REPORT

SpareBank 1 SMN Green Portfolio Impact Assessment 2022

CLIENT

SpareBank 1 SMN

SUBJECT

Impact assessment- energy efficient residential and commercial buildings, electric vehicles and renewable energy

DATE: / REVISION: July 8, 2022 / 01

DOCUMENT CODE: 10245136-1-TVF-RAP-001

Multiconsult

REPORT

PROJECT	**SMN Green Portfolio Impact Assessment**	DOCUMENT CODE	10245136-1-TVF-RAP-001
SUBJECT	Impact assessment- energy efficient residential and commercial buildings, electric vehicles and renewable energy	ACCESSIBILITY	Open
CLIENT	**SpareBank 1 SMN**	PROJECT MANAGER	Stig Jarstein
CONTACT	Trond Barikmo	PREPARED BY	Stig Jarstein, Jan Ohlenbush
		RESPONSIBLE UNIT	10105080 Renewable Energy Advisory Services

In summary, impact assessed for all examined asset classes in the SpareBank 1 SMN portfolio qualifying according to green bond criteria is dominated by energy efficient residential and commercial buildings but with significant contributions from all asset classes. This table sums up the impact in rounded numbers:

Energy efficient residential buildings		*16,600 ton CO_2e/year*
Energy efficient commercial buildings		*8,300 ton CO_2e/year*
Clean transportation	*Scope 2: -1,800 ton CO_2e/year*	*Scope 1: 4,900 ton CO_2e/year*
Renewable energy		*4,800 ton CO_2e/year*
Total		*34,600 ton CO_2e/year*

Note that the impact in the table above is not scaled by the bank's engagement.

TABLE OF CONTENTS

Contents

1 Introduction

Assignment

On assignment from SpareBank 1 SMN, Multiconsult has assessed the impact of the part of SMN's loan portfolio eligible for green bonds according to SMN's Green Bonds Framework.

In this document, we briefly describe SMN's green bond qualification criteria, the evidence for the criteria and the result of an analysis of the loan portfolio of SMN. More detailed documentation on baseline, methodologies and eligibility criteria is made available on the SMN website [1].

1.1 CO_2 emission factors related to electricity demand and production

The eligible assets are either producing renewable energy and delivering it into the existing power system or using electricity from the same system. The energy consumption of Norwegian buildings is also predominantly electricity, with some district heating and bioenergy. The share of fossil fuel is very low and declining.

As shown in figure 1, the Norwegian production mix in 2021 (91% hydropower and 8% wind) results in emissions of 4 gCO_2/kWh. The production mix is also included in the figure for other selected European states for illustration.

