Retrofitting the Property Sector:

Future-Proofing Buildings, Health & Net Zero

Plentific | GlobeScan

Cem Savas, CEO &
Co-Founder, Plentific

Message from the CEO.

There is a collective realisation settling in across real estate – 80% of the homes we will use in 2050 have already been built. Retrofitting this existing stock by 2050 will be a challenge, leaving many wondering if it is even possible.

At Plentific we like to make the impossible, possible. We work closely with landlords, property managers and energy consultants to plan, execute and improve the monitoring of retrofits with our solutions.

This report constitutes a critical step in that direction. Our clients are looking for clarity on the retrofit process and best-practice in the markets we operate in. This report provides key takeaways for every property provider to implement a retrofit process and measure results.

There will be barriers, from policy and financing challenges; to data gaps and hurdles in supply chains. But I believe it is in such challenging times that we create the most resilient solutions.

This swift retrofitting journey presents real estate with a tremendous opportunity, not only future-proofing the buildings we all live in, it will fix the most pressing environmental, social and economic issues facing society today.

I invite you to use the research within and to work with Plentific as we move towards a more inclusive, low-carbon economy.

Cem Savas.

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01 Introduction.

Energy use, climate change and housing are urgent, interconnected issues facing society and the property sector. Climate change is turning up the heat on the need to reduce energy consumption and improve the resilience of the built environment.

Buildings account for 30%-40% of the energy consumed and 20%-36% of energy-related greenhouse gas emissions across the European Union, Germany, United Kingdom and US. Increases in flooding and extreme weather triggered by climate change pose heightened risks to real assets like buildings and property.

Governments, landowners, property managers and investors alike are recognising these challenges and looking for solutions to safeguard buildings and users, shore up their investments and respond to policy imperatives. One area where they have found common ground is the huge and urgent need for upgrades to improve the energy efficiency, affordability, comfort and resilience of housing and building stock.

Despite the great need and potential, efforts to retrofit buildings for energy efficiency have thus far fallen well short of the level required to meet energy and climate goals. Rather than refurbishing whole units or buildings, most retrofits to date have focused on just one or a few components in isolation. Many property managers lack the resources or do not fully understand how to undertake and support retrofit projects.

This report identifies key issues, opportunities and barriers to advancing retrofits for energy efficiency. In particular, it seeks to help equip property managers with knowledge and insights that will help them understand and effectively navigate the context, design and implementation of retrofit projects. While many issues and barriers are shared across borders and sectors, some are also specific to certain countries and property markets. Therefore, this report focuses most directly on retrofits for residential properties in European Union, Germany, the United Kingdom and US.

Staggering Scale: The Challenge and Opportunity

The numbers behind the retrofit movement are staggering. A massive transformation is needed to fill the demand for energy efficient homes and buildings and to keep climate change within the bounds of the Paris Accords.

The statistics below offer a glimpse of the scale of the retrofit challenge:

- In the European Union, roughly 15,000 houses need to carry out works every day for the next 30 years.[1]
- In the European Union and Germany, only 1% of buildings currently undergo energy-efficient renovation annually, while roughly 75% of European Union buildings are not energy efficient and 85-95% of them will still be used in 2050.[2]
- Some 26 million homes in the United Kingdom need retrofitting by 2050 according to a 2018 report by IET and Nottingham Trent University.[3]

1. "This Dutch construction innovation shows it's possible to quickly retrofit every building", Fast Company, January 2022.
2. Climate-neutral building stock by 2050: A highly ambitious goal, Deutsche Bank, March 2021.
3. "Scaling Up Retrofit 2050," The Institution of Energy and Technology and Nottingham Trent University, 2020.

02 ESG & Sustainability in the Housing and Property Sector.

Issues relating to ESG – which stands for environmental, social and governance – are fast becoming more important and integral to the strategy and practices of landlords and investors. Studies show ESG and sustainability are good for the bottom line of properties, as well as the people who live and work in them. For example, research has found that ESG initiatives can increase and safeguard property values, reduce the turnover of tenants, improve resilience and boost the health and productivity of residents and workers.

