REPORT

DNB Green Buildings portfolio- impact assessment

CLIENT

DNB Bank ASA

SUBJECT

Norwegian Energy Efficient Buildings- Green residential buildings- Impact assessment

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REPORT

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1 Introduction

Assignment

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

In this document we briefly describe DNB's green bond qualification criteria, the evidence for the criteria and the result of an analysis of the loan portfolio of DNB.

2 Eligibility criteria

New or existing Norwegian residential buildings that comply with the Norwegian building code of 2010 (TEK10) and later codes are eligible for green bonds as all these buildings have significantly better energy standards and account for less than 15 % of the residential building stock. A two year lag between implementation of a new building code and the buildings built under that code has been accounted for[1].

The methodology to select the qualifying assets is based on Climate Bonds Initiative (CBI) taxonomy, where no more than the top 15 % most energy efficient buildings are considered eligible. DNB's baseline and criterion are in line with the CBI baseline methodology for energy efficient residential buildings for Norwegian conditions published in spring 2018[2].

As of 2020, 10% of Norwegian residential buildings are eligible according to the DNB criterion.

2.1 New or existing Norwegian residential buildings that comply with the Norwegian building code of 2010 (TEK10) and later codes

Changes in the Norwegian building code have consistently over several decades resulted in more energy efficient buildings.

Figure 1 illustrates how the calculated net energy demand declines with decreasing age of the buildings. Note that, for residential buildings, there was no change between TEK07 and TEK10 with respect to energy efficiency requirements.

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 on the Norwegian residential building stock is 252 kWh/m^2. Building code TEK10 and TEK17 gives an average specific energy demand for existing dwellings, weighted for actual stock, of 117 kWh/m^2.

Hence, compared to the average residential building stock, the existing buildings built according to building code TEK10 (and to a very little degree TEK17) gives a calculated specific energy demand reduction of 54 %.

[1] TEK10 was implemented in July 2010, however since the energy requirements were unchanged from TEK07 to TEK10 it is a very robust assumption that all buildings finished in 2012 or later have used energy requirements according to TEK10.

[2] The CBI criteria allows for including small residential buildings built under TEK07. These buildings are however not included in the DNB Green Bonds Framework.

