

Energy efficiency project focused funds

European Transformation and the cross-asset class opportunity



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- Europe's goals for energy security, net zero emissions, and economic growth requires much higher levels of investment in energy efficient and sustainable technologies, particularly in buildings.
- This report expands on DWS's European Transformation report¹ by focusing on energy efficiency and building renovation, which is where there is the largest green investment gap in Europe²: EUR 185bn/yr.
- To help avoid fossil gas shortages in Europe in 2023 and beyond, the International Energy Agency³ (IEA) concludes that energy efficiency is the most important action: insulation, heat pumps and other technologies plus changing energy using behaviour in homes and businesses could meet ~56% of a fossil gas supply gap.
- Energy efficiency investment hit USD563bn last year, a 16% growth from 2021. Investment could reach USD840bn in 2030 under current policies or USD1.5trn in 2030 for net zero policies⁴. In 2022 energy efficiency related investment for the first time exceeded renewable power investment of USD472bn.



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- Energy efficiency can create multiple benefits⁵ - energy security; improved air quality, health and wellbeing; economic stimulus and jobs; productivity; higher asset valuation; and lower financial risks.
- Energy efficiency contributes to society's energy supply. From 2016-2021, global energy final demand grew 6%. Without energy efficiency, energy demand would have been 13% higher⁶.
- Public policy changes can help ramp up investment. However, it is possible to act now to deploy capital that can contribute to Europe's energy efficient, green and energy secure transformation.
- Macro stewardship: For nearly ten years, the lead author of this paper has advised the European Commission through the [Energy Efficiency Financial Institutions Group \(EEFIG\)](#).
- Energy efficiency is a cross-asset class opportunity. Each asset class has a different potential to contribute to Europe's transformation: **Dark green**: very high; **Light green**: high; **amber**: medium. The difference is due to the need to convince others to act in some way vs. direct capital allocation. In this report we focus on project finance funds. Future reports will examine other asset classes.

Transformation potential – private markets	Transformation potential – public markets
<i>Project finance investment funds (focus of this report)</i>	Investor stewardship with corporates and banks
Real estate private equity funds	Sustainability linked bonds
Sustainable focused infrastructure deals and funds	Use of proceeds green/sustainable bonds
Direct lending and private debt	Public equities: climate solution providers
Corporate supply chain partnership private equity	
Private equity fund of funds: sustainable technologies	

¹ DWS Research Institute (December 2022) www.dws.com/insights/global-research-institute/a-framework-for-european-transformation/

² European Commission (May 2022) Identifying Europe's recovery needs https://commission.europa.eu/strategy-and-policy/recovery-plan-europe_en

³ IEA (December 2022) www.iea.org/reports/how-to-avoid-gas-shortages-in-the-european-union-in-2023

⁴ IEA (October 2022) www.iea.org/reports/world-energy-outlook-2022

⁵ IEA (March 2019) www.iea.org/reports/multiple-benefits-of-energy-efficiency

⁶ IEA (December 2022) www.iea.org/reports/energy-efficiency-2022

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1 / Energy efficiency: the first fuel

The International Energy Agency (IEA) annually publishes reports on major sources of energy, to examine trends and provide medium term forecasts. In **2013**, the IEA published its first Energy Efficiency Market report⁷. The foreword to that report stated:

"We must change the way we think about energy efficiency.

We need to start considering it a fuel, alongside oil, gas, coal, or renewable energy, even though you cannot see or transport it as you can these other energy commodities...

Investing in energy efficiency is a valuable alternative to investing in traditional supply-side fuels. By reducing or limiting energy demand, energy efficiency measures can increase resilience against a variety of risks...

The reduced energy demand stemming from energy efficiency over the past decades is larger than any other single supply-side energy source for a significant share of IEA member countries, suggesting it is not so much a "hidden fuel" but could in fact be our "first fuel".

In **2022**, the IEA found that: **investment in energy demand side technologies in buildings, industry and transport reached US\$563bn, larger than renewable power investment of US\$472b⁸n.**

Reaching Europe's climate and energy security goals will critically depend on the widespread acceleration of energy efficiency measures to green existing European buildings and infrastructure. Buildings represent 40% of Europe's energy use.

