REPORT

Sparebanken Vest Green Portfolio Impact Assessment

CLIENT

Sparebanken Vest

SUBJECT

Impact assessment- energy efficient residential and commercial buildings and renewable energy

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

Energy efficient residential buildings	*23,300 ton CO_2e/year*
Energy efficient commercial buildings	*4,100 ton CO_2e/year*
Renewable energy	*126,600 ton CO_2e/year*
Total	*154,000 ton CO_2e/year*

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1 Introduction

Assignment

On assignment from Sparebanken Vest, Multiconsult has assessed the impact of the part of Sparebanken Vest's loan portfolio eligible for green bonds.

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

1.1 CO_2- emission factors related to energy demand

The eligible assets are either producing renewable energy and delivering 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. Since January 2020, all use of fossil oil is banned from use in buildings. The fuel mix in Norwegian district heating production in 2019 included only 5 % from fossil fuels (oil and gas) (Fjernkontrollen[2]).

As shown in figure 1, the Norwegian production mix in 2019 (93% hydropower and 4% wind) results in emissions of 11 gCO_2/kWh. The production mix is also included in the figure for other selected European states for illustration.

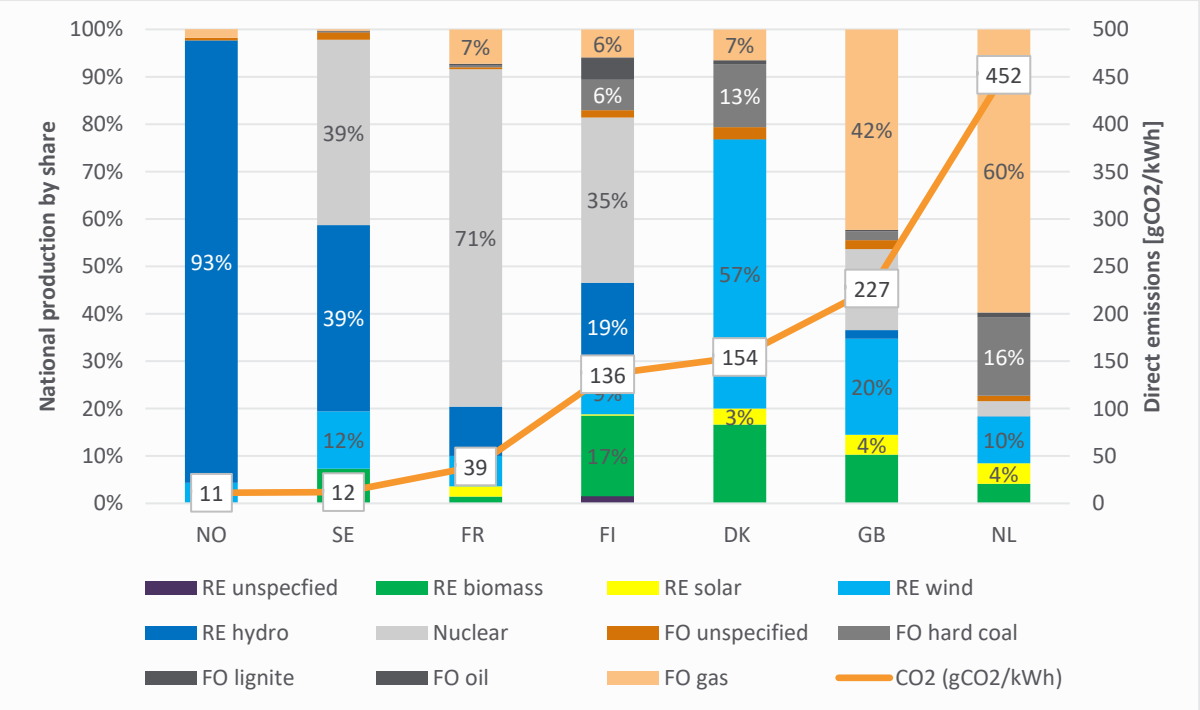

Figure 1 National electricity production mix in some relevant countries (European Residual Mixes 2019, Association of Issuing Bodies[3])

[1] https://www.spv.no/om-oss/investor-relations/gronne-obligasjoner
[2] http://fjernkontrollen.no/
[3] 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.

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 (EU28 + Norway) production mix	136
Norwegian production 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. Using a European mix instead of a national production mix is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[4].

Applying the factor based on EU28 + Norway energy production mix, the resulting CO_2- factor for Norwegian residential buildings[5] is on average 124 gCO_2/kWh due to the influx of bioenergy and district heating in the energy mix. This factor is used in impact calculations on pages 7 through 10.

[4] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf
[5] Multiconsult. Based on building code assignments for DiBK

2 Energy efficient buildings

2.1 Residential buildings

2.1.1 Eligibility criteria

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

i. New or existing Norwegian apartments that comply with the Norwegian building codes of 2010 (TEK10) or 2017 (TEK17). Hence, finished 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, finished 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 building code and information on the residential building stock, the calculated average specific energy demand for the Norwegian residential building stock is 253 kWh/m^2. Building code TEK07 (small residential buildings), TEK10 and TEK17 gives an average specific energy demand for existing houses and apartments, weighted for actual stock, of 120 kWh/m^2.

