Sustainable Edge Sector Brief: Real Estate

Year 2020

Sector definition

This document defines the activities of the real estate sector as developing and managing buildings and areas. The sector encompasses real estate developers, landlords, companies managing buildings and advisors. This sector brief covers companies that primarily operate real estate assets in Norway. Real estate activities depend on inputs from other sectors including materials, construction companies, utilities (heat, electricity and water), financial services and insurance.
Real estate activities are defined here as NACE codes F41.1 (Development of building projects), L68.1 (Buying and selling of own real estate), L68.2 (Renting and operating of own or leased real estate. Construction companies are not covered in this brief.

Summary

The real estate sector is already facing climate risks, and these are expected to increase in severity over time. The key emission sources from buildings are construction, energy use during operations and demolition. In Norway, direct emissions of greenhouse gases from heating and cooling during operations are low due to the high level of renewable energy in the grid and the prevalence of electric heating. The indirect emissions related to production and transport of materials and waste handling related to construction and refurbishment of buildings is much higher. Key options for reducing indirect emissions include: choice of low emission building materials, prioritizing refurbishments over newbuilds, implementing low emission construction sites and access to public transportation to reduce tenants' transport emissions.

Main climate and environmental risks[1]

Happening now

1. Heavy rainfall can lead to floods, urban stormwater and mudslides
2. Sea level rise can worsen impacts of flooding and extreme weather, and impact some high value coastal properties
3. Stricter regulations for energy use and/or efficiency may require refurbishments and affect the value of buildings
4. Buildings in urban areas without or with limited access to public transportation may face reduced attractiveness given efforts to reduce emissions from transportation

[1] The selection of key risks and categorization of those is based on expert judgement. Short-term refers to impacts that are likely in the next decade.

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Physical risk exposure

- Extreme precipitation (1) and its impacts are already observed with a significant probability to increase (CICERO, 2017). Among the impacts towards 2050 (2) of extreme precipitation are pluvial floods (urban flooding) and fluvial floods (rivers, lakes)
- Flooding from changing precipitation patterns and snow melt is already observed with a significant probability to increase
- Landslides are expected to increase in intensity and frequency in the next few years, especially for winter. Mountainous regions are especially sensitive.
- Sea level rise is expected to impact low-lying coastal areas. Impacts become more severe if in combination with extreme rainfall and/or winds (CICERO 2017)
- Periods with heat stress could manifest towards mid-century (CICERO 2017). There are observations that this is already affecting the building sector in terms of the attractiveness and value of individual buildings.

Transition risk exposure

- Mandatory efficiency upgrades may be required
- Buildings in locations where increased physical risk impacts are expected may face rising insurance premiums
- Buildings without or with limited access to public transportation may face reduced attractiveness given efforts to reduce emissions from transportation
- Changing consumer preferences might increase demand for buildings with high energy-efficiency
- Public-sector tenders may increasingly require low emission construction sites
- Heating systems based on fuel oil have been banned in Norway from 2020
- Bans on natural gas-based heating systems have not been officially proposed, but government has assessed the technical and economic possibilities for converting to alternatives. (Mdir NVE 2020). Political discussions on this should be followed closely

1) Definition of extreme precipitation used here is frequency of ‘very wet days’, defined here as the 90th percentile of daily precipitation on wet days

(2) Projected impacts towards 2050. Based primarily on RCP2.6 and RCP8.5 results for 2046-2065. CICERO 2017. (See flom-sonkart)

