REPORT

Santander Consumer Bank Electric Vehicles Portfolio

CLIENT

Santander Consumer Bank

SUBJECT

Impact assessment Norwegian EV portfolio

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1 Introduction

On assignment from Santander Consumer Bank, Multiconsult has assessed the impact of electric vehicles in Norway on climate gas emissions. In this document we briefly describe Santander Consumer Bank's qualification criteria for Green Product Framework, the evidence for the criteria and the result of an analysis of the loan portfolio of Santander Consumer Bank. For more information related to the eligibility criteria we refer to Santander Consumer Bank's website[1].

The eligibility criteria are formulated in line with Climate Bonds Initiative (CBI) criteria[2]. The eligible EVs/ zero tailpipe emissions vehicles in the portfolio are also automatically eligible according to the wording in the proposed criteria in the EU Taxonomy Delegated Acts[3].

The bank's portfolio is assessed regarding direct emissions (Scope 1) and indirect emissions related to electric power production (Scope 2). A baseline is established as the average emissions from the new vehicles introduced to the market, EV's excluded.

2 Electric vehicles - Eligibility criteria

This report investigates the electric vehicle portfolio relevant under the Low carbon vehicles criterion in Santander's Green Finance Framework:

- Fully electric, hydrogen or otherwise zero emissions vehicles for the transportation of passengers or freight.

The portfolio examined includes solely electric vehicles financed by the bank.

Related to clean transportation the Santander Consumer Bank Green Product Framework has a comprehensive number of relevant eligibility criteria for Green Financing Instruments. This report, however, investigate the electric vehicle portfolio and the relevant criterion:

- Upgrading or replacement of vehicles for land passenger and freight transport with new electric or hydrogen-based technology

The portfolio examined includes solely electric vehicles financed by the bank.

3 Electric Vehicles – general description

Personal mobility in Norway is among the highest in Europe, with privately owned passenger vehicles taking the lion's share of the passenger transportation work. Figure 3-1 shows the nature of passenger transport in Norway compared to other selected countries.

Historical figures of how far the average passenger vehicle is driven annually in Norway, show a falling slope from 2007 and 2008, when the passenger vehicles peaked and were on average driven about 14,000 km. In 2021 the average passenger vehicle travelled about 11,290 km[4] in Norway. The expected yearly travelled distance for the vehicles in the portfolio is in this analysis estimated based on an expectation of a continuing trend of reduced yearly travelled distance, and as an average in the vehicles' lifetime.

[1] https://www.santanderconsumer.no/om-oss/investor-relations/green-bonds/
[2] https://www.climatebonds.net/standard/transport
[3] https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852/amending-and-supplementary-acts/implementing-and-delegated-acts_en
[4] SSB 12578: Kjørelengder , etter kjøretøytype, drivstoffype, alder, staisikkvariabel og år, 2019