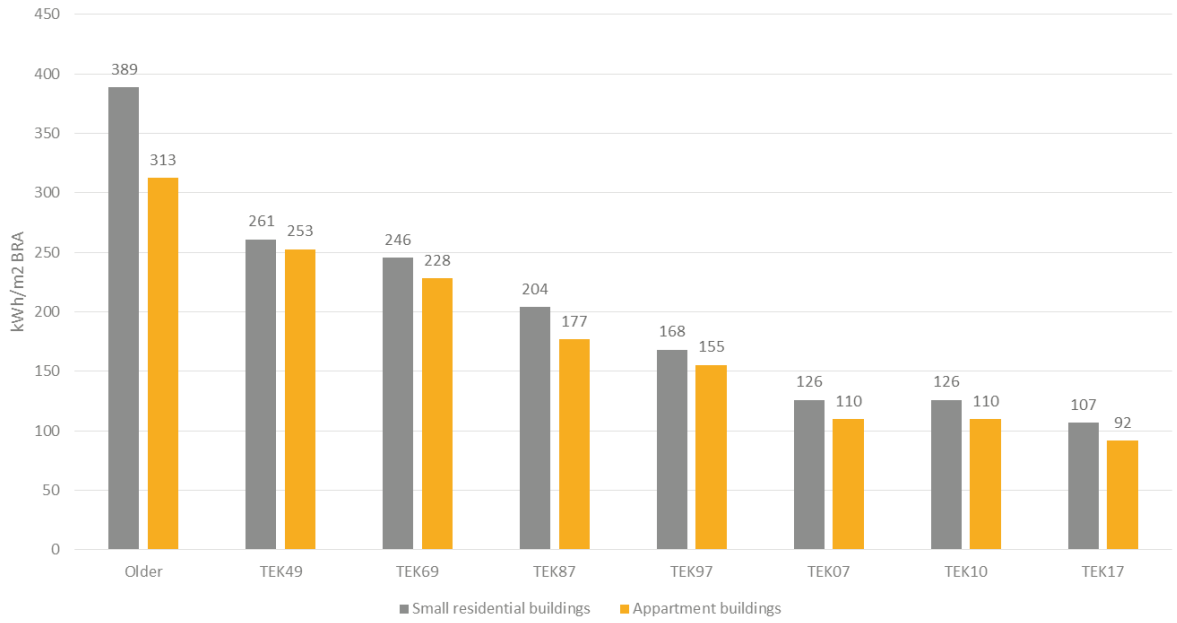

Figure 1 Development in calculated specific net energy demand based on building code and building tradition, (Multiconsult, simulated in SIMIEN)

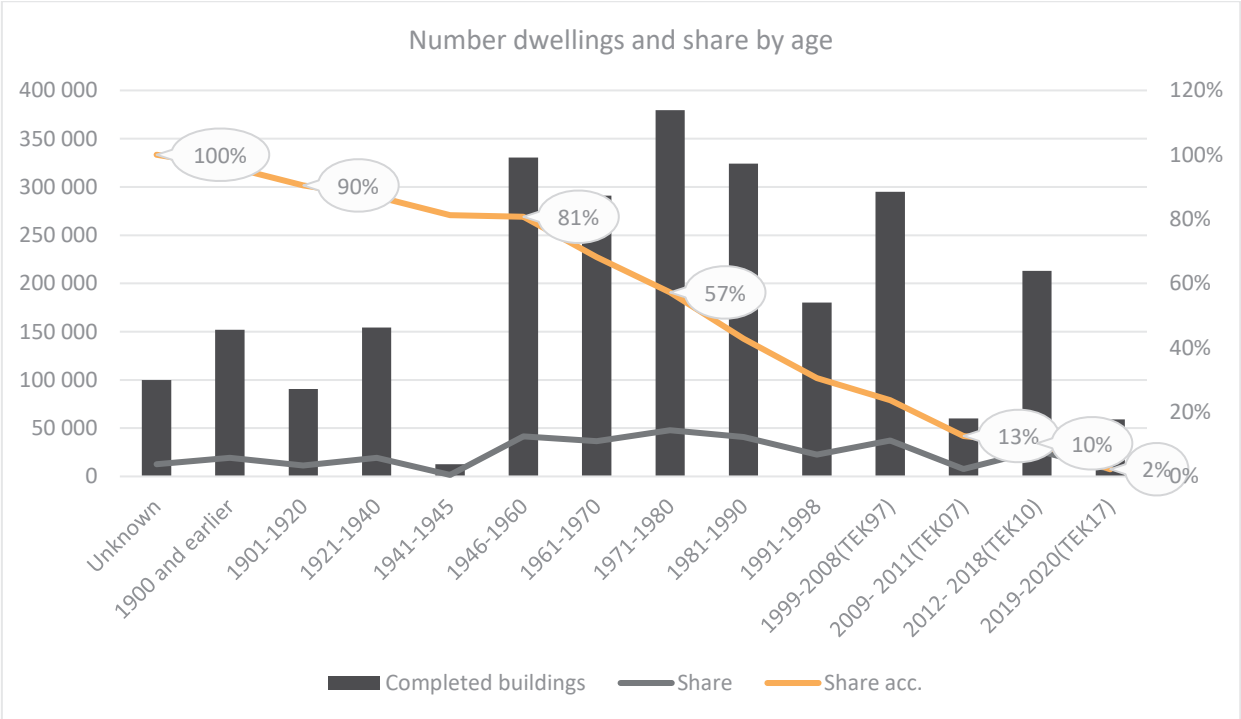

Figure 2 Age and building code distribution of dwellings (Statistics Norway[3] and Multiconsult, 2020)

Figure 2 above shows how the Norwegian residential building stock is distributed by age. The figure shows how buildings finished in 2012 and later (and built according to TEK10, and to a smaller degree TEK17) amount to 10% of the total stock.

