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Sustainable investing

The impact of deep energy retrofit costs on the real estate sector

Sustainable Investing Expertise by ROBECOSAM

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Introduction

This publication focuses on the cost and impact of deep energy retrofits on real estate companies in the office and residential sectors

The real estate sector is estimated to produce around 40% of annual global greenhouse gas (GHG) emissions.[1] Therefore, for countries to align with the Paris agreement, the real estate sector plays an important role in GHG emissions reduction plans. Reducing carbon emissions within the real estate sector cannot be solely solved by electrification[2] and/or the use of renewable energy contracts for current building operations. Improvements in terms of energy efficiency will also be necessary. The European Commission has, for example, stated the following: "Improving energy efficiency in buildings therefore has a key role to play in achieving the ambitious goal of carbon-neutrality by 2050".[3] The 'energy efficiency first' principle has been embedded in the EU Regulation on the Governance of the Energy Union and Climate Action and the Energy Efficiency Directive.[4]

Following from this principle, new and stricter policies are introduced to address the real estate sector's energy efficiency. An example is the introduction of new legislation affecting office buildings in the Netherlands:[5] from January 2023 it is no longer allowed to rent out office space in a building with an energy consumption intensity exceeding 225 kWh/m^2. Another example are the Minimum Energy Efficiency Standards (MEES) regulations in the UK, where commercial landlords are no longer allowed to rent out property with an EPC rating below E since April 2020.[6]

Deep energy retrofit projects for existing buildings are required to achieve the large reductions in energy consumption needed to comply with the coming, and potentially even stricter future, policies. This publication looks into deep energy retrofit examples, the costs involved and the resulting energy efficiency improvements. Based on these deep energy retrofit cases, we first estimate the costs of reducing energy intensity by one kWh per m^2 for both office and residential properties. We then formulate two scenarios of maximum energy intensity allowed under future policies. For a representative set of office and residential real estate companies, the additional capital expenditure (CAPEX) companies need to spend on energy reduction projects, if any, under the two scenarios is estimated. For the set of listed real estate companies included in this research there is a wide disparity in what additional CAPEX is needed to comply. The financial consequences and potential impact on the valuation of the companies will therefore be very different for each individual company. To gauge the impact on the valuation of the companies, the required net additional CAPEX is reflected both as a percentage of revenue and market capitalization for a comparative overview.

We will show that the marginal cost to reduce one kWh per m^2 becomes progressively higher as the starting point of energy intensity is lower. This means that for the stricter scenario the additional CAPEX needed to comply with the energy intensity target is material for the sector overall. Additionally, for investors in real estate stocks an important conclusion is that the costs are not equally distributed among the sector's companies. Some companies are already much better positioned for the energy transition than others. Potential costs of complying with new regulation might not be reflected in stock prices yet and could therefore become a factor to take into account in stock selection.

[1] IEA (2019), Global Status Report for Buildings and Construction 2019, IEA, Paris https://www.iea.org/reports/global-status-report-for-buildings-and-construction-2019
[2] Electrification is the process of replacing the current power source e.g., oil, gas or coal, by electricity.
[3] In focus: Energy efficiency in buildings. (2020). European Commission. https://ec.europa.eu/info/news/focus-energy-efficiency-buildings-2020-feb-17_en
[4] Energy efficiency first. (n.d.). Energy. https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-first_en
[5] Energielabel C kantoren | RVO.nl | Rijksdienst. (2021). Rijksdienst voor Ondernemend Nederland. From https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/wetten-en-regels/bestaande-bouw/energielabel-c-kantoren
[6] Minimum Energy Efficiency Standards (MEES) –. Newham Council. From https://www.newham.gov.uk/housing-homes-homelessness/minimum-energy-efficiency-standards-mees/2

Energy in buildings

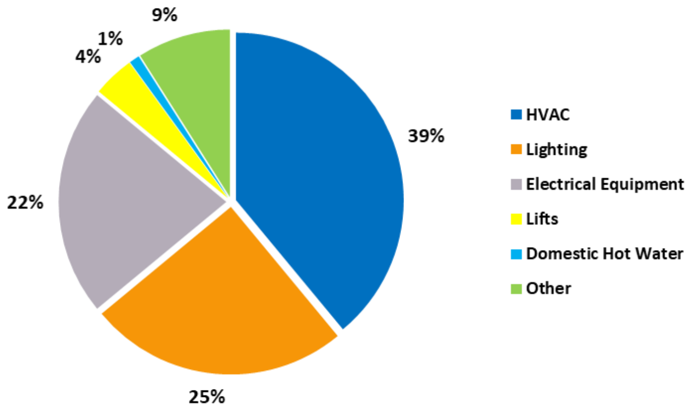
Buildings can be divided into components that consume energy and components that leak energy

To understand what measures can be taken to reduce a building's energy demand it is helpful to first understand in what ways energy is used in buildings and how energy is lost. Buildings can be divided into components that consume energy and components that leak energy. Building components that are energy-consuming are the equipment for HVAC (Heating, Ventilation, and Air-Conditioning), equipment for sanitary services, elevators, escalators, and electric household appliances like computers or fridges. Building components that leak energy are mostly the building envelope, so the foundation, the exterior walls (above ground and underground), pillars, ceilings, interior walls, partition walls[7], windows, and the roof.

How is energy consumed in a building?

Figure 1 shows the average energy consumption in an office building. Energy use in office buildings is dependent on factors such as climate, building material and type of building (high-rise, mid-rise or low-rise) for instance. However, the HVAC system typically has the highest level of energy consumption. Figure 2 contains a further breakdown of the HVAC energy consumption. Lighting is the second largest consumer of energy, followed by electrical household equipment. These three categories together already account for 86 percent of total energy consumption. As a building owner, the biggest impact on energy reduction can be made by focusing on the first and second-largest categories in energy consumption: HVAC and lighting. The category of electrical equipment is largely dependent on the habits of the tenants in the building and this can be hard to influence as a building owner.

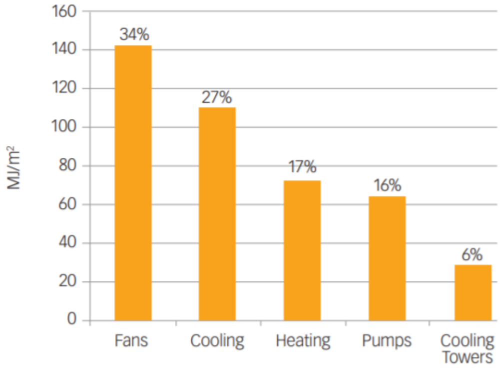
Figure 1 | Breakdown of typical energy consumption for an office building



Source: Australian Department of the Environment and Energy

[7] Partition walls are non-load bearing walls. Their main function is to divide a space into rooms. The difference between partition walls and interior walls is that interior walls are the load-bearing walls of the building and partition walls are non-load-bearing walls.

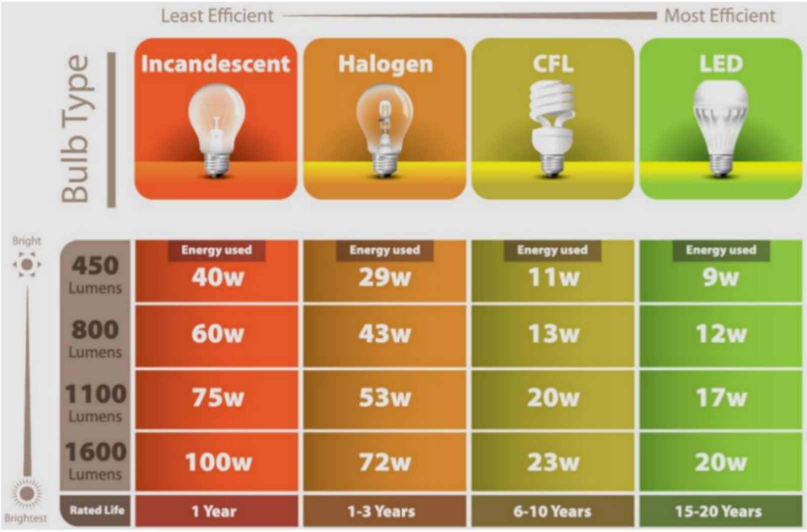
Figure 2 | Breakdown of typical energy consumption of an HVAC system



Source: Australian Department of the Environment and Energy

When it comes to making changes in the HVAC and lighting system it is useful to keep the lifespan of this equipment in mind. One would rather wait until the equipment is at the end of its economic lifespan, where the costs of renewing the equipment are already budgeted in. This prevents double spending unless it is urgent due to new stricter regulations. The lifespan of a commercial HVAC system is generally between 15 and 20 years. A residential HVAC system ideally lasts 20 years, but conditions in coastal and humid areas can reduce this lifespan to between 8 and 14 years.[8] The lifespan of lighting equipment such as light bulbs can vary as the use of lighting per day varies across buildings. Figure 3 depicts the rated life for different light sources: this can range between 1 and 20 years. The figure also shows energy efficiency for the different light sources: LED lighting can be up to 5 times more efficient than incandescent lighting.

Figure 3 | Energy efficiency and rated life of different light sources



Source: Campiotti et al. (2015)

How do buildings leak energy?

Energy is lost from buildings in two ways: **1. Low air tightness 2. Bad thermal insulation.**

Airtightness is important in buildings, as it is crucial in order to achieve a controlled environment that is resistant to influences from the outside environment like air (warm or cold), water, light, and sound. As figure 1 shows, the HVAC system demands the largest energy portion. From an energy perspective it is therefore useful to have an environment where the air is 'trapped' so that the HVAC system can influence the characteristics of the air within the building: that is why we do not open all the windows while turning up the thermostat.