Key statistics & background figures

- In Norway, direct emissions of greenhouse gases from heating and cooling are about 1.2% of total territorial emissions (expected to fall after ban on fuel-oil heating). The emission intensity has been approximately halved since 2010. (Mdir 2016)
- Indirect emissions related to production and transport of materials and waste handling related to construction and refurbishment of buildings accounts for around 10% of total territorial emissions in Norway. (Bygg21 2018: Bygg- og eiendomssektorens betydning for klimagassutslipp)
- Emissions connected to building materials, construction and demolition of buildings are a considerable share of total life-cycle emissions and range between 33% and 57%, depending on building type and age (Dibk 2018)
- According to a report from Asplan Viak, a little over half of all life cycle greenhouse gas emissions from a new building (TEK17) comes from heat and energy use, while approximately 40% comes from use of materials. Emissions associated with construction and demolition account for 2-5% (Dibk 2018)
- The energy intensity of buildings varies by building type. The most recent official data on energy use in buildings is from 2012 or 2011. In 2011, average energy intensity for commercial buildings was 230 kWh/m2 (in use) and 179 kWh/m2 for all real estate activities (SSB, 2011). According to the EIA global energy efficiency is expected to be improved annually by 1,6 percent.
- 63% of Norwegian private homes have no known Energy Performance Certificate (EPC) label, 7.7% are rated G and only 0.35% are rated A. (Enova energy statistics)
- BREEAM-NOR is the most used environmental certification scheme for all building types in Norway. 305 buildings are currently registered under this scheme. 66% are office and educational buildings. 71% are in Oslo and Østlandet (Grønn Byggallianse 2019)
- The availability of updated and encompassing energy data is very limited. See chapter on data and indicators.

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About this brief

This sector brief was developed by CICERO as a part of the Sustainable Edge research project. The purpose of the brief is to outline the key material climate-related issues for the sector. The audience for the brief is the financial sector, either as potential investors or lenders to the sector. The reader is expected to have background knowledge of the sector and of climate risk assessment. The analysis methodology is rooted in CICERO's climate science and build on CICERO Shades of Green's methodology for green bond frameworks. This brief is to be considered a science-based opinion.

CICERO Shades of Green AS is a subsidiary of CICERO established in November 2018. CICERO Shades of Green AS has commercialized a corporate climate risk assessment based partially on the Sustainable Edge research, in addition to their own methodological development.

The Sustainable Edge project is financed by ENOVA SF and our financial sector partners: Oslo Pensjonsforsikring, CICERO Shades of Green AS, Nysnø, Sparebank 1 SMN, Sparebank 1 Nord-Norge, SR-Bank, Samspar and Sparebank 1 Østlandet. Thank you also to our partners Finans Norge and Schjødt.

Please note this assessment focuses on climate-related issues and risks. Other environmental and social aspects may be noted, but assessing material social, ethical and governance issues are outside the scope of the assessment. We discuss governance specifically in the context of climate governance, this should not be viewed as a substitute for a full evaluation of the governance of the sector and does not cover, e.g., corruption.

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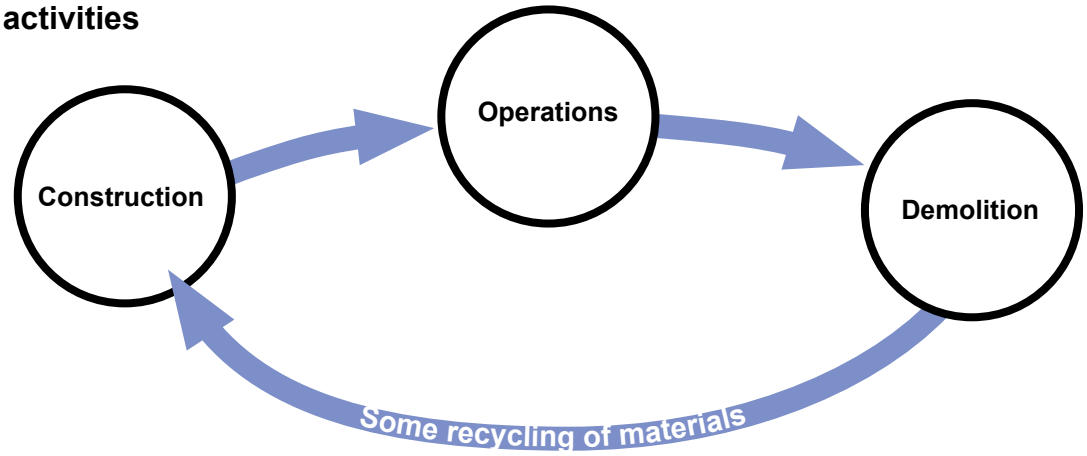
Emissions

