LeasePlan's 2020 green bond impact assessment report

Final report

April 2021

Who we are

The Carbon Trust's mission is to accelerate the move to a sustainable, low carbon economy. It is a world leading expert on carbon reduction and clean technology. As a not-for-dividend group, it advises governments and leading companies around the world, reinvesting profits into its low carbon mission.

LeasePlan is one of the world's leading vehicle leasing companies, with over 55 years' experience and 1.9 million vehicles under management in over 30 countries. Across these countries, LeasePlan purchases, funds and manages vehicles for its customers, providing a complete end-to-end service through two core businesses, its 'Car as a Service' business and CarNext.com, a fast-growing digital pan-European marketplace for high-quality used cars.

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Abbreviations

BEV(s)	Battery electric vehicle(s). Only BEVs are included within the scope of LeasePlan's Green Finance Framework.
CO_2(e)	Carbon dioxide (equivalent).
CT	Carbon Trust.
EU	European Union.
EV(s)	Electric vehicle(s). EVs include BEVs and Plug-in Hybrids (PHEVs).
kg or tCO_2(e)	Kilogram or tonne of CO_2 (equivalent).
HEV(s)	Hybrid Electric Vehicle(s).
ICE	Internal Combustion Engine.
LCV(s)	Light Commercial Vehicle(s).
LP	LeasePlan.
OEM	Original Equipment Manufacturer.
PHEV(s)	Plug-in hybrid electric vehicle(s).
SDGs	Sustainable Development Goals.
TEG	Technical Expert Group.
UN	United Nations.

Executive summary

Context

LeasePlan (LP), a global fleet management company, has established a Green Finance Framework (Framework)[1] dated March 2020, under which it can issue Green Bonds to finance and/or refinance 'Eligible Projects' within the 'Eligible Category' of Clean Transportation[2]. Eligible Projects are defined as eligible vehicles meaning battery electric vehicles (BEVs). The issuance of Green Bonds is aligned with LP's ambition to achieve net-zero carbon emissions from its total funded fleet by 2030, as outlined in the LP Sustainability Strategy. In accordance with the Framework, LeasePlan has committed to report, based on the availability of suitable data, on metrics regarding the Eligible Projects' environmental impact. LP commissioned the Carbon Trust (CT) to produce the environmental impact metrics calculation. CT has provided technical advisory support to:

1. Develop a methodology to calculate the estimated avoided emissions originated from LP's BEV funded fleet, considering both Direct and Indirect emissions; and

2. Understand the average carbon intensity of LP's passenger car funded fleet.

Definitions: fleets, avoided emissions, baseline, and carbon intensity

Throughout the report, three *fleets* within LP's funded fleet are distinguished:

- *Total funded fleet:* refers to all powertrains (e.g. internal combustion engine vehicles (ICE), electric vehicles (EVs), hybrid electric vehicles (HEVs), etc.) and vehicle types (e.g. passenger cars, light commercial vehicles (LCVs), trucks, etc.) in LP's funded fleet;

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[1] LeasePlan's Green Finance Framework.

[2] The LeasePlan Green Finance Framework is structured in alignment with the ICMA Green Bond Principles as well as the LMA "Green Loan Principles".

- *BEV funded fleet:* refers to BEVs only in LP's total funded fleet. If not specified, it refers to all vehicle types within the BEV powertrain (e.g. passenger cars and LCVs); and

- *Passenger car funded fleet:* refers to passenger cars only in LP's total funded fleet. If not specified, it refers to all powertrains (e.g. ICE, EVs, HEVs, etc.).

Avoided emissions refer to the incremental difference in emissions that internal combustion engine or ICE vehicles (e.g. petrol, diesel, etc.) would have generated when driving a given distance (i.e. "the baseline" see definition below), compared with the carbon emissions associated with generating electricity to charge BEVs to drive the same given distance. Figure 1 below illustrates this concept.

Avoided emissions refer to the difference between Direct or "tailpipe" emissions of ICE vehicles and the Indirect emissions from generating electricity to charge BEVs. These are defined as follows:

- *Direct emissions:* Direct emissions occur from ICE vehicles during the combustion of fuel, often referred to as "tailpipe" emissions. BEVs have zero tailpipe emissions.

- *Indirect emissions:* Indirect emissions originate from the production of electricity required to charge BEVs.

Both Direct and Indirect emissions originate from the use phase of the vehicle and do not include upstream (e.g. well-to-wheel emissions, battery manufacturing, etc.) or downstream (e.g. end of life treatment) emissions.

The *baseline* can be considered as a hypothetical scenario in which BEVs in the LP total funded fleet[3] were replaced with ICE vehicles. In other words, the baseline refers to what would have happened if LP had not, in recent years, increased the share of BEVs in its total funded fleet and had leased ICE vehicles in their place. The baseline represents the emissions that would have occurred if the current budgeted mileage of BEVs was driven by ICE vehicles instead, using an emission factor derived from the carbon intensity of ICE vehicles in LP's total funded fleet.

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[3] In this report, only the carbon intensity of LP passenger cars funded fleet (rather than the total funded fleet) was considered. Please see section 2.4 below for more information.
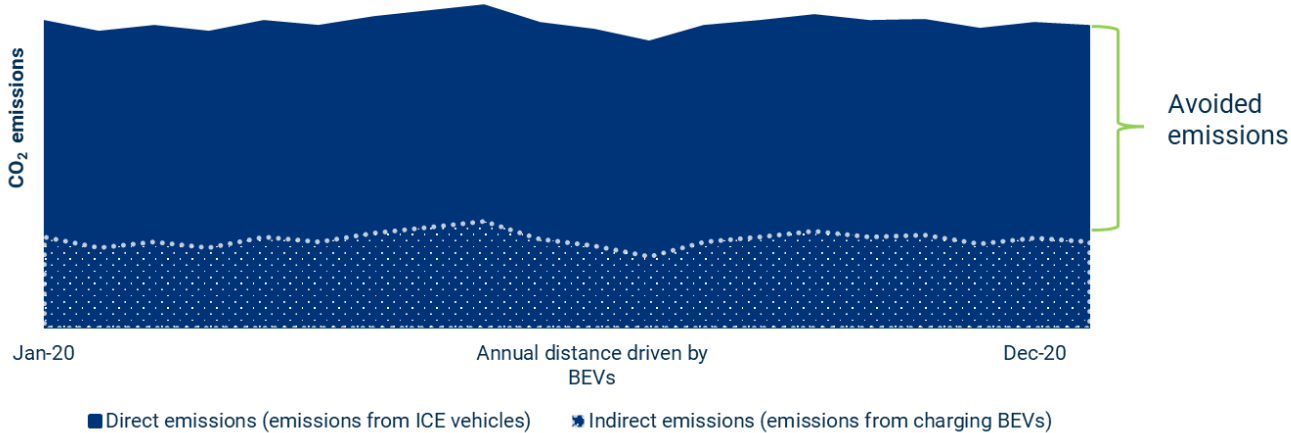
Avoided emissions

Figure 1. Visual representation of avoided emissions, or Direct emissions minus Indirect emissions (demonstration purposes only).

Carbon intensity refers to the weighted average of the emission factors of LP's passenger car funded fleet[4] (including BEVs) based on the number of passenger cars in each country, and is measured in carbon emissions per kilometre travelled (gCO_2/km).

Avoided emissions calculation

The diagram above provides an insight into how avoided emissions were calculated. The full report provides extensive detail on the methodology used in the calculations. The estimated annual carbon

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[4] In this report, only the carbon intensity of LP passenger cars funded fleet (rather than the total funded fleet) was considered. Please see section 3.4 below for more information.

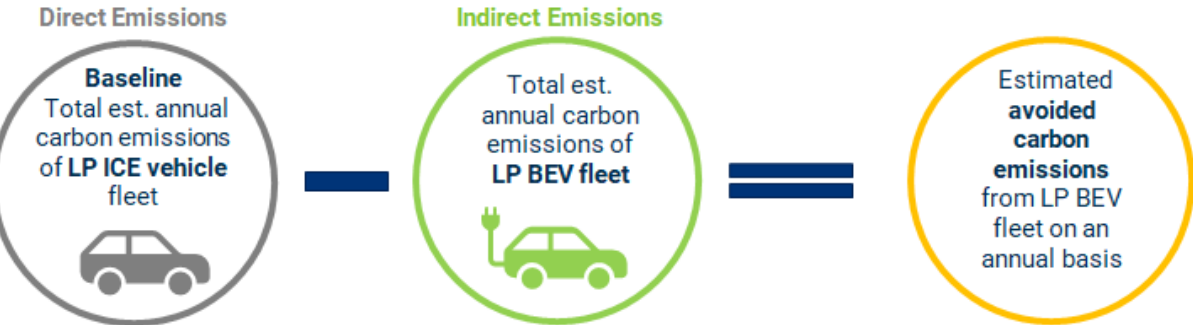emissions resulting from LP's BEV funded fleet were calculated using both the EU average emissions factor for charging BEVs and the relevant country emission factor for charging BEVs[5].

