6.51	6.16	1.51	1.74	23.22%	28.29%
	Diesel	6	5.34	5.15	4.83	4.62	0.52	0.53	10.73%	11.52%
	Petrol+Diesel	**10**	**6.41**	**6.24**	**5.50**	**5.23**	**0.92**	**1.01**	**16.64%**	**19.36%**
CO2 emissions (g/km)	Petrol	4	182.67	180.04	148.25	140.34	34.42	39.70	23.22%	28.29%
	Diesel	6	140.63	135.53	127.00	121.52	13.63	14.01	10.73%	11.52%
	Petrol+Diesel	**10**	**157.44**	**153.20**	**135.50**	**128.99**	**21.94**	**24.20**	**16.19%**	**18.76%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 74: PSA

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	89	8.31	7.83	6.98	6.91	1.33	0.93	19.05%	13.39%
	Diesel	30	5.62	5.27	4.96	4.68	0.66	0.59	13.37%	12.67%
	Petrol+Diesel	**119**	**7.63**	**7.13**	**6.47**	**6.29**	**1.16**	**0.83**	**17.95%**	**13.25%**
CO2 emissions (g/km)	Petrol	89	189.34	178.47	159.04	157.39	30.30	21.08	19.05%	13.39%
	Diesel	30	147.84	138.77	130.40	123.16	17.44	15.61	13.37%	12.67%
	Petrol+Diesel	**119**	**178.88**	**167.49**	**151.82**	**147.93**	**27.05**	**19.57**	**17.82%**	**13.23%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 75: RENAULT

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (< 0.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	3	6.94	5.67	5.38	5.29	1.56	0.38	28.88%	7.15%
	Diesel	13	5.95	5.59	5.23	5.07	0.71	0.52	13.67%	10.33%
	Petrol+Diesel	**16**	**6.13**	**5.62**	**5.26**	**5.14**	**0.87**	**0.48**	**16.59%**	**9.30%**
CO2 emissions (g/km)	Petrol	3	158.09	129.24	122.67	120.62	35.42	8.62	28.88%	7.15%
	Diesel	13	156.42	147.05	137.62	133.28	18.81	13.77	13.67%	10.33%
	Petrol+Diesel	**16**	**156.74**	**141.48**	**134.81**	**129.32**	**21.92**	**12.15**	**16.26%**	**9.40%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 76: SEAT

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (2.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	0								
	Diesel	4	6.03	6.18	5.21	5.34	0.83	0.84	15.87%	15.77%
	Petrol+Diesel	**4**	**6.03**	**6.18**	**5.21**	**5.34**	**0.83**	**0.84**	**15.87%**	**15.77%**
CO2 emissions (g/km)	Petrol	0								
	Diesel	4	158.74	162.50	137.00	140.36	21.74	22.14	15.87%	15.77%
	Petrol+Diesel	**4**	**158.74**	**162.50**	**137.00**	**140.36**	**21.74**	**22.14**	**15.87%**	**15.77%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 77: SUZUKI MOTOR CORPORATION

Year of first registration: 2021			**Real-world data**		**WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)**		**Gap**			
ICEV + NOVC-HEVs (1.2% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	110	7.19	7.17	7.59	7.59	-0.41	-0.42	-5.35%	-5.57%
	Diesel	0								
	Petrol+Diesel	**110**	**7.19**	**7.17**	**7.59**	**7.59**	**-0.41**	**-0.42**	**-5.35%**	**-5.57%**
CO2 emissions (g/km)	Petrol	110	163.74	163.36	173.00	173.00	-9.26	-9.64	-5.35%	-5.57%
	Diesel	0								
	Petrol+Diesel	**110**	**163.74**	**163.36**	**173.00**	**173.00**	**-9.26**	**-9.64**	**-5.35%**	**-5.57%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 78: TOYOTA

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (0.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	1	5.09	5.09	4.52	4.52	0.57	0.57	12.65%	12.65%
	Diesel	41	10.50	10.43	9.40	9.42	1.11	1.01	11.81%	10.70%
	Petrol+Diesel	**42**	**10.38**	**10.42**	**9.28**	**9.41**	**1.10**	**1.01**	**11.82%**	**10.70%**
CO2 emissions (g/km)	Petrol	1	116.03	116.03	103.00	103.00	13.03	13.03	12.65%	12.65%
	Diesel	41	276.38	274.48	247.20	247.95	29.19	26.53	11.81%	10.70%
	Petrol+Diesel	**42**	**272.57**	**273.98**	**243.76**	**247.49**	**28.80**	**26.49**	**11.82%**	**10.70%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 79: VOLKSWAGEN

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (2.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	37	8.07	7.83	6.43	6.31	1.64	1.52	25.43%	24.18%
	Diesel	2 450	7.42	6.95	6.42	6.20	1.00	0.75	15.61%	12.16%
	Petrol+Diesel	**2 487**	**7.43**	**6.96**	**6.42**	**6.20**	**1.01**	**0.76**	**15.76%**	**12.26%**
CO2 emissions (g/km)	Petrol	37	183.80	178.38	146.54	143.65	37.26	34.73	25.43%	24.18%
	Diesel	2 450	195.14	182.84	168.79	163.01	26.35	19.82	15.61%	12.16%
	Petrol+Diesel	**2 487**	**194.97**	**182.80**	**168.46**	**162.86**	**26.51**	**19.94**	**15.74%**	**12.24%**
OVC-HEVs (0.0% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								
CO2 emissions (g/km)	Petrol/Electric	0								
	Diesel/Electric	0								
	Petrol+Diesel Electric	**0**								

Table 80: VOLVO

Year of first registration: 2021			Real-world data		WLTP Monitoring data (Art.7 of Reg (EU) 2019/631)		Gap			
ICEV + NOVC-HEVs (5.1% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol	31	8.98	8.51	7.24	7.24	1.75	1.27	24.14%	17.59%
	Diesel	11	6.70	6.87	6.26	6.39	0.44	0.49	7.00%	7.61%
	Petrol+Diesel	**42**	**8.38**	**7.72**	**6.98**	**6.83**	**1.40**	**0.89**	**20.12%**	**13.05%**
CO2 emissions (g/km)	Petrol	31	204.63	193.97	164.84	164.95	39.80	29.02	24.14%	17.59%
	Diesel	11	176.17	180.84	164.64	168.05	11.53	12.79	7.00%	7.61%
	Petrol+Diesel	**42**	**197.18**	**187.58**	**164.79**	**166.46**	**32.39**	**21.12**	**19.66%**	**12.69%**
OVC-HEVs (17.9% of vehicles registered)										
		# of vehicles	Average				Absolute		%	
			Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted	Arithmetic	km-weighted
Fuel consumption (l/100km)	Petrol/Electric	50	5.84	5.97	2.11	2.10	3.73	3.87	176.34%	184.73%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**50**	**5.84**	**5.97**	**2.11**	**2.10**	**3.73**	**3.87**	**176.34%**	**184.73%**
CO2 emissions (g/km)	Petrol/Electric	50	133.03	135.97	48.14	47.76	84.89	88.22	176.34%	184.73%
	Diesel/Electric	0								
	Petrol+Diesel Electric	**50**	**133.03**	**135.97**	**48.14**	**47.76**	**84.89**	**88.22**	**176.34%**	**184.73%**