REPORT

Norwegian Green Bond – Commercial real estate

CLIENT

SpareBank1 SMN

SUBJECT

Green commercial real estate

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SUBJECT	Green commercial buildings	ACCESSIBILITY	Open
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1 Introduction

Assignment

On assignment from SpareBank1 SMN, Multiconsult has developed criteria and a methodology to identify the most energy efficient commercial real estate in Norway, to be used with respect to a green bond issuance. In this document we describe SpareBank1 SMN's identification criterion and the evidence for the criterion and the result of an analysis of a part of the loan portfolio of SpareBank1 SMN. The criterion to select the buildings is based on credible standards in Norway such as the Norwegian building regulation.

Commercial real estate- included in this analysis

The analysis of the building stock includes office buildings, commercial/retail buildings (shops and stores), hotel and restaurants and small industrial buildings and warehouses. These categories are most relevant in SpareBank1 SMN's portfolio.

Data quality and sources

The building statistics have variable quality for commercial buildings in Norway. To establish a robust methodology, data on number and age of existing buildings are crucial, and for impact assessments, the relevant factors are area and age.

For the most important period, the latest years stretching further back than the criteria cut-off point, the data on number of buildings and age in the total stock have good quality for the whole stock. These data have been published for the whole period from 2000 to 2017. Some building categories are only available on an aggregated level but the necessary splits are made on the basis of data available for the years 2006 and 2018. Building years for older buildings are somewhat uncertain and assumptions on building rate and demolition rate had to be made.

Regarding building area, data is available on new buildings every year from 1983 to 2017. These data have been supplemented by data in a study on energy efficiency in existing buildings.[1]

Energy

Apart from this criterion, we also want to stress that commercial buildings in Norway are heated mostly with renewable energy. The energy consumption of Norwegian commercial buildings is predominantly electricity, with some district heating and bioenergy. The share of fossil fuel is very low and falling.

Statistics Norway made in 2011 a statistic on energy use in Norwegian commercial buildings. The demand was approximately covered by electricity (80 %), fossil oil and gas (5 %) and district heating etc. (15 %). Already in 2007, the building code was in clear disfavour of fossil energy, and the use of fossil energy in commercial buildings has declined since. In 2020, all use of fossil oil is banned from use in commercial buildings. The fuel mix in Norwegian district heating production in 2017 included

[1] Enova publication "Potensial- og barrierestudie Energieffektivisering i norske yrkesbygg», Multiconsult 2011

only 4.5 % from fossil fuels (oil and gas) (Fjernkontrollen[2]). In 2017, the Norwegian power production was 98 % renewable (NVE[3]).

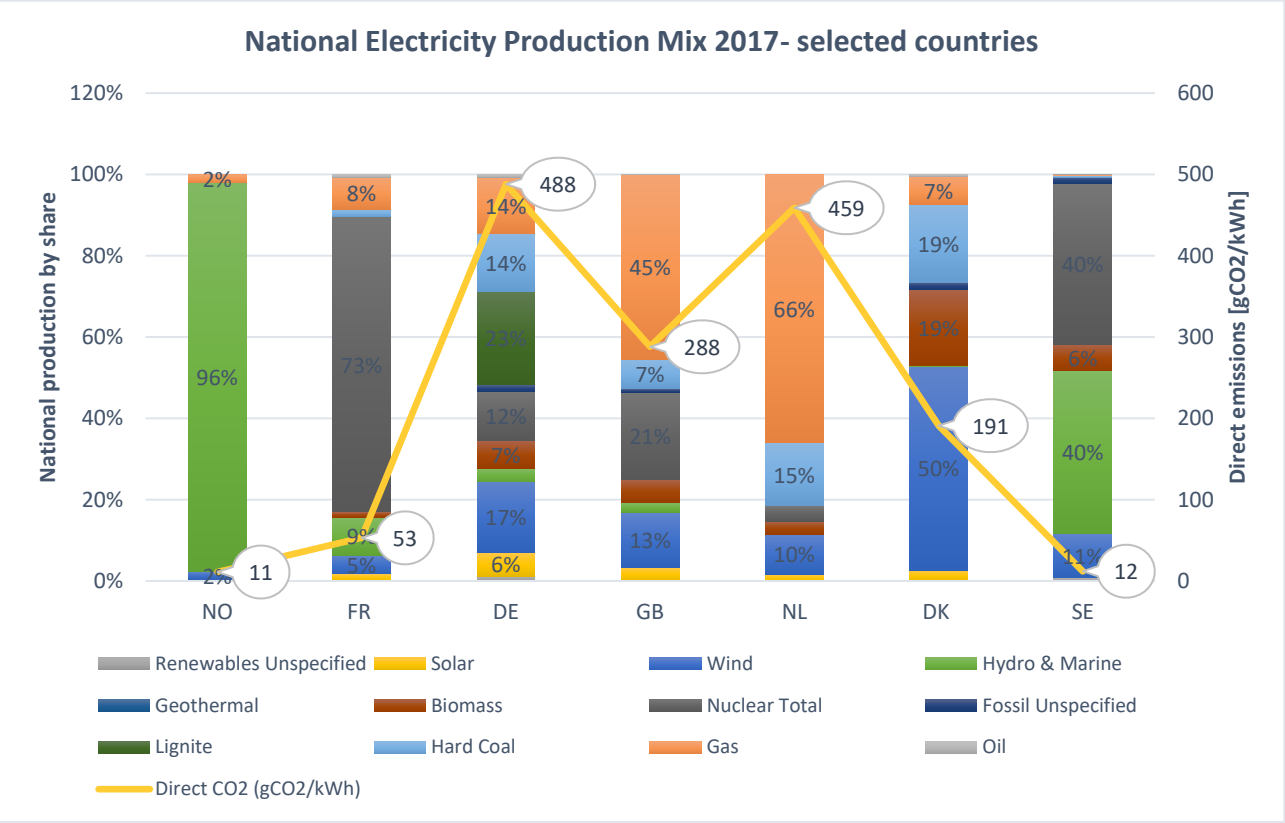


Figure 1 National electricity production mix in some relevant countries (European Residual Mixes 2017, Association of Issuing Bodies[4])

As shown in figure 1, the Norwegian production mix gives resulting emissions of 11 gCO_2/kWh. However, taking into account the international trade, the consumption is not necessary equal to production. The environmental classification system for buildings, BREEAM, uses in its Norwegian version an emission factor of 132 g CO_2/kWh. Using BREEAM factors for electricity, bioenergy, and fossil energy, and the energy mix in Norwegian commercial buildings[5], the resulting CO_2- factor is on average approximately 126 g CO_2/kWh.