In terms of know how there are a wide range of measures based on well-established technologies available. Whether it's LED lighting, heat pumps, waste heat recovery, combined heat and power generation based on bioenergy or energy-efficient building renovations with different types of insulation, the importance of energy efficiency on the road to climate neutrality is indisputable. And yet capital markets have largely neglected this important sector.

Investing in energy efficiency on a large scale, is a challenge due to the fragmentation of the market and the individual nature of projects. With specialized investment teams and innovative financing structures, the sector can be a highly attractive opportunity for institutional investors. Investment across multiple asset classes needs to be deployed to secure the benefits of energy efficiency for investors and society.

To advance the role of energy efficiency, in 2013, the European Commission and the United Nations Environment Programme's Finance Initiative (UNEP FI) came together to create dialogue between financial institutions, experts and policymakers: the Energy Efficiency Financial Institutions Group (EEFIG).

The author of the report you are reading now was a founding EEFIG member and was invited to join the group's first steering committee in 2018. In 2015, EEFIG's first report⁹ "*Energy Efficiency – the first fuel for the EU Economy*" played a key role, in establishing energy efficiency as a key principle of Europe's Energy Union strategy¹⁰.

Overview of this report

The second section of this report presents graphs on the trends and characteristics of energy efficiency investment.

The third section of this report focuses on dedicated energy efficiency focused funds as one important way that investors can contribute today to Europe's energy and climate security. Future reports will examine other asset classes. The final section looks at net zero

⁷ IEA (2013) www.iea.org/reports/energy-efficiency-market-report-2013

⁸ IEA (October 2022) www.iea.org/reports/world-energy-outlook-2022

⁹ EEFIG (2015) https://eefig.ec.europa.eu/about-us_en

¹⁰ European Commission (2015) https://energy.ec.europa.eu/topics/energy-strategy/energy-union_en#five-dimensions-of-the-energy-union
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2 / Energy efficiency in charts

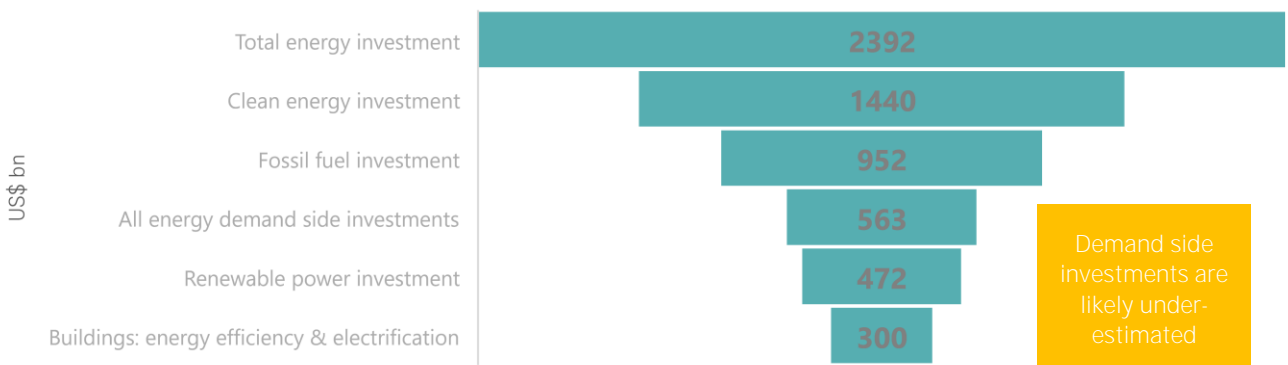
Understanding investment trends

Total energy investment was -US\$2.4 trillion in 2022 of which the largest component was clean energy investment of US\$1.4 trillion, accounting for just over 2% of average global GDP over the last several years, [Figure 1](#).

Fossil fuel investment continues to be too high for a world trying to be serious about climate risk, particularly as the IEA’s net zero scenario requires no investment in new fossil fuel supply projects. However, fossil fuel capex is down 30% since the 2015 Paris Climate Agreement. Many investors, NGOs, and some policy efforts rightly focus on phasing down fossil fuel capex in a socially just manner. However, capex in energy saving and demand side technologies also needs to grow.