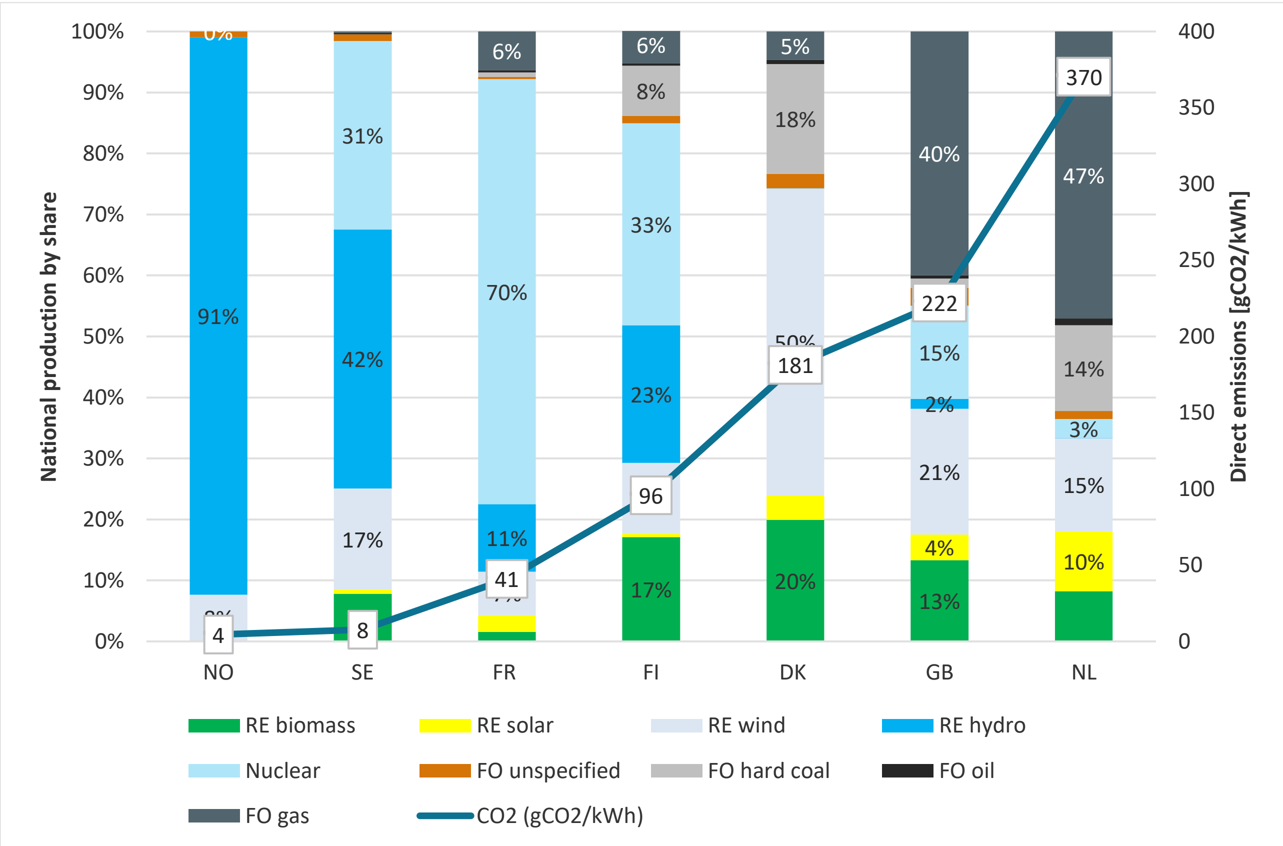

Figure 1 National electricity production mix in some selected countries (European Residual Mixes 2021, Association of Issuing Bodies[2])

[1] https://www.sparebank1.no/nb/smn/om-oss/barekraft/rammeverk-for-gronne-obligasjoner.html
[2] https://www.aib-net.org/facts/european-residual-mix

Power is traded internationally in an ever more interconnected European electricity grid. For impact calculations, the regional or European production mix is more relevant than national production. Using a life-cycle analysis, the Norwegian Standard NS 3720:2018 “Method for greenhouse gas calculations for buildings” takes into account international electricity trade and that the consumption is not necessarily equal to domestic production. The grid factor, as average in the lifetime of an asset, is based on a trajectory from the current grid factor to a close to zero-emission factor in 2050 and is steady until the end of the lifetime.

The mentioned standard calculates, on a life-cycle basis, the average CO_2- factor for the next 60 years, a lifetime relevant for buildings and renewable energy assets, according to two scenarios as described in table 1.

Scenario	**CO_2 factor (g/kWh)**
European (EU27 + UK + Norway) electricity mix	136
Norwegian electricity mix	18

Table 1 Electricity production greenhouse gas factors (CO_2 equivalents) for two scenarios (source: NS 3020:2018, Table A.1)

The impact calculations in this report apply the European mix in table 1. This is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[3].

Applying the factor based on EU27 + UK + Norway energy production mix, the resulting CO_2- factor for Norwegian residential buildings, including the influence of bioenergy and district heating in the energy mix, is on average 111 gCO_2/kWh due to. This factor is used in impact calculations in section 2.

The average emission factor relevant for electric vehicles is calculated not based on this Norwegian standard for greenhouse gas calculations for buildings, but based on the last three-year average for the European production mix. This is described in more detail in section 3.

[3] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf

2 Energy efficient buildings

2.1 Residential buildings

2.1.1 Eligibility criteria

Eligibility in this impact assessment for residential buildings in the SpareBank 1 SMN portfolio is only identified against a building code criterion as formulated below. This criterion is in line with the equivalent CBI's proxy criterion for Norwegian residential buildings.