Main activities



Scope 1

Definition: Direct emissions from owned or controlled sources, e.g. on-site fossil heating

Status:

- Scope 1 emissions from the real estate sector and their assets are small, of the order of 1,2% of total territorial Norwegian emissions (Mdir 2016)
- These emissions are expected to fall since fuel-oil based heating systems was banned from 2020.
- While fuel oil has a direct emissions factor of 315 tCO2/t, the alternatives power and district heating emit indirectly resp. 100 and 114 gCO2/kWh (Dibk 2018)
- Passive houses represent best practice.
- Older buildings are generally much less energy efficient.

Potential and challenges:

- Natural gas is still used as a heating fuel. Bans have not been officially proposed, but political discussions on this should be followed closely.
- According to the IEA, buildings in 2040 could be nearly 40% more energy efficient than today, on a global average level.

Targets

Along EU's climate goals, Norway is to reduce emissions from sectors including heating of buildings by 40% on average until 2030 with 1990 as base year. Specific targets for buildings have not been defined.

Scope 2

Definition:

Indirect emissions from generation of purchased energy, e.g. electricity, district heating.

Status:

Emissions from electricity and heat generation are low but depend on chosen emissions factor.

Scope 2 emissions' share of life-cycle emissions	
Office building	52%**
Apartment building	52%**
Commercial building	67**

*med standard byggematerialer **electricity and district heating, TEK 17
Kilde: Direktoratet for byggkvalitet, 2018

Potential and challenges:

- The emissions grid factor in Norway is low in European comparison.
- In some areas, district heating is available and sometimes mandatory to use. A share of district heating stems from waste incineration, including fractions of solid plastics.

Targets

The Parliament has decided on a goal of 10 TWh reduced energy use annually in existing buildings by 2030 – specific actions to achieve this have not yet been defined (TU 2019).

Scope 3

Definition:

All indirect emissions that occur in the value chain of the reporting company including up- and downstream emissions, e.g. production- and transport of building materials, construction and machinery, demolition and material removal.

Status:

- Scope 3 emissions are substantial, approx. 10% of national emissions.
- 93% of residential buildings have access to public transport within 500m walking distance (incl. bus) and by 15% (excl. bus) (2019, Eiendomsverdi).

Scope 3 emissions' share of life-cycle emissions	
Office building	47% (materials 40%, construction 5%, demolition 2%)
Apartment building	48% (materials 39%, construction 6%, demolition 3%)
Commercial building	33% (materials 27%, construction 4%, demolition 2%)

Potential and challenges:

- Depending on building type, the choice of building materials has a strong impact on life-cycle emissions of a building. A large number of LCA studies show that wood-frame building results in lower primary energy and GHG emission compared to non-wood alternatives including concrete and steel. (R&D Fund for public real estate, 2016)
- Given the footprint from materials, refurbishments have a lower climate effect than newbuilds
- Low emission construction sites can reduce life-cycle emissions by 4-6%
- Access to low-emission public transportation reduces tenants' transport emissions. Further electrification of the vehicle fleet will also reduce Scope 3 emissions.

Targets

Norway has no specific emission targets on building materials or low-carbon public transport access but aims to achieve 40% emissions reductions by 2030 and 80-95% by 2050 at a national level.

Disclosure of climate risk

Disclosure of climate risk and environmental impact

The real estate sector in Norway scores low compared to other sectors in a survey of sustainability reporting by the 100 largest listed Norwegian companies. The score assesses reporting under GRI, CDP, TCFD, SDGs. Only one company from this sector, Entra, was among the top 14 performers. (Governance Group 2019)
A survey of publicly listed real estate and building companies across 18 major markets, including Norway, showed that this sector lacks behind other non-financial sectors regarding disclosure of climate risks according to the TCFD recommendations. (EY 2018)
Eiendomsverdi and Kartverket and other actors are collecting data but reporting of key metrics is insufficient.