[2] http://fjernkontrollen.no/
[3] https://www.nve.no/energy-market-and-regulation/retail-market/electricity-disclosure-2017/
[4] https://www.aib-net.org/documents/103816/176792/AIB_2016_Residual_Mix_Results.pdf/6b49295b-ad99-a189-579e-877449778f62
[5] Multiconsult. Based on building code assignments for DiBK and correlated with EPC-data

2 Loan Portfolio Analysis SpareBank1 SMN

The Green loan portfolio of SpareBank 1 SMN will consist of commercial buildings that meet the criterion as formulated below.

2.1 Eligible buildings

Multiconsult has investigated a sample of SpareBank1 SMN's portfolio and can confirm that the reviewed commercial real estate have been identified as eligible for green bonds according to SpareBank1 SMN's eligibility criterion.

2.2 Availability and quality of data to identify other eligible buildings

Energy performance data for commercial buildings are not easily available for lenders or investors. The Energy Performance Certificate (EPC), a possible source of data, is at the present not publically available. Some essential data will, however, likely be made available in 2019. Before the data is made available the database is to be cleaned of faulty data and IT solution established for easy access.

Enova, entity owned by the Norwegian Ministry of Climate and Environment responsible for the EPC system, aims to make the register publically available and accessible, and is prioritising this work. The data of publication of the database is uncertain.

When permission is granted to access and utilise the full database, it will be possible to link the individual buildings to the register, and give the energy certificate results based on some key information:

- Address- street and number, postal code
- Building identifiers GNR (Gårdsnummer) and BNR– (Bruksnummer)

The database is already available for statistical purposes and an investigation shows that, comparing the number of certificates with actual buildings in the building stock from Statistics Norway, at the best, only 35 % of all office and retail buildings, 3 % of all hotel and restaurant buildings and 4 % of all industry buildings have an energy performance certificate. This is based on raw data, before the database has been cleaned of double entries and test entries. This influences the data quality for developing eligibility criteria and the pool of which a bank may identify objects in their portfolio.

All buildings over 1,000 m^2 are required to have a certificate. New buildings are well represented in the statistics, and much better than older and less energy efficient buildings. In case all buildings had a certificate, the distribution in the statistics would shift towards poorer energy grades.

3 Eligibility criteria

Multiconsult has studied sections of the Norwegian commercial building stock and identified solid eligibility criteria for Green Bonds on energy efficient commercial buildings in specific subcategories. Unique criteria have been established for the four subcategories: office buildings, retail, hotel and restaurant buildings and industry/warehouses. The criteria identifies no more than the top 15 % most energy efficient commercial buildings countrywide based on building code. The methodology is based on Climate Bonds Initiative (CBI) taxonomy, where the top 15 % most energy efficient buildings are considered eligible.

Eligible Commercial Green Buildings for SpareBank1 SMN must meet the following eligibility criterion:

Hotel and restaurant buildings. New or existing Norwegian hotel buildings that comply with the Norwegian building code of 2007 (TEK07) 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 hotel and restaurant building stock. 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 2011 or later qualify.

Office buildings, retail buildings and industrial buildings and warehouses. New or existing Norwegian office, retail and industrial buildings/warehouses that comply with the Norwegian building code of 2007 (TEK07) 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 office, commercial and industry/warehouse building stock. A two 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 2010 or later qualify.

3.1 New or existing buildings within the relevant building categories that comply with the chosen criteria

New or existing Norwegian hotel and restaurant buildings that comply with the Norwegian building code of 2007 (TEK07) or later codes: 6.8 %

New or existing Norwegian office buildings that comply with the Norwegian building code of 2007 (TEK07) or later codes: 5.1 %

New or existing Norwegian retail/commercial buildings that comply with the Norwegian building code of 2007 (TEK07) or later codes: 5.1 %

New or existing Norwegian small industrial buildings and warehouses that comply with the Norwegian building code of 2007 (TEK07) or later codes: 13.9 %

Changes in the Norwegian building code have consistently over several decades resulted in more energy efficient buildings. As of January 1st 2018, far less than 15 % of the Norwegian commercial buildings, within the investigated subcategories, are eligible according to the SpareBank1 SMN criterion; commercial buildings in the specific subcategories built according to TEK07, TEK10 and TEK17 are eligible for Green Bonds.

Figure 2 Development in calculated specific net energy demand based on building code and building tradition, (Multiconsult, simulated in SIMIEN)

Net energy demand is calculated for model buildings used for defining the building code (TEK07/TEK10/TEK17). The result presented in figure 2 illustrates how the calculated energy demand declines with decreasing age of the buildings. From TEK10 to TEK17 the reduction is between 14 – 23 %. The former shifts from TEK07 to TEK10 was about 10 %, and from TEK97 to TEK07 about 20 %.

Figure 2 gives theoretical values for representative models of an office building, retail/commercial building, hotel building and industry/ warehouse, calculated in the computer programme SIMIEN and in accordance to Norwegian Standard NS 3031:2014 *Calculation of energy performance of buildings Method and data*, and is not based on measured energy use. In addition to the guiding assumption in Norwegian Standard NS3031:2014, experience with building tradition is included. Indoor air quality is assumed not to be dependent on building year. By that, it is assumed that older buildings (TEK69 - older) that originally had natural ventilation or mechanical exhaust with relatively small air volumes, have at one time upgraded to balanced ventilation with satisfactory air volumes - this is assumed to be a necessary upgrade the property owner had to take to meet the tenancy requirements. Many such older buildings underwent such upgrades in the 80's and 90's. For these, a minimum allowable airflow from NS 3031: 2014 Table A.6 is used. This is the same methodology as used in the EPC-system.