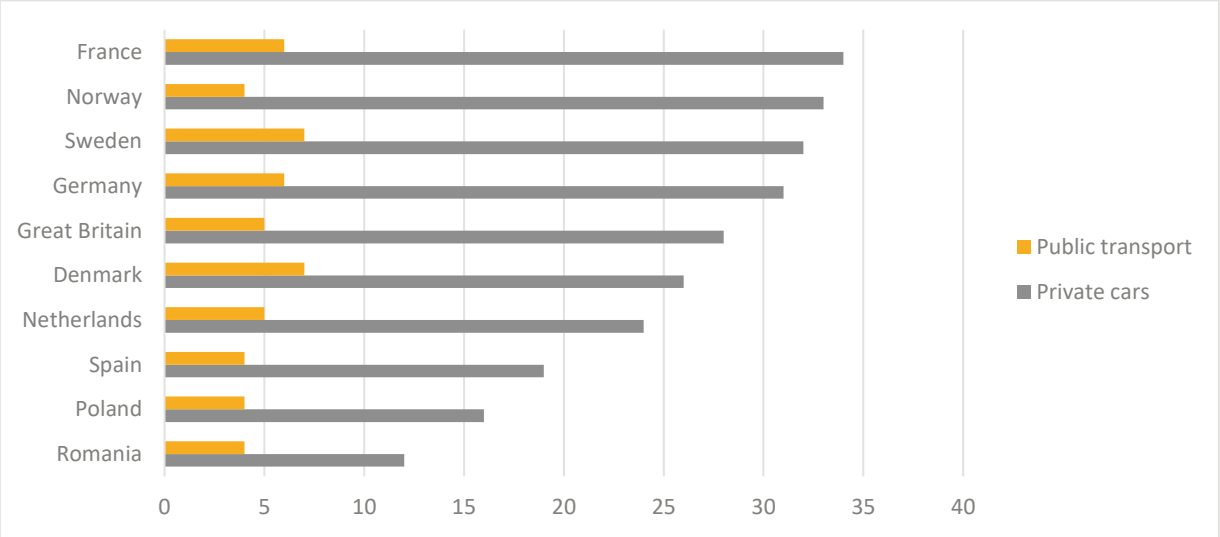

Figure 3-1 Passenger transport in selected countries [passenger kilometre per person per day] (Source Statistics Norway[5]/Eurostat,2014)

In 2020 the average age of passenger vehicles scrapped for refund in Norway was 18 years old[6]. The history of modern EV's is short and there is yet no evidence for the lifetime of EV's being different from other vehicles. Due to big uncertainties related to the expected lifetime of new vehicles sold between 2011 and 2021, the average lifetime for both passenger vehicles and light duty vehicles are set to 18 years in this analysis independent of fuel type.

3.1 EV policy in Norway

There were over 460,700 electric passenger vehicles on Norwegian roads by the end of 2021, which accounts for 16 percent of the total passenger vehicle stock[7]. The Norwegian Parliament have unanimously agreed that all new light-duty and passenger vehicles sold should be zero-emission from 2025[8].

A broad consensus around gradually expanding the Norwegian EV-politics has been sustained in parliament. The Norwegian EV policy, one of the world's most ambitious EV policies, was made effective by the tax exemption on VAT and the steep registration tax, in addition to a series of initial benefits like free fares on the many toll roads, ferries, free parking and free charging in cities.

In 2023, the Norwegian government adjusted the previous VAT exemption to only be applicable up to 500,000 NOK of the purchase price. Additionally, EV vehicles now need to pay a registration fee, to the same degree as fossil fuel vehicles. Many of the other benefits have been reduced and EVs are currently paying up to a maximum, by law, of 70 percent for toll roads, and 50 percent for parking and ferries.

3.2 Biofuel policy in Norway

Norway has an ambitious biofuel policy, with a 50 percent reduction in GHG emissions from fossil fuel from 2018[9]. In 2018 legislation was put in place to require all petrol retailers to sell fuel containing biofuels, with a benchmark of 2 percent of their annual sold volume of ordinary petroleum products. This requirement was extended to a minimum of 24.5 percent in 2021, whereof 9 percent was

[5] https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/kovrer-nest-mest-i-europa
[6] https://www.ssb.no/en/statbank/table/05522
[7] https://www.ssb.no/transport-og-reiseliv/landtransport/statistikk/bilparken/artikler/to-av-tre-nye-personbiler-er-elbiler
[8] https://www.regjeringen.no/no/tema/transport-og-kommunikasjon/veg_og_vegtrafikk/faktaartikler-vei-og-ts/norge-er-elektrisk/id2677481/
[9] Produktforskriften kapittel 3: Omsetningskrav for biodrivsoff og bærekrafskrierier for biodrivsoff og flytende biobrensel, Lovdata, 2019

advanced biofuel[10]. The goal has since been advanced, with a special emphasis on avoiding the usage of biofuels with a high risk of increasing deforestation[11]. As of 2023, the percentage of advanced biofuel of the overall quota obligation (24.5 percent) is set at 12.5 percent. To incentivise the use of advanced biofuels, one litre of advanced biofuels is counted as two litres of conventional biofuel. Subsequently, the overall use of advanced biofuel has increased year after year. In 2021, advanced biofuels accounted for 75 percent of the overall biofuel usage, thus reducing the usage of conventional biofuels[12]. As a result, the overall volume of biofuel has declined the past years, even though the percentage of biofuels has increased. The current government platform (Hurdalsplattformen) strengthens the obligations to utilize second-generation biofuels in the fuels sold[13].