Regulations and scenario information

Policies in Norway

- Norway has no specific emission targets for buildings but aims to achieve 40% emissions reductions by 2030 and 80-95% by 2050.
- The Parliament has decided on a goal of 10 TWh reduced energy use in existing buildings by 2030. New buildings have to follow the existing building regulations at any one time. Currently, the regulation named TEK17 (to be updated in 2020) provide an energy standards varying by type of building.
- Currently, flood zones and immediate risks are included in the standard building planning procedure. The Norwegian Water Resources and Energy Directorate (NVE) provides detailed maps of flood zones and hazard maps for flooding.[2] The data used for these maps varies in age and is based on statistical analysis of historical data, data on typography and hydraulic modelling. There are limitations with using historical data to predict future flood events as flooding patterns are changing due to climate change.
- In Norway, natural hazard insurance coverage is high due to the government-mandated bundling of flood and fire insurance through the Natural Perils Insurance Act. For uninsurable assets, the government has a separate natural hazard compensation scheme. Due to the mandatory insurance coverage, direct damages to property are less of an immediate concern. However, indirect costs, e.g. from transport disruptions, may not always be covered.
- The EU, and Norway, aims to achieve a 70% recycling rate for waste from construction. Companies' efforts to increase the share of sorted and recycled waste from construction are insufficient to reach this target (34% in 2017, EY 2019).
- The building sector has developed a roadmap for sustainable growth towards 2050, which includes several recommendations for the sector. Some of the key recommendations include certifying the organization, removing all fossil fuel heating, requesting fossil free construction sites and commissioning an energy budget for the estimated actual energy consumption (Grønn Byggallianse, 2016)

2 The maps can be accessed here: https://www.nve.no/flaum-og-skred/kartlegging/flaum/

EU Taxonomy

The March 2020 EU taxonomy includes the following real estate related activities : Construction of new buildings (F41.1 F41.2) and Building renovation (F41.1 F41.2), Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities (F41.2), and Acquisition and ownership of buildings (L68).

The following criteria applies to construction of new buildings

- The net primary energy demand of the new construction must be at least 20% lower than the primary energy demand resulting from the relevant regulations[3].

Note that the construction of new buildings designed for the purpose of extraction, storage, transportation, or manufacture of fossil fuels is not eligible.

Renovation is eligible when it meets either of the following thresholds[4]:

- Major renovation: compliant with the requirements set in the applicable building regulations for 'major renovation' transposing the Energy Performance of Buildings Directive (EPBD)
- Relative improvement: the renovation achieves savings in net Primary Energy Demand of at least 30% in comparison to the baseline performance of the building before the renovation.

Under the category F41.2, a range of Individual renovation measures, installation of renewables on-site and professional, scientific and technical activities are eligible. These include for example, Replacement of existing windows with new energy efficient windows, Installation of solar hot water panels and Accredited energy audits[5].

Acquisition and ownership of buildings could be eligible in these two cases[6]:

- Case A – Acquisition of buildings built before 31 December 2020: calculated performance of the building must be within the top 15% of the local existing stock.
- Case B – Acquisition of buildings built after 31 December 2020: The building must meet the criteria established for the 'Construction of new buildings'.

Note that large non-residential buildings must meet an additional requirement: efficient building operations must be ensured through dedicated energy management.

The current EU taxonomy draft sets additional requirements in the area of "Do no significant harm" in terms of physical risk assessment, building materials, water consumption etc.

The current draft also requires minimum social safeguards, currently defined as meeting the International Labour Organisation (ILO) Core Labour Practices.

