REPORT

Sparebanken Møre Green Portfolio Impact Assessment 2022

CLIENT

Sparebanken Møre

SUBJECT

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

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PROJECT	**Sparebanken Møre Green Portfolio Impact Assessment**	DOCUMENT CODE	10245304-01-TVF-RAP-001
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In summary, impact assessed for all examined asset classes in the Sparebanken Møre 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	*7,500 ton CO_2e/year*
Energy efficient commercial buildings	*1,800 ton CO_2e/year*
Renewable energy	*80,400 ton CO_2e/year*
Total	*89,700 ton CO_2e/year*

Note that the impact in the table above is not scaled by the bank's engagement. The scaled values for the green residential buildings portfolio are presented later in the report.

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1 Introduction

Assignment

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

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

1.1 CO_2 emission factors related to electricity demand and production

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.

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.

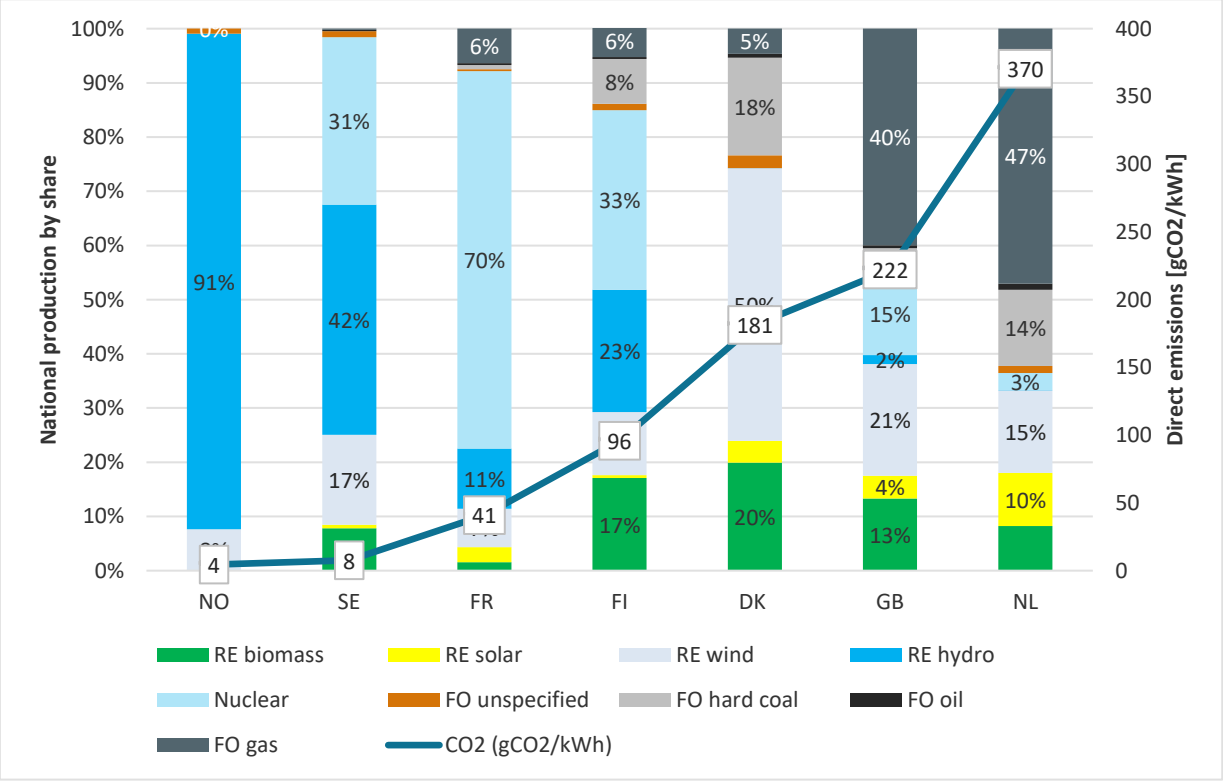

Figure 1 National electricity production mix in some selected countries (European Residual Mixes 2021, Association of Issuing Bodies [2])

[1] https://www.sbm.no/samfunnsansvar/green-bond-framework/
[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 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

In this impact assessment eligible Residential Green Buildings for Sparebanken Møre must meet one of the following eligibility criteria:

Building code criterion

New or existing Norwegian residential dwellings that comply with the Norwegian building code of 2010 (TEK10) or later codes. Hence, built in 2012 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 on the Norwegian residential building stock is 251 kWh/m^2. Building code TEK10 and TEK17 gives 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 code TEK10 and TEK17 gives a calculated specific energy demand reduction of 53 %

EPC criterion

Existing Norwegian residential buildings built using older building codes than TEK10 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. According to the EPC system, the average energy performance of a dwelling 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 based on the EPC statistics, where the average dwelling gets an E.

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, independently 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 the portfolio are estimated to amount to ~517,000 square meters.

	Møre boligkreditt			Sparebanken Møre			Total
	Number of units	Area qualifying buildings in portfolio [m^2]		Number of units	Area qualifying buildings in portfolio [m^2]		Area qualifying in portfolio [m^2]
		TEK10/TEK17	EPC A-B		TEK10/TEK17	EPC A-B	
Apartments	970	69 495	3 256	905	47 552	1 389	121 692
Small residential houses	1 393	217 065	16 312	1 375	150 889	11 018	395 284
Sum		286 560	19 568		198 441	12 407	516 976

Table 3 Eligible objects and calculated building areas

11% of the area in table 3 is area in buildings completed in 2021 or later. Of total green portfolio impact, this accounts for 8%.

Energy efficiency of this part of the portfolio is estimated based on calculated energy demand dependent on the building code. 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.