The second element of energy loss is heat loss from bad thermal insulation. Insulating materials are bad conductors that are attached to the building envelope to slow down the movement of heat between two spaces, thus reducing the heat

[8] Wheeler, Grant, & Deru, Michael. Planning for Failure: End-of-Life Strategies for HVAC Systems. United States.

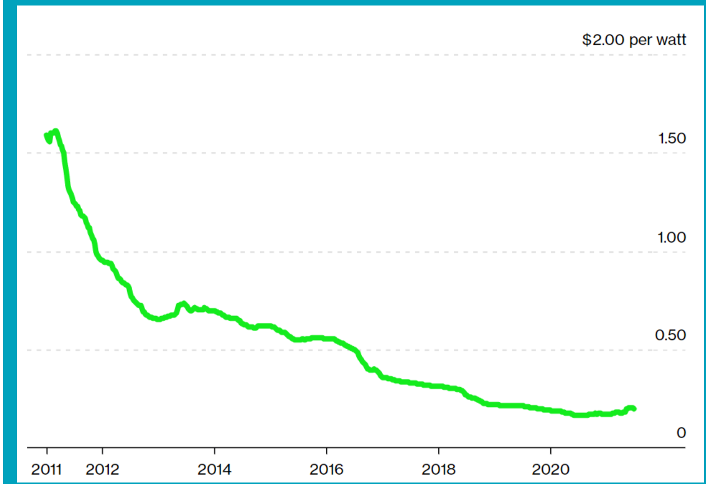
loss from the inside to the outside of a building. Heat loss from buildings without insulation can be reduced by up to 40% just by filling the cavity walls[9] with insulation.[10] The thickness of the insulation material depends on the building's climate zone:[11] buildings in colder climates benefit from thicker insulation, accompanied by higher costs. Thus, depending on the energy demand for heating and cooling the building, there is an optimal thickness for the insulation and the energy savings it brings. At a certain point, there will be diminishing returns as the costs of thicker insulation might be outweighed by the energy costs saved.[12]

An essential part of thermal insulation is the reduction of the conduction level of a building's windows. Glass is a good conductor of heat, however, this is not the case for air. A well-known energy-saving measure is the double-glazing of windows.[13] The reduction in energy consumption this measure realizes can also vary a lot. The energy-saving potential is again dependent on the heating and cooling demand and also on the amount of sunshine on the building. On average, double-glazing of windows results in energy savings of around 15%.[14]

Box 1: Adding a third dimension: energy-producing components

With the Paris Agreement targets in sight, the real estate sector is diverting more and more from sources of traditional power generation to realize the decarbonization and energy efficiency goals for 2050. In addition, tenants are also increasingly demanding renewable energy. The real estate sector has experienced and will further experience a growing adaptation of renewable energy sources like solar power, wind energy, and geothermal energy. Figure 4 shows how it has become cheaper for building owners over the years to invest in energy-producing components like solar panels.

Figure 4 | Photovoltaic panel costs per watt over the years



Source: PVinsights

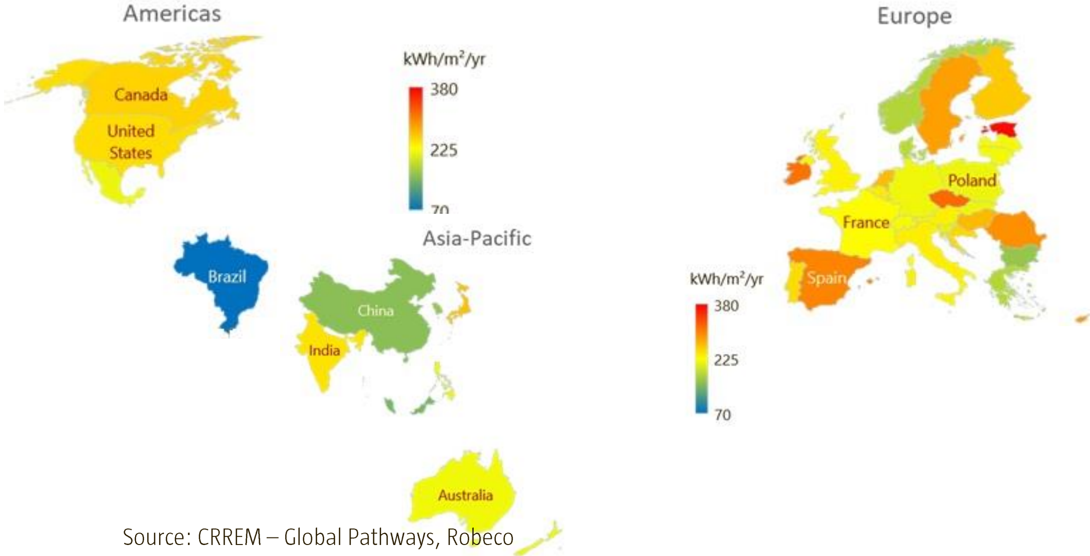
Global differences in energy consumption intensity of office buildings

The energy consumption of a building not only depends on the building components, but also on the local climate. This is reflected in the average energy consumption intensity levels for offices across the world, which ranges from 70 kWh/m^2 to 373 kWh/m^2 (see figure 5). The global average energy consumption intensity for offices is 233 kWh/m^2. The highest

[9] Cavity walls are two brick walls with space in between.
[10] Roberts, S. (2008). Altering existing buildings in the UK. Energy Policy, 36(12), 4482–4486. https://doi.org/10.1016/j.enpol.2008.09.023
[11] Lam, J. C., Wan, K. K., Tsang, C., & Yang, L. (2008). Building energy efficiency in different climates. Energy Conversion and Management, 49(8), 2354–2366. https://doi.org/10.1016/j.enconman.2008.01.013
[12] Bolattürk, A. (2006). Determination of optimum insulation thickness for building walls with respect to various fuels and climate zones in Turkey. Applied Thermal Engineering, 26(11–12), 1301–1309. https://doi.org/10.1016/j.applthermaleng.2005.10.019
[13] By creating a space with air between two panes of glass, the transfer of heat between indoors and outdoors is hardened.
[14] Average calculated from the studies (Forughian & Taheri Shahr Aiini, 2017), (Hilliaho et al., 2015), (Tafakkori & Fattahi, 2021), and (He et al., 2019).

average energy intensity level for offices is in Hong Kong (373 kWh/m^2) and the lowest in Brazil. Therefore, when it comes to retrofit costs, the same policy would have different effects across nations.

Figure 5 | Average energy consumption intensities in 2018 for office buildings across the world

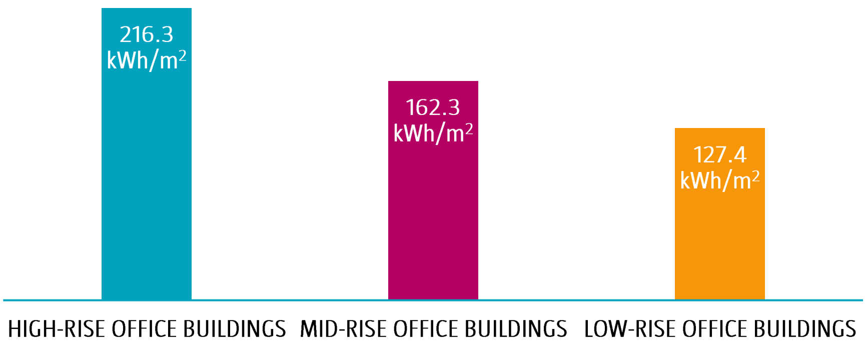


Source: CRREM – Global Pathways, Robeco

Higher buildings come with higher energy consumption intensities

Energy consumption intensity levels are also influenced by the number of stories a building has. Data from GRESB (Global Real Estate Sustainability Benchmark) show a clear difference in average energy consumption intensity across three categories of office buildings. GRESB reports annually on the ESG performances of cooperating real estate companies and splits the data on the company portfolios into high-rise office buildings, mid-rise office buildings, and low-rise office buildings.

Figure 6 | GRESB 2019 benchmark energy consumption intensity levels[15] for listed office real estate companies, split into high-rise, mid-rise, and low-rise office buildings

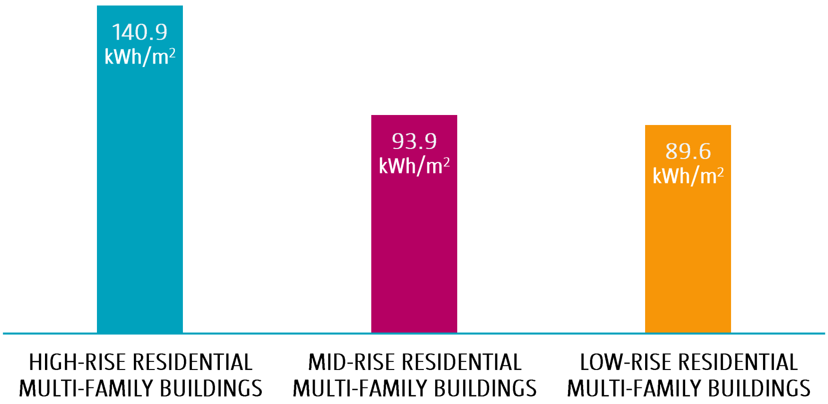


Source: GRESB, Robeco

GRESB defines a low-rise office building as office properties with 1 to 4 stories, mid-rise office buildings as properties with 5 to 9 stories, and high-rise office buildings as properties with 10 or more stories. Figure 6 illustrates the average energy consumption intensity for these three categories. As the number of stories increases, the level of energy consumption intensity increases. A possible explanation, according to research from UCL, is the greater exposure of taller buildings to strong winds, lower temperatures, and hours of direct sun. The consequence is thus higher energy use for heating and cooling.