Building code	Specific energy demand office building	Specific energy demand commercial building	Specific energy demand industry/warehouse	Specific energy demand hotels and restaurants
TEK07	165 kWh/m^2	235 kWh/m^2	190 kWh/m^2	240 kWh/m^2
TEK 10	150 kWh/m^2	210 kWh/m^2	175 kWh/m^2	220 kWh/m^2
TEK 17	115 kWh/m^2	180 kWh/m^2	140 kWh/m^2	170 kWh/m^2

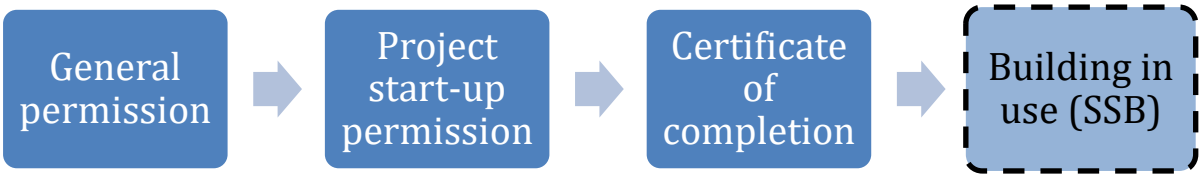
Table 1 Specific energy demand as from the building codes

Table 1 includes the specific energy demand as a maximum requirement in the respective building codes, relevant for identifying the top 15 %, by a margin, most energy efficient commercial buildings in Norway.

The building codes are having a significant effect on energy efficiency.

3.1.1 Time lag between building permit and building period

After the implementation of new a building code there is some time lag before we see new buildings completed according to this new code. First there is some transition period where two codes are overlapping. Further, the lag between the date of general permission received (no; rammetillatelse), which decides which code is to be used, and the date at which the building is completed and taken into use, varies a lot depending on such things as the complexity of the site and project, financing, the market and the building category.



The time from granted general permission to granted project start-up permission is often spent on design, sales and contracting. Based on Multiconsult's experience, six months to a year is a reasonable timespan for commercial buildings in this phase. As an illustration, the figure below, based on statistics from Statistics Norway (SSB), indicates that approximately six months to a year construction period is standard for office buildings.

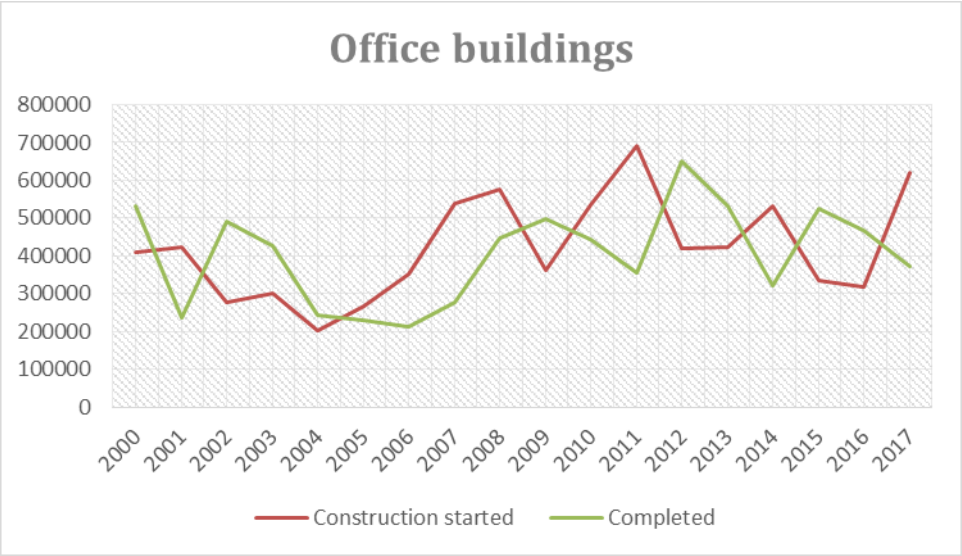


Figure 3 Project start-up and completion (Statistics Norway, bygningsarealstatistikken)

The 2007 building code was implemented February 2007. Based on the discussions on time for design and construction, we regard a time-lag of two years for offices, retail and industry/ warehouses between code implementation and buildings based on this code to be a robust and conservative assumption. Being more complex buildings, a time-lag of three years are assumed for hotel and restaurant buildings. The data available on completed construction is only available to the issuer on a yearly basis.