Building code criterion

i. New or existing Norwegian apartments that comply with the Norwegian building codes of 2010 (TEK10) or 2017 (TEK17). Hence, built in 2012 and later.

ii. New or existing Norwegian other residential dwellings that comply with the Norwegian building codes of 2007 (TEK07), 2010 (TEK10) or 2017 (TEK17). Hence, built in 2009 and later.

Over the last several decades, the changes in the building code have pushed for more energy efficient buildings. Combining the information on the calculated energy demand related to the building code and information on the residential building stock, the calculated average specific energy demand on the Norwegian residential building stock is 251 kWh/m^2. Building codes TEK07 (small residential buildings), TEK10 and TEK17 give an average specific energy demand for existing houses and apartments, weighted for actual stock, of 117 kWh/m^2.

Hence, compared to the average residential building stock, the building codes TEK07 (small residential buildings), TEK10 and TEK17 give a calculated specific energy demand reduction of 53 %

Given the dynamic nature of the top 15% of the building stock, the bank has decided to tighten the eligible criteria to respect the top 15% threshold. Hence, the bank is no longer including TEK07 buildings in the portfolio in the green pool that were originated post 31/12/2021. Loans originated before this date are grandfathered.

EPC criterion

Existing Norwegian residential buildings built using older building codes than TEK10 for apartments and TEK07 for other residential dwellings with EPC-labels A and B.

As only half of all dwellings have a registered EPC, the available data have been extrapolated assuming the registered dwellings are representative for their age group regarding energy label. Then the EPC data indicates that 7.5 % of the current residential buildings in Norway will have a B or better. The average energy performance of a dwelling, according to the EPC system, relates to an energy label E.

The system boundary in the Norwegian EPC system differs from the one used in the building code (EPC uses delivered energy and not gross energy demand). For impact assessments the building code baseline is hence based on the EPC statistics where the average dwelling gets an E.

Given the dynamic nature of the top 15% of the building stock, the bank has decided to tighten the eligible criteria to respect the top 15% threshold. Hence, the bank is no longer including EPC C label buildings in the portfolio in the green pool that were originated post 31/12/2020. Loans originated before this date are grandfathered.

Combination of criteria

The two criteria are based on different statistics. It is however interesting to view them in combination. Table 2 illustrates how the criteria, idenpendently and in combination, make up cumulative %'s.

Interpretation: TEK10 and newer in isolation represents 11.3% ; TEK10 and newer in combination with A+B labels represents 12.6% ; TEK10 and newer in combination with A+B+C labels represents 17.1%

	TEK10+TEK17	TEK07 small resi.	EPC A+B	EPC A+B+C
TEK10+TEK17	11,3 %		12,6 %	17,1 %
TEK07 small resi.		13,5 %	14,7 %	18,7 %
EPC A+B			7,5 %	
EPC A+B+C				15,9 %

Table 2 Matrix of Cumulative %'s for criteria combinations (FY21), relative to the total residential building stock in Norway

2.1.2 Impact assessment - Residential buildings

The eligible residential buildings in SpareBank 1 SMN's portfolio are estimated to amount to 1,177,216 square meters. The available data include a reliable area for most objects. For objects where this data is not available, the area per dwelling is calculated on the basis of the average area derived from national statistics (Statistics Norway[4]).

		Number of units	Area qualifying buildings in portfolio [m^2]
Both building code and EPC criteria	Apartments	4,046	299,982
	Small residential buildings	3,475	635,641
Grandfathered Both criteria	Apartments	344	25,255
	Small residential buildings	1,187	216,338
	Total	9,052	1,177,216

Table 3 Eligible objects and calculated building areas

Energy efficiency of this part of the portfolio is estimated based on calculated energy demand dependent on the building code. All these residential buildings are not necessarily included in one single bond issuance.

To calculate the impact on climate gas emissions, the trajectory is applied to all electricity consumption in all buildings. Electricity is the dominant energy carrier to Norwegian buildings, but the energy mix also includes bio energy and district heating, resulting in a total specific emission factor of 111 gCO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 4 indicates how much more energy efficient the eligible part of the portfolio is compared to the average residential Norwegian building stock. It also presents how much the calculated reduction in energy demand constitutes in CO_2 emissions.