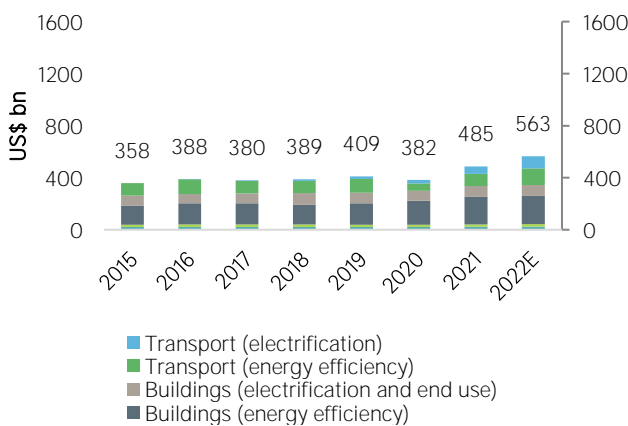
Energy demand side and energy efficiency investment (including electric vehicle related assets) likely hit US\$563bn last year, larger than renewable power investment. The largest segment (US\$300bn) of demand side investment is from building related energy efficiency and electrification such as heat pumps, [Figure 2](#). This is likely an under-estimate of energy efficiency’s true size due to the diffuse nature of most capex in millions of buildings. The IEA also concludes that energy efficiency related investment is very likely to grow with current policies and in a net zero scenario, [Figure 3](#).

Figure 1: Demand side energy efficiency related investments are the largest component of clean energy investment



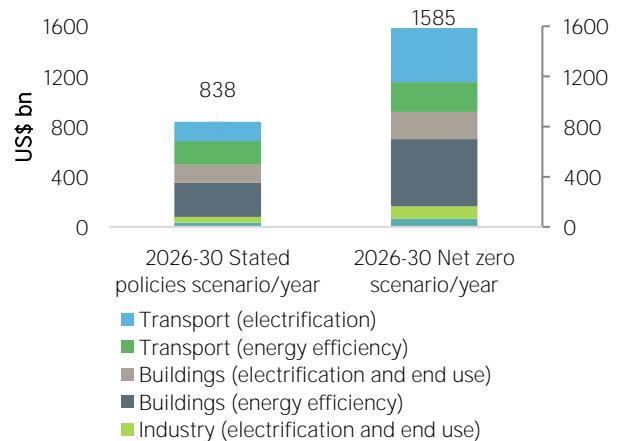
Source: IEA World Energy Investment Outlook 2022

Figure 2: Energy demand side investments are growing globally. Buildings and energy efficiency are the largest component and Europe is the largest market



Source: IEA World Energy Outlook 2022

Figure 3: Energy efficiency related investments may increase 49% under currently stated government policies or 182% under a net zero scenario

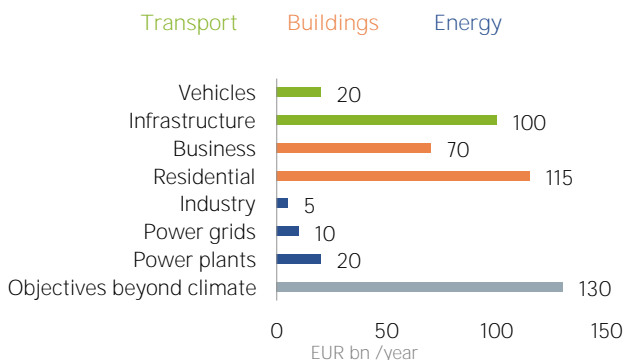


Source: IEA World Energy Investment 2022

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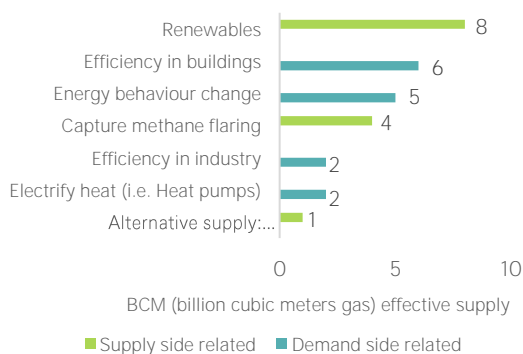
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Figure 4: Building renovation is the largest green investment gap in Europe