3.1.2 Building age statistics

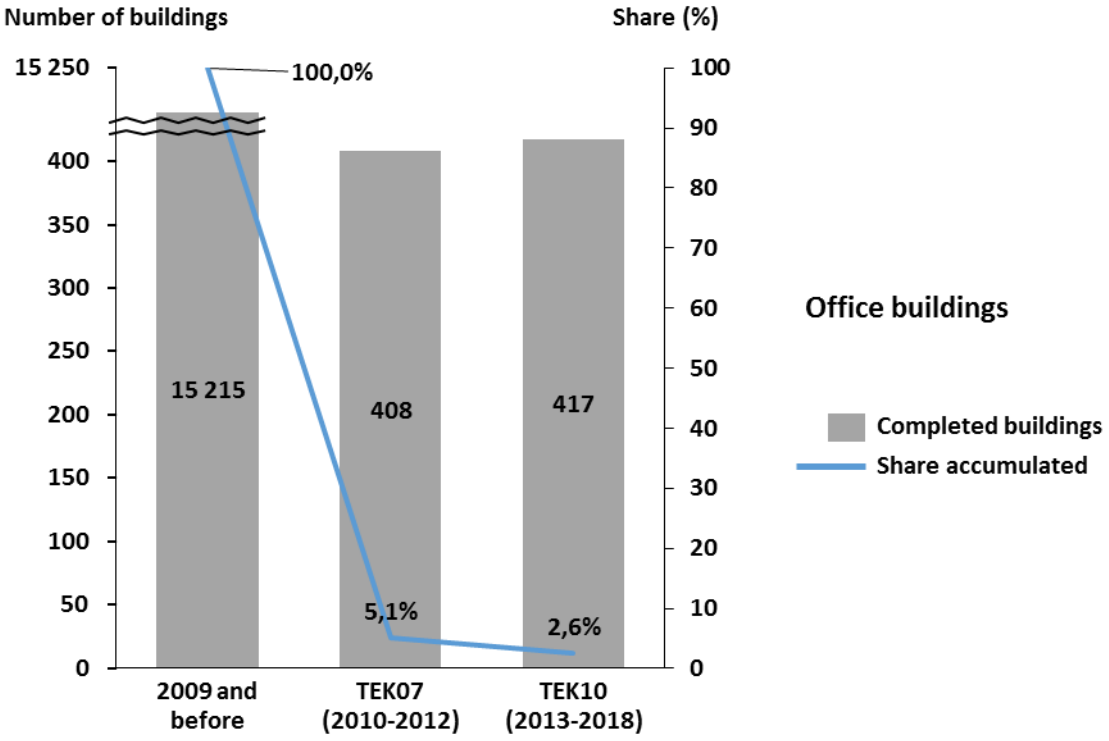


Figure 4 Age and building code distribution of office buildings (Statistics Norway and Multiconsult)

Figure 4 above shows how the Norwegian office building stock is distributed by age. The figure shows also how office buildings finished in 2010 and later (built according to TEK07) amount to 5.1 % of the total stock. The three figures below include the same information for the other three subcategories.

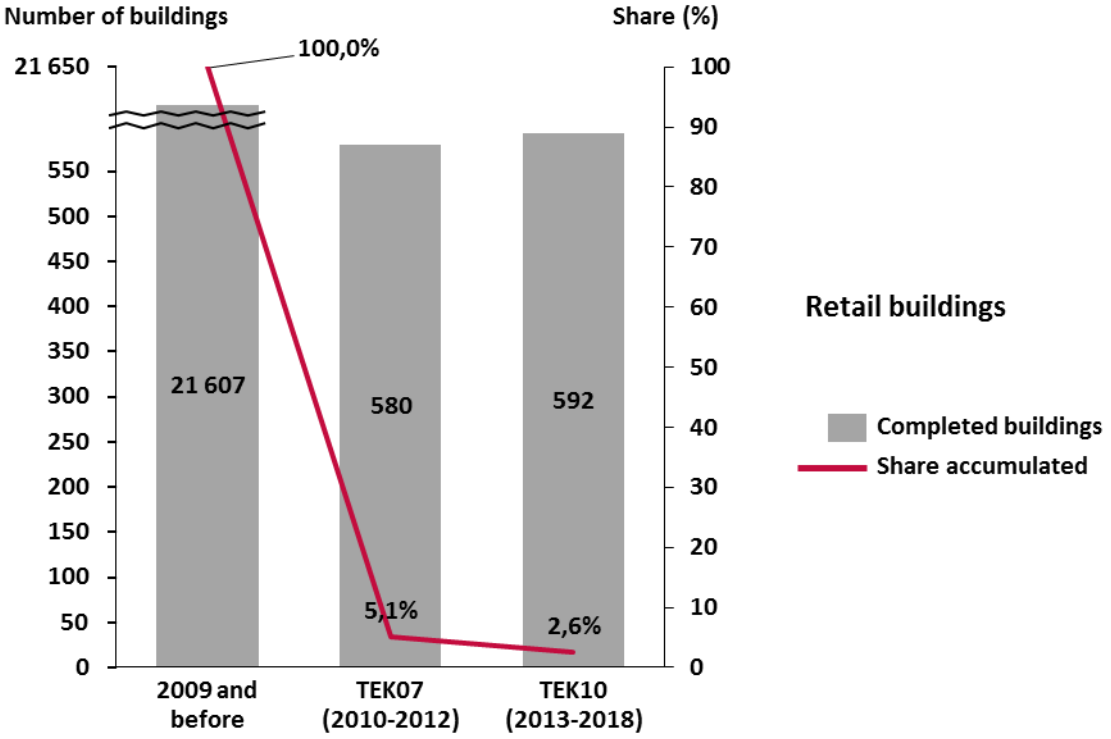


Figure 5 Age and building code distribution of commercial/retail buildings (Statistics Norway and Multiconsult)