[15] The averages are m^2-weighted averages.

Figure 7 | GRESB 2019 benchmark energy consumption intensity levels[16] for listed residential real estate companies, split by high-rise, mid-rise, and low-rise multi-family buildings



Source: GRESB, Robeco

For the residential sector, the low-rise multi-family building is defined as a residential building of 1 to 3 occupiable stories. The mid-rise multi-family building is defined as a residential building of 4 to 8 occupiable stories and the high-rise multi-family building as a residential building of 8 or more occupiable stories.[17] Figure 7 shows the averages in energy consumption intensity for these three categories. If we compare the two figures we can see the difference in average energy consumption intensity between the residential sector and the office sector.

[16] The averages are m^2-weighted averages.
[17] GRESB Documents. (2020). Real Estate Reference Guide. From https://documents.gresb.com/generated_files/real_estate/2020/real_estate/reference_guide/complete.html

Costs of deep energy retrofitting

Deep energy retrofits: reaping the benefits of synergies

A deep energy retrofit is a complete makeover to benefit from synergies, in contrast to the standard green retrofit where each different element of the building is addressed by separate projects. Unlocking synergies will be necessary in the pursuit of lower energy consumption. A complete makeover therefore highly likely means a disturbance in the rental operations of a building and thus missing out on rental revenues for the length of the retrofit project. A deep energy retrofit project can be divided into the elements of the building itself:

1. The building envelope: all the building components that separate the indoors from the outdoors. Examples are exterior walls, building foundations, roofs, windows, and doors. This is where the deep energy retrofit differentiates itself from the standard retrofit.
2. The HVAC system: in a deep energy retrofit, often the entire system is replaced.
3. Lighting: reducing the energy use of lighting by switching lamp types, delamping, or installing sensors and other smart lighting systems.
4. Service water heating: building components dedicated to generating, storing, distributing, and dispensing hot water used for sanitary purposes other than space heating. This plays a role in lodging and hospital-type buildings where these costs are substantial in the operation.

Synergies between these building components are what a deep energy retrofit can unlock. For instance, synergies between the building envelope and the lighting system can be created by sizing up or strategically adding windows for an increased amount of daylight. With proper design, 100 percent of the space close below can be daylit, with only 3 to 5 percent of the roof area designated to skylights. Also, the interior can be designed to reflect light better, or more reflective materials can be used to decrease glare and improve light distribution.[18] This is why the design is essential in the building's energy use and the biggest impact in energy consumption can be achieved in the design, which takes place at the earliest stage of a building's lifecycle.

What is the cost of reducing energy consumption by one kilowatt-hour (kWh) per m^2 for residential and office buildings?

In order to determine the cost of reducing energy consumption, we calculate an estimate based on the reduction of energy consumption in kilowatt-hours per square meter. The costs of a deep energy retrofit vary across industries as the buildings themselves have different purposes. In addition, information on the costs of deep energy retrofits is very scarce. Therefore, in our opinion, the best starting point to estimate energy reduction costs is to look at the current energy consumption intensity, as future regulations are most likely to focus on energy intensity levels. Our research also shows that the energy intensity and the type of building form a good starting point for estimating costs compared to, for example, the building's age. We use case study data from the International Energy Agency (IEA) and the Rocky Mountain Institute (RMI) for calculating our estimate. These case studies contain data on the building's age, total floor area (m^2), the pre-retrofit energy consumption intensity (kWh/m^2), and post-retrofit energy consumption intensity (kWh/m^2). Sometimes the accomplished reduction in energy consumption intensity (kWh/m^2) is provided (see box 2 for case study details). The case studies on residential buildings are all deep energy retrofits in Europe. The case studies on office buildings are more diverse as they include deep energy retrofits in the US as well as Europe, which might have affected the estimated costs of reducing a kWh per m^2.

The reason we use these case studies instead of adding all the estimated costs per m^2 per component is that the retrofit costs of the building envelope are difficult to estimate. Additionally, these projects are often done in combination with non-energy-related projects like making the building more accessible for disabled people. Building owners prefer to

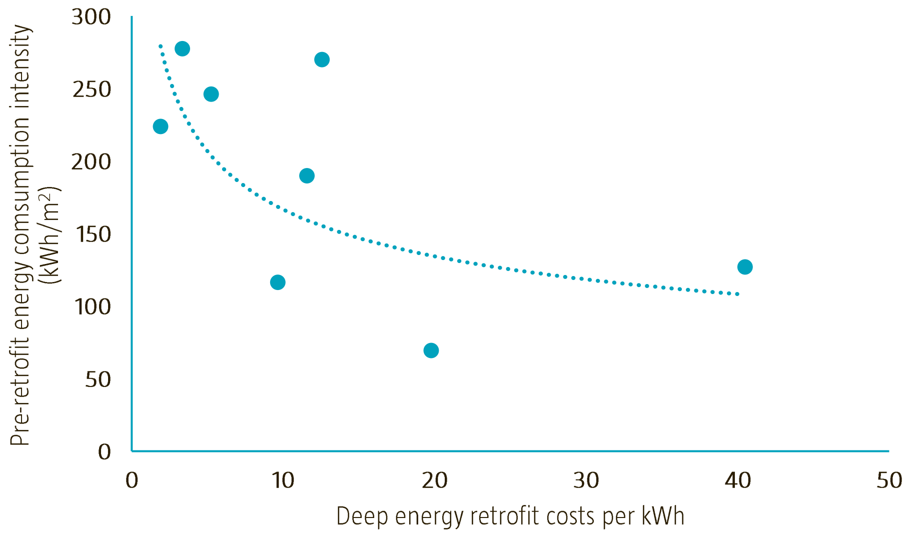
[18] RMI (2012): Identifying Design Opportunities for Deep Energy Retrofits

implement everything in the same timeline to avoid any additional losses on rental revenues and to benefit from construction synergies.

A head start does not necessary lead to an advantage

The case studies are also an opportunity to look for correlations between a building's characteristics and its deep energy retrofit costs. Figure 8 shows a scatterplot between the pre-retrofit energy demand of a building and the deep energy retrofit costs per kWh/m². The scatterplot indicates a downward trend, which implies that the lower the energy consumption intensity before a retrofit, the higher the costs to reduce a kWh/m² of energy consumption by a deep energy retrofit. Intuitively, this sounds right as, a building with a lower energy consumption intensity would be the result of a newer and/or better HVAC system, insulation, lighting, and other measures. The use of the latest sustainable innovations would be required to accomplish a further decrease in energy consumption, and this comes with a higher price tag. The current energy consumption intensity therefore needs to be considered when assessing the costs for a company to retrofit, which is the purpose of our research. We use this finding in our analysis of the impact of sustainability policies on capital expenditures for office real estate companies. We create three cost brackets, based on the pre-retrofit energy consumption intensity, and used these in the calculation for impact on capital expenditures. Different deep energy retrofit costs per kWh/m² reduction are then allocated to each of the brackets. For details on the cost allocation for each bracket, we refer to the section 'Data & methodology' on page 15. Other building characteristics from the case studies (like age and total floor area) showed no clear relation with their deep energy retrofit costs per kWh/m². We refer to the appendix for figures and further information on this.

Figure 8 | Relation between the office buildings' pre-retrofit energy consumption intensity and the deep energy retrofit costs per kWh/m² reduction

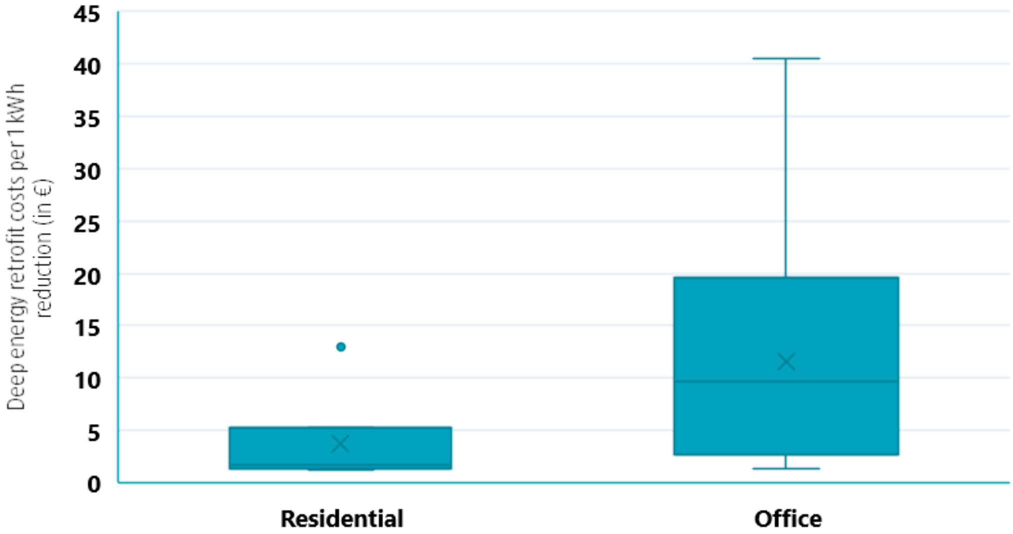


Source: IEA, RMI, Robeco

Average costs for the residential and office sector to reduce one kWh/m²

Based on the pre-retrofit and post-retrofit energy consumption intensity and the total project costs we can estimate the average cost of reducing one kWh/m² in energy consumption for a deep energy retrofit. This method allows us to draw parallels between companies, and ensures more efficient assessment of government policies on sustainability for the real estate sector, as the energy intensity level often forms the basis of these policies. Figure 9 shows the average cost for the residential and office sub-industry to reduce one kWh/m² in energy consumption. This is EUR 3.7 per one kWh/m² of energy reduction for the residential sub-industry and EUR 11.6 per one kWh/m² of energy reduction for the office sub-industry. It also shows the larger spread in costs per kWh for office buildings compared to residential buildings. Figure 8, however, also shows that there is low-hanging fruit when it comes to improving the energy efficiency of buildings, like just replacing the HVAC or lighting system. The major costs arise when the building envelope is addressed. Therefore, instead of using the average cost of EUR 11.6 to reduce one kWh/m², we allocate costs in three brackets and thus take into account the fact of increasing costs when the pre-retrofit energy intensity level decreases.