31% **In one study, more energy efficient homes were empty for a 31% shorter period on average than homes with lower energy efficiency ratings.**[4]

Many housing providers, property managers and investors have developed their own ESG strategies and programs. Large, publicly listed landlords have committed to long-term targets for their ESG performance. Some providers have implemented the good practice of basing their ESG strategies and programs on a materiality assessment, which identifies the issues that matter most to their business, users and external stakeholders.

ESG initiatives, reporting and performance are also opening valuable new financing channels that can help to accelerate upgrades to properties and improvements in the energy efficiency of buildings. Property managers and housing providers are leveraging ESG to issue a variety of sustainable finance instruments in the bank and bond markets.

Key ESG Issue Areas

Retrofits sit at the convergence of key issues and trends in the rapidly emerging ESG space. Key ESG issues that are driving the interest in retrofits and linked to the performance and impacts of buildings and property managers can be grouped into the categories below:

- **Environment** – issues include: climate change and Green House Gas (GHG) emissions; energy usage, efficiency and renewables; resource management and sustainable materials
- **Social** – issues include: energy access and affordability, health and well-being of residents and building users, supplier diversity, green jobs and inclusive economic growth
- **Governance** – issues include: responsible business practices; responsible sourcing and supplier sustainability; privacy and security of personal data

4. "Touching the Void," Sustainable Homes, 2016. p. 5.

In the real world, many of these economic, environmental and social issues are closely intertwined. As a result, ESG strategies and programs need to understand and account for these connections, and solutions need to adopt integrated approaches to address them effectively and efficiently. In many ways, retrofits are a great example of a powerful solution that jointly addresses many of these closely linked issues.

Five ESG Themes Driving Interest in Retrofits

The five topics that follow illustrate how these interconnected issues are driving retrofit interest in the housing, public and other property sectors.

1. Climate change, GHG emissions and energy usage
2. Green jobs and inclusive economic growth
3. Energy access, affordability and energy poverty
4. Health and productivity impacts of housing and the built environment
5. Tech-enabled resource management and sustainable materials

Climate Change, GHG Emissions and Energy Usage

Climate change already has a large, growing impact on economies, property values, livelihoods and the health and well-being of people around the world. The European Union, Germany, the United Kingdom and the United States have all committed to ambitious goals to dramatically reduce their GHG emissions. As noted above, buildings account for 20-36% of energy-related GHG emissions across the European Union, Germany, the United Kingdom and the United States. Therefore, reducing the energy consumption and improving the energy efficiency of buildings is a key component of the European Union's and national governments' plans to achieve their long-term climate goals.

Green Jobs and Inclusive Economic Growth

Retrofits play a key role in delivering the economic goals of the European Union's Green New Deal and countries' efforts to Build Back Better in the wake of the COVID-19 pandemic. The extensive work needed to implement retrofits is expected to create high demand for skilled workers and generate a large influx of new jobs. Advocates also see this as an opportunity for workforce development that expands access to high-paying jobs to under-represented groups.

7 million

lifted out of energy poverty every year

The Buildings Performance Institute Europe (BPIE) reviewed 35 reports to assess the extent of job creation and macro-economic benefits of energy renovation in the European Union. Their analysis confirmed the findings of a study sponsored by C40 Cities in 2019 that estimated "overall job creation in the renovation of residential buildings, offices and schools ranges between 13 and 28 jobs per €1 million invested."[5]

Energy Access, Affordability & Energy Poverty

160,000

new jobs created

High energy prices and sub-par housing raise living costs and cut into tight household budgets. Drafty, low-quality homes are not good at retaining heat, driving more demand for energy. In the worst cases, this set of conditions leads to energy poverty, where families aren't left with enough money to cover other basic needs if they pay their energy bills.