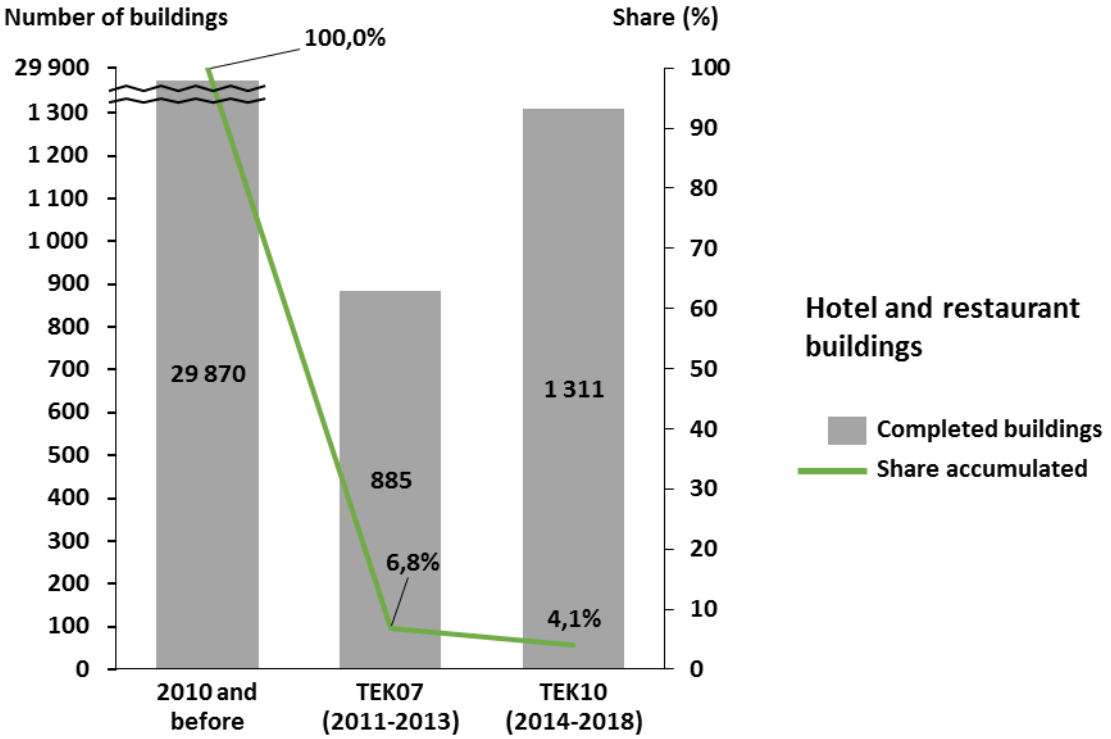


Figure 6 Age and building code distribution of hotel and restaurant buildings (Statistics Norway and Multiconsult)

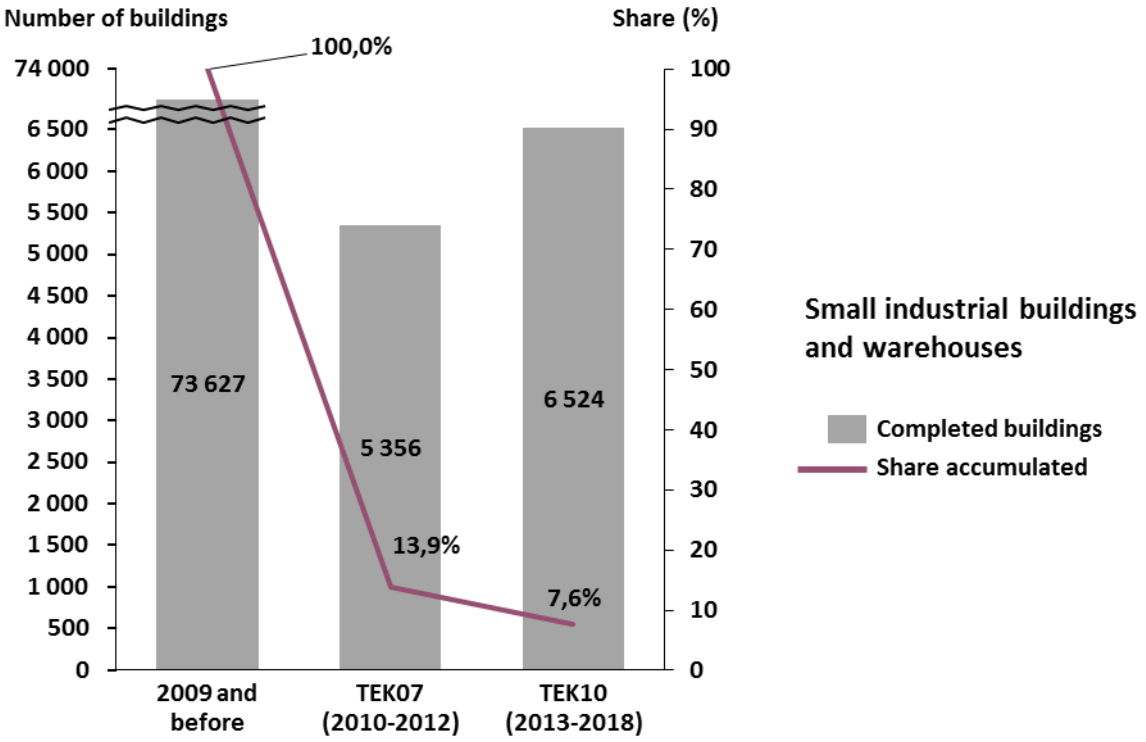


Figure 7 Age and building code distribution of small industrial buildings and warehouses (Statistics Norway and Multiconsult)

Figures 8 through 11 below show how much, based on theoretical energy demand in the same building stock, the same share of the building stock make up in share of the energy demand in the same subcategories. The same picture is relevant for CO_2- emissions.

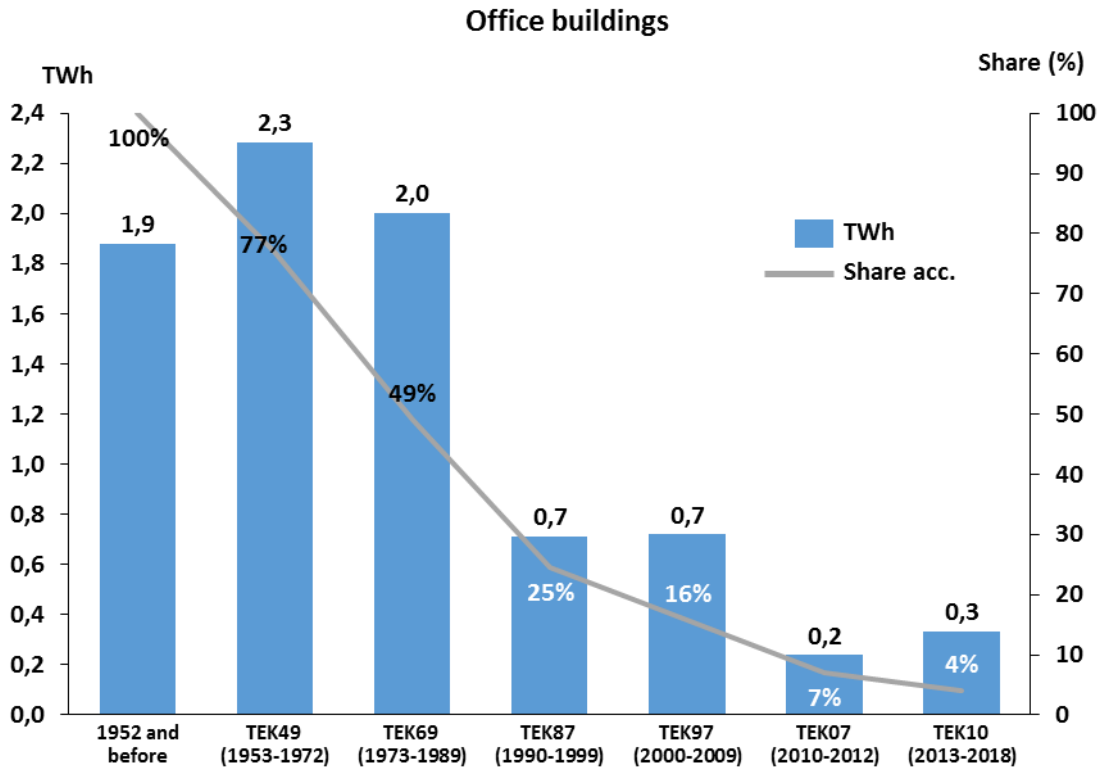


Figure 8 Share energy demand related to office buildings depending on building year