Hence, compared to the average residential building stock;

- the building code TEK07 (small residential buildings), TEK10 and TEK17 gives a calculated specific energy demand reduction of 52 %

Energy Performance Certificate criterion

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

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

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

One of two criteria below must be met:

i. Refurbished Norwegian residential 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 residential buildings with at least a 30% improvement in energy efficiency measured in specific energy, kWh/m2, compared to the calculated label based on building code in the year of construction.

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

2.1.2 Impact assessment - Residential buildings

The eligible residential buildings in Sparebanken Vest's portfolio is estimated to amount to 1,412,256 square meters. The available data include reliable area for most objects. For object where this data is not available, the area per dwelling is calculated on the basis of average area derived from national statistics (Statistics Norway[6]).

Table 2 include information on the number of qualifying objects and their living area for residential buildings in both the bank's Private market portfolio (PM) and Business market portfolio (BM).

		Number of units	Area qualifying buildings in portfolio [m^2]
PM	Apartments	3,693	281,303
	Small residential buildings	6,382	1,098,537
	Sum PM	10,075	1,379,840
BM	Apartments	135	21,199
	Small residential buildings	55	11,217
	Sum BM	190	32,416
	Sum PM and BM	10,265	1,412,256

Table 2 Eligible residential objects and calculated building areas in PM and BM portfolios

Energy efficiency of this part of the portfolio is estimated based on calculated energy demand dependent on 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 124 gCO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 3 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.

	Area	Avoided energy compared to baseline	Avoided CO_2-emissions compared to baseline
Buildings eligible under the building code criterion (PM)	1,379,840 m^2	183.6 GWh/year	22,772 tons CO_2/year
Buildings eligible under the building code criterion (BM)	32,416 m^2	4.3 GWh/year	535 tons CO_2/year
Buildings eligible under the building code criterion (PM + BM)	1,412,256 m^2	187.9 GWh/year	23,307 tons CO_2/year

Table 3 Performance of eligible residential objects compared to average residential building stock

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

2.2 Commercial buildings

2.2.1 Eligibility criteria

The eligibility criteria for commercial buildings are divided in three, one based on building code, one based on certifications as BREEAM, and at last an upgrade criterion.

Building code criterion

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

i. New or existing Norwegian hotel and restaurant buildings that comply with the Norwegian building code TEK07, TEK10, TEK17 and later building codes. Hence, finished in 2010 and later.

ii. New or existing Norwegian office and retail that comply with the Norwegian building TEK07, TEK10, TEK17 and later building codes. Hence, finished in 2009 and later.

iii. New or existing Norwegian industrial buildings and warehouses that comply with the Norwegian building TEK10, TEK17 and later building codes. Hence, finished in 2012 and later.

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.

Building category	Average total stock [kWh/m^2]	Average qualifying objects [kWh/m^2]	Reduction [%]
Office buildings	251	151	40 %
Commercial buildings	323	214	34 %
Hotel buildings	309	208	33 %
Small industry and warehouses	297	169	43 %

Table 4 Average specific energy demand for the building stock; whole stock, part eligible according to criteria and reduction

A reduction of energy demand from the average of the total commercial building stock to the average for eligible building codes is multiplied to the emission factor and area of eligible assets to calculate 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/m^2 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 269 eligible buildings in Sparebanken Vest's portfolio is estimated to amount to 311,925 square meters. The bank has specific data on assets including area and building category. Table 5 indicates the number of objects and the area of each building category making basis for the following impact assessments.

Table 5 include information on the number of qualifying objects and the building area for commercial buildings in both the bank's Private market portfolio (PM) and Business market portfolio (BM).

		Number of units	Area qualifying buildings in portfolio [m^2]
PM	Commercial buildings	16	4,516
	Small industry and warehouses	1	867
	Sum PM	17	5,383
BM	Office buildings	150	192,457
	Commercial buildings	57	62,415
	Hotel buildings	5	9,601
	Small industry and warehouses	40	42,069
	Sum BM	252	306,542
	Sum PM and BM	269	311,925

Table 5 Eligible objects and calculated building areas

(The business market portfolio also includes a few school buildings, culture buildings and nursing homes not included in the commercial buildings analysis.)

As for residential buildings, the specific emission factor of energy used in buildings are set at 124 g CO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

Table 6 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.

	Area	Avoided energy compared to baseline	Avoided CO_2-emissions compared to baseline
Commercial buildings in PM	5,383 m^2	0.6 GWh/year	77 tons CO_2/year
Commercial buildings in BM	306,542 m^2	32.5 GWh/year	4,038 tons CO_2/year
Commercial buildings in PM + BM	311,925 m^2	33.2 GWh/year	4,115 tons CO_2/year

Table 6 Performance of eligible objects compared to average building stock

3 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 93 % of the national power production. Onshore wind power is developed at speed in Norway and production in 2019 accounted for 4 % 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 operate 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 on different kind of projects[7].