		Area [m^2]	Avoided energy compared to baseline [GWh/year]	Avoided CO_2-emissions compared to baseline [tons CO_2/year]
Møre Boligkreditt	Buildings eligible under the building code criterion	286 560	38	4 233
	Buildings eligible under the EPC criterion	19 568	2	222
Sparebanken Møre	Buildings eligible under the building code criterion	198 441	27	2 932
	Buildings eligible under the EPC criterion	12 407	1	143
Total	**Eligible buildings in portfolio- total**	**516 976**	**68**	**7 530**
Møre Boligkreditt	Impact scaled by bank's engagement		21	2 304
Sparebanken Møre	Impact scaled by bank's engagement		17	1 825
Total	Impact scaled by bank's engagement		37	4 129

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 Sparebanken Møre eligibility criteria for commercial buildings considered in this impact assessment is the building code criterion described below and buildings with an EPC A or B. Criteria based on certification schemes as BREEAM-NOR and an upgrade criterion is not considered.

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 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 TEK10, TEK17 or later building codes. Hence, finished in 2010 and later.

1. Norwegian commercial buildings that comply with the Norwegian building code of 2010 (TEK10) and later codes are eligible for green bonds as these buildings have significantly better energy standards and account for less than 15% of the commercial building stock.
    a. For **office buildings, retail buildings, industrial buildings and warehouses,** a two-year lag between the implementation of a new building code and the buildings built under that code must be taken into account. Hence all buildings finished in 2012 or later qualify.
    b. For **hotel and restaurant buildings,** a three-year lag between implementation of a new building code and the buildings built under that code must be taken into account. Hence all buildings finished in 2013 or later qualify.
2. Renovated Norwegian residential buildings which have achieved an improvement in energy-efficiency of at least 30%.

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 TEK10 and TEK17 [kWh/m^2]	Reduction [kWh/m^2]
Office buildings	251	147	42 %
Commercial buildings	323	206	36 %
Hotel buildings	309	184	41 %
Small industry and warehouses	297	169	43 %

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

2.2.2 Impact assessment - Commercial buildings

The eligible buildings in Sparebanken Møre's commercial portfolio are estimated to amount to ~145,000 square meters.

The difference between the average specific energy demand for each sub-category in the building stock and the average for qualifying buildings is multiplied by the emission factor and area of eligible assets to calculate the impact for buildings qualifying under the building code criterion.

	Area qualifying buildings in portfolio [m^2]		
	TEK10	TEK17	Total
Office buildings	50 986	3 565	54 551
Retail/commercial buildings	43 508	7 590	51 097
Hotel and restaurant buildings	18 736	0	18 736
Industry and small warehouse buildings	19 321	1 618	20 939
Sum	132 551	12 772	145 323

Table 6 Eligible objects and calculated building areas

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.

	Area	Reduced energy compared to baseline	Reduced CO_2 emissions compared to baseline
Eligible commercial buildings in portfolio	145,323 m^2	16 GWh/year	1,771 tons CO_2/year

Table 7 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 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 the 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[4].

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

3.1 Eligibility

The Sparebanken Møre's Green Product Framework includes equipment, development, manufacturing, construction, operation, distribution and maintenance of renewable energy generation. The Green loan portfolio of Sparebanken Møre assessed in this report consists of hydropower plants that meet the criteria as formulated as:

- Power plants with emission intensity below 100 gCO2/kWh are eligible for green bonds.
- Projects are limited to small-scale run-of-river with maximum production capacity of less than 25 MW.

The eligibility criteria are formulated in line with CBI criteria[5], 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[6].

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

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 areas 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

[4] https://www.nve.no/konsesjonssaker/konsesjonsbehandling-av-vannkraft/
[5] https://www.climatebonds.net/standard/hydropower
[6] 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.

3.2 Eligible assets in the portfolio

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

All hydropower stations in the portfolio have installed capacities in the range of 0.7 - 24 MW and are either run-of-river plants or hydropower plants with very small reservoirs and hence a very high power density of several thousand W/m^2 (ratio between capacity and impounded area). Multiconsult has conducted a brief general assessment of eligibility based on available reports on the performance of national hydropower. The assets have not been examined in detail using designated tools (e.g. G-RES) nor assessed against all elements of "do no significant harm" mentioned in the EU taxonomy.

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 Møre's 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[7], 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[8] 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.

3.3.2 Power production estimates

The renewable energy power plants in Sparebanken Møre'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[9].

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

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

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 Sparebanken Møre's criterion – New or existing Norwegian renewable energy plants

The eligible plants in Sparebanken Møre's portfolio have a planned capacity stated in concession documents to produce about 773 GWh per year. In the impact assessment this has been adjusted to an expected 619 GWh based on research mentioned in the previous section. The available data from the bank include:

- Type of plant (all being run-of-river)
- Yearly production capacity (estimated)

Installed capacity of the plants has not been shared but some plant names. The energy production estimations indicate, supported with public available date for the named plants, indicate that alle powerplant capacities in the portfolio is below 10 MW.

Due to the often overestimated annual production in small hydropower, the impact for plants smaller than 10 MW is conservatively calculated, and estimated production is reduced by 20%.

	Capacity [MW]	# of plants	Estimated production [GWh/yr]	Expected production [GWh/yr]
Small hydropower	< 10	53	773	619

Table 8 Capacity and production of eligible hydropower plants (HPP), estimated and expected production (reduced for common errors)

Table 9 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	Reduced CO_2 emissions compared to baseline
Eligible hydropower plants in portfolio	**619 GWh/year**	**80,407 tons CO_2/year**

Table 9 Power production and estimated positive impact on GHG-emissions