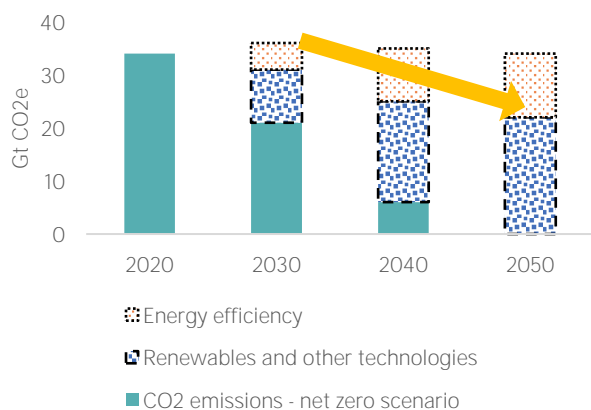
Source: European Commission 2021

Figure 5: Demand side energy efficiency measures could meet ~56% of a potential 2023 fossil gas supply gap in Europe



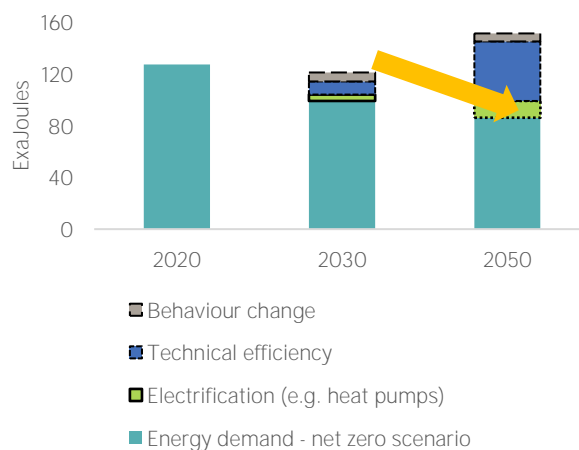
Source: IEA 2022 www.iea.org/reports/how-to-avoid-gas-shortages-in-the-european-union-in-2023

Figure 6: Globally, energy efficiency could create 33% of all emission reductions in a net zero scenario



Source: IEA 2022 <https://prod.iea.org/reports/the-value-of-urgent-action-on-energy-efficiency/highlights>

Figure 7: Building related efficiency investments could significantly cut energy demand globally



3 / Energy efficiency project funds

With the growing market dynamic highlighted in the previous section, interest in established investment solutions for energy efficiency is increasing. After all, the most sustainable kilowatt hour is the one that is never consumed. Additionally, the turmoil in European energy markets during 2022 has brought the issue to the forefront in private and public debates. Particularly in geopolitically unstable times the value of energy efficiency becomes even clearer. And yet capital markets have largely neglected this important sector.

The main reason for this is the highly fragmented nature of the market. Individual energy efficiency measures rarely reach a size that is attractive for institutional capital. Projects are usually customized to the specific context and often cannot be scaled easily. For institutional investors this means that in-depth technological knowledge and structuring expertise is required. In addition, infrastructure owners often do not have the necessary budgets, capacity, or the right incentives to finance measures themselves.

This is because energy efficiency measures involve a relatively large initial capital outlay, while the resulting energy and cost savings are achieved over longer periods of time. Projects require feasibility studies to estimate the amount of savings. However, the 'low hanging fruit' (like indoor LED lighting upgrades) receive preferential treatment over capex that is strongly needed (e.g. building insulation) but can require longer investment periods or lower (but still attractive) rates of return.

Renovations may be less appealing for conventional infrastructure funds due to their relative complexity and smaller investment requirements as compared to traditional infrastructure investments. This creates a situation where investment opportunities that have positive societal impacts go unfunded, leaving long-term institutional investors such as pension funds and insurance companies without clear investment strategies to fund this important area.

The good news is that this challenge can be met with specialized energy efficiency focused investment teams and innovative financing structures. Part of the solution is for fund managers to form long-term, mutually beneficial partnerships with public infrastructure owners who are especially under pressure to green their assets. The challenges of long payback periods and limited budgets can be overcome by innovative financing structures such as public private partnerships, energy-as-a-service concession agreements, subsidies, and grants for feasibility studies

Energy-as-a-service concession agreements are usually concluded for 8-15 years with an engineering company becoming the project sponsor and institutional capital financing the debt portion. The engineering company installs the energy efficiency measures and takes the risk for construction and resulting energy savings.