Global scenarios

- The buildings and buildings construction sectors combined are responsible for 36% of global final energy consumption and nearly 40% of total direct and indirect CO2 emissions (IEA 2019). Energy demand from buildings and buildings construction continues to rise, driven by improved access to energy in developing countries, greater ownership and use of energy-consuming devices, and rapid growth in global buildings floor area, at nearly 3% per year.
- The IEA Efficient World Scenario highlights the potential for global building energy demand to decline between now and 2040, despite total building floor area growing by a further 60%. On average, buildings in 2040 could be nearly 40% more energy efficient than today.
- Space heating offers over a quarter of the potential energy savings. Water heating efficiency could also improve by 43% and improvements in space cooling, which is the fastest growing source of building energy demand, could see air conditioner efficiency double.

[3] See the EU Taxonomy for detailed criteria https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en
[4] As above
[5] As above
[6] As above

CICERO Shades of Green & analyst perspective[7]

CICERO Dark Green for the sector

Considerations for main activities

- CICERO Dark Green shading is difficult to achieve in the building sector because buildings have a long lifetime.
- CICERO Dark Green shading in the building sector should therefore conform to strict measures and is reserved for the highest building standards such as LEED Platinum, BREEAM Outstanding, Zero-Energy buildings and passive houses.
- Energy efficiency should be significantly below current regulations/standards (for example, a 30 % improvement).
- Resiliency is a core consideration for a Dark Green shading. The main risk to consider in most Norwegian regions is flood risk and other risks of more intense precipitation, for example, risk of urban overflow and increased snow loads. For some regions, mudslides, avalanches and more intense storms should also be considered. Heat stress may be a concern for certain buildings in urban settings.

Considerations for upstream and downstream factors

- Dark Green projects have strict climate related requirements for material, handling of waste during construction.
- Minimal emissions from construction are permissible for Dark Green projects, however, efforts should be taken to establish zero-emission construction sites.
- The building should encourage a low-emission transportation system. Consider access to public transportation, availability of charging points for EVs, pedestrian and bicycle accessibility

Current best practice – activities

- ★ Ambitious greenhouse gas emission targets with a clear timeline, taking into account life-cycle considerations and emissions from sub-contractors upstream (construction) and downstream (demolition) activities.
- ★ Environmental impact assessment of refurbishment versus new construction before investment decisions.
- ★ Due consideration of transport solutions and associated lifetime emissions for new projects.

Current best practices – governance

- ★ Climate sensitive key performance indicators regularly measured and reported systematically to the leadership of the company.
- ★ Climate risk assessment including scenario analysis relevant both to physical and transition risks.
- ★ Transparent and regular reporting against established targets verified by independent third parties.

7 The Shades of Green methodology assesses alignment with a low-carbon resilient future. CICERO Dark Green is allocated to projects and solutions that correspond to the long-term vision of a low carbon and climate resilient future. For more information see: https://www.cicero.green/our-approach

Key opportunities

- Buildings that are already green now can face lower risk of future upgrade costs and physical climate impacts, lower operating risks and lower risk of becoming stranded assets (World Green Building Council).
- Deep retrofits are often cost efficient and achieve a better climate impact than newbuilds.
- Access to low-carbon public transport can provide long-term benefits for tenants/owners.

Key pitfalls

- Incentive problems for builders/owners/tenants:
  - ► Builders do not necessarily focus on long-term efficiency.
  - ► Owners do not necessarily upgrade the building as the running costs are carried by the tenants.
  - ► Tenants often have less flexibility to upgrade efficiency as this requires investments from owners.
  - ► Public transport access of buildings not necessarily in the focus of builders/owners/tenants.
- In the long run, insurance coverage might be insufficient to cover climate risk impacts on supply chain and communication infrastructure.
- Building materials, construction emissions, transport solutions and waste handling (scope 3) should be in the focus in a Norwegian context as the potential for reducing life-cycle emissions is higher than in procured power and heat (scope 2).
- Energy efficiency improvements may lead to rebound effects. When the cost of an activity is reduced there will be incentives to do more of the same activity. This could be less of a concern in Norway given the high share of renewables in the grid.

