REPORT

Sunndal Sparebank Green Buildings Portfolio - Impact Assessment

CLIENT

Sunndal Sparebank

SUBJECT

Portfolio of Norwegian Green Residential Buildings

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1 Introduction

On assignment from Sunndal Sparebank, Multiconsult has assessed the impact of Sunndal Sparebank's residential building loan portfolio eligible for green bonds according to Sunndal Sparebank's Green Bond Framework (Sunndal Sparebank , 2024). In this report we briefly describe Sunndal Sparebank's green bond qualification criteria and our analysis results of the loan portfolio.

2 Green Residential Buildings Eligibility Criteria

According to Sunndal Sparebank's Green Bond Framework, buildings in the loan portfolio must meet one of the following eligibility criteria:

Residential buildings:

1. Buildings built in 2021 or later: Buildings complying with the relevant NZEB-10 percent threshold
2. Buildings built before 2021: EPC A or within the top 15 percent energy efficient buildings in Norway: Buildings complying with TEK10 or TEK17 building codes (built in 2012 or later) or EPC A or EPC B.

All objects in the residential building loan portfolio have been qualified by Sunndal Sparebank as green buildings according to the criteria outlined above. The following sections explain Multiconsult's approach for calculating the energy savings and corresponding avoided emissions for Sunndal Sparebank's residential building loan portfolio compared to the average energy usage of the Norwegian residential building stock (baseline).

3 The Norwegian Residential Building Stock

Changes in the Norwegian building code have over several decades consistently resulted in more energy efficient buildings. Figure 1 shows theoretical energy demand values (as opposed to measured energy use) for representative models of apartments and small residential buildings, calculated using the computer programme SIMIEN and in accordance with Norwegian Standard NS 3031:2014. In addition to the guiding assumption in Norwegian Standard NS 3031:2014, experience with building tradition is included. Net energy demand is calculated for model buildings used for defining the building code. For older buildings, the calculated values tend to be higher than the actual measured demand, mostly because the calculated ventilation air flow volume in older buildings is assumed to be as high as in newer buildings, but without heat recovery. Indoor air quality is hence assumed not to be dependent on building year. This is the same methodology as used in the EPC system. Note that, for residential buildings, there was no change between TEK07 and TEK10 with respect to energy efficiency requirements.

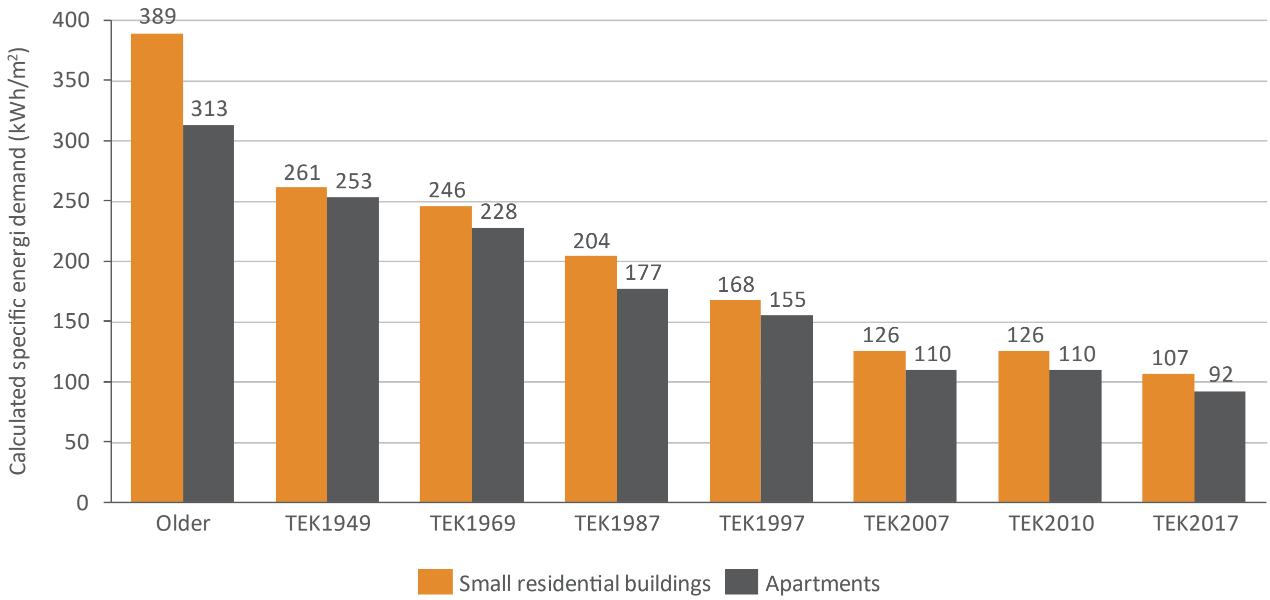

Figure 1 Development in calculated specific net energy demand based on building code and building tradition. Source: Multiconsult, SIMIEN simulations.