In the European Union, an estimated 50 million Europeans live in energy poverty.[6] Housing is the 'crucial backdrop' to poverty in the United Kingdom according to former UN Special Rapporteur on extreme poverty and human rights, Professor Philip Alston.[7]

€291bn

in environmental and social savings

Renovations can lift 7 million Europeans out of energy poverty every year alongside creating 160,000 new jobs and contributing €291bn in environmental and social savings.[8]

5. "Building Renovation: A kick-starter for the EU recovery," Renovate Europe.
6. "Energy Poverty in the EU" ODYSSEE-MURE- https://www.odyssee-mure.eu/publications/policy-brief/european-energy-poverty.html#:~:text=It%20is%20estimated%20that%20currently,levels%20of%20essential%20energy%20services.
7. "Statement on Visit to the United Kingdom, by Professor Philip Alston, United Nations Special Rapporteur on extreme poverty and human rights," United Nations Human Rights Office of the High Commissioner, November 2018.
8. "Unlocking the Trillions: Public-private innovation to deliver the EU's renovation wave ambition," Green Finance Institute, November 2021, p. 5.

Health and Productivity Impacts of Housing and the Built Environment

In colder climates, retaining and reducing demand for heat is a key focus of retrofit projects. Heating for living space and hot water generate over three-quarters of household demand for energy.

Inadequate housing costs an estimated €194bn per year to the European Union through increased use of services such as healthcare, while the annual NHS costs in the United Kingdom attributed to low-quality housing are estimated at £1.4 billion for first-year treatment. Cold homes contribute at least £145 million of those costs. "Cold homes are linked to a wide range of health issues, from mental health to asthma and respiratory issues, to trips and falls …," according to a report on fuel poverty commissioned by the United Kingdom government.

According to research by the Buildings Performance Institute Europe (BPIE), retrofitting buildings has tremendous potential to drive improvements in health and productivity. Transforming hospitals to nearly zero-energy buildings (nZEBs) would reduce the length of patient stays and potentially save the European Union health sector €42bn/year.[9] Bringing offices to nZEB levels could lead to increases in employee productivity worth up to €500bn/year across the European Union.[10] Retrofitting schools could accelerate the educational performance of students by up to two weeks/year.

Tech-enabled Resource Management and Sustainable Materials

Exciting developments in innovation and technology are key enablers of energy efficiency and sustainable buildings. This innovation is happening on many fronts, from smart homes and Building Information Modelling (BIM) to sustainable materials and nature-based solutions.

- **Smart homes** – Digital sensors and Internet of Things (IoT) make it possible to monitor and fine tune the conditions and energy usage of buildings in real time. Smart thermostats are giving residents new levels of control over their home environments and energy bills.
- **Sustainable materials** – A mix of new and traditional materials is improving sustainability across a building's lifecycle and reducing "embodied carbon," which accounts for a quarter of the climate impact of buildings. In Paris' public housing buildings, hempcrete – a climate- and nature-friendly form of insulation made from a mix of hemp, lime and water – helps keep out the winter chill.
- **Nature-based solutions** – Green walls and roofs can reduce energy consumption and create healthier living environments. Retrofitting an existing masonry cavity walled building with **a green or living wall can reduce the amount of heat lost through its structure by more than 30%**, according to a University of Plymouth research paper led by Matthew Fox.[11]
- **New techniques for off-site manufacturing** – Models such as Energiesprong are reducing the costs and disruption of retrofits through economies of scale and limiting the time workers need to spend in units.

9. "Deep Renovation: Shifting from Exception to Standard Practice in EU Policy," Sibileau, Helene et al., BPIE, November 2021, p. 10.
10. Ibid
11. "Living wall systems for improved thermal performance of existing buildings," Matthew Fox et al., University of Plymouth.

03 Who is Embracing Retrofits?

The residential property sector is a key focus of retrofitting initiatives across the European Union, Germany, the United Kingdom and the United States. Within the sector, many retrofit programs and projects have targeted larger properties for multifamily housing. Compared to commercial real estate, experts observe, "multifamily housing (MFH) generally offers investors a stable, long-term cash flow informed by a more balanced measure of economic, demographic and regulatory considerations."[12] The benefits of improving energy efficiency in multifamily housing can include: lower energy costs, higher property values, more affordable housing, greater living comfort and mitigating climate change.