In 2020, a road tax (veibruksavgift) for all biofuel was introduced. The taxation of bioethanol is significantly lower compared to standard gasoline, but the road tax for biodiesel is equal to conventional diesel[14]. Previous estimates from 2018 concluded that biofuel used in Norway resulted in 72 percent lower greenhouse gas (GHG) emissions in a life cycle perspective compared to regular fuels[15]. The same year, legislation was passed stipulating that biofuels shall have a minimum of 50 percent lower life-cycle GHG emissions than fossil fuels[16].

In 2021, 75 percent of the advanced biofuel utilized in the Norwegian transportation sector stems from waste and residue, with only one percent of the raw materials being produced in Norway[17]. The raw materials utilized in domestic biofuels were principally imported from North America and Europe. Biofuels accounted for 14 percent of all fuels consumed by domestic road traffic in 2021- a positive incremental change since 2020. In 2021, there were no sales of biofuels containing soy or palm oil in Norway, aligning with the target to reduce the usage of raw materials with a high risk for deforestation.

4 Climate gas emissions (Scope 1 and 2)

Categorizing the emissions, we have chosen to use the CBI guidelines for the emission calculations. CBI's *Land Transport Background Paper*[18] underlines the focus on tailpipe emissions because of their dominance, the need to send strong signals to vehicle purchasers and the need to promote technologies and infrastructure that have the potential to radically shift emissions trajectories and avoid fossil fuel lock-in. We do however include information on indirect emissions related to power production.

4.1 Indicators

In this analysis we are using two relevant climate gas emission indicators for vehicles:

- Emissions per kilometre [gCO_2/km]
- Emissions per passenger kilometre [gCO_2/pkm]

The passenger vehicle fleet composition and emissions from the types of passenger vehicles is used to calculate the emissions per kilometre.

[10] https://www.ssb.no/transport-og-reiseliv/landtransport/artikler/utfordringer-med-fornybart-drivstoff
[11] https://www.regjeringen.no/no/dokumenter/politisk-plattform/id2626036/
[12] https://www.miljodirektoratet.no/aktuelt/nyheter/2022/juni-2022/avansert-biodrivstoff-oker-pa-norske-veier/
[13] https://res.cloudinary.com/arbeiderpartiet/image/upload/v1/ievv_filestore/43b0da86f86a4e4bb1a8619f13de9da9afe348b29bf24fc8a319ed9b02dd284e
[14] https://www.skatteetaten.no/satser/veibruksavgift/?year=2023#rateShowYear
[15] https://www.miljodirektoratet.no/aktuelt/nyheter/2019/mai-2019/salget-av-avansert-biodrivstoff-okte-i-fjor/
[16] https://lovdata.no/dokument/LTI/forskrift/2022-12-20-2356
[17] https://www.miljodirektoratet.no/aktuelt/nyheter/2022/juni-2022/avansert-biodrivstoff-oker-pa-norske-veier/
[18] https://www.climatebonds.net/files/files/CBI_Background%20Doc_Transport_Jan2020%20.pdf page 25

A passenger-kilometre, abbreviated as pkm, is the unit of measurement representing the transport of one passenger over one kilometre. Passenger kilometers are found by multiplying the number of passengers by the corresponding number of kilometers travelled.

Statistics Norway's method for calculating indicators for emissions per passenger kilometre utilizes a vehicle occupancy of 1.7 persons in passenger vehicles and 1.5 persons in a light duty vehicle, and these factors have been adopted in this analysis[19].

4.2 Direct emissions (tailpipe)- Scope 1

Under scope 1 of the "Low Carbon Land Transport and the Climate Bonds Standard (Version 1.0)" we calculate the "Direct tailpipe CO_2 emissions from fossil fuels combustion" avoided.

The estimation of the baseline is performed through 3 steps:

1. Estimating the gross CO_2-emission per km (c) from the average vehicle that is being substituted by the zero-emission vehicle.
2. Multiplied by the number of km (d) the vehicle is estimated to travel.
3. Multiplied by the number (n) of vehicles substituting fossil vehicles in the portfolio.