Figure 9 | Boxplot of costs to reduce energy consumption for residential and office buildings by 1 kWh/m²



Source: IEA: Deep Energy Retrofit – Case Studies, RMI: Advanced Energy Retrofit Guides; Deep Retrofits, Robeco

Box 2: Case study characteristics

The 20 case studies from the International Energy Agency (IEA) and Rocky Mountain Institute (RMI) show the business and technical concepts for each of the deep energy retrofits. The IEA case studies are very detailed, whereas the RMI case studies only show project costs and energy consumption intensity before and after each retrofit. The cases we use for our analysis concern office buildings and multi-family residential buildings.[19] This results in the inclusion of 20 retrofit case studies. The measures observed in the case studies are:

1. replacing windows with windows that have higher thermal quality;
2. improving insulation of the walls, roof, and/or ceilings;
3. replacing lighting and/or lighting systems;
4. replacing the HVAC system in full or in part;
5. installing solar panels on the roof.

Not all deep energy retrofits in the IEA and RMI reports have implemented each of the measures mentioned above. For example, 17 out of the 20 selected case studies involved replacing the windows. A recurring matter is that windows with wooden frames were replaced by plastic frames of Passivhaus standards. Table 2 shows the frequency of measures observed in our selection of 20 case studies. All case studies involved an improvement in building insulation. The reason possibly lies in the application of a definition of a deep energy retrofit that involves an improvement of the building envelope. An interesting point is the variation observed in the thickness of the insulation material used: it varied between 7 cm and 32 cm for insulation of the building walls. Also, the insulation used for the roof was on average twice as thick compared to the wall insulation, and the thickness of the roof insulation varied between 13 cm and 40 cm. The most frequent measure for the HVAC system was the installation or replacement of Mechanical Ventilation by Heat Recovery (MVHR).[20] The heat pump was the least frequent measure in these cases: the air-source heat pump[21] was only observed in the US retrofit cases (5 out of 20) and the geothermal heat pump[22] was only observed in 4 out of the 20 cases.

Table 1 | Overview of measures taken in deep energy retrofit case studies

Measure	Frequency (out of 20 case studies)
Insulation:	**20/20**
Walls	16/20
Ceiling	6/20
Floor	5/20
Roof	5/20
HVAC:	**20/20**
MVHR	13/20
New ventilation system	9/20
Air-source heat pump	5/20
Geothermal heat pump	4/20
Windows:	**15/20**
Double-glazing	11/15
Triple-glazing	5/15
Solar panels:	**14/20**
Lighting:	**13/20**

Source: IEA: Deep Energy Retrofit – Case Studies, RMI: Advanced Energy Retrofit Guides; Deep Retrofits, Robeco

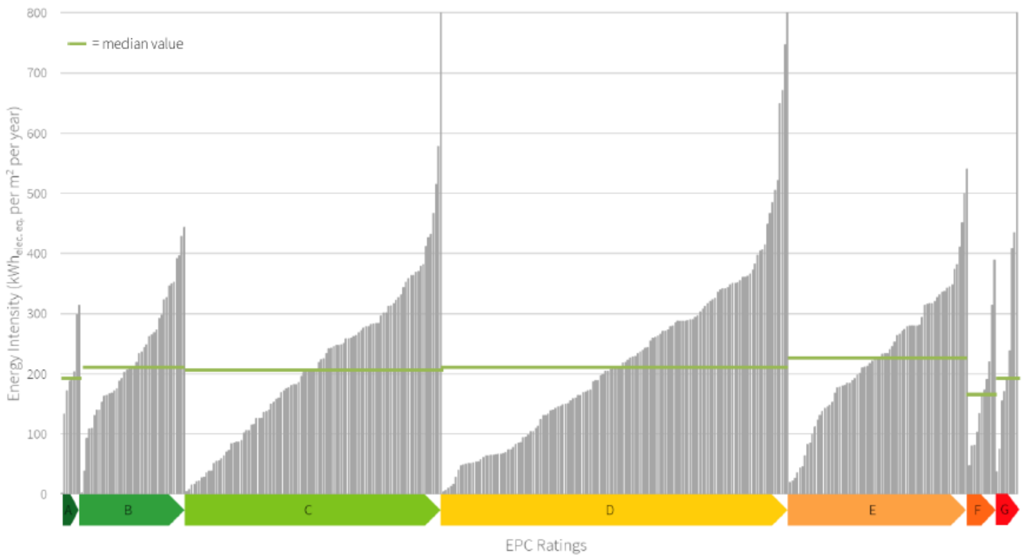
[19] Retrofit cases of residential buildings that are single-family houses are excluded from the dataset. Cases without information on the reduction of energy consumption due to the retrofit are also excluded.
[20] An MVHR is a ventilation system that removes moist stale air and delivers fresh air without losing the heat of a certain space.
[21] An air-source heat pump is a system that extracts heat from the outside air by using a refrigerant with a low boiling point that flows through the outdoor unit and absorbs thermal energy.
[22] A geothermal heat pump is similar to the air-source heat pump but instead of extracting heat from the outside air, this system extracts heat from the temperature of the earth.

Where will the governments' focus on improving energy efficiency lead to?

Energy ratings do not tell the whole story

Governments are increasingly focusing on the real estate sector, particularly the office sector, to achieve their climate ambitions, including reaching net zero by 2050.[23] This net-zero goal cannot be achieved by simple retrofits, such as replacing the HVAC system. It requires a comprehensive approach like a deep energy retrofit and the use of sustainable innovations to accomplish this. Real estate companies therefore need to be aware of future policies on sustainability and also need to start allocating financial and human capital accordingly. The office real estate sector will have to take into account that its ability to rent out office space will be capped by maximum energy consumption intensity levels. An example is the Dutch legislation on office buildings[24] effective from January 2023: the Dutch Building Decree prohibits the renting out of office space in buildings that exceed energy label C, meaning a maximum energy intensity level of 225 kWh/m^2. The UK has a similar approach: its Minimum Energy Efficiency Standards (MEES) Regulations, however, apply to all property rented out privately. In principle, since April 2020, it has not been allowed in the UK to rent out a property with an Energy Performance Certificate (EPC) rating lower than E, and those who fail to comply can get fined. There are exemptions, for example, if the costs of a measure cannot be earned back within 7 years.[25] These regulations are expected to become more stringent as there is currently a proposal to raise the minimum energy efficiency rating to EPC B by 2030 for privately rented non-domestic buildings.[26] To sidetrack for a brief moment, EPC ratings are, against expectations, not a good indicator of operational energy use,[27] as illustrated by figure 10. An explanation for this finding could be due to the fact that EPC ratings are valid for ten years.[28] The British government has recognized this and intends to shorten the validity of EPC ratings. [29]

Figure 10 | Relationship between operational energy use and EPC ratings



Source: Better Buildings Partnerships (2018)

[23] 2050 long-term strategy. European Commission; Climate Action. From https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2050-long-term-strategy_en
[24] Energielabel C kantoren | RVO.nl | Rijksdienst. (2021). Rijksdienst voor Ondernemend Nederland. From https://www.rvo.nl/onderwerpen/duurzaam-ondernemen/gebouwen/wetten-en-regels/bestaande-bouw/energielabel-c-kantoren
[25] Guidance on PRS exemptions and Exemptions Register evidence requirements. (2019). GOV.UK. https://www.gov.uk/government/publications/private-rented-sector-minimum-energy-efficiency-standard-exemptions/guidance-on-prs-exemptions-and-exemptions-register-evidence-requirements
[26] Department for Business, Energy & Industrial Strategy. (2021). Non-domestic Private Rented Sector minimum energy efficiency standards: EPC B implementation. GOV.UK. https://www.gov.uk/government/consultations/non-domestic-private-rented-sector-minimum-energy-efficiency-standards-epc-b-implementation
[27] BBP. (2018). Energy Performance Certificates For Buildings – Call For Evidence.
[28] Improving Energy Performance Certificates: action plan - progress report. (2021). GOV.UK. https://www.gov.uk/government/publications/improving-energy-performance-certificates-action-plan-progress-report/improving-energy-performance-certificates-action-plan-progress-report
[29] See note 28