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

3.1 Eligibility

The Sparebanken Vest green bonds eligibility criterion is formulated in line with CBI criteria[8] published for public consultation and signalled to be ready for use in certifications by the end of 2020. The threshold is also in line with the overarching, technology-agnostic emissions threshold of 100 gCO_2e/kWh proposed for electricity generation in the EU Taxonomy[9].

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 detailed investigation.

For Norwegian hydropower assets, these criteria are easily fulfilled 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 ESG, is in the Norwegian context

[7] https://www.nve.no/konsesjonssaker/konsesjonsbehandling-av-vannkraft/
[8] https://www.climatebonds.net/files/files/Hydropower%20Criteria%20Document.pdf
[9] https://ec.europa.eu/knowledge4policy/publication/sustainable-finance-teg-final-report-eu-taxonomy_en

covered by the rigid relevant requirements in the Norwegian regulation of energy plants. Hence, all Norwegian wind and hydropower assets conform to very high standards regarding environmental and social impact.

3.2 Eligible assets in the portfolio

Multiconsult has investigated a sample of Sparebanken Vest'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 are 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 very high power density of several thousand W/m^2 (ratio between capacity and impounded area).

3.3 Impact assessment- Renewable energy

3.3.1 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 Sparebanken Vest 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[10], 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 the average GHG emission intensity in Norwegian hydropower (all categories) been calculated, using LCA, to 2.39 gCO_2e/kWh. (Østfoldforskning, 2015[11])

For the type of assets in the portfolio, with many run-of-river and small hydropower assets, and all large and medium sized HPPs being minimum 30 years old, 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 presented in Table 1.

3.3.2 Power production estimates

The renewable energy power plants in Sparebanken Vest's portfolio are quite varied in age. And a large portion of younger plants add uncertainty to the future power production. A sample of the Planned power production for the assets has been attained from the Norwegian Water Resources and Energy Directorate's hydropower database[12].

For small hydropower it is important to understand that stated power production given in the concession documents do 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

[10] https://www.nve.no/norwegian-energy-regulatory-authority/retail-market/electricity-disclosure-2018/
[11] https://www.ostfoldforskning.no/media/1056/734-1.pdf
[12] https://www.nve.no/energiforsyning/kraftproduksjon/vannkraft/vannkraftdatabase/

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

3.3.3 Portfolio analysis – New or existing Norwegian renewable energy plants

The hydropower plants in Sparebanken Vest's portfolio is estimated to have the capacity to produce about 974 GWh per year. The available data from the bank and in open sources include:

- Type of plant
- Installed capacity
- Production in normal year
- Age
- Location
- The banks engagement as share of financing

	Capacity [MW]	# of plants	Total capacity [MW]	Expected production [GWh/yr]
Small HPP	0.1 - 25	81	315	681
Medium sized HPP	25- 100	5	324	141
Large HPP	> 100	3	835	152
Sum		89	1,474	974

Table 7 Capacity and production of hydropower plants in the portfolio

The expected production of renewable energy in the table above is representative of the bank's relative engagement in the plants and not the total production at approximately 7,000 GWh/yr.

Other important features of the portfolio are that 73 of the 89 plants are run-of-river plants, and that all other plants with impoundments are old, 30 years or older.

Table 8 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 portfolio	**974 GWh/year**	**126,581 tons CO_2/year**

Table 8 Power production and estimated positive impact on GHG-emissions

Sparebanken Vest Green Portfolio Impact Reporting
2020

Portfolio date: August/September 2020

Eligible Project Category	**Signed Amount**	**Share of Total Financing**	**Eligibility for Green Bonds**	**Annual Site Energy Savings**	**Annual Site Renewable Energy Production**	**Annual CO2 Emission Avoidance**
a/	**b/**	**c/**	**d/**	**e/**	**e/**	**e/**
Residential Green Buildings	**NOK**	**%**	**%**	**MWh**	**MWh**	**tCO2**
Green residential buildings in Norway	22 500 000 000	100	100	187 902		23 307
Green commercial buildings in Norway	3 700 000 000	100	100	33 173		4 115
Renewable energy	2 500 000 000	48	100		974 701	126 581
Total	**28 700 000 000**			**221 075**	**974 701**	**154 003**

Portfolio based green bond report according to the Harmonized Framework for Impact Reporting

a/ Eligible category
b/ Signed amount represents the amount legally committed by the issuer for the portfolio or portfolio components eligible for Green Bond financing
c/ This is the share of the total portfolio cost that is financed by the issuer
d/ This is the share of the total portfolio costs that is Green Bond eligible
e/ Impact indicators
-Site energy savings calculated using the difference between the top 12% of buildings and the national building stock bechmarks
-Annual CO2 emission avoidance