[4] Table 06513: Dwellings, by type of building and utility floor space

	Avoided energy compared to baseline [GWh/yr]	Avoided CO_2-emissions compared to baseline [ton CO_2/yr]
Buildings eligible under the building code criterion	119	13,144
Grandfathered under the building code criterion	20	2,194
Buildings eligible under the EPC criterion	5	521
Grandfathered under the EPC criterion	7	751
Total impact eligible buildings	**150**	**16,609**

Table 4 Performance of eligible objects compared to average residential building stock (Based on public statistics, SSB, Energimerking.no, Multiconsult)

2.2 Commercial buildings

2.2.1 Eligibility criteria

The SpareBank 1 SMN eligibility criteria for commercial buildings are divided into three, one based on building code, one based on certifications as BREEAM, and an upgrade criterion.

Building code criterion

New or existing commercial buildings belonging to the top 15% low carbon buildings in Norway:

i. New or existing Norwegian hotel and restaurant buildings that comply with the Norwegian building codes TEK07, TEK10, TEK17 or later building codes. Hence, finished in 2011 and later.
ii. New or existing Norwegian office, retail and industrial buildings and warehouses that comply with the Norwegian building codes TEK07, TEK10, TEK17 or later building codes. Hence, finished in 2010 and later.

Since the building code criteria was established, the building stock has grown, and the new buildings are entering the top 15%. For the sub-categories office, retail, hotel and restaurant buildings combined the buildings complying with TEK07 and later codes are currently 10% of the total. Small industry and warehouses, however, where the newbuild rate has been very high the last years, are now past 15%. This indicates the need to move the criterion for this sub-category.

Combining the information on the calculated specific energy demand related to building code and information on the commercial building stock, the calculated average specific energy demand on the part of the Norwegian building stock examined is presented in the table below. The table also presents the average specific energy demand for the younger and qualifying part of the building stock and the relative reduction in energy demand.

	Average total stock [kWh/m^2]	Average TEK07, TEK10 and TEK17 [kWh/m^2]	Reduction [kWh/m^2]
Office buildings	250	149	40 %
Commercial buildings	321	212	34 %
Hotel buildings	330	222	33 %
Small industry and warehouses	294	172	41 %

Table 5 Average specific energy demand for the building stock; whole stock, part eligible according to criteria and reduction (Source: SSB, historic building codes, Multiconsult)

A reduction of energy demand from the average of the total commercial building stock to the average for eligible building codes is multiplied by the emission factor and area of eligible assets to calculate the impact.

Certification criteria: BREEAM, LEED and Nordic Swan Ecolabel

New, existing or refurbished commercial buildings which received at least one or more of the following classifications:

i. LEED "Gold", BREEAM or BREEAM-NOR "Excellent", or equivalent or higher level of certification
ii. Nordic Swan Ecolabel

This criterion has so far not been used to identify eligible buildings in the portfolio.

Refurbishment criterion

Refurbished Commercial buildings in Norway with an improved energy efficiency of 30%

i. Refurbished Norwegian commercial buildings with at least two steps of improvement in energy label compared to the calculated label based on building code in the year of construction ii. Refurbished Norwegian commercial buildings with at least a 30% improvement in calculated energy efficiency, kWh/m² delivered energy to the building, compared to the calculated energy efficiency based on building code in the year of construction.

This criterion has so far not been used to identify eligible buildings in the portfolio.

2.2.2 Impact assessment - Commercial buildings

The 85 eligible buildings in SpareBank 1 SMN's portfolio amount to 668,903 square meters. The bank has specific data on assets, including area and building category. Where a building falls into several categories, the total area is distributed between the categories. Table 6 indicates the number of objects (counted once and placed in the dominant building category for each building) and the area of each building category providing a basis for the following impact assessments.

	Number of units	Area qualifying buildings in portfolio [m^2]
Office buildings	18	153,571
Commercial buildings	32	243,113
Hotel buildings	5	26,910
Small industry and warehouses	30	245,309
Sum	85	668,903

Table 6 Eligible objects and calculated building areas

(The business market portfolio also includes 4,900 qualifying square meters of residential buildings not included in the commercial buildings impact assessment.)