Policy on energy efficiency is going to become more stringent, and needs to become stricter in order to reach the Paris Agreement objectives. The UN considers the 'Passivhaus' building standard[30] an important key on the path to energy reduction and emission reduction, according to their 2016 Emission Gap Report. Since 2015, all new buildings and major retrofits in Brussels must be constructed in accordance with the Passivhaus standard.[31] This could perhaps nudge countries' policy on energy efficiency requirements more towards that of the Passivhaus standard. For the foreseeable future, the assumption is that this standard will serve as an anchor point for policies. This is also the case in our analysis of upcoming net additional CAPEX for the office and residential real estate sector. The Passivhaus building standard has the energy efficiency requirement of maximum energy consumption of 120 kWh/m^2 per year. To provide more context, this requirement would achieve a B rating in the Danish energy certification scheme, an A rating in the Dutch scheme and a C rating in the French scheme.[32] It is likely that from 2030 onwards, probably more in developed countries, it will be mandatory, especially for the office sector, to have an energy efficiency rating of at least a C, like in the UK. This is a good illustration of the current situation concerning energy ratings. Apart from the fact that the EPC rating is not a good indicator of energy performance, internationally there is also no uniform requirement for each of the EPC rating levels. Another example is the energy rating system NatHERS that assigns different scores depending on the location of the building.[33] This all shows that it is difficult to make comparisons on an absolute level between ratings and even within an energy rating itself. Energy-rating systems are still in their infancy, and we expect a uniform and clearer policy based on energy intensity to develop in the near future.

Scenario analysis

For our analysis, we explore two scenarios for the office and residential real estate sector. For our analysis of different companies worldwide, we assume that a universal global policy will be in place for the office and residential real estate sector. Even if this is unlikely to be the case, for the purpose of our analysis this approach will provide us with a comparative overview of the effects of sustainability policies on the financials of companies with office buildings and residential buildings in their portfolio. Table 3 contains an overview of the scenarios. In the first scenario, starting from 2025, the policy prohibits the private renting out of office space and residential space that exceeds energy consumption intensity of 225 kWh/m^2. The reason why the policy in this first scenario does not start from 2023, like the Dutch policy it is based on, is because it is less realistic to expect governments to introduce a policy with such a short timeframe as it does not give companies sufficient time to improve their energy efficiency. Furthermore, the Netherlands is one of the earlier adopters of this policy and it will take some time before other governments follow. The second scenario is based on a more stringent and effective approach from 2030 onwards: it is based on a worldwide policy that prohibits the private renting out of office space and residential space that exceeds energy consumption intensity of 120 kWh/m^2.

Table 2 | Future scenarios concerning sustainability policies on real estate

	Scenario 1	Scenario 2
Maximum energy intensity	225 kWh/m^2	120 kWh/m^2
Year of implementation	2025	2030
Applies to the real estate sub-sectors	Office & Residential	Office & Residential

Source: Robeco

[30] As a reaction towards the oil embargo of 1973, the Passivhaus Institute was created by the German physicist Wolfgang Feist and the development of the Passivhaus performance standard soon followed.
[31] UNEP. (2016). The Emissions Gap Report 2016.
[32] The Buildings Performance Institute Europe - BPIE. (2010). Energy Performance Certificates across Europe: From design to implementation.
[33] Area correction factor | Nationwide House Energy Rating Scheme (NatHERS). (z.d.). NatHERS. https://www.nathers.gov.au/nathers-accredited-software/area-correction-factor

What are the effects of real estate sustainability policies on the capital expenditures of office and residential real estate companies?

Data & Methodology

Our research is based on a selection of companies: 200 of the largest listed real estate companies in 2021, accounting for 84% of the market value of the S&P Global Development Property Index, filtered for companies in the office and residential real estate sector. We filtered out the companies where we could not accurately split out the proportion of net operating income (NOI) or energy consumption attributable to the office segment or residential segment. Out of the 200, 30 remained, and this selection includes 24 companies from the office real estate sector and 6 companies from the residential real estate sector. Table 4 shows the mix of companies in the dataset by the country/region where the majority of their portfolio resides.

Table 3 | Distribution of companies in the dataset by geography of portfolio

Country/region	Frequency
USA	12
Japan	7
Canada	3
Continental Europe	3
Great Britain	2
Other	3*
Total	30

* Other consists of Norway, Australia and Singapore
Source: Robeco

To understand the effect of the policies on the capital expenditure of the selected companies, we first need to know the total energy consumption (in kWh) and energy consumption intensity levels are for each of the companies. This information is available in the GRESB database, and we used the 2019 figures because these figures were not affected by the Covid-19 pandemic. For companies from our dataset that do not report to GRESB, we use the information from that company's 2019 CSR/Sustainability report. For companies in the office real estate sector with data available in GRESB, we filtered out the real estate exposure outside of the office sector from the companies' portfolios, thus purely analyzing the energy consumption intensity of their office portfolio. We applied the same approach to companies in the residential sector. In general, disclosure of historical environmental performances is good. However, reported scope 1 and scope 2 data often do not include all operational energy consumption, as we discuss in Robeco's white paper titled *'The financial risk of carbon footprint in real estate'*.

For each scenario, we calculated the companies' excess energy consumption intensity (kWh/m^2) by subtracting the scenario's maximum energy consumption intensity from the companies' 2019 energy consumption intensity levels. The total excess energy consumption (kWh) is then calculated by multiplying the excess energy consumption intensity with the floor area[34] (in m^2) of the company's portfolio. The total excess energy consumption is multiplied by the sector's deep energy retrofit costs per kWh/m^2 energy reduction to arrive at the total deep energy retrofit costs for the company. The deep energy retrofit costs per kWh/m^2 for the residential sector are estimated to be EUR 3.7. However, for the office sector, figure 8 shows that the lower the pre-retrofit energy consumption intensity, the higher the deep energy retrofit costs are for the reduction of one kWh/m^2 energy consumption. Therefore, we created three costs brackets based on the relation with the pre-retrofit energy consumption intensity shown in figure 8 and the policies in scenarios 1 and 2. The deep energy retrofit costs per one kWh/m^2 energy reduction is EUR 5 for the pre-retrofit energy intensity range of 300 – 225 kWh/m^2. For the 225 – 150 kWh/m^2 range, this is EUR 10 per kWh/m^2 reduction in energy consumption. The last bracket is the 150 – 120 kWh/m^2 range, and here the cost of one kWh/m^2 reduction is EUR 15 per kWh/m2. This calculation results in the total capital expenditure for each company to improve energy efficiency in the form of a deep energy retrofit in order to comply with the relevant policy of the scenario. To create a more comparative perspective of a

[34] Some companies in the GRESB database do not report environmental performances on 100 percent of their office or residential portfolio. For these companies, floor area is adjusted to reflect 100 percent of the companies' office floor area or residential floor area.

policy's effect on the financials, the required capital expenditures are reflected as a percentage of FY2019 Net Operating Income (NOI). Formulas 1 and 2 depict the calculation method used for the total deep energy retrofit costs for each of the companies in the dataset.

1. $Total\ Required\ Capital\ Expenditures = (Total\ kWh/sqm\ Reduction * Total\ Floor\ Area) * \text{Deep Energy Retrofit Cost Per 1 kWh/sqm}\ energy\ reduction$

2. $Total\ kWh/sqm\ Reduction = Energy\ Intensity\ Level\ Portfolio - Energy\ Intensity\ Level\ Policy$

To determine the impact on valuation, the required capital expenditures need to be net of the already budgeted in maintenance CAPEX of companies. This is to avoid double-counting capital expenditures. When components are at the end of their lifecycle they will get replaced whether there is a policy on energy efficiency in place or not, also known as maintenance CAPEX. So, naturally, the energy consumption will decrease by replacing old or broken components by newer and more energy-efficient ones. However, this annual maintenance CAPEX might not be enough for the portfolio to achieve a certain energy consumption intensity. Therefore, the capital expenditures required in order to be compliant with the policy are divided into maintenance CAPEX (as % of NOI) and an excess part called 'net additional CAPEX'. The assumption here is that maintenance CAPEX for real estate companies is, on average, annually 15% of their NOI. The net additional CAPEX is also reflected as a percentage of market capitalization to show an alternative view of the effect on the companies' valuation. This is done by discounting[35] the net annual additional CAPEX over the years. The sum of the discounted net annual additional CAPEX is then divided by the 2019 year-end market capitalization, corrected for office share or residential share.[36] Formula 3 shows the calculation of the net additional CAPEX.