Results

The estimated annual avoided emissions from LP's BEV funded fleet and average carbon intensity of LP's passenger car funded fleet was calculated for the period January 2020 – December 2020. The analysis considered all vehicles in LP's total funded fleet as of December 2020. See below a summary of all results, split by emission factor source, which are further discussed in the full report.

Table 1. Avoided emissions from BEVs in LP's Eligible Project Portfolio.

Description	Units	Result – EU grid emission factor	Result – country grid emission factor
Total distance travelled by LP BEV funded fleet	Million km/year	1,290	1,290
Direct emissions ("baseline" emissions from the equivalent miles being driven by ICE vehicles in LP's fleet)	tCO_2e	159,883	159,883
Indirect emissions (from electricity used to charge LP BEV funded fleet)	tCO_2e	(-) 79,847[6]	(-) 84,573[7]
Estimated avoided emissions from LP BEV fleet (annual)	**tCO_2e**	**80,037**	**75,311**

[5] Using electricity grid emission factors from the International Energy Agency (2020).

[6] Please note that charging BEVs does generate emissions and that this is being presented as a negative for demonstration purposes only – to show that Indirect emissions are being subtracted from Direct emissions to calculate avoided emissions.

[7] See footnote 6.

Carbon intensity

A weighted average of LP's passenger car funded fleet emission factors by country was provided by LP. This was evaluated against the weighted average[8] of each country's average emission factor for newly sold passenger cars in 2019 sourced from publicly available databases (2019 was chosen based on data availability). Both carbon intensity figures included zero-carbon emitting vehicles (e.g. BEVs) as a way to illustrate how LP compares against a 'best-in-class' scenario (i.e., the European market of newly sold cars) with regards to mobility decarbonisation trends.

Across all countries, the average carbon intensity of LP's passenger car funded fleet was 8.73 gCO_2e/km lower than the EU country averages sourced. This suggest that, if LP's passenger car funded fleet was representative of one country, it would be less carbon intensive than the European market average of newly sold cars (adjusted to reflect LP's fleet composition and presence in individual countries).

At a country level, LP's emission factors were lower in 17 out of the 21 countries analysed, while the EU country average was lower in four countries. See section 3.2 for more information.

Comparison with previous assessment

The following chart shows a comparison of this year's results (for the period from January 2020 to December 2020) against the results from the previous assessment (for the period from January 2019 to December 2019), displaying a significant increase in avoided emissions. This is mostly due to a large increase in LP's funded BEV fleet size, resulting in higher absolute avoided emissions, and decarbonisations of EU and UK grids, resulting in lower emissions from charging BEVs. More detailed comparisons from last year are available in section 3.3 and in the appendix.

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[8] Note that the previous assessment compared LP's passenger car funded fleet emission factors against a simple average of all countries' newly sold passenger cars emission factors, while this year this is done with a weighted average based on the number of LP leased vehicles in each country. This enables an equal comparison of the overall carbon intensity of LP.
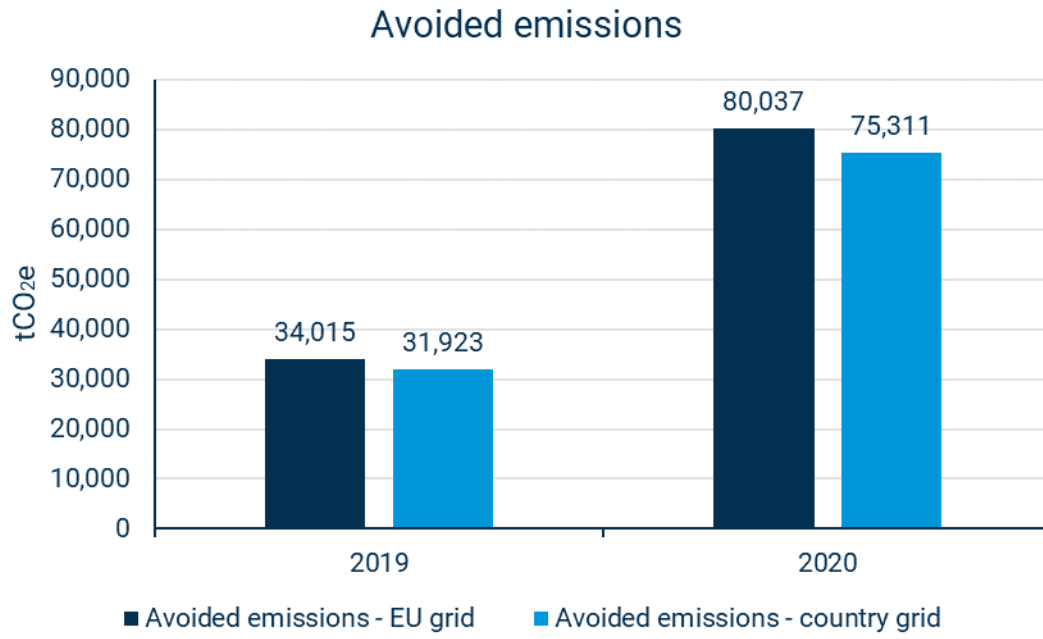
Figure 2. Avoided emissions estimated for the years 2020 (current assessment) and 2019 (previous assessment).

1. Introduction

1.1 From LeasePlan[9]

As one of the world's leading 'Car as a Service' (CaaS) companies LeasePlan has committed to taking a leadership role in the transition from internal combustion engine (ICE) vehicles to alternative powertrains such as battery electric vehicles (BEVs). LeasePlan has set the ambitious goal of working towards net zero emissions from the funded fleet by 2030, supporting the effective implementation of the Paris Agreement and climate-related United Nations (UN) Sustainable Development Goals (SDGs).

The company's aim is to help create healthier environments in towns and cities by promoting cleaner, low-emission vehicles and the infrastructure required to make these cars a viable option for customers.

Sustainability is therefore at the heart of LeasePlan's business and is viewed as a vital enabler of the overall strategy towards all stakeholder groups. In 2017, the company developed a sustainability strategy with three key focus areas: shaping the future of low-emission mobility; strengthening their contribution to societal wellbeing; and reducing their own environmental impact.

Sustainability is also of growing importance in the CaaS industry as customers look to access cleaner, low-emission vehicles. Through its innovative 'full package electric vehicle (EV) solution', which includes both home and office charging solutions, as well as educational initiatives, LeasePlan is aiding its customers to make the switch to EVs. As a result, LeasePlan is enabling a positive environmental impact via the avoidance of carbon dioxide emissions by encouraging increased uptake of EVs by its customers.

LeasePlan is committed to using its scale, expertise and broad geographic presence to be at the heart of the discussion on the transition to low-emission mobility. LeasePlan's global advocacy programmes and initiatives include the EV100, World Economic Forum (WEF), World Business Council for Sustainable Development and WEF's Global Battery Alliance. In 2021, LeasePlan will solidify its commitment to the achievement of the SDGs by becoming a signatory of the UN Global Compact.

In line with its ambition of providing low-carbon mobility solutions, LeasePlan established its Green Finance Framework under which it can issue Green Bonds to finance and/or refinance assets within the 'Eligible Category' of Clean Transportation. Under the Framework, LeasePlan committed to reporting

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[9] Please note – this introduction was authored by LeasePlan and was included for context purposes. The Carbon Trust did not write this part of the report.

the weighted average fleet carbon intensity and the estimated CO_2 emissions avoided as a result of increasing the proportion of BEVs in the funded fleet.

1.2   From Carbon Trust

To underpin and achieve the aims of its sustainability strategy, LP has established a Green Finance Framework[10] (Framework) under which LP can issue green bonds to finance and/or refinance a portfolio (Eligible Project Portfolio) of Eligible Projects (defined as eligible vehicles meaning battery electric vehicles, or BEVs) that contribute to the development of clean transportation and the transition to a low-carbon future (LeasePlan, 2020)[11].

As at December 2020, LeasePlan has EUR 1billion in Green Bonds outstanding[12]. Under its Framework, LP has committed to reporting on:

1. The estimated CO_2e emissions avoided as a result of increasing the proportion of BEVs in LP's total funded fleet; and

2. The carbon intensity of LP's passenger car funded fleet measured after increasing the proportion of BEVs[13].

This report therefore outlines the methodology used to 1) estimate the annual avoided emissions of the BEVs included in the Eligible Project Portfolio that substituted ICE and other types of carbon-emitting vehicles, and 2) showcase the carbon intensity of LP's passenger car funded fleet after increasing the proportion of BEVs.

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[10] Which supersedes its Green Bond Framework (2019).

[11] LeasePlan's Green Finance Framework.