Data and indicators for climate risk disclosure

Historic data

Figure 1 illustrates that specific energy use decreased only slightly while average energy use remained unchanged. Figure 2 illustrates that there is a long-term consistent trend that more new buildings are constructed than older buildings being refurbished. This is probably not a trend that is most aligned with a low carbon and zero emission vision of the future.

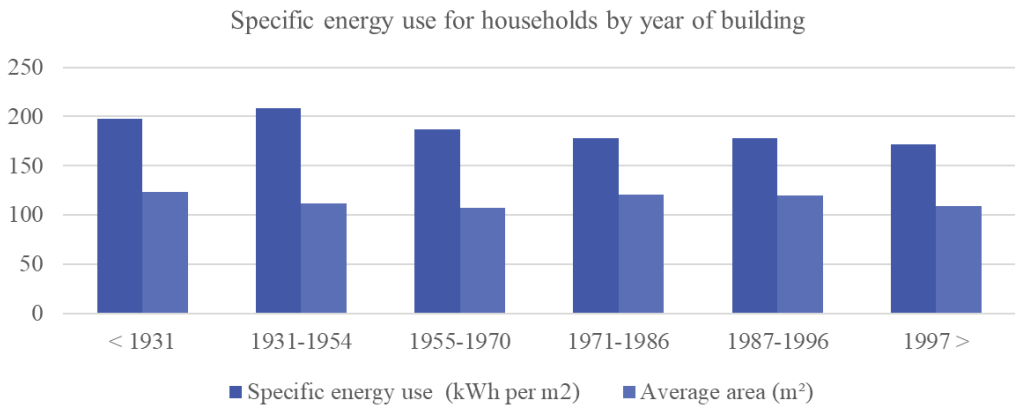


Figure 1 energy use for households.

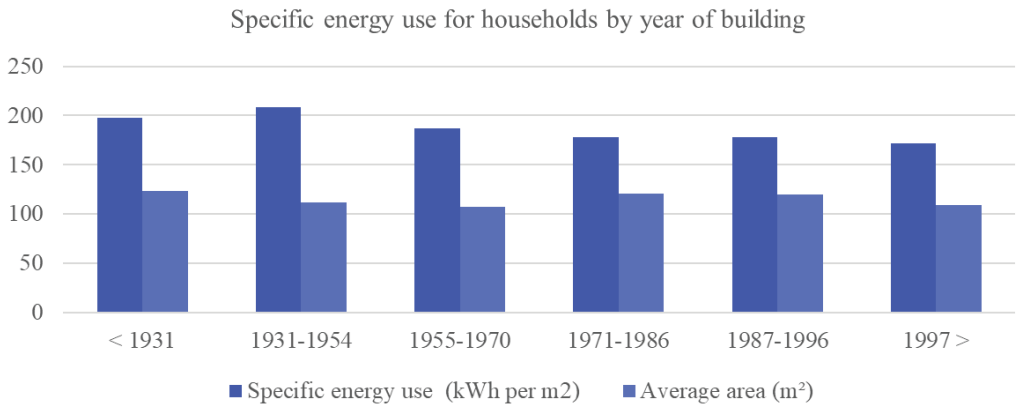


Figure 2 production index

The most recent available official data from Statistics Norway is from 2012 and 2011. The average energy use for residential buildings in 2012 was 181 kWh/m2 (in use). The average energy use in commercial buildings in 2011 was 230 kWh/m2 (in use). Average energy use by all real estate activities (2011) in Norway: 179 kWh/m2 (in use) (Statistics Norway).

Climate-relevant data sources

- Data in the building sector remains scarce.
- Full coverage of energy efficiency data in Norway is not yet available.
- Additional efforts are needed to capture building materials and construction emissions accounting.

Potential difficulties in attaining / using existing data

- There is currently no systematic way of capturing national buildings' Scope 1, 2 and 3 emissions.
- The Norwegian EPC label covers only approximately 20% of the total building stock. Since the EPC label covers energy efficiency and heating character on a specific scale, actual emissions accounting is difficult to obtain.
- Currently, the EPC label is in the phase of being updated.
- Some data sources do not clearly separate between commercial and residential buildings.