3. $Net\ Annual\ Additional\ CAPEX = Total\ Required\ CAPEX/\#years - Annual\ Maintenance\ CAPEX$

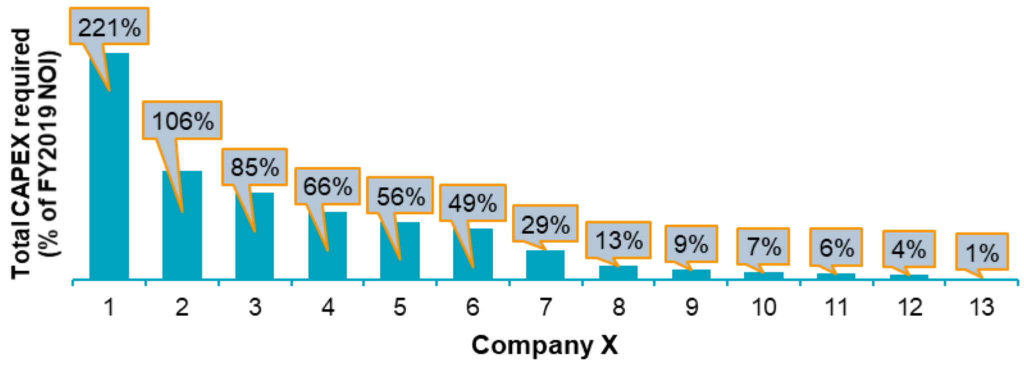
The benefits from lower energy costs following a deep retrofit are calculated by multiplying the reduction in energy intensity by the total floor area and by the electricity price per kWh. The assumption here is the most expensive option of energy mix per kWh in the buildings, which is 100% electricity. The rationale behind this is to calculate the maximum benefit of reduced energy consumption in a building, and it is also in line with the trend of building electrification. For the electricity price, we use an average of EUR 0.13 per kWh.[37]

Scenario 1: maximum energy intensity of 225 kWh/m^2 (Energy Level C)

When looking at the consequences for companies in this first scenario, we see that 13 out of the 30 companies in the dataset have a portfolio with parts, on average, exceeding the maximum energy intensity of 225 kWh/m^2. Figure 11 depicts the total deep energy retrofit costs required for the companies, expressed as a % of their FY2019 NOI, to have a portfolio that is policy compliant. This group of 13 companies contains one large outlier concerning the percentage of NOI required for deep energy retrofit costs. If we exclude this outlier, the average percentage of the companies' FY2019 NOI required in total over the years up to 2025 for deep energy retrofit costs amounts to 36%. If we include the outlier, the average is 50%. The range is between 221% and 1% for the 13 companies with a portfolio that is not compliant with the policy for this scenario.

[35] The discount factor is a REIT specified WACC of 5.51% derived from the Damodaran database (https://people.stern.nyu.edu/adamodar/New_Home_Page/datafile/wacc.html)
[36] For the market, capitalization is corrected by taking the share of FY2019 NOI that can be attributed to the office business segment for the office real estate companies. The same method is applied to residential real estate companies.
[37] Derived from https://www.eia.gov/outlooks/steo/report/electricity.php

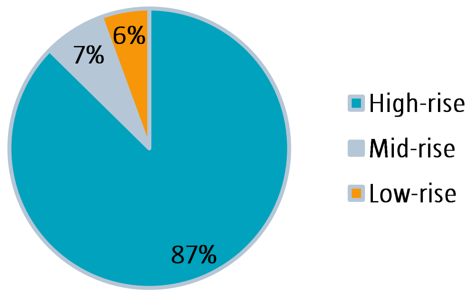
Figure 11 | Total capital expenditure required, expressed as % of FY2019 NOI, for the parts of the companies' portfolio that, on average, exceed 225 kWh/m² energy intensity



Source: Robeco

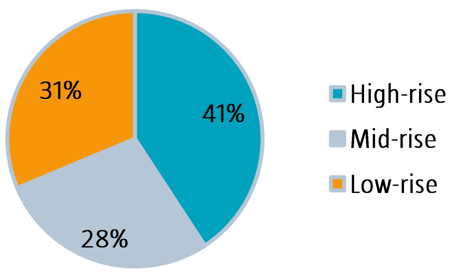
An interesting observation is the significant role of high-rise buildings if we break down the proportion of floor area exceeding the maximum energy intensity of 225 kWh/m². As figure 12 shows, the floor area of high-rise buildings exceeding the maximum intensity of 225 kWh/m² is 87% of the total floor area that is above this intensity for companies with GRESB figures available. This is remarkable as figure 13 shows that the floor area of high-rise buildings is 41% of the total floor area of all companies in this dataset, and also that it is quite evenly distributed amongst the three categories. Therefore, the focus of real estate companies to improve the energy efficiency of their portfolio is likely to be on the portion of high-rise buildings within the portfolio.

Figure 12 | Breakdown of total floor area in excess of 225 kWh/m² intensity: split by high-rise, mid-rise, and low-rise buildings



Source: GRESB, Robeco

Figure 13 | Breakdown of total floor area: split by high-rise, mid-rise, and low-rise buildings

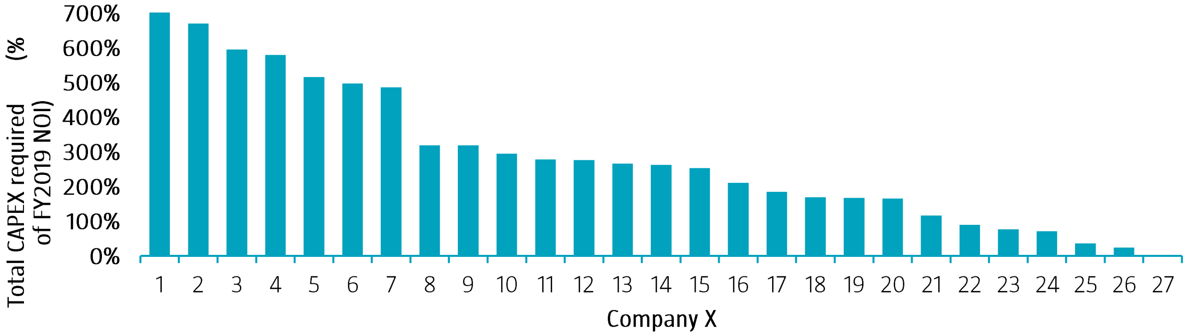


Source: GRESB, Robeco

Scenario 2: maximum energy intensity of 120 kWh/m² (Passivhaus standard)

If we examine the scenario for a policy where the maximum energy intensity is 120 kWh/m², 27 out of the 30 companies in the dataset have a portfolio with parts that, on average, exceed this maximum intensity level. For this selection of 27 companies, figure 14 shows the total deep energy retrofit costs required as % of NOI. The group average amounts to 282%, meaning that (on average) the total amount of deep energy retrofit costs required over the years up to 2030, amounts to 282% of the companies' FY2019 NOI. For the 27 companies with a portfolio that is not compliant with the policy for this scenario we see, as depicted in figure 14, that these costs range between 703% and 2%.

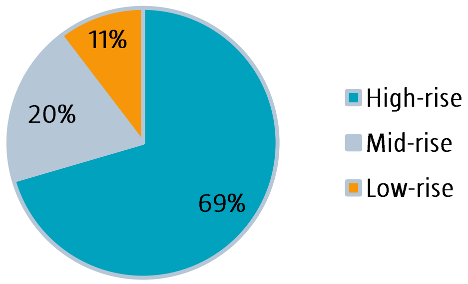
Figure 14 | Total capital expenditure required, expressed as % of their FY2019 NOI, for the parts of the companies' portfolio that, on average, exceed 120 kWh/m² energy intensity



Source: Robeco

The role of high-rise buildings is also significant in scenario 2, where they account for 69% of the total floor area exceeding the maximum energy intensity level, as depicted in figure 15. The portion of the mid-rise floor area has grown more than that of the low-rise building floor area, compared to scenario 1 (see figure 12). However, this is not surprising given the slightly higher average energy consumption intensity for mid-rise buildings compared to low-rise buildings.

Figure 15 | Division of total floor area in excess of 120 kWh/m² intensity: split by high-rise, mid-rise, and low-rise buildings



Source: Robeco

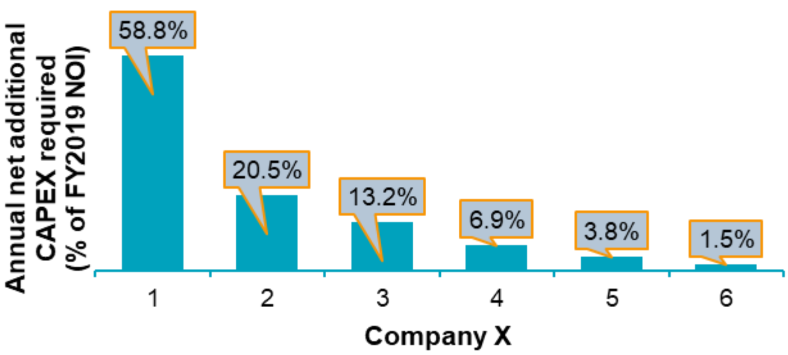
Impact on valuation

To examine the impact of these sustainability policies on valuation, we focus on the capital expenditures required to be compliant with the policy and the decrease in energy costs. These are the two areas of a company's finances where the effects are most noticeable. Research from JLL[38] and CBRE[39] shows that other aspects of a company's finances will also be affected by the role of sustainability in the real estate sector. For instance, rental premiums have been observed in Central London for buildings with green rating certifications like BREEAM Excellent or an energy performance rating of EPC A or B. The research also states that it expects lower voids and lower financing costs for green buildings due to green financing. However, as the magnitude of these effects is not clear, we will exclude them from our consideration of the subject of valuation.

Scenario 1: maximum energy intensity of 225 kWh/m^2 (Energy Level C)

What we have seen so far is that government policy on energy efficiency results in a wide range of deep energy retrofit cost estimates. The question that now remains is what effect this will have on capital expenditures for each company. To determine the effect, the net additional CAPEX required per year is calculated. As this depends on the energy consumption intensity of a company's portfolio and the total floor area, a policy does not necessarily have to influence the company's budgeted CAPEX and the effects could easily fall within the budget. Scenario 1 will be effective from January 2025, so companies have just three years to improve their energy efficiency. Six out of the 30 companies in our dataset need to dedicate additional financial means to their annual CAPEX. Figure 16 shows for these six companies that, on average, net additional CAPEX is required to the extent of 17.5% of NOI per year up to 2025 in order to reach the energy consumption intensity level of 225 kWh/m^2. Excluding the outlier, this average amounts to 9.2% of NOI. This deep energy retrofitting results in lower energy costs. To show this from a valuation perspective, figure 17 displays the total net additional CAPEX relative to the companies' 2019 year-end market capitalization. The magnitude of financial impact for three out of six companies ranges from 14.1% to 2.3% of 2019 year-end market capitalization. The other three companies will not have a financial impact higher than 1% of their 2019 year-end market capitalization. For the companies in this dataset, we estimate lower energy costs in scenario 1: on average, 1.4% of NOI.