[12] EUR 500 million issued in February 2019 and EUR 500 million issued in April 2020.

[13] Based on vehicle manufacturer's data concerning engine carbon emissions per kilometre travelled.

2. Methodology

This methodology explains how 1) the estimated annual avoided emissions originating from LP's Eligible Project Portfolio were calculated; and 2) the carbon intensity of LP's passenger car funded fleet was measured.

Definition - avoided emissions: avoided emissions refer to the incremental difference in emissions that internal combustion engine or ICE vehicles (e.g. petrol, diesel, etc.) would have generated when driving a given distance (i.e. "the baseline" or Direct emissions – see section 2.2 below for full definition), compared with the carbon emissions associated with generating electricity to charge BEVs to drive the same given distance (Indirect emissions). In other words, the estimated annual emissions avoided as a result of driving a fully electrical vehicle instead of a vehicle with an internal combustion engine (ICE) over a given distance.

Definition - carbon intensity: the weighted average of the emission factors of LP's passenger car funded fleet[14] (including BEVs) based on the number of vehicles in each country, measured in carbon emissions per kilometre travelled (gCO_2e/km).

The report presents and discusses the results of the annual avoided emissions calculation for the Eligible Project Portfolio and of LP's passenger car funded fleet carbon intensity for the period January 2020 to December 2020.

2.1 Scope

2.1.1 Carbon emissions assessed

As more BEVs are sold and circulate on the road, they replace conventional petrol and diesel cars, therefore reducing CO_2e emissions that would have otherwise been emitted following the combustion of these fuels. BEVs do not produce any Direct ("tailpipe") emissions but they cause Indirect emissions through the charging of their batteries.

In calculating the avoided emissions of the eligible vehicles, this study has considered two types of emissions, categorized as follows:

- *Direct emissions, or ICE emissions:* Tailpipe CO_2e emissions from fossil fuel combustion when driving ICE vehicles; and

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[14] In this report, only the carbon intensity of LP passenger car funded fleet (rather than the total funded fleet) was considered. Please see section 2.4 below for more information.

- *Indirect emissions, or BEVs emissions:* CO_2e emissions from generating electricity used to charge BEVs.

To standardise the emission comparison between Direct and Indirect emissions (between emissions originating from ICE vehicles when driving and BEVs when charging), an emission factor (expressed in gCO_2e/km driven) for both vehicle categories was developed (see section 2.3.3 and 2.3.4 below). These ratios are subsequently used in CT's impact assessment model to calculate the CO_2e emissions avoided as a result of LP replacing ICE vehicles with BEVs.

Both Direct and Indirect emissions originate from the use phase of the vehicle and do not include upstream (e.g. well-to-wheel emissions, battery manufacturing, etc.) or downstream (e.g. end of life treatment) emissions.

2.1.2   Eligible Projects (BEVs)

Eligible Projects are BEVs[15], classified as eligible projects by the Climate Bonds Initiative's Land Transport Criteria[16] and in accordance with the ICMA Green Bond Principles, and LMA Green Loans Principles[17]. The criteria used to select eligible projects for LeasePlan comply with the recommendations of the Technical Expert Group (TEG)[18] on the EU Taxonomy, which establishes a system to classify environmentally sustainable activities by setting out metrics and thresholds. In accordance with the final EU Taxonomy, electric powertrain passenger vehicles are considered fully eligible for green finance purposes. The Eligible Project Portfolio refers to the total number of Eligible Projects, or BEVs, that can be financed or re-financed by LP's green bonds. See section 2.3.1 for more information.

2.1.3   Time period

The avoided emissions are calculated for an annual period[19]. All the data provided by LP for this current reporting cycle is as at December 2020. Given the ongoing flow of acquisition and turnover of LP's total

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[15] For the avoidance of doubt, vehicles with the following powertrains are excluded: ICE, Hybrid electric including PHEV, Liquefied Petroleum Gas (LPG), Compressed Natural Gas (CNG), Ethanol, Biofuels. Only battery electric vehicles are included.

[16] Climate Bonds Initiative.

[17] LeasePlan's Green Finance Framework.

[18] EU Taxonomy.

[19] LeasePlan will report annually, throughout the life of its green bonds.

funded fleet composition, this period was considered to be an accurate representation for the whole year of 2020.

The timeframe provides a boundary for which eligible vehicles are included in the analysis, which also guides the following boundary decisions:

- The analysis considers all BEVs circulating on the road at the end of 2020;

- The analysis considers the estimated annual avoided emissions of a given BEV vehicle, regardless of when it was included in LP's total funded fleet during 2020 and of how much of its annual budgeted mileage the BEV has driven; and

- The reporting period is from January 2020 to December 2020.

More detail, discussion and rationale for all the inputs used in the analysis can be found in the inputs section (section 2.3).

2.1.4   Geography

The impact calculation considers only European countries[20] in which BEVs represent a proportion of LP's total funded fleet equal or greater than 0.1%. This includes the following 21 countries: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the UK.

2.2   Baseline to calculate the avoided emissions

The baseline can be considered as a hypothetical scenario in which BEVs in the LP total funded fleet (Eligible Project Portfolio) were replaced with ICE vehicles. In other words, the baseline refers to what would have happened if LP had not, in recent years, increased the share of BEVs in its total funded fleet and had leased ICE vehicles in their place. It calculates the emissions that would have occurred if the current budgeted mileage of BEVs was driven by ICE vehicles instead, using an emission factor derived from the carbon intensity of ICE vehicles in LP's total funded fleet.

One main baseline was developed to calculate the avoided emissions originating from increasing the proportion of EVs in LP's total funded fleet (a baseline was not needed for the carbon intensity output – see section 2.4):

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[20] Where the greatest proportion of LeasePlan's BEV funded fleet is operational.

- *Baseline – LeasePlan total funded fleet:* Calculating the Direct Emissions based on the composition of all ICE vehicles in LP's total funded fleet and the distance driven by LP's Eligible Project Portfolio in 2020.

Table 2 summarises the input data used in the baseline. The 'Inputs' section that follows gives further details on the datasets used in the calculations.

Table 2. Summary of input data for the baseline considered.

Baseline	Number of ICE vehicles	Distance driven	ICE emission factor
LeasePlan total funded fleet	LP's Eligible Project Portfolio	Based on LP's Eligible Project Portfolio	Based on LP total funded fleet (excluding BEVs)

2.3   Inputs to calculate the avoided emissions

The inputs required to calculate the avoided emissions include the:

- Number of BEVs in the Eligible Project Portfolio;

- Distance travelled by BEVs;

- Emission factor of ICE vehicles; and

- Emission factor related to charging BEVs.

Table 3 summarises the main inputs of the model and Table 4 provides an example for one of the countries analysed. The subsequent sections provide further information on each individual input.

Table 3. Summary of inputs used to calculate avoided emissions.

Input	Unit	Description	Source	Section
Number of BEVs in the Eligible Project Portfolio	#	Number of BEVs included in the Eligible Project Portfolio	Provided by LP	2.3.1
Distance driven in 2020	km/year	Budgeted and expected annual mileage driven for each leased BEV	Provided by LP	2.3.2
Emission factor of ICE vehicles	$(k)gCO_2e/km$	Weighted average of LP ICE vehicles' emission factors	Provided by LP	2.3.3
Emission factor of BEVs – EU average	$(k)gCO_2e/km$	Emission factor for charging BEVs based on an EU average grid emission factor	Carbon Trust analysis based on BEIS and DEFRA (2020) and IEA (2020) data	2.3.4
Emission factor of BEVs – country specific	$(k)gCO_2e/km$	Emission factor for charging BEVs based on country-specific grid emission factors	Carbon Trust analysis based on BEIS and DEFRA (2020) and IEA (2020) data	2.3.4

Table 4. Example of inputs used for one selected country.

Number of BEVs in the Eligible Project Portfolio	BEV cars	544	#
	BEV LCVs	31	#
Distance	Average annual budgeted mileage (LP)	22,720	Km
ICE emission factor	ICE vehicle emission factor (LP country avg)	0.128	kgCO$_2$e/km
Electricity	Grid emission factor (example country)	0.1437	kgCO$_2$e/kWh
	Grid emission factor (EU avg)	0.2433	kgCO$_2$e/kWh
BEV emission factor	BEV car emission factor (example country specific grid)	0.0363	kgCO$_2$e/km
	BEV LCV emission factor (example country specific grid)	0.0382	kgCO$_2$e/km
	BEV car emission factor (EU avg grid)	0.0615	kgCO$_2$e/km
	BEV LCV emission factor (EU avg grid)	0.0647	kgCO$_2$e/km

2.3.1   Number of BEVs in the Eligible Project Portfolio

'Number of BEVs' refers to the quantity of battery electrical vehicles included in the LP's Eligible Project Portfolio as of December 2020. This only includes vehicles that were already circulating on the road at the end of 2020.