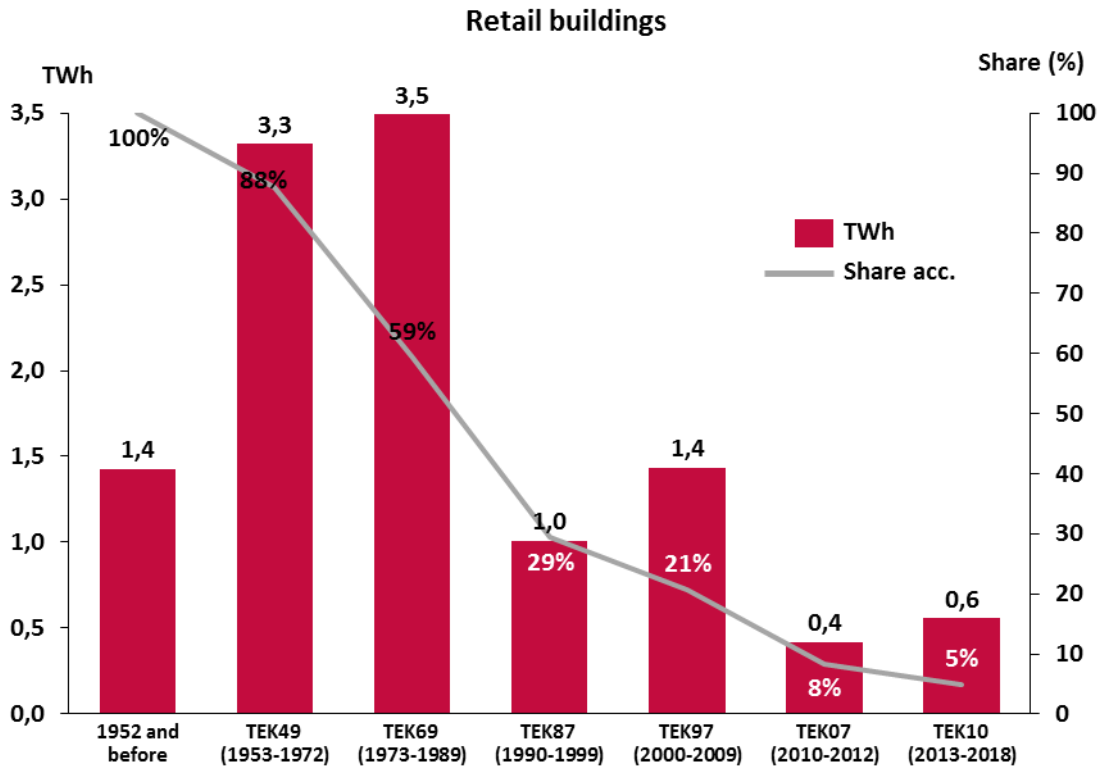


Figure 9 Share energy demand related to retail buildings depending on building year

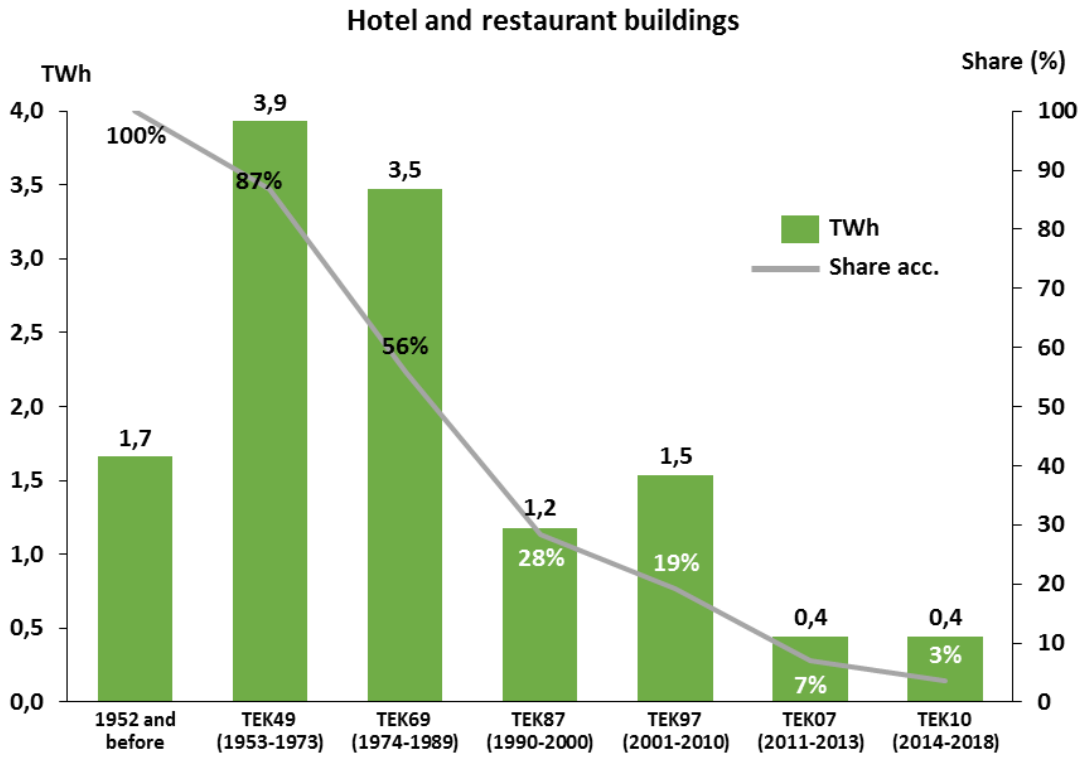


Figure 10 Share energy demand related to hotel and restaurant buildings depending on building year