Indicators which would improve climate risk disclosure[8]

Preliminary indicators and metrics
Electricity intensity (kWh/m2), heating energy intensity (kWh/m2) and carbon intensity (CO2eq/ m2) (Estimated or measured. Area as BOA or BRA, please indicate.)
Installed heating type(s)
Supply chain emissions of construction and building materials
Percentage of sorting of waste from construction activities
Percentage of materials recycling from construction related waste (2017: 34%, EU target: 70% in 2020. EY 2019)
Demand for low fossil/fossil free construction-sites in standard tendering documents
For what share of the real estate assets has a physical climate risk assessment been conducted?
What share of the real estate assets are in areas prone to flooding and urban overflow?

Indicators providing information on the scale of climate hazard (e.g. heavy precipitation) could be relevant for the individual buildings. Some indicators of physical climate risk are being developed by the CICERO lead CimINVEST project and will be presented in an open access data portal. The project has also developed factsheets on climate risks that provide guidance on physical risk assessment[9].

8 Please note that these are preliminary indicators and metrics that will be further developed. As the methodology and data availability evolves, we expect adjustments to the list. Also note that within the sector there are many different busines models and different indicators and metrics may be more relevant depending on the company under assessment.
9 These can be downloaded here: https://cicero.oslo.no/en/climinvest

Key analyst questions for all companies in this sector

1. What are the company's goals for energy intensity? How do these compare to regulations?
2. How does the company consider environmental and climate impacts linked to transport solutions/public transport access?
3. How does the company consider the full life-cycle emissions of the building incl. construction emissions and from building materials and recycling?
4. How are decisions about new build vs renovating older buildings taken? Is there a consideration of the potential to use existing infrastructure or materials from any demolition?
5. How does the company assess, integrate and disclose climate risk exposure?
6. How resilient are the buildings to physical impacts, including increased precipitation (flooding and urban overflow), heat stress, snow loads and wind?
7. How are environmental characteristics and energy use discussed with potential tenants?
8. Does company obtain third-party building certifications for the buildings?
9. What is the current share of recycling of waste from construction, are there defined targets? (EU target: 70%)

Additional data and information

Building age

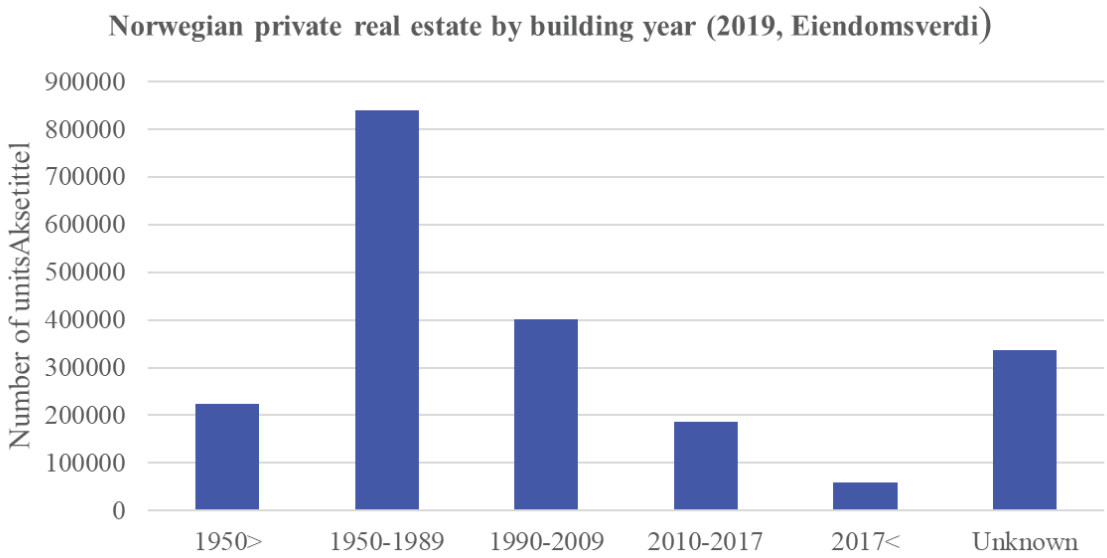


Figure 3 private real estate by building year

Most buildings are between 20 and 50 years old. Rehabilitation is therefore a primary concern.