Within the Eligible Project Portfolio, LP leases different types of vehicles, primarily: passenger cars, LCVs, and micro-mobility vehicles[21]. Despite the majority of BEVs being passenger cars, different emission factors were used to calculate the emissions related to charging a passenger car and an LCV (see section 2.3.4). It is important to make this distinction for two reasons:

1. The efficiency of passenger cars is higher than LCVs, therefore a car would normally drive further per every unit of electricity used for charging compared to an LCV; and

2. LP projects the share of LCVs to increase in the next few years in line with the overall fleet mix percentage[22], making this distinction necessary for future reporting purposes.

2.3.2   Distance driven

The distance driven considered each country's average budgeted annual mileage for BEVs included in the Eligible Project Portfolio during the reference period considered (2020). It should be noted that budgeted mileage could be different from the mileage ultimately driven by vehicles once contracts are signed, however it represents a reasonable estimate.

2.3.3   Emission factors for Direct emissions (ICE vehicles)

To calculate the Direct emissions originating from ICE vehicles, the impact assessment model used an emission factor expressed in kgCO$_2$e per kilometre driven (kgCO$_2$e/km). The ICE emission factor for every country was provided by LP and it represents a weighted average of all vehicles generating Direct emissions (therefore excluding BEVs included in the Eligible Project Portfolio) in each country's respective fleet as of December 2020. The ICE emission factor includes all vehicle types in LP's total funded fleet, including passenger cars, vans, LCVs, and others.

2.3.4   Emission factors for Indirect emissions (BEVs)

To calculate the Indirect emissions originating from charging BEVs, an emission factor expressed in kgCO$_2$e per kilometre driven was used. The UK's emission factor for an average sized fully electric passenger car and LCV were sourced from BEIS and DEFRA (2020). Subsequently, an EU average and each country's grid emission factor for electricity were sourced from IEA (2020). Through a

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[21] Despite having a significant share in France and Italy, a separate emission factor for micro-mobility vehicles was not calculated; instead, they were grouped under, and were considered to have, the same emission factor as passenger cars. This is because, over time, the share of micro-mobility vehicles will become insignificant as the number of BEVs (passenger cars) are expected to grow materially.

[22] Funded fleet mix as at December 2020: 76% passenger vehicles, 23% LCVs, and 1% others.

proportionality calculation, the electricity emission factors were used to obtain the charging emission factors for both BEV passenger cars and LCVs for all countries in the study.

An EU average grid emission factor for electricity generation was used because:

1. Europe's electricity network is interconnected and therefore allows for frequent energy trading within countries; and

2. As a result of 1), it is not technically feasible for the electricity generated in a country to be fully and solely used within that same country throughout one given year.

The formula below illustrates the calculation performed for both BEVs and LCVs and Table 5 illustrates an example for one of the countries.

$$EF_{BEV}^{x} = \frac{\left(EF_{grid}^{x} \times EF_{BEV}^{UK}\right)}{EF_{grid}^{UK}} \qquad (1)$$

Where:

- EF_{BEV}^{x}, is the BEV emission factor of country x;

- EF_{grid}^{x}, is the grid emission factor of country x (this was substituted with the EU average grid emission factor);

- EF_{BEV}^{UK}, is the UK's BEV emission factor; and

- EF_{grid}^{UK}, is the UK's grid emission factor.

Table 5. Example of calculation process for a select country's BEV passenger car emission factor.

UK grid emission factor	kgCO$_2$e/kWh	0.2086
UK BEV charging emission factor	kgCO$_2$e/km	0.0527
Country x's grid emission factor	kgCO$_2$e/kWh	0.1437
Country x's BEV charging emission factor	kgCO$_2$e/km	0.0363

2.4   Inputs for carbon intensity calculation

Carbon intensity refers to the weighted average of the emission factors of LP's passenger car funded fleet (including BEVs) based on the number of vehicles in each country. To measure the carbon intensity

of LP's passenger car funded fleet it was not necessary to develop a baseline. Rather than a calculation, a comparison analysis was performed between the carbon intensity of LP's passenger car funded fleet versus each country's average emissions factor of newly sold passenger cars in 2019[23] sourced from publicly available databases (namely EEA, 2019; and SFOE[24], 2019).

Both measurements included zero-carbon vehicles, which have no Direct ("tailpipe") emissions. This comparison was included to:

1. Assess the impact of BEVs in the Eligible Project Portfolio on the overall carbon density of LP's passenger car funded fleet versus the carbon density of each country's newly sold passenger cars; and

2. Assess LP's passenger car funded fleet against a 'best-in-class' scenario (or the market of newly sold cars in Europe, adjusted to reflect LP's fleet composition and presence in individual countries).

Only Direct (tailpipe) emissions of passenger cars were considered because:

1. The emission factor of a given vehicle as per its manufacturer's data refers to Direct emissions from fuel combustion when driving; and

2. The emission data sourced at the EU level was for passenger cars only and therefore to ensure a fair comparison other vehicle types present in LP's total funded fleet (e.g. trucks, LCVs, vans, etc.) were excluded.

2.5   Outputs

2.5.1   Total distance driven

To calculate the total distance travelled by LP's eligible vehicles, the total number of BEVs in each country was multiplied by the average distance driven in said country. Subsequently, each of the respective 21 country's distance travelled was summed to obtain the cumulative distance travelled, as per the below two formulas:

$$D_{tot}^{x} = D_{avg}^{x} \times BEV_{n}^{x} \qquad\qquad (2)$$

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[23] Based on data availability.

[24] Swiss Federal Office for Energy.

$$\sum_{i=1}^{21} D_i = D_{tot}^1 + D_{tot}^2 + \cdots + D_{tot}^{21} \qquad (3)$$

Where,

- D_{tot}^x , is the total distance driven in country x;

- D_{avg}^x , is the average distance travelled in country x; and

- BEV_n^x , is the number of BEVs in country x.

2.5.2 Total Direct emissions (the baseline – equivalent emissions from ICE vehicles)

To obtain the total Direct emissions (emissions from ICE vehicles) that ICE vehicles would have generated by driving the considered total distance, each country's average ICE emission factor was multiplied by the total distance travelled in said country. Subsequently, each of the respective 21 country's emissions from ICE vehicles were summed to obtain the cumulative Direct emissions, as per the below two formulas:

$$E_{tot\,(ICE)}^x = D_{tot}^x \times EF_{ICE}^x \qquad (4)$$

$$\sum_{i=1}^{21} E(ICE)_i = E_{tot\,(ICE)}^1 + E_{tot\,(ICE)}^2 + \cdots + E_{tot\,(ICE)}^{21} \qquad (5)$$

Where,

- $E_{tot\,(ICE)}^x$, are the total Direct emissions in country x;

- D_{tot}^x , is the total distance driven in country x;

- EF_{ICE}^x , is the ICE emission factor in country x; and

- $E(ICE)$, are the cumulative Direct emissions (emissions from ICE vehicles) from all countries.

2.5.3 Total Indirect emissions (emissions from BEVs)

While the same emission factor was used for all ICE vehicles, two distinct emission factors were used to calculate the Indirect emissions related to charging BEVs: one for electric passenger cars and one for electric LCVs. As such, an additional step was included to calculate the total emissions originating from charging BEVs. The total number of vehicles in each BEV category was multiplied by each country's average distance driven, and subsequently multiplied by the emission factor of the respective

BEV category. The total Indirect emissions from both BEV categories were summed to obtain the cumulative Indirect emissions from charging BEVs sufficiently to drive the given total distance. The same calculation process was performed using both an EU average and country-specific grid emission factors to account for the carbon-intensity of the electricity used to charge the BEVs. These steps are summarised in the following two formulas:

$$E_{tot\,(BEV)}^{x} = \left(D_{avg}^{x} \times EF_{BEV\,car}^{x}\right) + \left(D_{avg}^{x} \times EF_{BEV\,LCV}^{x}\right) \tag{6}$$

$$\sum_{i=1}^{21} E(BEV)_i = E_{tot\,(BEV)}^{1} + E_{tot\,(BEV)}^{2} + \cdots + E_{tot\,(BEV)}^{21} \tag{7}$$

Where:

- $E_{tot\,(BEV)}^{x}$, are the total Indirect emissions from charging BEVs in country *x*;

- D_{avg}^{x}, is the average distance travelled in country *x*;

- $EF_{BEV\,car}^{x}$, is the emission factor for an electric passenger car in country *x*;

- $EF_{BEV\,LCV}^{x}$, is the emission factor for an electric LCV in country *x*; and

- $E(BEV)$, are the cumulative Indirect emissions from charging BEVs in all countries.

2.5.4 Avoided emissions

Once the total Direct emissions from ICE vehicles (the baseline) and Indirect emissions from BEVs were obtained as per formula (5) and (7) above, the avoided emissions were calculated by subtracting Indirect emissions from Direct emissions, as per the below formula:

$$E_{tot\,(avoided)} = E(ICE) - E(BEV) \tag{8}$$

The above calculation was performed with both an EU average and a country-specific grid emission factor for electricity.