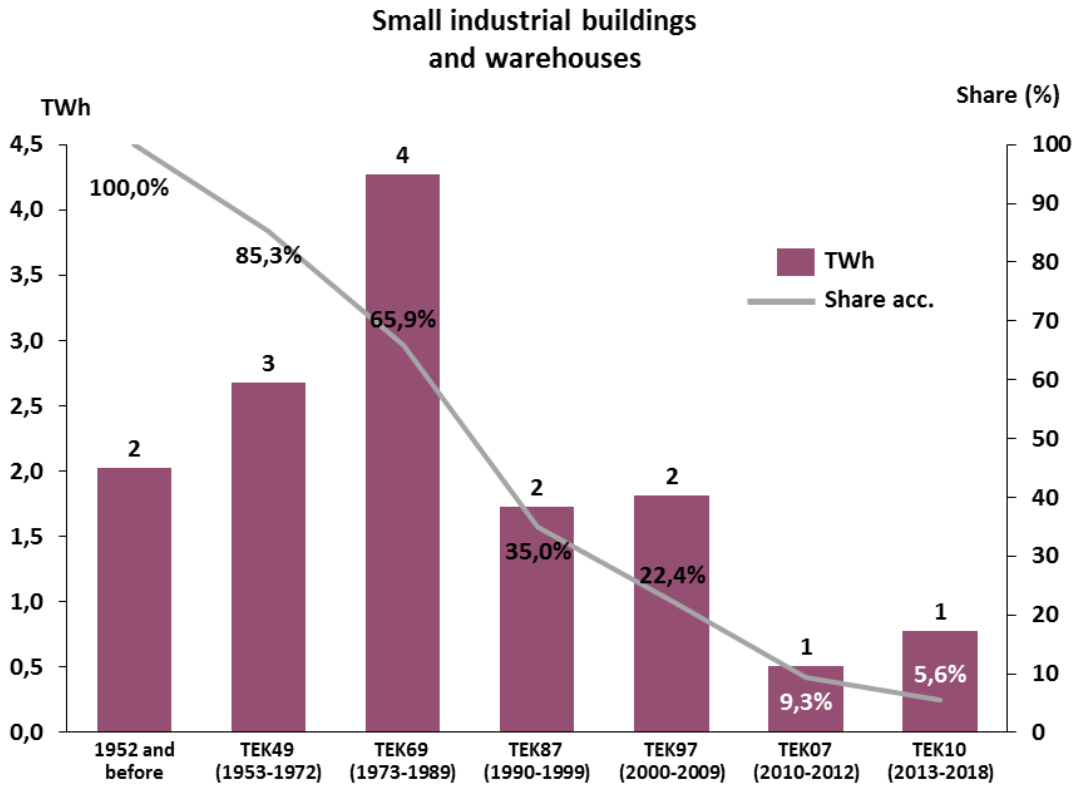


Figure 11 Share energy demand related to small industrial buildings and warehouses depending on building year

3.1.3 Eligibility under SpareBank1 SMN's building code criterion

Over the last several decades, the changes in the building code have pushed for more energy efficient commercial buildings. The building stock data indicates that, dependent on type of commercial building, between 5.1 and 13.9 % of the current buildings in Norway were constructed using the 2007 code or a younger code with even more energy efficient solutions.

Combining the information on the calculated specific energy demand related to building code in Figure 2 and information on the commercial building stock in Figures 4 through 7, the calculated average specific energy demand on the part of the Norwegian building stock examined here 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	255	156	61 %
Commercial buildings	329	220	67 %
Hotel buildings	345	230	67 %
Small industry and warehouses	307	181	59 %

Table 2 Average specific energy demand for the building stock; whole stock, part eligible according to criteria and reduction

3.2 Refurbished Norwegian commercial buildings with an improved energy efficiency of ≥30 %

Refurbished buildings with an improved energy efficiency of at least 30 % or more are eligible for Green Bonds. This is aligned with the CBI taxonomy, where buildings qualify after being refurbished to a standard resulting in at least a 30 % reduction in energy demand[6]. In this case, we are looking to identify buildings that already have improved energy performance in this scale. To identify relevant buildings, the EPC database would be a very well suited source of data. Data in the database is likely to be released for this purpose in 2019. As well as only being representative of a small percentage of the total commercial building stock, the first data release will only include current certificates and will not include historic certificates for the buildings. The historic EPC-labels may be made available at a later stage, so two approaches are included in this criteria, one solely based on the EPCs, current and historic, and one approach based on the current certificate compared to calculated energy demand for different building code (TEK) periods (shown in Figure 2).

Table 3 below includes limit values for qualifying to the different energy grades in the EPC system that make up the basis for the following calculations. It important to note that these values are calculated with a different system boundary than the building code requirements.

[6] https://www.climatebonds.net/standard/buildings/upgrade

Building categories	Delivered energy per m^2 heated area (kWh/m^2)						
	A	**B**	**C**	**D**	**E**	**F**	**G**
Office	90	115	145	180	220	275	> F
Hotel and restaurant	140	190	240	290	340	415	> F
Commercial	115	160	210	255	300	375	> F
Industry/warehouse	105	145	185	250	315	405	> F

Table 3 Limit values in specific energy demand for energy grades in the EPC system

Table 4 below present calculated reduction in energy demand for an improvement of two steps on the energy grade scale in the Norwegian EPC system. To be able to include buildings originally only qualifying for a G, the values are calculated based on average values, and the average G building is assumed to have a specific energy demand as far off from the limit value for F as the average F is from the limit value for E ($G_{av}=F_{lim}+(F_{lim}+E_{lim})/2$).

This can be exemplified by an office building with an F (specific energy demand average of the limit value for F and limit value for E) will, with a 34 % reduction in energy demand end up with a specific energy demand average of the limit value for a C and the limit value for a D and with a D as new energy grade.