Figure 2 shows the age distribution of the Norwegian residential building stock. Combining the information on the calculated energy demand related to building code in Figure 1 and information on the residential building stock in Figure 2, the calculated average specific energy demand of the Norwegian residential building stock, weighted for actual stock, is 202 kWh/m^2 for apartments and 257 kWh/m^2 for small residential buildings. These energy demand baselines will be applied below for calculating the energy savings and corresponding avoided emissions for the residential building portfolio.

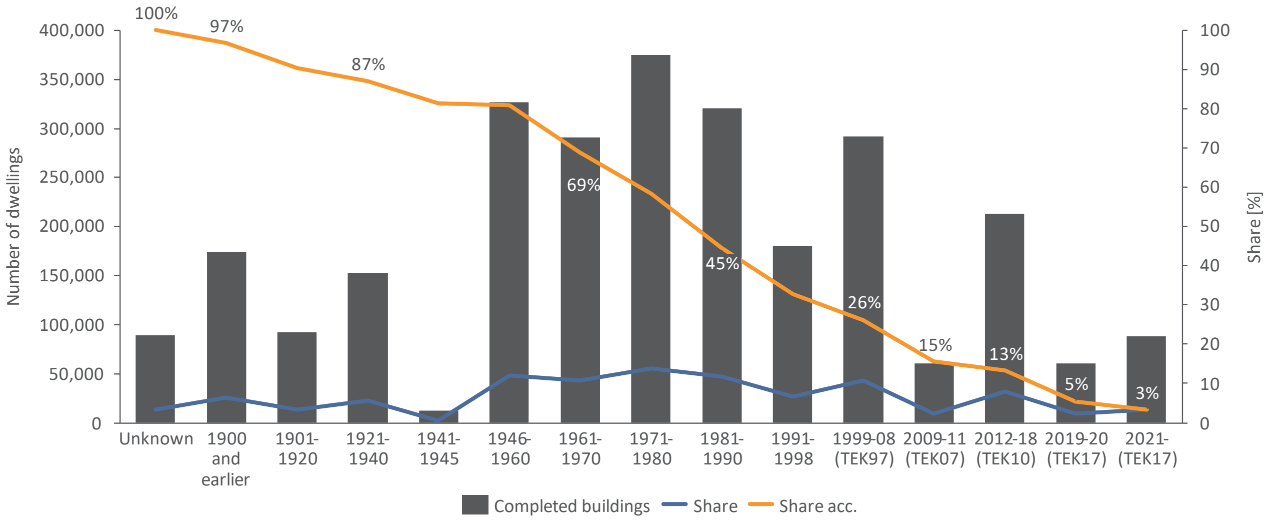

Figure 2 Age and building code distribution of dwellings. Source: Multiconsult

4 Emission Factor

This section outlines the emission factor used in the impact assessment of Sunndal Sparebank's residential portfolio.

The CO_2 emissions resulting from energy consumption in residential buildings depends to a large degree on the age of the building. This is due to two factors: the differences in energy efficiency requirements in the building code, and development in the predominant solutions and energy sources for heating in new buildings. Examples of the latter are direct electric heating, several types of heat pumps, bioenergy, and district heating. The share of fossil fuel is low and declining.

Since the Norwegian buildings are predominantly heated by electricity, the placement of the system boundary for power production heavily influences the emission factor. Since the eligible objects in the portfolio are rather new, and expected to have a 60-year life, the impact is considered best illustrated by the yearly average CO_2 emissions over their lifetime. The emission factor applied in this green portfolio impact assessment reflects a projected lifetime average, assuming a decarbonisation of the European energy system.

Using a life-cycle analysis (LCA), the Norwegian Standard NS 3720:2018 considers international trade of electricity and the fact that consumption and emission factors do not necessarily mirror domestic production. As shown in table 1 the European emission factor is 136 gCO_2-eq/kWh. This constitutes the greenhouse gas emission intensity baseline for energy use in buildings with a life span of 50-60 years, assuming the emission factor of the European power production mix follows a linear declining trajectory and approaches zero by 2050.

Table 1 Electricity production emission factors (CO2-eq) without and with influx of other heating sources for buildings. Source: (Norwegian Water Resources and Energy Directorate (NVE), 2024), (Association of Issuing Bodies, 2024), (Standard Norge, 2018)

Scenario	Description	Emission factor electricity [gCO_2-eq/kWh]	Emission factor considering other heating sources [gCO_2-eq/kWh]
European (EU27+ UK+ Norway) NS 3720:2018 electricity mix	Location-based electricity mix with wide system boundary including EU countries, UK and Norway, average emissions over building's 60-year lifetime	136	115

Electricity is the dominant energy carrier to Norwegian residential buildings, but the energy mix also includes other energy carriers such as bio energy and district heating. The influx of other energy sources for heating purposes is applied to all electricity emission factors, reducing the emission factor for Norwegian residential buildings to 115 gCO_2-eq/kWh. We will thus apply 115 gCO_2-eq/kWh as the emission factor for our impact analysis below.