This can be described in the following equation:

$$E_{baseline} = c_{weighted\ average} * d_y * n_{total} = E_{avoided} \quad (1)$$

All EVs and fuel cell vehicles are considered eligible with zero tailpipe emissions. Therefore, for scope 1 calculations, the emissions from these vehicles are set to zero, and the baseline will amount to the total avoided emissions.

For the substituted fossil-fuelled vehicles, emission data are retrieved from recognized test methods and not actual registrations of emissions in a Nordic climate. Test methods have lately been improved to better reflect actual emissions but are still likely to underestimate the emissions[20].

Biofuels are to some degree mixed with fossil fuels, and the reduced emissions due to these contributions are considered in the emissions from the vehicle that would have been bought as an alternative for the electric vehicle in this portfolio, in effect reducing the climate impact of zero-emission vehicles. As Norway is aiming at substantially reducing emissions from fossil fuelled vehicles through use of biofuel in the fuel sold before 2030, the marginal emission reduction possibly obtained through these political goals between 2020-2030 have been accounted for in the analysis. It is assumed that the biofuel share in the fuel mix will remain constant between 2030 and 2038.

To estimate the annual emissions avoided by the eligible assets, projections are made for direct tailpipe CO_2-emissions from fossil fuels combustion in the national passenger vehicle fleet.

To estimate the weighted average of emissions per fossil passenger vehicle ($c_{weighed\ average}$) we use the average annual emission from new passenger vehicle models from 2011-2022[21].

To estimate the distance travelled by the average passenger vehicle we assume that EVs drive the average of the total passenger vehicle portfolio in each country each of the 18 years it is used. Statistics of annual driven distance by electric, diesel and gasoline cars younger than 10 years builds up under this assumption[22].

[19] https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/mindre-utslipp-per-kjorte-kilometer
[20] https://www.vegvesen.no/fag/fokusomrader/miljo+og+omgivelser/klima
[21] https://ofv.no/CO2-utslippet/co2-utslippet
[22] https://www.ssb.no/statbank/table/12578/

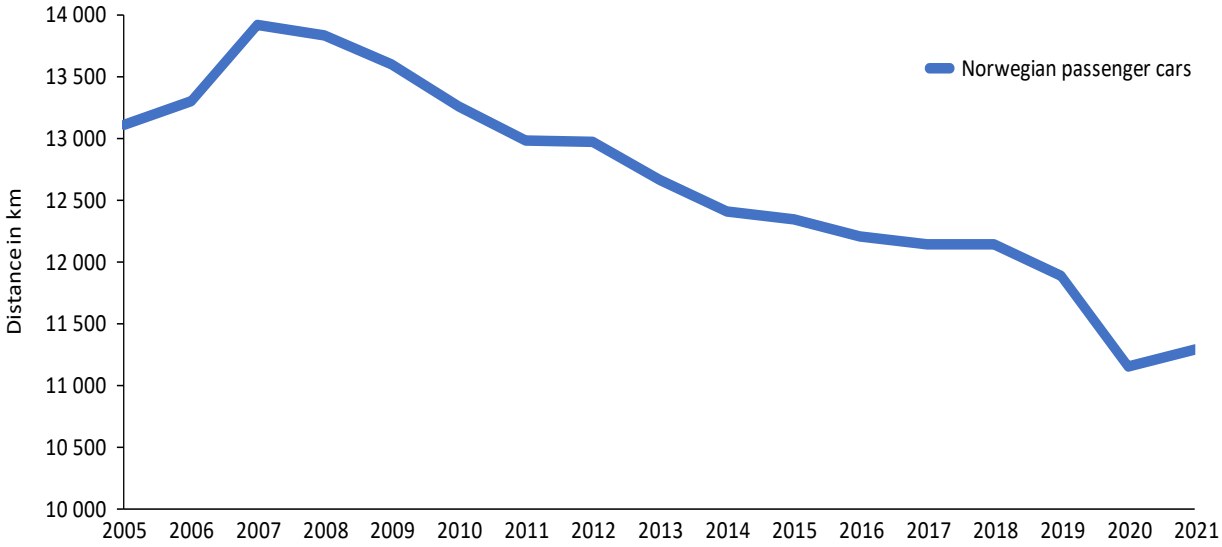

Figure 4-1 Average travelled distance per passenger vehicles 2005-2021 [km] (Source: Statistics Norway[23] [24])