To calculate the impact on climate gas emissions, the trajectory is applied to all electricity consumption in all buildings. Electricity is the dominant energy carrier to Norwegian buildings, but the energy mix also includes bio energy and district heating, resulting in a total specific factor of 111 g CO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 7 indicates how much more energy efficient the eligible part of the portfolio is compared to the average residential Norwegian building stock. It also presents how much the calculated reduction in energy demand constitutes in CO_2 emissions. The impact related to buildings completed since January 1st 2021 account for 19% of the total calculated impact.

	Area	Reduced energy compared to baseline	Reduced CO_2 emissions compared to baseline
Buildings eligible under the building code criterion	668,903 m^2	75 GWh/year	8,303 tons CO_2/year

Table 7 Performance of eligible objects compared to average building stock

3 Electric vehicles

The impact of electric vehicles in Norway on climate gas emissions is assessed in the following. The bank's portfolio in June 2022, consisting of 5,319 electric vehicles, is assessed regarding direct emissions (Scope 1) and indirect emissions related to electric power production (Scope 2). A baseline is established as the emission of the average vehicle of the total new vehicle introduced to the market, EVs excluded. The bank has provided data on the number of electric passenger vehicles in the portfolio.

3.1 Loan Portfolio Analysis

The Green loan portfolio of SpareBank 1 SMN consists of electric vehicles that meet the eligibility criteria as formulated below.

Eligibility criterion:
Low carbon vehicles. Automatically eligible passenger vehicles, Light Duty and Heavy Goods Vehicles: electric and fuel cell vehicles

The identified eligible vehicles in the portfolio all align with the technical eligibility criteria formulated by Climate Bonds Initiative (CBI)[5] and in the June 2021 EU Taxonomy Annex I to the Commission Delegated Regulation[6].

3.2 General description EVs

Personal mobility in Norway is high, among the highest in Europe, with privately owned passenger vehicles taking the lion's share of the passenger transportation work.

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 was on average driven about 13,900 km. This has declined ever since, and in 2020 the average passenger vehicle travelled 11,152 km[7]. The sudden reduction from 11,883 km driven in 2019 might, however, be a COVID-19 effect that early tendencies show will not last.

In 2020 the average age of passenger vehicles scrapped for refund in Norway was 18 years old[8]. The history of modern EVs is short, and there is yet no evidence that EVs' lifetime is different from other vehicles. Due to significant uncertainties related to the expected lifetime of new vehicles sold between 2011 and 2021, the average lifetime for passenger vehicles is set to 18 years in this analysis, independent of fuel type.

The Norwegian government have, over time, with different administrations, had high ambitions both regarding electric vehicles and biofuel to reduce CO_2 emissions. By the end of 2020, there were about 340,000 electric passenger vehicles on Norwegian roads, which is 12% of the total passenger vehicle stock[9]. The Norwegian Parliament have unanimously adopted a target of 100 % of sales of zero-emission light-duty and passenger vehicles from 2025.[10] Petrol retailers are obliged to sell biofuels as a defined percentage of their total sales of ordinary petroleum products. This obligation was increased

[5] https://www.climatebonds.net/standard/transport
[6] https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf
[7] SSB 12578: Kjørelengder , etter kjøretøytype, drivstoffype, alder, staisikkvariabel og år, 2019
[8] https://www.ssb.no/en/statbank/table/05522
[9] https://www.ssb.no/transport-og-reiseliv/landtransport/statistikk/bilparken
[10] https://www.regjeringen.no/no/tema/transport-og-kommunikasjon/veg_og_vegtrafikk/faktaartikler-vei-og-ts/norge-er-elektrisk/id2677481/

to 20 % in 2020, whereof a share of a minimum 9% should be advanced biofuel. The new government has in their government platform (Hurdalsplattformen) established that the requirements for the share of second-generation biofuels in the fuels sold will be tightened[11].

3.3 Climate gas emissions (Scope 1 and 2)

Categorising the emissions, we have chosen to use the CBI guidelines for the Scope 1, Scope 2 and Scope 3 emission calculations. CBI's Low Carbon Transport Background Paper to Eligibility Criteria[12] 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 indirect emissions related to power production for information.

3.3.1 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 are used to calculate the emissions per kilometre.

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

Statistics Norway's method for calculating indicators for emissions per passenger kilometre utilises a vehicle occupancy of 1.7 persons in passenger vehicles, and this factor is adopted in this analysis[13].