Energy intensity in different building types

Highly specialized buildings, e.g. hospitals, are most energy intensive, while business and industry buildings have the greatest gap between the best and the average buildings in this sample

Building category	Average energy intensity (kWh/m2)	Average energy intensity (kWh/m2) of top 5%
Office building	174	84
Schools	138	69
Kindergartens	164	66
Apartment buildings	139	54
Shops	145	58
Business buildings	168	48
Hospitals	200	98
Industry and storage buildings	188	49
Health buildings	178	89
Sports buildings	145	47

Sample of 3300 Norwegian commercial buildings' energy intensity (2019, Entro)

BREEAM certifications

BREEAM Outstanding can reduce CO2 emissions by half compared to standard buildings. This certification is most expensive for office and shopping buildings, with an added cost of approximately 10%.
Source: Caroline Gjøsund Larsen, 2018.

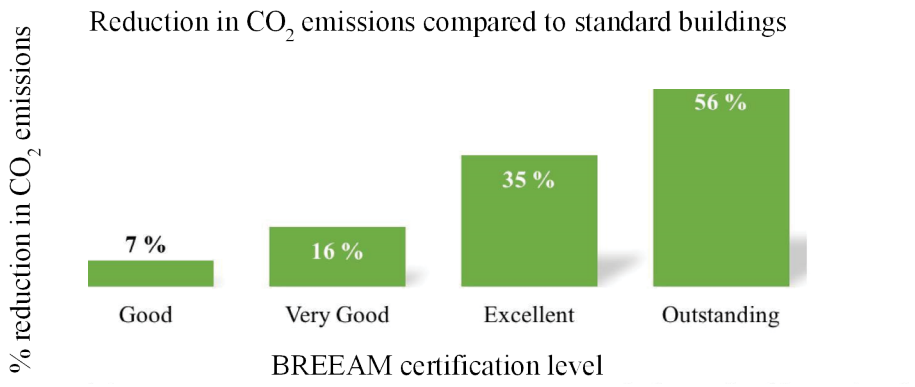


Figure 4 BREEAM and reduction in CO2 emissions

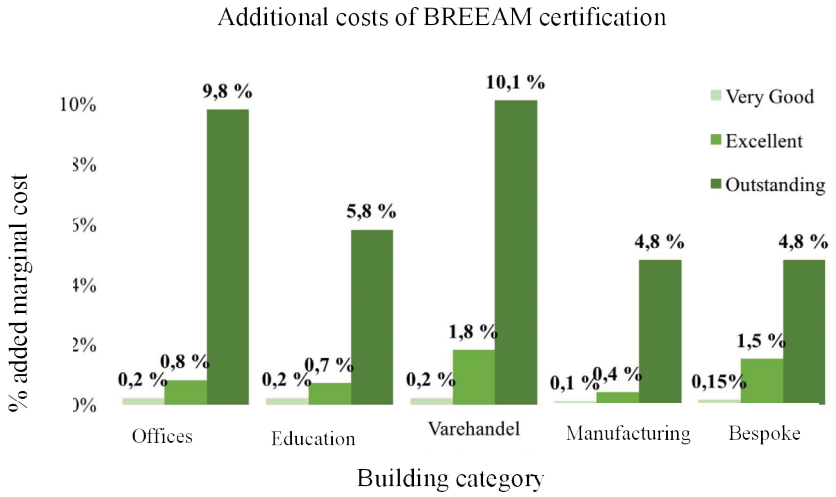


Figure 5 Additional costs of BREEAM

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