Traffic volumes per passenger vehicle and light duty vehicle has shown a historic decline and we use linear regression on publicly available dataset (d_{2005}-d_{2021}) and extrapolate until 2040. This is a conservative approach as it is likely, at some point, to see a flattening.

Based on calculated gross tailpipe CO_2-emissions for the average vehicle produced in each of the years between 2011-2022, biofuel- and fossil fuel content in petrol/diesel pumped in each year between 2022-2040, as well as the travelled annual distance for the average vehicle, Table 1 present the calculated emission factors and CO_2-emissions in a year for the relevant vehicle categories.

Table 1 ***Passenger vehicles****: Greenhouse gas emission factors (CO_2- equivalents), average direct emissions*

	Direct emissions substituted fossil passenger vehicles – Average Norway	**Direct emissions EV**
Emissions per passenger km	52 gCO_2/pkm	0 gCO_2/pkm
Emissions per km	89 gCO_2/km	0 gCO_2/km
Emissions per vehicle per year	811 $kgCO_2$/vehicle/year	0 $kgCO_2$

4.3 Indirect emissions (Power consumption only)- Scope 2

4.3.1 Electricity production mix

In 2021, renewables accounted for 99 percent of the total (157.1 TWh) Norwegian electricity production[25]. As shown in Figure 4-2, the Norwegian production mix in 2021 (91.5 percent hydropower and 7.5 percent wind) resulted in emissions of 4.5 gCO_2/kWh. In the figure, the production mix is included for other selected European states for comparison.

[23] https://www.ssb.no/statbank/table/12578/
[24] https://www.ssb.no/en/statbank/table/12575/
[25] https://www.ssb.no/statbank/table/08307