3.3.2 Direct emissions (tailpipe)- Scope 1

Under scope 1, we calculate the "Direct tailpipe CO_2 emissions from fossil fuels combustion" avoided.

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.

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.

For the substituted fossil fuelled vehicles, emission data are retrieved from recognised 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[14].

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 aims to substantially reduce emissions from fossil fuelled vehicles

[11] https://res.cloudinary.com/arbeiderpartiet/image/upload/v1/ievv_filestore/43b0da86f86a4e4bb1a8619f13de9da9afe348b29bf24fc8a319ed9b02dd284e
[12] https://www.climatebonds.net/files/files/Low%20Carbon%20Transport%20Background%20Paper%20Feb%202017.pdf page 10
[13] https://www.ssb.no/transport-og-reiseliv/artikler-og-publikasjoner/mindre-utslipp-per-kjorte-kilometer
[14] https://www.vegvesen.no/fag/fokusomrader/miljo+og+omgivelser/klima

through biofuel use in the fuel sold before 2030, the marginal emission reduction possibly obtained through these political goals between 2020-2030 has 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 weighted average of emissions per fossil passenger vehicle ($c_{weighed\ average}$) we use the average annual emission from new passenger vehicle models from 2011-2021[15].

To estimate the distance travelled by the average passenger vehicle, we assume that EVs drive as much as an average Norwegian passenger vehicle each of the 18 years it is in use. Existing EVs younger than 9 years have a yearly mileage somewhere between petrol and diesel passenger vehicles[16].

Traffic volumes per passenger vehicle have shown a historic decline, and we use linear regression on publicly available dataset (d_{2005}-d_{2019}) and extrapolate until 2038. This is a conservative approach as it is likely, at some point, to see a flattening. For busses, we do not expect this declining trend. The distance travelled by busses is assumed at about 32,000 km/year, which is the average from the last 10 years[17].

Table 8 present the calculated emission factors for the relevant vehicle categories. The calculations are based on emissions statistics between 2011-2019, calculated gross tailpipe CO_2 emissions for the average vehicle produced in each of the years 2011-2021, and anticipated biofuel- and fossil fuel content in petrol/diesel pumped each year between 2020-2038.

	Direct emissions substituted fossil passenger vehicles – Average	**Direct emissions EV**
Emissions per passenger km	53 gCO_2/pkm	0 gCO_2/pkm
Emissions per km	90 gCO_2/km	0 gCO_2/km
Emissions per passenger vehicle and year	957 $kgCO_2$/vehicle/year	0 $kgCO_2$

*Table 8 **Passenger vehicles**: Greenhouse gas emission factors (CO_2 equivalents), average direct emissions*

3.3.3 Indirect emissions (Power consumption only)- Scope 2

Power is traded internationally in an ever more 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 analysis. The direct emissions in power production in Europe are expected to be dramatically reduced in the coming decades. Due to urgency, a 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 2050. This is in line with the EU's ambitious decarbonisation of the power sector.

Passenger vehicles in Norway have a life expectancy of 18 years. The production mix is based on the assumed emissions in 2028, which is the weighted average of the lifetime for the vehicles in the portfolio.

[15] https://ofv.no/CO2-utslippet/co2-utslippet
[16] https://www.ssb.no/statbank/table/12578/
[17] SSB 12578: Kjørelengder , eter kjøreøyype, drivstoffype, alder, staisikkvariabel og år, 2019

The GHG emission intensity baseline for power consumption may be calculated with different system boundaries. For this section, a three-year average emission factor for power in Europe is applied. Yearly power production and related CO_2 emissions presented by the Association of Issuing Bodies[18] are included for all European countries except Iceland, Cyprus, Ukraine, Russia and Moldova. From a factor of 245 gCO_2/kWh, the reduction in the vehicles lifetime gives the applied average factor of 169 gCO_2/kWh.

Using a European production mix is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[19].

The energy consumption of EVs 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[20], 19.5 kWh/100km, which is close to the factor presented in the Swedish "Handbok för vägtrafikens luftföroreningar"[21]. This factor has been used in the analysis. In Table 9, emission factors are presented in both emissions per kilometre and per passenger kilometre.