5 Green Portfolio Analysis and Impact Assessment

The residential building portfolio consists of objects that have been qualified by Sunndal Sparebank according to the criteria outlined in section 2 (Sunndal Sparebank , 2024). Below we will have a look at the portfolio and its green impact.

5.1 Eligible Buildings

Table 2 shows that there are 91 eligible residential objects in Sunndal Sparebank's portfolio as of 31 December 2024 with a residence area of approximately 14 700 square meters. The 67 small residential buildings and 24 apartments were built in the period from 2015 to 2024 whereof 64 percent (58 dwellings) were built after 31 Dec 2020. The majority of the dwellings (82) have an EPC energy rating B while the remaining (9) have rating A.

Table 2 Eligible objects and calculated building areas

	Building code	No. of objects	Area of eligible objects in portfolio [m^2]
Apartments	TEK17 and EPC A (built 2021-2024)	5	305
	TEK17 and EPC B (built 2021-2024)	14	1 077
	TEK17 and EPC B (built before 2021)	5	315
	TEK10 and EPC B (built before 2021)	0	0
Small residential buildings	TEK17 and EPC A (built 2021-2024)	4	570
	TEK17 and EPC B (built 2021-2024)	35	6 445
	TEK17 and EPC B (built before 2021)	20	4 540
	TEK10 and EPC B (built before 2021)	8	1 460
Total		91	14 712

5.2 Energy Demand Reduction and Avoided Emissions

The portfolio data set provided by Sunndal Sparebank contains an EPC energy rating and estimated energy demand for each residential object. Due to discrepancies between the EPC rating and estimated energy demand data, we have chosen to base our impact assessment on the provided EPC energy ratings.

The impact for each object is calculated by determining the reduction in energy demand and related emissions compared to the baseline (an average residential building from the entire building stock). The reduction in energy demand is calculated as the difference between the baseline and the EPC threshold defined in the Norwegian EPC system, see table 3. For portfolio objects with EPC energy rating B, the average of the EPC A and EPC B thresholds will be applied.

Table 3 EPC energy rating thresholds for residential building categories. Source: (Enova SF, 2015)

Building category	Calculated specific net delivered energy per m² heated utility area [kWh/m²]						
	A	B	C	D	E	F	G
	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	Lower than or equal to	No limit
Small residential buildings	95	120	145	175	205	250	> F
Area adjustment	+800/A	+1600/A	+2500/A	+4100/A	+5800/A	+8000/A	
Apartments	85	95	110	135	160	200	> F
Area adjustment	+600/A	+1000/A	+1500/A	+2200/A	+3000/A	+4000/A	

A = m² heated utility area

For portfolio objects with EPC energy rating A, the EPC A threshold will be applied due to EPC A having no lower threshold (no midpoint). The reduction in energy demand is then multiplied with the area of the residential objects and the emission factor from table 1, which is 115 gCO_2-eq/kWh. As mentioned in section 3, the baseline energy demands for apartments and small residential buildings are 202 kWh/m² and 257 kWh/m², respectively. The formulas for the total energy demand reduction and corresponding avoided CO_2 emission for all 91 portfolio objects are thus as follows:

(1) Energy demand reduction (GWh/year) = $\sum_i \left(T^i_{baseline} - T^i_{EPC}\right) A^i\, k$

(2) Avoided emissions (tonnes CO_2/year) = $\sum_i \left(T^i_{baseline} - T^i_{EPC}\right) A^i\, k\, C$

where i = portfolio object 1 to 91, A^i = m² heated utility area, k = 10^{-6}, $T^i_{baseline}$ = 202 or 257 kWh/m², T^i_{EPC} = threshold midpoint, C = 115 gCO_2-eq/kWh.

We can also scale the formulas in (1) and (2) by Sunndal Sparebanks's share of financing (the loan-to-market value) for each portfolio object:

(3) Energy demand reduction (GWh/year) – scaled = $\sum_i \left(T^i_{baseline} - T^i_{EPC}\right) A^i\, k\, \frac{L^i}{MC^i}$

(4) Avoided emissions (tonnes CO_2/year) – scaled = $\sum_i \left(T^i_{baseline} - T^i_{EPC}\right) A^i\, k\, C\, \frac{L^i}{MC^i}$

where $\frac{L^i}{MC^i}$ = loan-to-market value.

Table 4 presents the energy efficiency and corresponding avoided CO_2 emissions of the portfolio compared to the average Norwegian residential building (baseline).

Table 4 Portfolio's savings in energy usage and corresponding avoided emissions compared to the baseline – in total and scaled by bank's share of financing. Using emission factor "European lifetime mix".

	Area [m^2]	Avoided energy usage compared to baseline [GWh/year]	Avoided CO2-emissions [tonnes CO2/year]
Portfolio	14 712	2.0	235
Portfolio – scaled by the bank's share of financing	7 589	1.1	121

6 References

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