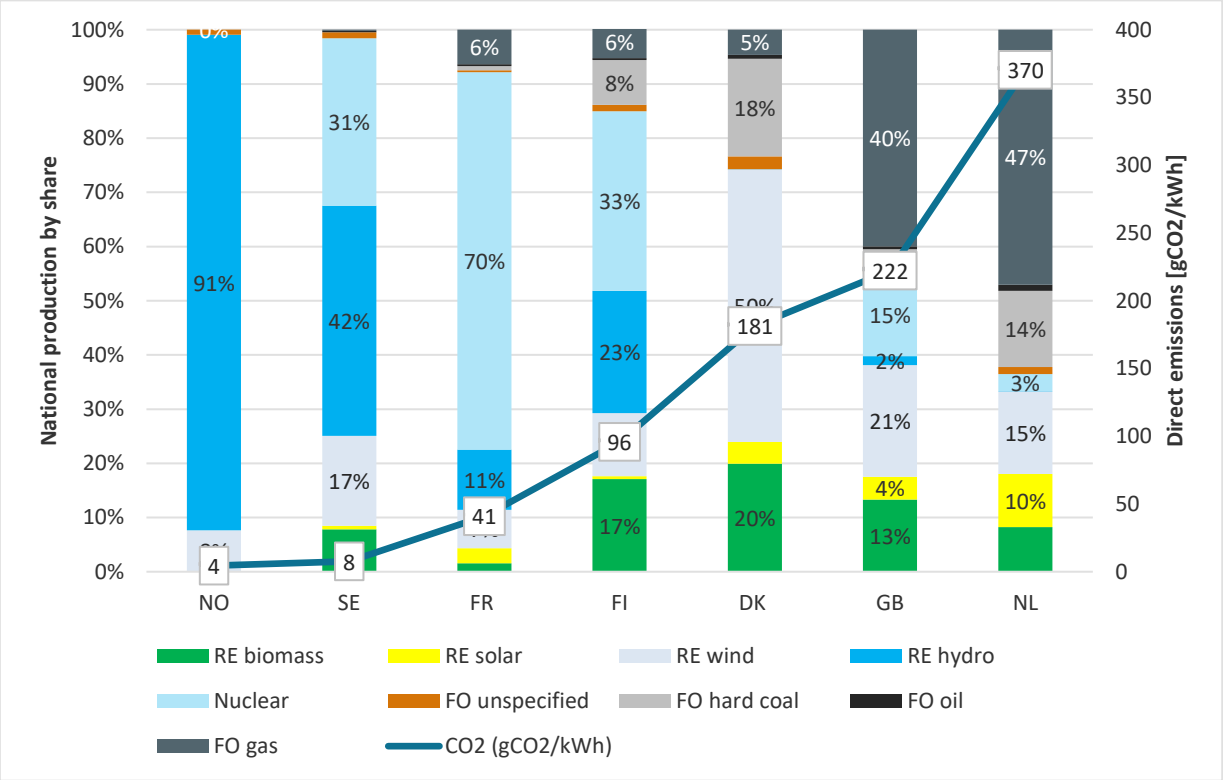

Figure 4-2 National electricity production mix in some selected countries (European Residual Mixes 2021, Association of Issuing Bodies[26])

4.3.2 CO_2- emissions related to electricity demand

Power is traded internationally in an interconnected European electricity grid. For impact calculations of all power consumption, and even electrification of transportation, the regional or European production mix is more relevant than the national power production mix and is the basis for the main analysis. We have, however, also included calculations of indirect emissions from power production setting the system boundary at national borders.

The direct emissions in power production in Europe (EU27+UK+Norway) is expected to be dramatically reduced the coming decades. Figure 4-3 illustrates the emission trajectory used as basis for scope 2 emission calculations for EV's. Due to urgency the trajectory takes into consideration the 1.5 °C scenario and a substantial reduction of emissions in the power sector that will have close to zero emissions in 2040. This is in line with the EU's ambitious decarbonisation of the power sector[27].

[26] https://www.aib-net.org/facts/european-residual-mix
[27] http://www.europarl.europa.eu/RegData/etudes/BRIE/2019/631047/IPOL_BRI(2019)631047_EN.pdf

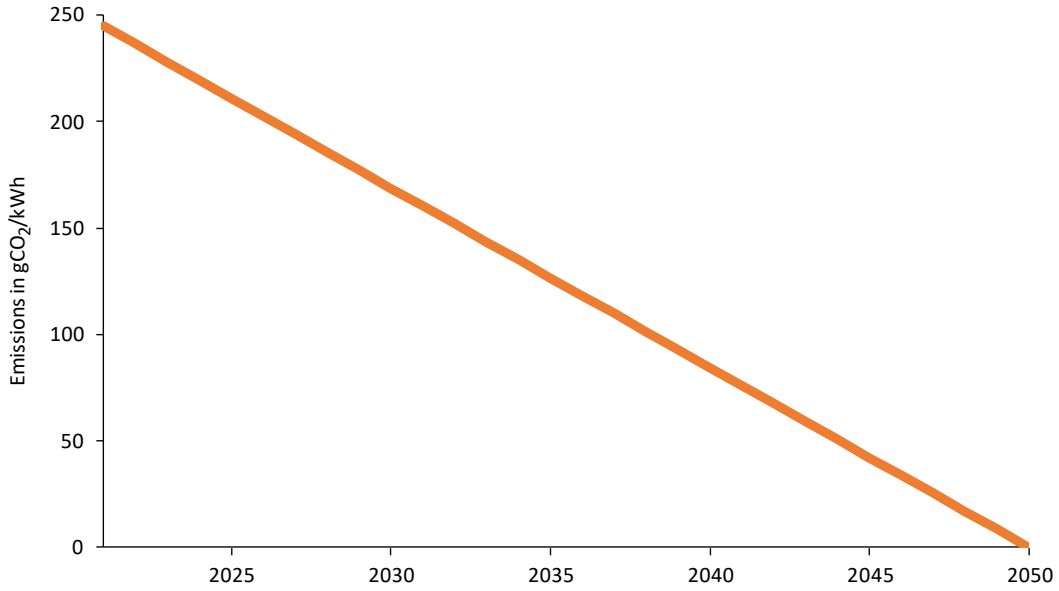

Figure 4-3 Direct CO_2 emissions in European electricity production mix, trajectory from 2021 to a zero target in 2050 (EU, Multiconsult, Association of Issuing Bodies)

The GHG emission intensity baseline for power consumption depends on system boundaries. The table below illustrates the CO_2-factor for the European production mix and Norwegian production mix as an average of the three last years with available data.