	Indirect emissions electric passenger vehicle - annual average
Emissions per passenger km, indirect emissions from power production	19 gCO_2/pkm
Emissions per km, indirect emissions from power production	33 gCO_2/km

Table 9 Electricity consumption greenhouse gas factors (CO_2- equivalents) electric vehicles- based on EU power production mix

*Note that there are indirect emissions related to fossil fuel as well but these are scope 3 emissions and 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. Indirect emissions related to fossil fuelled vehicles are zero for scope 2.

3.4 Impact assessment: Avoided emissions – Clean transportation

The 5,319 eligible vehicles in SMN's portfolio are estimated to drive 55 million kilometres in a year. The available data from the bank include the current number of contracts and related portfolio volume.

	Number of vehicles	Sum km/yr	Sum person km/yr
Eligible passenger vehicles in portfolio	5,319	55 mill.	94 mill.

Table 10 Number of eligible passenger vehicles and expected yearly mileage

[18] https://www.aib-net.org/facts/european-residual-mix
[19] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf
[20] https://ev-database.org/cheatsheet/energy-consumption-electric-car
[21] Handbok för vägtrafikens luftföroreningar, chapter 6, Trafikverket, 2019

The table below summarises, in rounded numbers, the reduced CO_2 emissions compared to the 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 indirect emissions are only calculated for EVs and not fossil fuelled vehicles.

Direct emissions in table 11 are calculated by multiplying the distance travelled by the vehicles in the portfolio in a year by the specific emission factor [CO_2/km] in table 8.

Indirect emissions are calculated by multiplying the distance travelled by the number of vehicles in the portfolio in a year by the specific emission factor [CO_2/km] in table 9.

Eligible passenger vehicles	Avoided CO_2 emissions compared to baseline
Total Direct emissions only (Scope 1)	**4,865 tons CO_2/year**
Total Indirect emissions EVs only (Scope 2)	-1,821 tons CO_2/year
Total Avoided emissions	3,043 tons CO_2/year

Table 11 The EV portfolio's estimated impact on direct, indirect and avoided GHG emission in rounded numbers

The reduction in direct emissions from passenger vehicles corresponds to 1.9 million litres of gasoline saved per year.

4 Renewable energy

Hydropower is the clearly dominant power production solution in Norway and has been for 100 years since the beginning of the industrialisation. Hydropower accounts for about 91% of the national power production. Onshore wind power is developed at speed in Norway, and production in 2021 accounted for 8% of the national power production.

Power production development in Norway is strictly regulated and subject to licencing and is overseen by Norwegian Water Resources and Energy Directorate (NVE), a directorate under the Ministry of Petroleum and Energy. Licenses grant rights to build and run power production installations under explicit conditions and rules of operation. NVE puts particular emphasis on preserving the environment. The Norwegian part of the NVE homepage gives detailed information about different requirements for different kinds of projects[22].

Data about the assets are available from Norwegian Water Resources and Energy Directorate (NVE), as all assets are subject to licencing.

4.1 Eligibility

The eligibility criteria are formulated in line with CBI criteria[23] , and the threshold is in line with the emissions threshold of 100 gCO_2e/kWh in the June 2021 EU Taxonomy Annex I to the Commission Delegated Regulation[24].

Eligibility criteria:
All renewable energy plants with emission intensity below 100 gCO_2e/kWh are eligible for green bonds.

Hydropower plants with power density > 5 W/m^2 are exempt from the most detailed investigations.

These criteria are easily fulfilled for Norwegian hydropower assets, and most assets overperform radically.

- All run-of-river power stations have no or negligible negative impact on GHG emissions
- Due to the cold climate, Norwegian reservoirs are not exposed to cyclic revegetation of impoundment, and hence the negative impacts on GHG emissions from these reservoirs are very small
- Hydropower stations with high hydraulic head and/or relatively small impounded area have high power density

The adaptation and resilience component in Climate Bonds Initiative (CBI) hydropower eligibility criteria and the EU Taxonomy's "Do no significant harm", addressing environmental and social issues, is in the Norwegian context to a large degree covered by the rigid relevant requirements in the Norwegian regulation of energy plants. Hence, all Norwegian wind and hydropower assets conform to

[22] https://www.nve.no/konsesjonssaker/konsesjonsbehandling-av-vannkraft/
[23] https://www.climatebonds.net/standard/hydropower
[24] https://ec.europa.eu/finance/docs/level-2-measures/taxonomy-regulation-delegated-act-2021-2800-annex-1_en.pdf

very high standards regarding environmental and social impact. Portfolio alignment with DNSH requirements has not been assessed in detail.