Additionally, to show the avoided emissions per Eligible Project (BEV), the total avoided emissions were divided by the total number of BEVs:

$$E_{(per\,BEV)} = E_{tot\,(avoided)} \div BEV_{tot} \tag{9}$$

Where,

- $E_{(per\ BEV)}$, are the avoided emissions per Eligible Project (BEV);

- $E_{tot\ (avoided)}$, are the total avoided emissions; and

- BEV_{tot} , are the total number of Eligible Projects (BEVs).

3. Results

3.1 Avoided emissions

This impact report calculated the total avoided emissions as a result of increasing the proportion of BEVs in LP's total funded fleet. The avoided emissions originate from BEVs replacing ICE vehicles in driving a given distance. In other words, avoided emissions are the total Direct emissions minus the total Indirect emissions[25]. The tables below summarise the total distance driven by BEVs, the total Direct emissions (from ICE vehicles) and Indirect emissions (from charging BEVs) from driving that distance, as well as the avoided emissions for the considered baseline.

Table 6. Avoided emissions from BEVs in LP's Eligible Project Portfolio.

Description	Units	Result – EU grid emission factor	Result – country grid emission factor
Total distance travelled by LP BEV funded fleet	Million km/year	1,290	1,290
Direct emissions ("baseline" emissions from the equivalent miles being driven by ICE vehicles in LP's fleet)	tCO_2e	159,883	159,883
Indirect emissions (from electricity used to charge LP BEV funded fleet)	tCO_2e	(-) 79,847[26]	(-) 84,573[27]
Estimated avoided emissions from LP BEV fleet (annual)	**tCO_2e**	**80,037**	**75,311**

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[25] Considering avoided emissions as the difference between Direct and Indirect emissions is normally advised and is Carbon Trust's advisable approach when developing green bond impact reporting. However, there are other approaches that consider Direct emissions as the avoided emissions, thus not considering the Indirect emissions related to charging BEVs.

[26] Please note that charging BEVs does generate emissions and that this is being presented as a negative for demonstration purposes only – to show that Indirect emissions are being subtracted from Direct emissions to calculate avoided emissions.

[27] See footnote 26.

It is noticeable that emissions originating from charging BEVs are not insignificant. This is especially true when using country-specific grid emission factors, due to some countries relying on carbon intensive energy sources for their electricity generation (e.g. Poland, Czech Republic, and Greece). When using an EU average grid emission factor for electricity, avoided emissions are greater. This is partially due to the Netherlands having the largest BEV fleet (and therefore the longest cumulative distance driven) and a relatively carbon-intensive grid, significantly higher than the EU average figure. Figures 3-6 showcase the Direct emissions from ICE vehicles, Indirect emissions from charging BEVs and the associated avoided emissions.
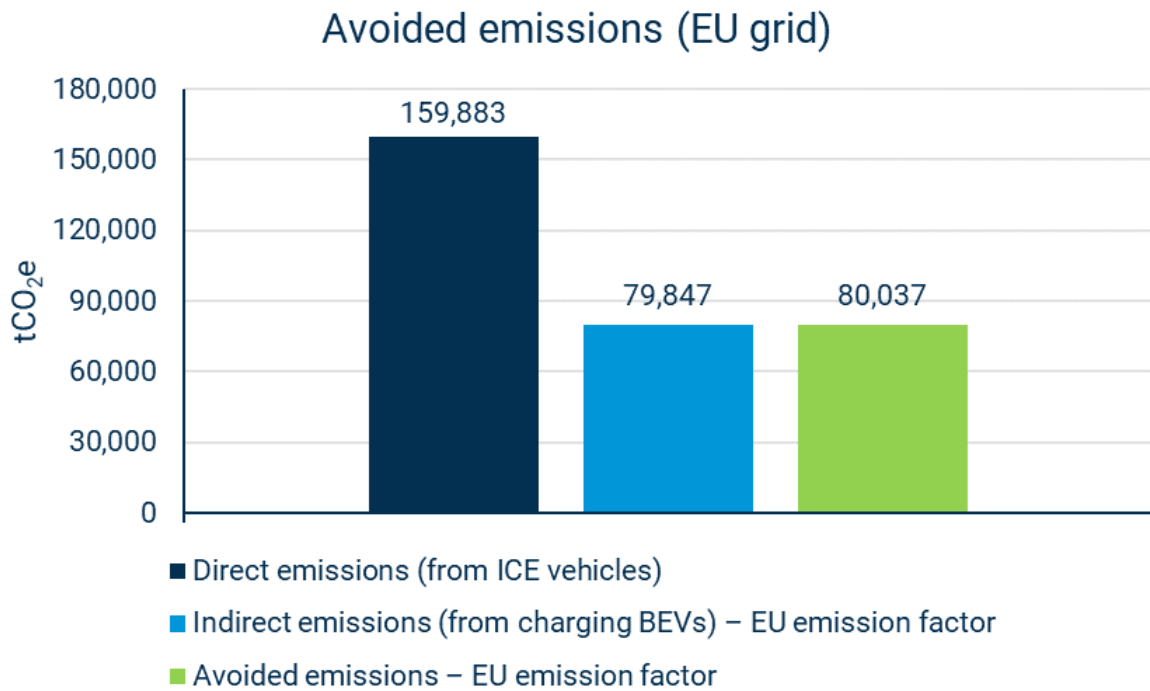
Figure 3. Avoided emissions using an EU grid emission factor.

Avoided emissions (country grid)
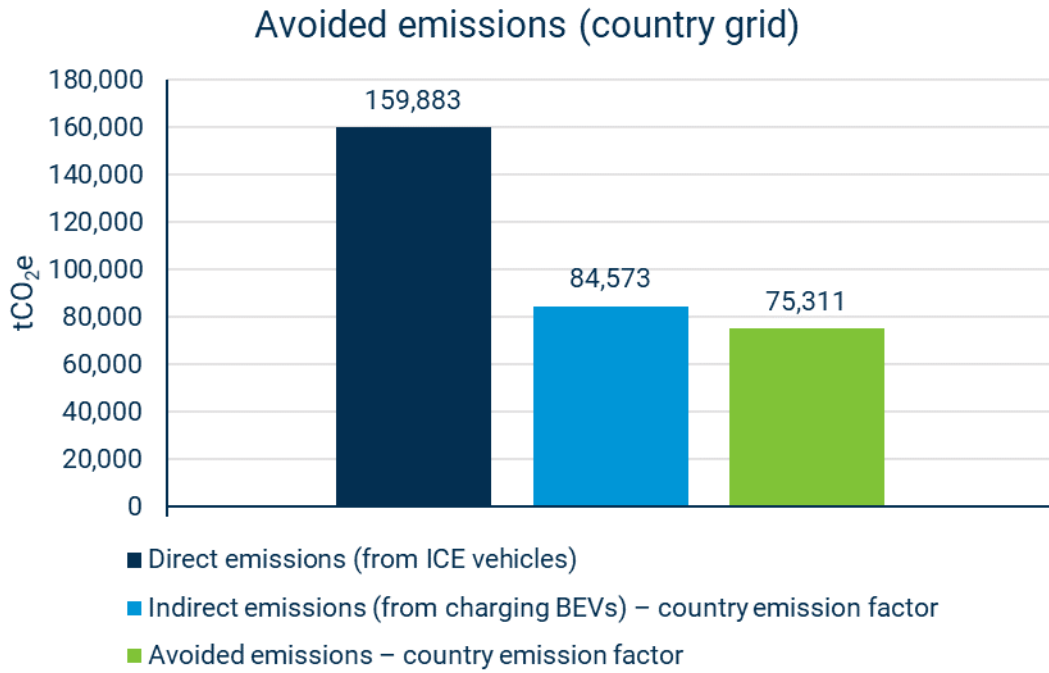
Figure 4. Avoided emissions using a country-specific grid emission factor.