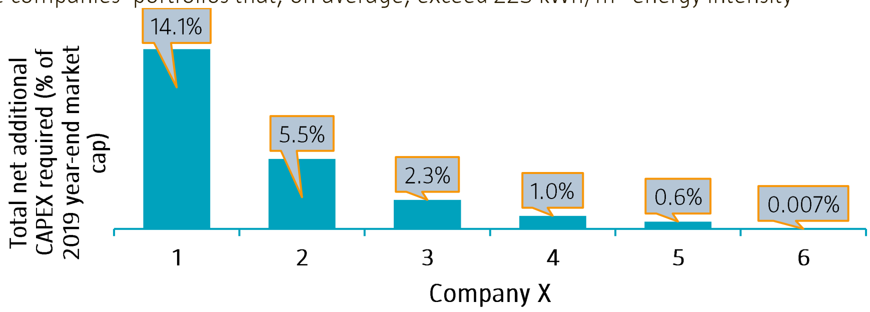
Figure 16 | Net additional CAPEX required per year up to 2025, expressed as % of FY2019 NOI, for the parts of the companies' portfolios that, on average, exceed 225 kWh/m^2 energy intensity



Source: Robeco

[38] JLL. (2020). The impact of sustainability on value: Developing the business case for net zero carbon buildings in central London.
[39] CBRE. (2021). Is Sustainability Certification in Real Estate Worth it?

Figure 17 | Total net additional CAPEX required, expressed as % of 2019 year-end market capitalization, for the parts of the companies' portfolios that, on average, exceed 225 kWh/m² energy intensity

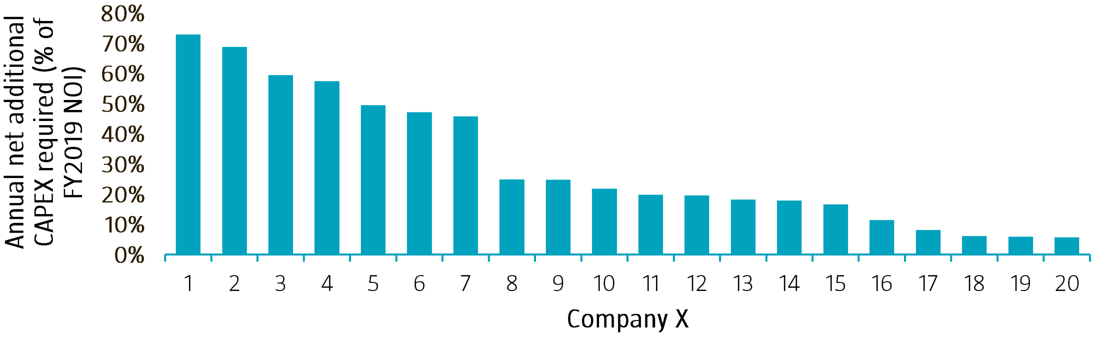


Source: Robeco

Scenario 2: maximum energy intensity of 120 kWh/m² (Passivhaus standard)

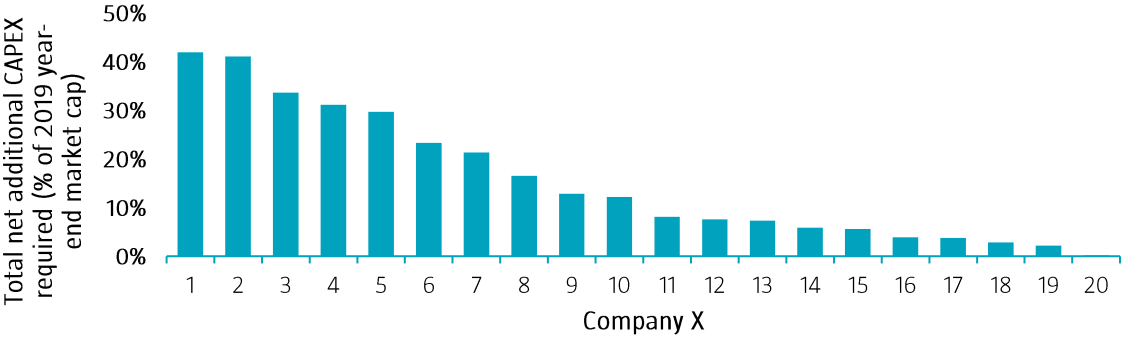
To evaluate the financial impact of scenario 2, we subtract the annual maintenance CAPEX from these estimates. Scenario 2 will be effective from January 2030, leaving companies in the dataset with eight years of budgeted maintenance CAPEX to improve energy efficiency. As mentioned earlier, the annual maintenance CAPEX is assumed to be 15% of NOI on average. The maintenance CAPEX is thus 120% in total. Figure 18 shows that 20 companies are left if we take the percentage of maintenance CAPEX into account. So 20 out of 30 companies in our dataset need to dedicate additional financial means to improve the energy efficiency of their portfolio, on top of the annual 15% maintenance CAPEX. The observations are within the range of 73% and 6% of FY2019 NOI. The average additional CAPEX required per year up to 2030 amounts to 30.1% of FY2019 NOI. Figure 19 shows the total net additional CAPEX relative to the companies' 2019 year-end market capitalization. The magnitude of financial impact ranges between 41.9% and 0.2% of the companies' market capitalization. In scenario 2, we estimate the financial benefits of reduced energy costs for the group of 20 companies at, on average, 3.6% of NOI.

Figure 18 | Net additional CAPEX required per year up to 2030, expressed as % of FY2019 NOI, for the parts of the companies' portfolios that, on average, exceed 120 kWh/m² energy intensity



Source: Robeco

Figure 19 | Total net additional CAPEX required, expressed as % of 2019 year-end market capitalization, for the parts of the companies' portfolios that, on average, exceed 120 kWh/m² energy intensity



Source: Robeco

Conclusion

Since the Paris agreement, governments have heightened their focus and set targets to reduce carbon emissions and improve energy efficiency. The real estate sector plays a crucial role in this global transition since it accounts for almost 40% of global carbon emissions. Governments have therefore increasingly started to focus on the real estate sector by introducing new policies on both carbon emissions and energy efficiency. Currently, in some cases energy ratings are already required to transact or lease a building. In the future, we expect binding minimum requirements to be set, with properties that do not meet specific energy consumption intensity levels no longer being allowed to be rented out. As of yet, no energy consumption intensity requirements have been set, but target levels are being discussed. The UN, for example, has called the 'Passivhaus standard', which also has a maximum energy intensity level as one of its criteria, an essential tool to accomplish the global goal of carbon emission reduction and improved energy efficiency. The energy consumption intensity level will therefore become an important factor for the real estate sector and the significant role it plays in the global energy transition.

In this publication we focus specifically on energy consumption intensity levels. The policies which are emerging are going to increasingly put pressure on property owners to invest in their assets to comply with future energy standards. We created two likely future scenarios for maximum energy consumption intensity levels. To comply with these target levels, we showed that all building components, both energy-consuming and energy-leaking, have to be addressed. For many assets a deep energy retrofit – a renovation of a building addressing all these components together – will be needed. Based on publicly available case study data from the International Energy Agency (IEA) and the Rocky Mountain Institute (RMI), we designed an approach to estimate the cost of a deep energy retrofit based on energy consumption intensity per m^2. We also published our initial estimates of the costs of a deep energy retrofit per m^2 for office and residential properties. Our analysis of deep energy retrofit cases on office buildings indicates a negative relationship between the pre-retrofit energy consumption intensity level and the deep energy retrofit costs per kWh reduction. This implies that the lower the energy consumption intensity level is before a retrofit, the higher the costs will be of reducing energy consumption intensity even further. In line with this finding, we therefore use three different cost brackets in our analysis for the office sector that are based on the range of pre-retrofit energy consumption intensity. Using these estimates, we assess the costs of reducing energy consumption intensity to the level required for the two scenarios for a set of listed real estate companies. Out of a set of 200 of the largest listed real estate companies, we selected 30 companies for which the portfolio consists mainly of office or residential properties.