4.2 Eligible assets in the portfolio

Multiconsult has investigated a sample of SpareBank 1 SMN's portfolio and can confirm that the assets have low to negligible GHG emissions related to construction and operation.

All power produced by renewable energy power stations in the portfolio is in hydropower stations with capacities in the range of 0.1-3 MW. These are all run-of-river plants with no or very small reservoirs and hence a very high power density of several thousand W/m^2 (ratio between capacity and impounded area).

4.3 Impact assessment- Renewable energy

4.3.1 CO_2 emissions from renewable energy power production

All power production facilities have a negative impact on GHG emissions. Instead of calculating the impact on GHG emissions for all, and most of them rather small facilities in the SpareBank 1 SMN portfolio, we refer to The Association of Issuing Bodies (AIB). AIB is responsible for developing and promoting the European Energy Certificate System – "EECS".

The Association of Issuing Bodies (AIB), referred to by NVE[25], uses an emission factor of 6 gCO_2/kWh for all European hydropower in their calculations of the European residual mix. The value is based on a life-cycle analysis where all upstream and downstream effects in the whole value chain for power production are included.

In subsequent assessments, we are using the AIB emission factors for all assets, even though they are higher than factors in other credible sources. E.g. has Østfoldforskning[26] calculated the life-cycle emissions of Norwegian hydropower (all categories) to 3.33 gCO_2e/kWh. For the type of assets in the portfolio, with many run-of-river and small hydropower assets, the AIB emission factor is regarded as conservative in an impact assessment setting. The positive impact of the hydropower assets is 130 gCO_2/kWh compared to the baseline of 136 gCO_2/kWh.

4.3.2 Power production estimates

The renewable energy power plants in SpareBank 1 SMN's portfolio are quite varied in age. And a large portion of younger plants add uncertainty to the future power production. Planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's hydropower database[27].

For small hydropower, it is important to understand that the stated power production given in the concession documents does not necessarily represent what can realistically be expected from the plant over time. For one, the hydrology is uncertain and, unfortunately, often overestimated in early project phases for small hydropower. There is, however, also the fact that the production figures normally do not account for planned and unplanned production stops due to accidents, maintenance etc. Research on small hydropower has shown that actual production often is more than 20% lower than the

[25] https://www.nve.no/norwegian-energy-regulatory-authority/retail-market/electricity-disclosure-2018/
[26] https://norsus.no/wp-content/uploads/AR-01.19-The-inventory-and-life-cycle-data-for-Norwegian-hydroelectricity.pdf
[27] https://www.nve.no/energiforsyning/kraftproduksjon/vannkraft/vannkraftdatabase/

concession/pre-construction figures. There is no equivalent evidence to claim the same mismatch for large hydropower.

4.3.3 SpareBank 1 SMN's criterion – New or existing Norwegian renewable energy plants

The eligible plants in SpareBank 1 SMN's portfolio have a planned capacity stated in concession documents to produce about 46.6 GWh per year. This has in the impact assessment been adjusted to an expected 37.3 GWh based on research mentioned in the previous section. The available data from the bank and in open sources include:

- Type of plant
- Installed capacity
- Planned annual production

	Capacity [MW]	Total capacity [MW]	Planned production [GWh/yr]	Expected production [GWh/yr]
Small run- of – river	0.1 – 3	13.3	46.6	37.3

Table 12 Capacity and production of eligible hydropower plants (HPP), estimated and expected production (reduced for common errors)

Table 13 summarises the expected renewable energy produced by the eligible assets in the portfolio in an average year and the resulting avoided CO_2 emissions the energy production results in.

	Produced power compared to baseline	Reduced CO_2 emissions compared to baseline
Eligible hydropower plants in the portfolio	**37.3 GWh/year**	**4,846 tons CO_2/year**

Table 13 Power production and estimated positive impact on GHG-emissions