Table 2 Electricity production greenhouse gas factors (CO_2- equivalents)

Scenario	**CO_2- factor (g/kWh)**
European (EU27+UK+Norway) production mix average 2019- 2021	245
Norwegian production mix average 2019- 2021	7.8

Using a European production mix is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[28]. The following calculations use the CO_2- factor as an average from a baseline in 2021 (the European production mix in Table 2) and the expected lifetime for each type of vehicle, following the trajectory of the European production mix in Figure 4-3. For passenger vehicles, with an expected lifetime of 18 years, the CO_2- factor will then be an average of the CO_2-factor presented in Figure 4-3 in the period from 2021-2038. The projected trajectories for declining CO_2 emissions related to power production for EU, from 2021 and forward, will impact the indirect emissions and avoided emissions from the vehicle portfolio.

The energy consumption of EV's is very much dependent on size and outdoor temperature. There is not sufficient available data to ensure an accurate estimation of energy consumption for the average EV. In these calculations we are using the average for all currently available EV models in the Electrical Vehicle Database[29], 0.2 kWh/100km. In Table 3 and 4 emission factors are presented in both emissions per kilometre and per passenger kilometre.

[28] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf
[29] https://ev-database.org/cheatsheet/energy-consumption-electric-car

Table 3 Annual average GHG-factors (CO_2- equivalents) EV's - based on European power production mix

	Indirect emissions electric passenger vehicle
Emissions per passenger km, indirect emissions from power production	20.4 gCO_2/pkm
Emissions per km, indirect emissions from power production	34.6 gCO_2/km

Table 4 Electricity annual average consumption emission factors (CO_2- equivalents) fossil fuelled alternatives

	Indirect emissions fossil vehicle*
Emissions per passenger km, indirect emissions from power production	0 gCO_2/pkm
Emissions per km, indirect emissions from power production	0 gCO_2/km

*Note that there are indirect emissions related to fossil fuel as well but scope 3 emissions are not included in this analysis. Scope 3 emissions differ between fossil and electric vehicles mostly due to the batteries where there is rapid technology development.

5 Portfolio analysis and impact assessment - avoided emissions EVs

The 59,405 eligible vehicles in Santander's portfolio are estimated to drive 539 million km per year. The available data from the bank includes the current number of contracts and related portfolio volume.

Table 5 Number of eligible passenger vehicles and expected yearly mileage

	Number of vehicles	Sum km/yr	Sum person km/yr
Sum passenger vehicle portfolio	**59,405**	**539 mill.**	**916 mill.**

The table below summarises the lower CO_2-emissions compared to baseline for the eligible assets in the portfolio in an average year in the lifetime of the vehicles in the portfolio, presented as reductions in direct emissions and indirect emissions. Note that the indirect emissions are only calculated for EV's and not fossil fuelled vehicles.

Direct emissions in the following tables are calculated by multiplying distance travelled by the vehicles in the portfolio in a year, by the specific emission factor [CO_2/km] in Table 1 (89 CO_2/km). Indirect emissions are calculated by multiplying distance travelled by the vehicles in the portfolio in a year by the specific emission factors [CO_2/km] in Table 3 (34.6 CO_2/km) through Table 4 (0 CO_2/km).

*Table 6 The portfolio's estimated impact on GHG-emissions, indirect emissions based on **European power production mix***

	CO_2-emissions compared to baseline
Direct emissions only (Scope 1)	- 42,939 tons CO_2/year
Indirect emissions only (Scope 2, European mix)	18,651 tons CO_2/year
Direct and indirect	- 24,288 tons CO_2/year

The reduction in direct emissions correspond to 18 million litres gasoline saved per year.