During the term of the concession agreement the beneficiary of the measures is charged a periodic concession fee that is lower than the pre-investment energy costs. The concession fee is used for amortization and interest payments to the fund, as well as equity returns to the project sponsor.

This type of structure benefits all parties involved: beneficiaries realize annual energy cost savings that in the best case exceed the amortization payments, thus lowering the cost base; the project sponsor generates more business while benefiting from the equity investment into the project structure; and the fund investor earns an attractive risk-adjusted return. And, of course, not to be forgotten is the significant contribution to the fight against climate change that such projects make.

Nevertheless, the devil is often in the details. Although this outlined financing structure has proven to be extremely effective in enabling energy transition projects in fragmented sectors, it requires a highly specialized investment manager with good networks and the ability to source and structure customized public-private-partnership projects.

What does energy efficiency investment mean in terms of technology installation?

The IEA's 2022 World Energy Outlook updated their net zero roadmap net zero scenario. Reaching net zero is a challenge as emissions have continued to grow while fossil fuel and energy inefficient technology investments continue to be made. Current inefficient and carbon intensive investments are likely to lock in future carbon emissions unless assets are retired or renovated before their planned economic life (stranded asset risk). But the IEA concludes that their pathway is "still achievable".

The roadmap contains many milestones of the investments which are necessary to reach net zero emissions. The building milestones can be seen in [Figure 8](#). These milestones visualise what energy efficiency means in practice.

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Figure 8: IEA’s net zero pathway: building related milestones set a global strategic vision for energy efficiency

- All countries should have zero-carbon-ready building codes for new buildings by 2030
- Renovation of nearly 20% of existing building stock to zero-carbon-ready by 2030 is ambitious but necessary
- Installation of about 600 million heat pumps covering 20% of buildings heating needs by 2030
- Approximately 100 million households rely on rooftop solar PV by 2030
- Solar PV and wind supply about 40% of building electricity use by 2030
- 350 million building units connected to district energy networks by 2030 provide about 20% of space heating needs
- Solar thermal technologies deployed in around 400 million dwellings by 2030
- Targeting 100% LED lighting sales by 2025
- Residential behaviour changes lead to a reduction in heating and cooling energy use by 2030
- By 2030 EVs represent more than 60% of vehicles sold globally, requiring an adequate increase in chargers installed

Source: IEA 2022 www.iea.org/reports/technology-and-innovation-pathways-for-zero-carbon-ready-buildings-by-2030

Science based guidance for net zero in buildings

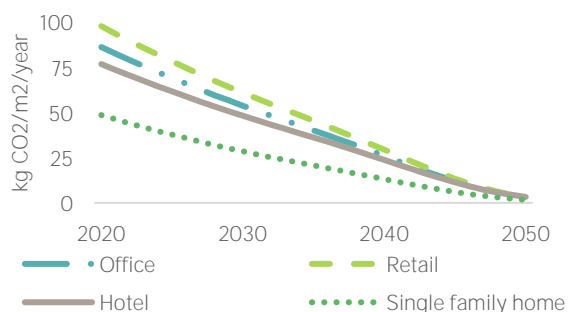
Institutional investors APG, PGGM and Norges Investment Management, with the support of European Commission research funding, established the Carbon Risk Real Estate Monitor (CRREM) in 2018. The initiative’s objective is to down-scale climate science and national climate plans by sector, and property level for more transparency, as shown in Figure 9.

As society has not been reducing emissions fast enough, CRREM is updating these curves and their methodology to account for the latest scientific evidence. The result will be even steeper curves, providing guidance that to be on a net zero pathway, emissions from buildings have to be reduced even faster.

CRREM also facilitates analysis of stranded asset risk and makes decarbonisation in the commercial real estate sector measurable, as shown in Figure 10. CRREM could be used for other asset classes like bank property loans.