Direct, indirect, and avoided emissions for the Netherlands, the UK, and Norway
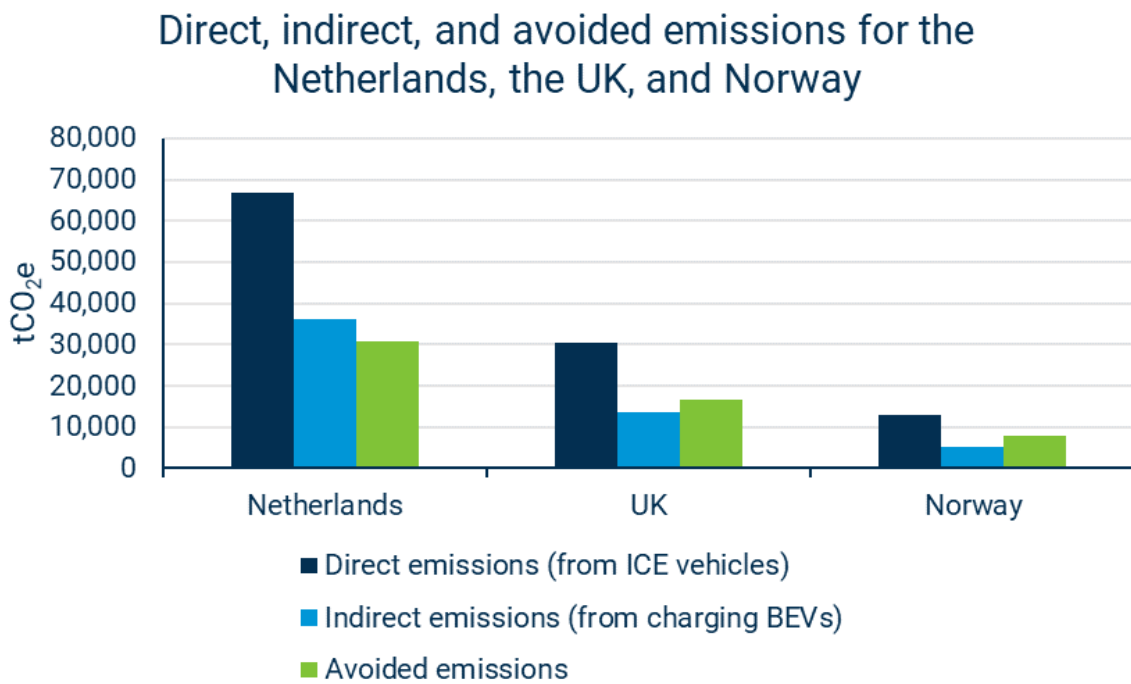
Figure 5. Direct, Indirect and avoided emissions in the Netherlands, UK and Norway (using an EU grid emission factor).

Direct, indirect, and avoided emissions by country

Legend:
- Direct emissions (from ICE vehicles)
- Indirect emissions (from charging BEVs)
- Avoided emissions
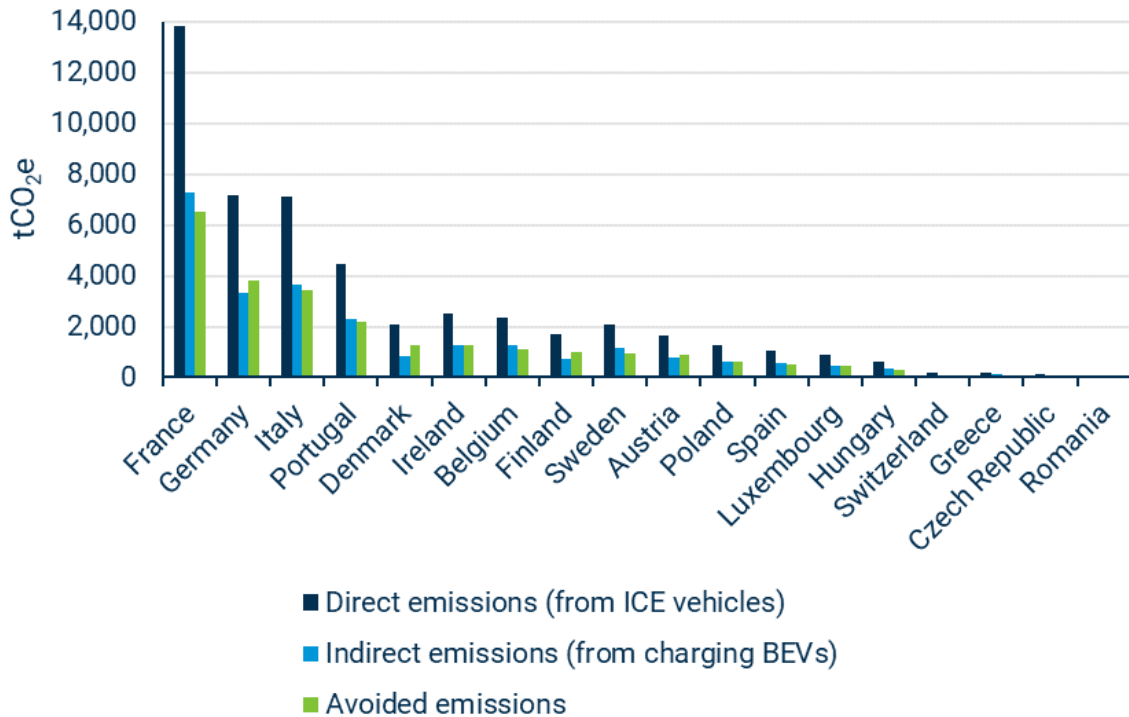
Figure 6. Direct, Indirect and avoided emissions in the other countries (using an EU grid emission factor).

3.1.1   Avoided emissions by country

When breaking down the avoided emissions by country, the Netherlands is the highest contributor (38% of the total avoided emissions) primarily due to having the largest number of Eligible Projects (BEVs). The UK (21%) and Norway (10%) are the next highest. The following two figures display the percentage breakdown of avoided emissions by country. For demonstration purposes, the top three contributing countries were graphed separately to the rest.

Avoided emissions for the Netherlands, the UK, and Norway (%)
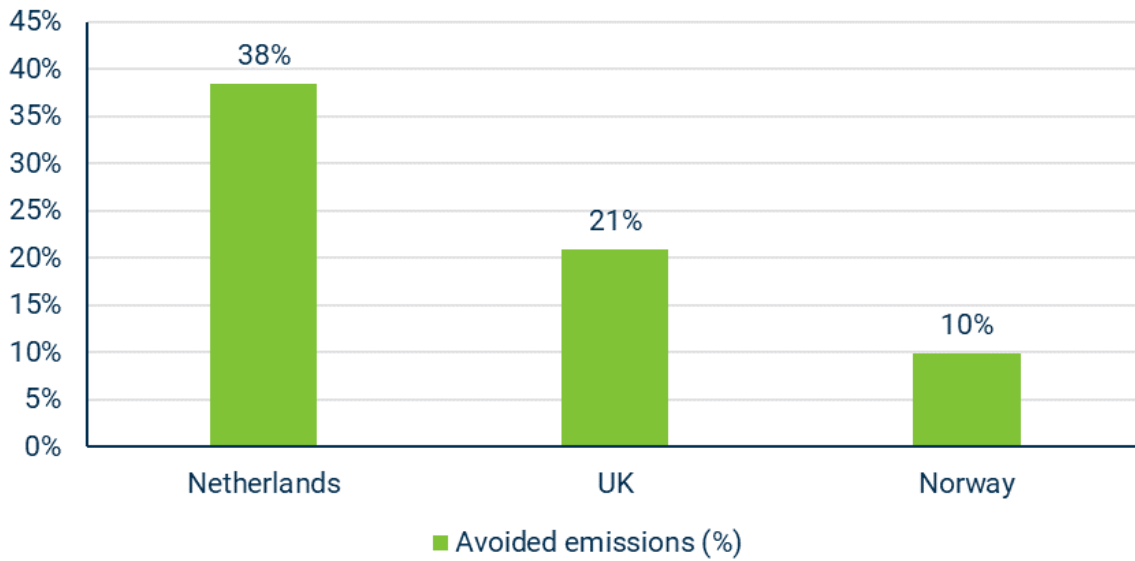
Figure 7. Avoided emissions by country (using an EU grid emission factor), expressed in percentage of total (top three contributing countries).