	Two-step improvement D → B	Two-step improvement E → C	Two-step improvement F → D	Two-step improvement G → E
Office buildings	37 %	35 %	34 %	34 %
Commercial buildings	41 %	33 %	31 %	33 %
Hotel buildings	38 %	32 %	30 %	30 %
Small industry and warehouses	43 %	42 %	40 %	37 %

Table 4 Improvement in specific energy demand from a two-step improvement in energy grade in EPC system calculated for average values.

3.2.1 Eligibility under building upgrade criteria

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.

4 Impact assessment

Impact is calculated for the criterion in the earlier sections.

The grid factor in Norway is set at an average of 132 g CO_2eq/kWh for the 60 year period from 2010 to 2070. (The expected life of a building from 2010 is 60 years.) This is in line with the grid factor used by the environmental certification system for buildings, BREEAM-NOR. This factor is based on a trajectory from the current grid factor to a close to zero emission factor in 2050.

The grid factor in 2010 is set at European production mix and an optimistic trajectory, as shown in the figure below, require political will and capacity to reach the Two-degree target.

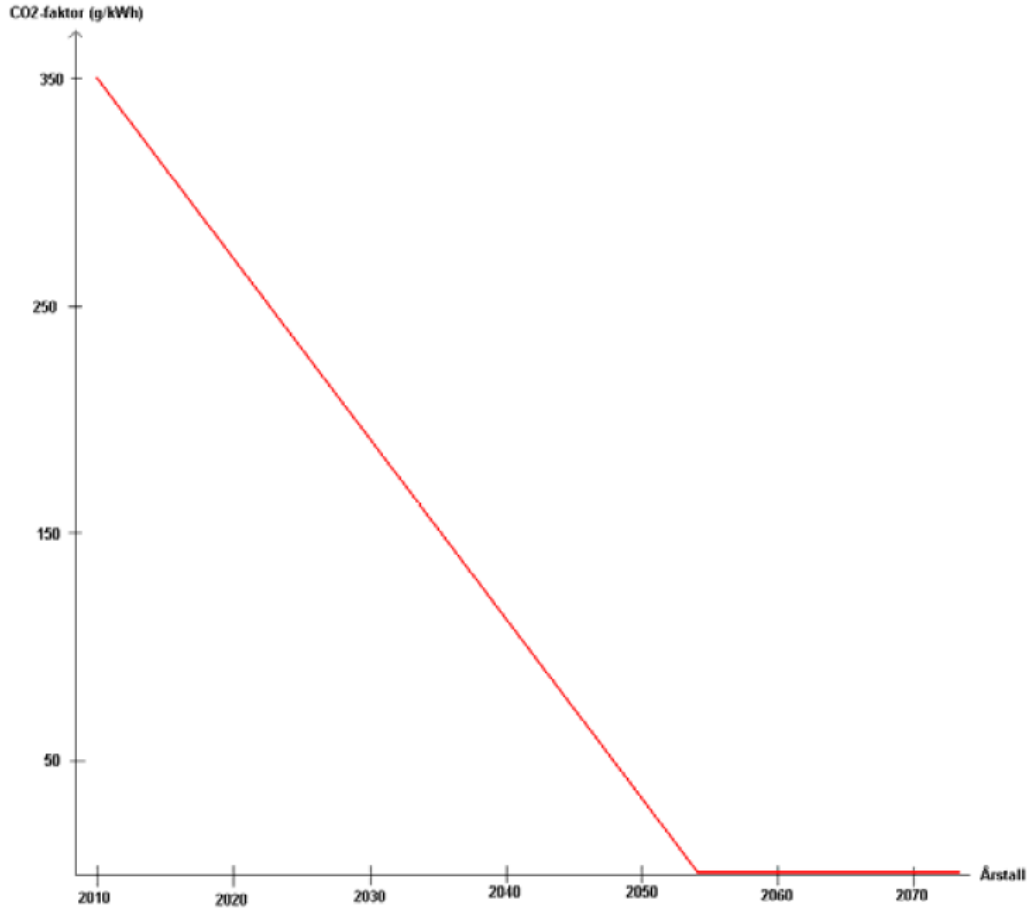


Figure 12 Simulated and extrapolated specific CO2-emission from the European electricity system from 2010 to 2070 (typical lifetime of a new building constructed in 2010). (Source: The Research Centre on Zero Emission Buildings, "Proposal for CO2-factor for electricity and outline of a full ZEB-definition" May 2011)

To calculate the impact on climate gas emissions the trajectory is applied to all electricity consumption in all commercial 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 126 g CO_2eq/kWh. A proportional relationship is expected between energy consumption and emissions.

A reduction of energy demand in line with Table 2 can be multiplied to the emission factor and area of eligible assets to calculate impact.

4.1 SpareBank1 SMN's criterion - New or existing Norwegian commercial buildings that comply with the Norwegian building code of 2007 (TEK07) or later codes

The cumulative surface of the eligible buildings in SpareBank1 SMN's portfolio is approximately 480 000 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. The areas in the table below makes basis for the following impact assessments.

	Number of objects	Area total [m^2]
Office buildings	30	162 653
Commercial buildings	25	179 945
Hotel buildings	5	25 921
Small industry and warehouses	24	114 014
Sum	84	482 534

Table 5 Eligible objects and calculated building areas

Based on the calculated figures in table 4 the energy efficiency of this part of the portfolio is estimated.

The table below indicates how much more energy efficient the eligible part of the portfolio is

The calculated average specific energy demand for the eligible assets is 190 kWh/m^2. This is 45 % lower than the calculated average of the total commercial building stock of same categories.

compared to the average commercial Norwegian building stock, and how much lover CO_2-emissions these buildings directly and mostly indirectly the same energy efficiency result in.

	Area	Reduced energy compared to baseline	Reduced CO_2-emissions compared to baseline
Eligible buildings in portfolio	482 534 m^2	**53 GWh/year**	**6 700 tons CO_2/year**

Table 6 Performance of eligible objects in the portfolio compared to average building stock