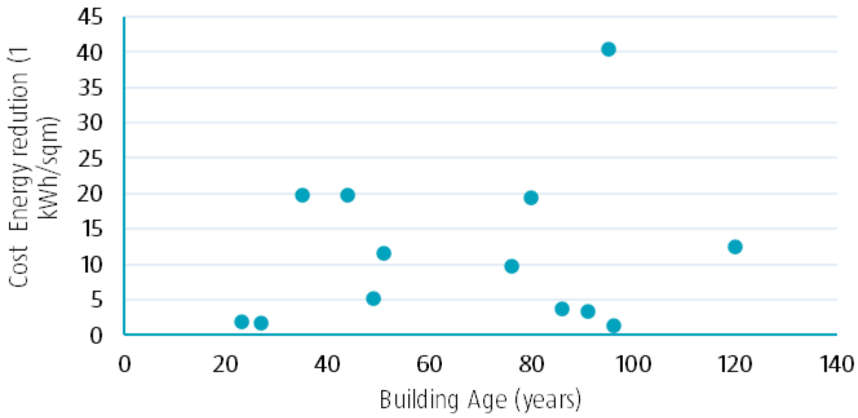
For the financial impact analysis of energy intensity regulation on companies, we created two scenarios. The first scenario involves the introduction of a policy, based on current UK and Dutch policies, where a property may not be rented out if the energy consumption intensity level exceeds 225 kWh/m^2, starting in January 2025. We see that 13 out of the 30 companies in our dataset have a portfolio that on average is not compliant with this policy. Six out of the 13 companies are required to assign annually, on average, 9% of NOI to additional CAPEX on top of their budgeted maintenance CAPEX up to 2025. The impact of additional CAPEX expressed as a percentage of 2019 year-end market capitalization for these 6 companies is on average 4%. This is a strong indication that the portfolios of listed real estate companies are well prepared for most of the currently discussed energy efficiency policies and that the financial impact of them is limited.

The second scenario, based on the Passivhaus standard, involves the introduction of a policy, starting in January 2030, where a property may not be rented out if the energy consumption intensity level exceeds the maximum of 120 kWh/m^2. In this scenario, 27 out of the 30 companies have a portfolio that is not compliant with this policy. Twenty out of the 30 companies in our dataset are required to assign annually, on average, 30% of NOI to additional CAPEX on top of their budgeted maintenance CAPEX up to 2030. As a percentage of 2019 year-end market capitalization, the average required additional CAPEX is 15%. While this indicates the additional Capex is manageable, the divergence between companies in this scenario is large; from no impact to as high as an additional capex to 40% of market capitalization.

It is important that companies in the listed real estate sector address the challenges associated with energy consumption intensity policies and allocate capital accordingly. While manageable overall, the additional CAPEX needed is not equally distributed among the sector's companies. Some real estate companies seem better positioned for the energy transition than others which might not be fully reflected in current stock price valuations.

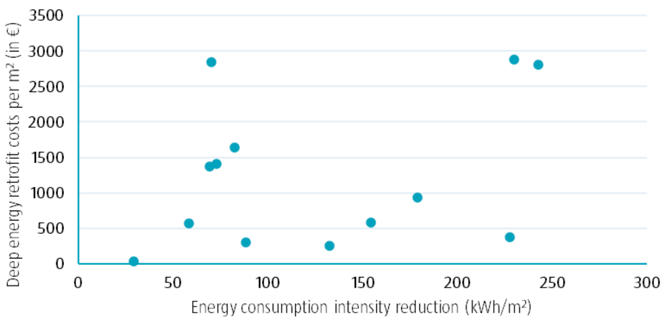
Appendix

Figure 20 | Correlation between costs of 1 kWh energy reduction (in EUR) and building age (in years)



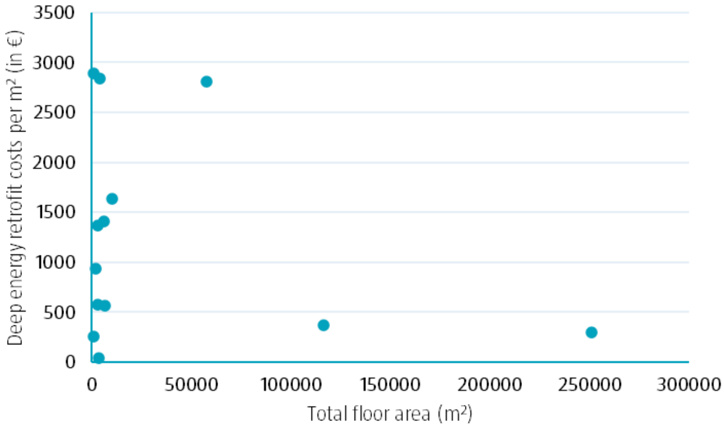
Source: IEA: Deep Energy Retrofit – Case Studies, RMI: Advanced Energy Retrofit Guides; Deep Retrofits, Robeco

Figure 21 | Correlation between reduction in energy consumption intensity (kWh/m²) and deep energy retrofit costs per m²



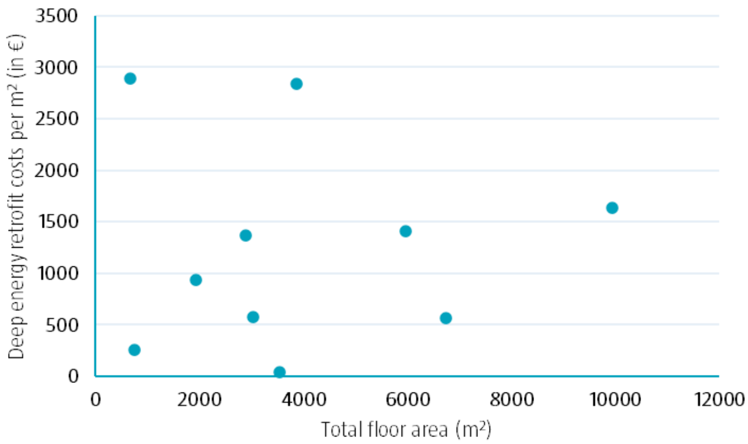
Source: IEA: Deep Energy Retrofit – Case Studies, RMI: Advanced Energy Retrofit Guides; Deep Retrofits, Robeco

Figure 22 | Correlation between deep energy retrofit costs (in EUR) per m² and total floor area (m²



Source: IEA: Deep Energy Retrofit – Case Studies, RMI: Advanced Energy Retrofit Guides; Deep Retrofits, Robeco

Figure 23 | Correlation between deep energy retrofit costs (in EUR) per m² and total floor area (m²); outliers excluded



Source: IEA: Deep Energy Retrofit – Case Studies, RMI: Advanced Energy Retrofit Guides; Deep Retrofits, Robeco

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No securities commission or similar authority in Canada has reviewed or in any way passed upon this document or the merits of the securities described herein, and any representation to the contrary is an offence. Robeco Institutional Asset Management B.V. relies on the international dealer and international adviser exemption in Quebec and has appointed McCarthy Tétrault LLP as its agent for service in Quebec.
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Generally, no offer or sale of the Shares is permitted in Malaysia unless where a Recognition Exemption or the Prospectus Exemption applies: NO ACTION HAS BEEN, OR WILL BE, TAKEN TO COMPLY WITH MALAYSIAN LAWS FOR MAKING AVAILABLE, OFFERING FOR SUBSCRIPTION OR PURCHASE, OR ISSUING ANY INVITATION TO SUBSCRIBE FOR OR PURCHASE OR SALE OF THE SHARES IN MALAYSIA OR TO PERSONS IN MALAYSIA AS THE SHARES ARE NOT INTENDED BY THE ISSUER TO BE MADE AVAILABLE, OR MADE THE SUBJECT OF ANY OFFER OR INVITATION TO SUBSCRIBE OR PURCHASE, IN MALAYSIA. NEITHER THIS DOCUMENT NOR ANY DOCUMENT OR OTHER MATERIAL IN CONNECTION WITH THE SHARES SHOULD BE DISTRIBUTED, CAUSED TO BE DISTRIBUTED OR CIRCULATED IN MALAYSIA. NO PERSON SHOULD MAKE AVAILABLE OR MAKE ANY INVITATION OR OFFER OR INVITATION TO SELL OR PURCHASE THE SHARES IN MALAYSIA UNLESS SUCH PERSON TAKES THE NECESSARY ACTION TO COMPLY WITH MALAYSIAN LAWS.
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Robeco Institutional Asset Management B.V., Sucursal en España with identification number W0032687F and having its registered office in Madrid at Calle Serrano 47-14º, is registered with the Spanish Commercial Registry in Madrid, in volume 19.957, page 190, section 8, sheet M-351927 and with the National Securities Market Commission (CNMV) in the Official Register of branches of European investment services companies, under number 24. The investment funds or SICAV mentioned in this document are regulated by the corresponding authorities of their country of origin and are registered in the Special Registry of the CNMV of Foreign Collective Investment Institutions marketed in Spain.
Additional Information for investors with residence or seat in South Africa
Robeco Institutional Asset Management B.V. is registered and regulated by the Financial Sector Conduct Authority in South Africa.
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Additional Information relating to RobecoSAM-branded funds/services
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The Prospectus has not been approved by the Securities and Exchange Commission which takes no responsibility for its contents. No offer to the public to purchase the Shares will be made in Thailand and the Prospectus is intended to be read by the addressee only and must not be passed to, issued to, or shown to the public generally.

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Some Funds referred to in this marketing material have been registered with the UAE Securities and Commodities Authority (the Authority). Details of all Registered Funds can be found on the Authority's website. The Authority assumes no liability for the accuracy of the information set out in this material/document, nor for the failure of any persons engaged in the investment Fund in performing their duties and responsibilities.

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Additional Information for investors with residence or seat in Uruguay
The sale of the Fund qualifies as a private placement pursuant to section 2 of Uruguayan law 18,627. The Fund must not be offered or sold to the public in Uruguay, except under circumstances which do not constitute a public offering or distribution under Uruguayan laws and regulations. The Fund is not and will not be registered with the Financial Services Superintendency of the Central Bank of Uruguay. The Fund corresponds to investment funds that are not investment funds regulated by Uruguayan law 16,774 dated September 27, 1996, as amended.