Avoided emissions by country (%)
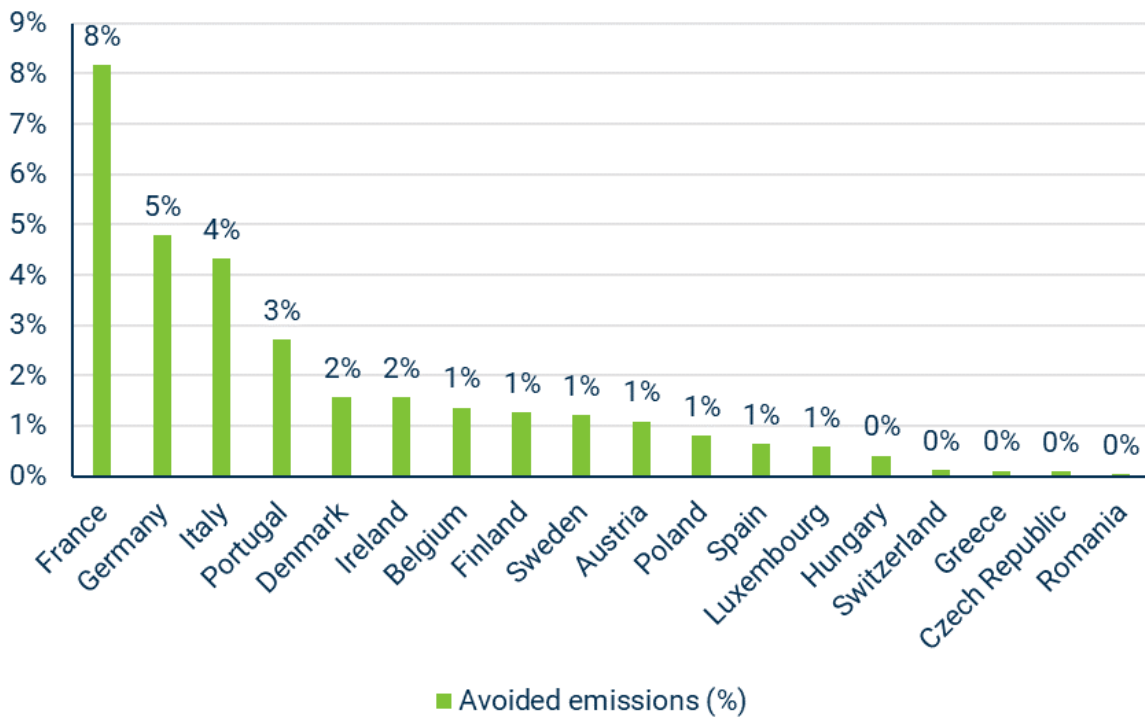
Figure 8. Avoided emissions by country (using an EU grid emission factor), expressed in percentage of total (other countries).

3.1.2 Avoided emissions per Eligible Project

The annual avoided emissions per Eligible Project amounted to 1.51 tCO_2e per BEV, considering 53,392 BEVs in the Eligible Project Portfolio and 80,341 tCO_2e as the total avoided emissions (using an EU average grid emission factor).

Table 7. Avoided emissions per Eligible Project versus baseline.

	Avoided emissions	Number of Eligible Projects	Avoided emissions per Eligible Project – EU grid emission factor
Baseline – LeasePlan total funded fleet	80,341 (tCO_2e)	53,392	1.51 (tCO_2e/vehicle)

3.2 Carbon intensity

A weighted average of LP's passenger car funded fleet emission factors by country was provided by LP. This was evaluated against the weighted average[28] of each country's average emission factor for newly sold passenger cars in 2019 sourced from publicly available databases (2019 was chosen based on data availability). Both carbon intensity figures included zero-carbon emitting vehicles (e.g. BEVs) as a way to illustrate how LP compares against a 'best-in-class' scenario (i.e., the European market of newly sold cars) with regards to mobility decarbonisation trends.

The average carbon intensity of LP's passenger car funded fleet was 108.26 gCO_2e/km, 8.73 gCO_2e/km lower than the EU country averages sourced (117 gCO_2e/km)[29]. This suggest that, if LP's passenger car funded fleet was representative of one country, it would be less carbon intensive than the European market average of newly sold cars (adjusted to reflect LP's fleet composition and presence in individual countries). At a country level, LP's emission factors were lower in 17 out of the 21 countries analysed, while the EU country average was lower in four countries.

These findings suggest that when compared against a 'best-in-class' scenario such as the European market of newly sold passenger cars, LP's passenger car funded fleet performs strongly in that its decarbonisation efforts reach beyond the European market average. In other words, LP is overall

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[28] Weighted on the total number of vehicles in LP's fleet in each country considered.

[29] Using a simple average instead of a weighted average (as was done in the previous assessment), this would be 118.75 gCO_2e/km, which would make the carbon intensity of LP's fleet 10.48 gCO_2e/km lower.

increasing its proportion of BEVs at a greater rate than the European passenger car market. The findings are summarised in Table 8 and Figure 9.
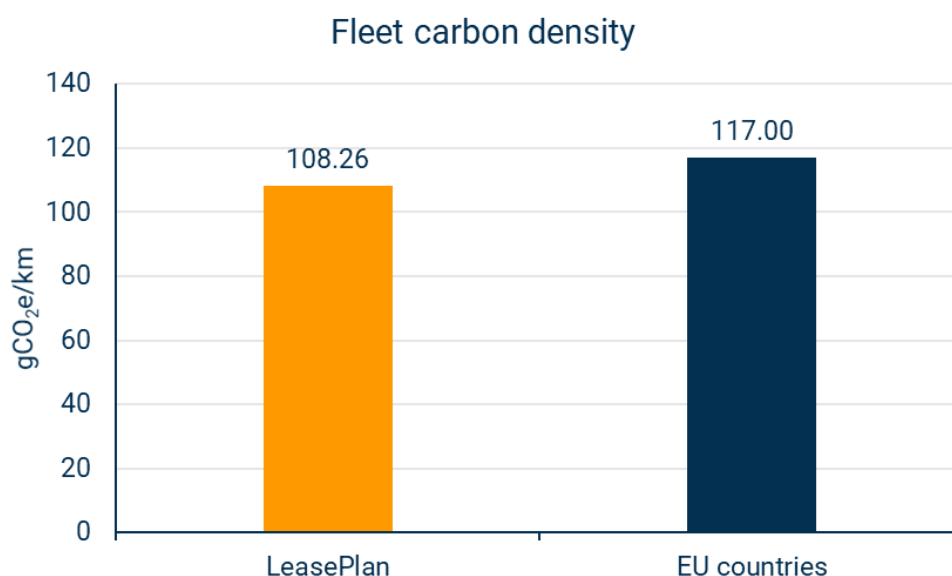
Table 8. Comparison of carbon intensity between LP's passenger car funded fleet and the analysed EU countries' newly sold passenger car fleets (gCO₂e/km).

	LeasePlan (gCO$_2$e/km)	EU countries (gCO$_2$e/km)
Passenger car fleet average	108.26	117.00[30]

Figure 9. Visual comparison of carbon intensity between LP's passenger car funded fleet and the analysed EU countries' newly sold passenger car fleets (gCO$_2$e/km).

3.3   Comparison with previous assessment

Figure 10 shows a comparison of this year's results (for the period from January 2020 to December 2020) against the results from the previous assessment (for the period from January 2019 to December 2019). Results show that there has been a significant increase in avoided emissions in the past year, of 135.30% (EU grid) and 135.19% (country grid) mostly due to a significant increase in LP's funded BEV

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[30] Weighted average of all 21 EU countries analysed based on the number of vehicles in LP's fleet in each country.

fleet size, resulting in higher absolute avoided emissions, and decarbonisations of EU and UK grids, resulting in lower emissions from charging BEVs. Additional graphical comparisons from last year are available in the appendix.
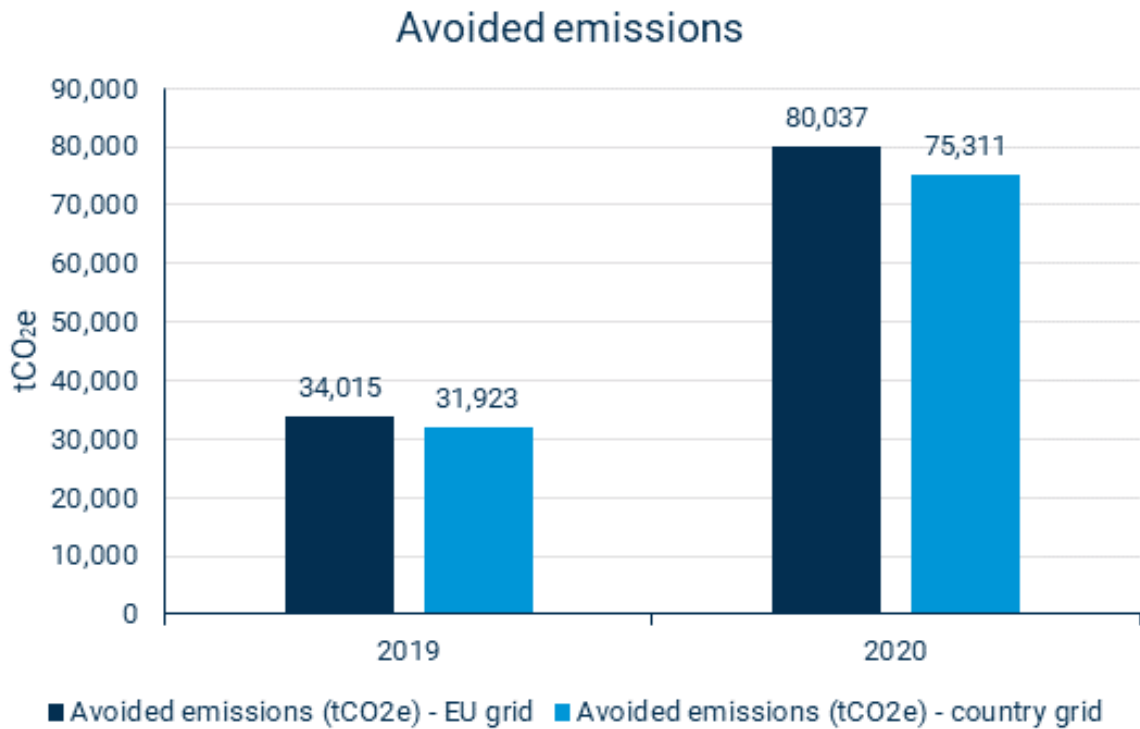

Figure 10. Avoided emissions estimated for the year 2020 (current assessment) and 2019 (previous assessment).