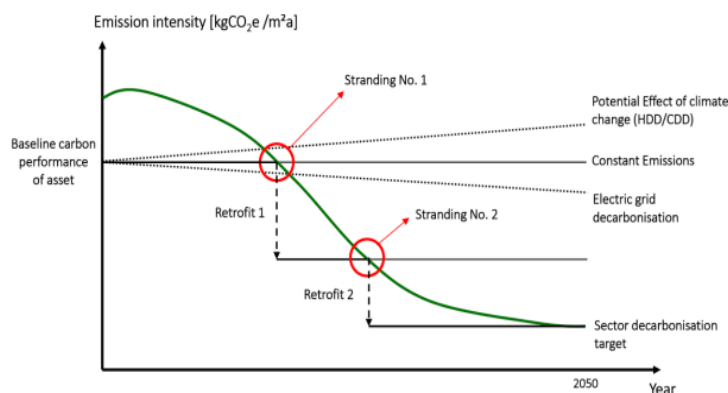
CRREM has been integrated into multiple net zero guidance reports and the annual real estate investment fund sustainability assessment GRESB, used by 1,820 investor participants with US\$7trn in assets in 2022¹¹. CRREM is perhaps one of the most successful EU funded research projects for energy efficiency due to the rapid take up by real estate investors. DWS real estate participates in the CRREM advisory board and chairs the GRESB standards committee.

Figure 9: Science based real estate emission reduction curves: example for select building types in Germany



Source: CRREM 2022 www.crrem.eu

Figure 10: CRREM carbon risk model



¹¹ GRESB 2022

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4 / Multiple benefits of energy efficiency

The multiple benefits of energy efficiency investments are not widely known outside of the energy efficiency and real estate expert committee. The benefits shown in [Figure 11](#) are significant. Not all of these benefits are (yet) able to be monetised by investors – indicating a role for policy innovation, implementation and investor macro-stewardship with policymakers and market standard setters.

Figure 11: Multiple benefits of energy efficiency investments

	Benefit description	Investor relevance
Macro energy security	In the IEA's net zero scenario, global energy consumption in buildings falls by over 20% between 2020 and 2030. This is due to a combination of measures including replacing fossil fuel boilers with electric heat pumps. Globally this equates to 650 bcm (billion cubic metres) of fossil gas, about four times the EU's 2021 imports of gas from Russia.	Energy security risks have driven a strengthening of public policies and societal attention. An increase in public funding may help address the public benefit from efficiency investments
Micro energy security	Power grid management is made easier and less expensive and blackout risks are reduced when energy demand is lower and more flexible.	Many grid operators have expanded incentives and tariffs to reward energy flexibility, but more energy system focus on energy efficiency is necessary
Energy bills	By 2030, households could save up to 30 to 40 percent on their energy costs ¹² (including monthly costs of power and gas and annualized infrastructure costs), through renovation and decentralised renewable energy	Cutting energy bills can act as a wider economic stimulus as energy bill savings are partially spent elsewhere
Carbon emissions	Globally, energy efficiency could create 33% of all emission reductions in a net zero scenario ¹³	Speed of emission reductions in buildings gives time for technology development & deployment in heavy industry
Job creation	A review ¹⁴ of thirty-five building retrofit programs found an average of 18 jobs created per €1m investment. Pre-pandemic, an estimated 7.5 million jobs were involved in the renovation of buildings in Europe. A tripling of building renovation rates could create an additional 2 –4 million jobs in the construction sector with additional jobs created amongst product manufacturers ¹⁵	The macro-economic benefit of job creation is likely not given sufficient weight by policymakers, leading to policies being weaker than would be ideal. Investor macro-stewardship with policy makers could strongly emphasise the full benefits of energy efficiency investment and policies.
Economic stimulus	A survey ¹⁶ of hundreds of central bank and national finance department officials found that retrofitting buildings was one of the top ways to stimulate growth and cut carbon emissions.	
Mortgage financial risk	Statistically significant analysis ¹⁷ of ~800,000 mortgages across UK, Germany, and Finland found that customers with high and medium energy efficient properties are ~20% less likely to default than low energy efficient mortgages, "all other things being equal".	Some banks are providing incentives for customers to undertake install heat pumps ¹⁸ or insulation

¹² McKinsey (2023) www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/refurbishing-europe-igniting-opportunities-in-the-built-environment