[3] Boligstatistikken, Tabell: 06266: Boliger, etter bygningstype og byggeår (K). Adjusted to match the development of building code.

3 Portfolio analysis and impact assessment

The grid factor on electricity consumption, as average in the building's lifetime, is based on a trajectory from the current grid factor to a close to zero emission factor in 2050. (The expected lifetime of a building from 2010 is 60 years.) According to Norwegian Standard NS 3720:2018 "Method for greenhouse gas calculations for buildings", greenhouse gas factor for electricity used in buildings is to be calculated on a life-cycle basis according to two scenarios:

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

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

The following calculations apply the European mix as listed in Table 1. This is in line with Nordic Public Sector Issuers: Position Paper on Green Bonds Impact Reporting (February 2020)[4]. 136 gCO_2/kWh constitutes the GHG emission intensity baseline for energy use in buildings with a life span of 50-60 years and assuming that the CO_2-factor of the European production mix is close to zero in 2050.

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 includes also bio energy and district heating, resulting in a total specific factor of 124 g CO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

3.1 DNB's criterion - New or existing Norwegian residential buildings that comply with the Norwegian building code of 2010 (TEK10) and later codes

The eligible buildings in DNB's portfolio is estimated to amount to 3.8 million square meters. The available data do not include reliable area per object. Area per dwelling is calculated on the basis of average area derived from national statistics (Statistics Norway[5]). The area is calculated based on the assumption that the residents in the portfolio are equivalent to the average Norwegian residential building stock. The values in the column [area per unit] in the table below are calculated from these statistics.

	Building code	Number of objects	Area per unit [m^2]	Area qualifying buildings in portfolio [m^2]
Apartments	TEK10	15,619	72	1,124,568
	TEK17	3,523	104	253,656
Small residential buildings	TEK10	13,352	172	2,057,446
	TEK17	2,404	126	365,494
Sum		34,898		3,801,164

Table 2 Eligible objects and calculated building areas

[4] https://www.kbn.com/globalassets/dokumenter/npsi_position_paper_2020_final_ii.pdf
[5] Table 06513: Dwellings, by type of building and utility floor space

Based on the calculated figures in table 2, the energy efficiency of this part of the portfolio is estimated. All these residential buildings are not included in one single bond issuance.

A reduction of energy demand from the average 252 kWh/m^2 of the total residential building stock, apartments and small residential buildings combined, to 122 kWh/m^2 (TEK10) or 102 kWh/m^2 (TEK17) dependent on building code, is multiplied to the emission factor and area of eligible assets to calculate impact.

The calculated average specific energy demand for eligible assets is 117 kWh/m^2.
This is 54 % lower than the calculated average of the total residential building stock.

The table below 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
Eligible buildings in portfolio	3.8 million m^2	**513 GWh/year**	63,673 tons CO2/year

Table 3 Performance of eligible objects compared to average building stock

3.2 Impact reporting sheet November 2021

DNB Boligkreditt Green Covered Bond Impact Reporting 2021

Portfolio date: November 2021

Eligible Project Category	Signed Amount	Share of Total Portfolio Financing	Eligibility for Green Bonds	Annual Site Energy Savings	Annual CO2 Emission Avoidance
a/	**b/**	**c/**	**d/**	**e/**	**e/**
Residential Green Buildings	**NOK**	**%**	**%**	**MWh**	**tCO2**
New residential buildings in Norway	98 125 000 000	100	100	512 897	63 673
Total	**98 125 000 000**			**512 897**	**63673**

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 10% of buildings and the national building stock bechmarks
-Annual CO2 emission avoidance