4. References

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5. Appendix

The table and figures below show detailed comparisons between this assessment (January 2020 to December 2020) and the previous assessment (January 2019 to December 2019).

Table 9. Detailed comparison between 2020 and 2019 assessments (EU grid emission factor).

Description	Units	2020 result	2019 result	*Change (%)*
Number of BEV in LeasePlan's funded fleet	#	53,168	31,194	*70.44%*
Total distance travelled by LeasePlan's BEV funded fleet	mkm/year	1,290	703	*83.43%*
Direct emissions ("baseline" emissions from the equivalent miles being driven by ICE vehicles in LP's fleet)	tCO_2e	159,883	84,512	*89.18%*
Indirect emissions (from electricity used to charge LeasePlan's BEV funded fleet) – EU	tCO_2e	79,847	50,498	*58.12%*
Estimated avoided emissions from LeasePlan's BEV fleet (annual) – EU	tCO_2e	80,037	34,015	*135.30%*
Avoided emissions per eligible project	tCO_2e/vehicle	1.51	1.09	*38.05%*

Avoided emissions (EU grid)
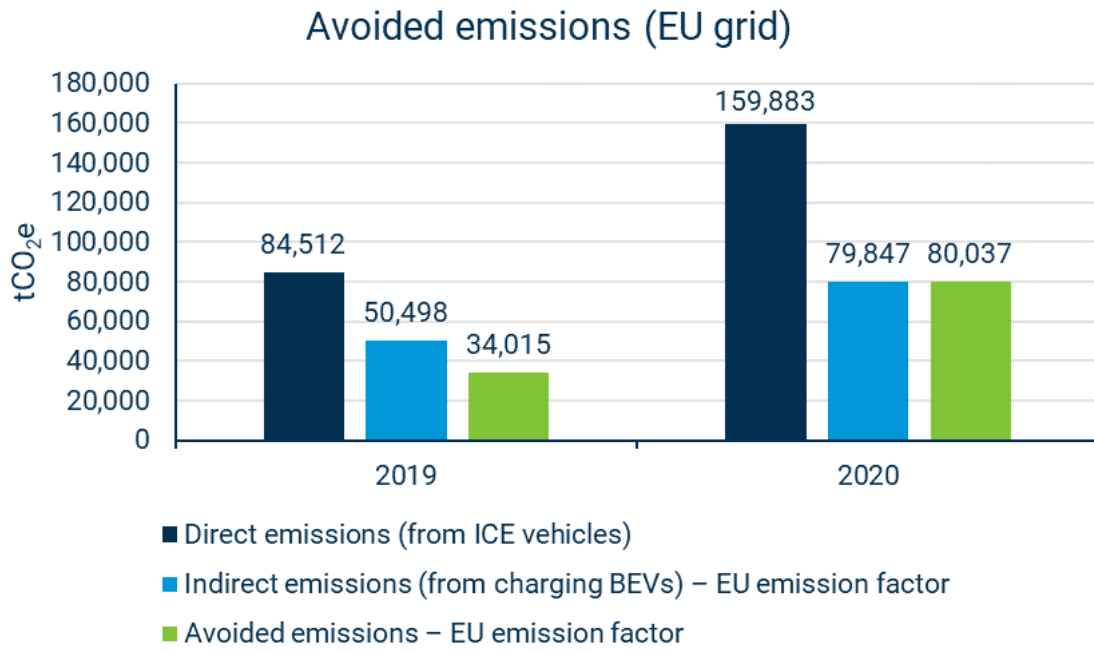
Figure 12. Direct, indirect, and avoided emissions, 2020 and 2019 comparison (EU grid).

Avoided emissions (country grid)
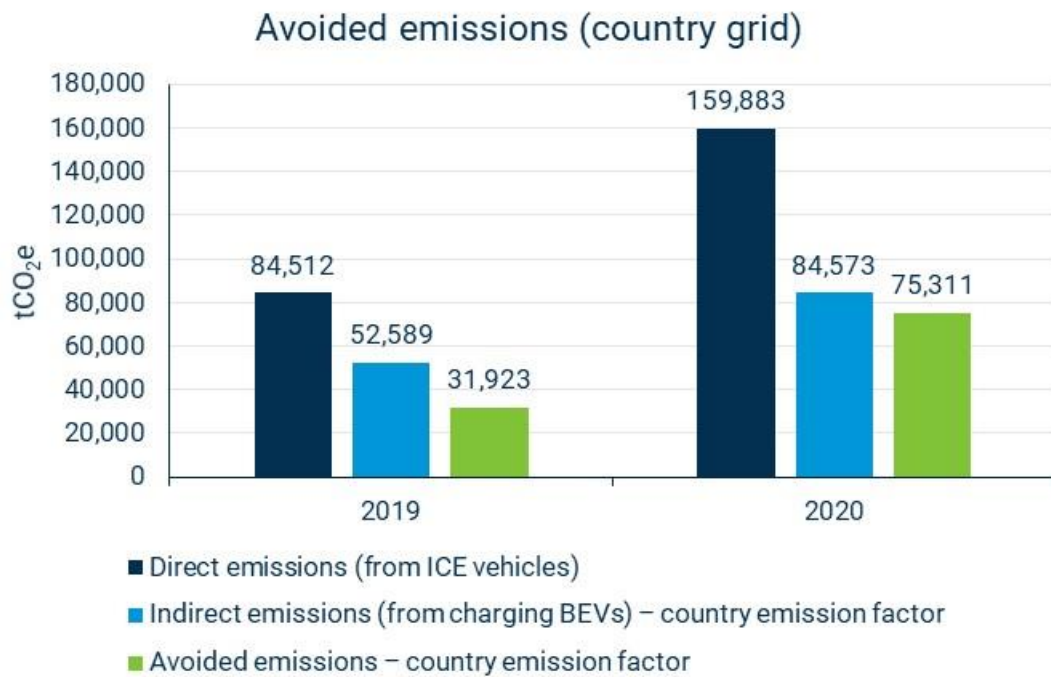
Figure 13. Direct, indirect, and avoided emissions, 2020 and 2019 comparison (country grid).

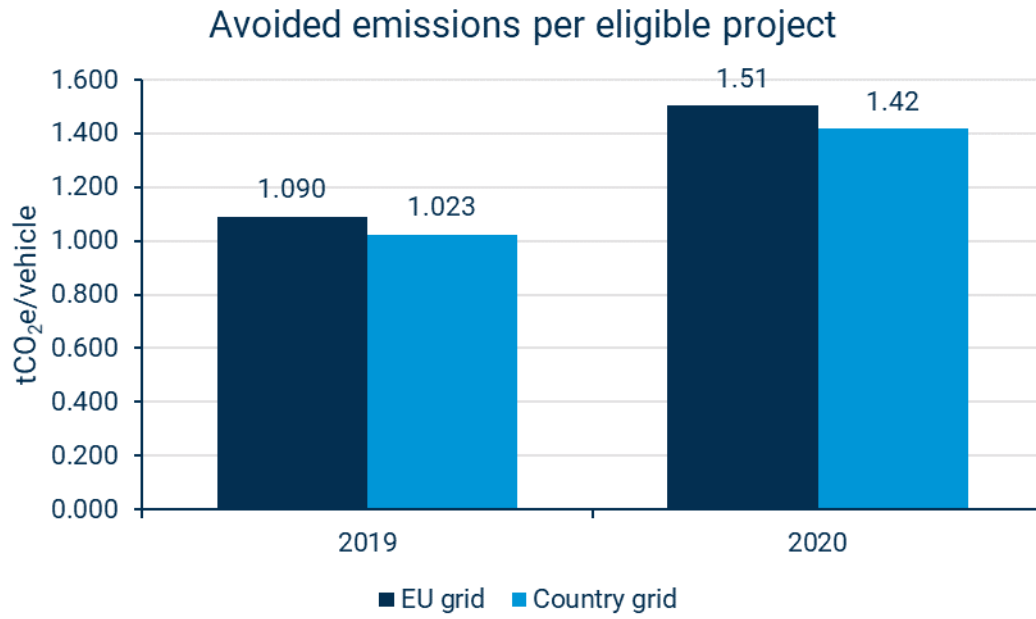## Avoided emissions per eligible project

Figure 14. Avoided emissions per eligible project, 2021 and 2020 comparison.

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