¹³ IEA 2022 <https://prod.iea.org/reports/the-value-of-urgent-action-on-energy-efficiency/highlights>

¹⁴ Renovate Europe, BPIE (2020) www.renovate-europe.eu/2020/06/10/building-renovation-a-kick-starter-for-the-eu-economy/

¹⁵ EU Commission, IPSOS, Navigant (Feb 2019) <https://op.europa.eu/s/xzQ2>

¹⁶ Hepburn et al 2020 <https://academic.oup.com/oxrep/advance-article/doi/10.1093/oxrep/graa015/5832003>

¹⁷ EEFIG (2022) The quantitative relationship between energy efficiency improvements and lower probability of default of associated loans and increased value of the underlying assets https://eefig.ec.europa.eu/news/new-report-final-report-risk-assessment-2022-05-09_en

¹⁸ Lloyds (2022)

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<p>Real estate valuation</p>	<p>Sustainability certified offices have a lower vacancy rate compared to non-certified buildings in major European cities. When the effects of building size, location, age, and renovation history are accounted for, offices with sustainability certifications gain a 6% rental premium¹⁹</p> <p>In 2018, the EU’s Joint Research Centre concluded that there could be a 3-8% increase in the sale price of residential assets resulting from energy efficiency improvements, as well as an increase of 3-5% in residential rents compared to similar properties²⁰.</p>	<p>Wider recognition and integration of a valuation premium for efficient and sustainable buildings could help the business case for renovation</p>
<p>Health, wellbeing and energy poverty</p>	<p>Energy efficiency measures can support good physical and mental health primarily by creating healthy indoor living environments with healthy air temperatures, humidity levels, noise levels, and improved air quality.</p> <p>Fuel poverty (spending more than ~10% of income on energy costs) tends to be caused by a combination of low income, poor housing quality and high energy costs.</p> <p>Fuel poverty is also strongly associated with sub-optimal mental health, in part because of the financial stress of coping with high energy bills and debt. Energy efficiency retrofits of low-income housing can offer a solution that permanently makes comfort more affordable²¹.</p>	<p>DWS survey²² of apartment tenants in Germany, the Netherlands and the UK found that over half of renters said that they would be more likely to renew their tenancy if a property had been managed to minimise air pollution, even if it meant paying more</p> <p>Renters consider landlords highly responsible for managing air quality within their homes, yet very few have received air pollution information or advice from landlords</p> <p>Over half of renters are concerned about the impact of air pollution on their health, while having a low level of understanding about the measures available to minimise their exposure to air pollution both indoors and outdoors</p>
<p>Productivity</p>	<p>People working in energy efficient offices with good indoor air quality may be less likely to suffer from fatigue, headaches, or skin irritations. Improving the health of workers will have significant implications for workplace productivity: 11% potential productivity gain compared to offices with poor ventilation²³.</p> <p>Efficiency can also lead to industrial productivity gains by lowering maintenance costs and increasing production yields per unit of input. Improvements in operation and process reliability, which can result from efficiency gains, lead to reductions in equipment downtime, shutdowns, or system failures. Optimising processes to enhance efficiency can also reduce staff time required to enhance operations and scheduling while reducing the risk of human errors²⁴.</p>	<p>Productivity benefits are likely under-recognised by hosts of building renovation projects.</p> <p>Wide-spread education and use of air quality sensors could help encourage tenants to request building renovation</p>

Source: DWS analysis 2023

¹⁹ CBRE (2022) Is sustainability certification in real estate worth it? Evidence from European office markets

²⁰ JRC (2018) https://publications.jrc.ec.europa.eu/repository/bitstream/JRC113215/jrc113215_kjna29471enn_v2_ipo_final.pdf

²¹ IEA (2019) www.iea.org/reports/multiple-benefits-of-energy-efficiency/health-and-wellbeing

²² DWS (2022) www.dws.com/our-profile/media/media-releases/dws-and-global-action-plan-survey-reveals-significant-impact/

²³ Frank Knight It’s in the Air: The Invisible Secret to Strategy and Productivity – Knight Frank (UK)

²⁴ IEA (2019) www.iea.org/reports/multiple-benefits-of-energy-efficiency/productivity

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