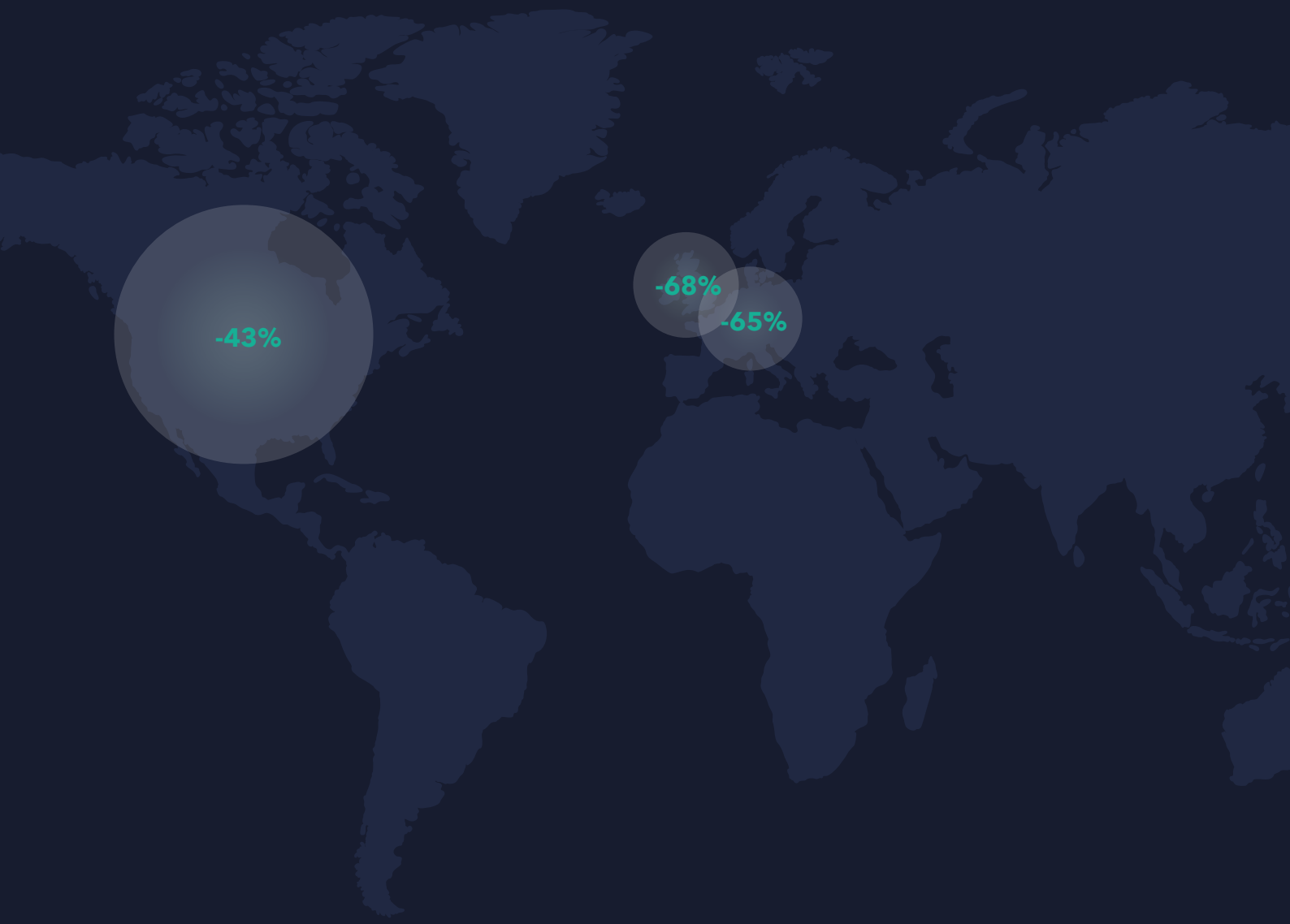
Public buildings represent another attractive opportunity to advance retrofit projects. Retrofitting public buildings directly aligns with governments' climate and energy goals. And governments have leverage to drive retrofits in public buildings that they don't have with private sector properties.

In parts of the housing sector, residential properties and public buildings combine in the form of public, social and affordable housing developments, which are managed by public or non-profit landlords and property managers.

> **"Retrofit isn't just about reducing carbon emissions. A best practice retrofit should reduce fuel bills and also improve health and wellbeing. Retrofit at scale would also generate significant employment opportunities and stimulate the economy.[13]**

12. "Comparing German and US Multifamily Housing," Dr. Christoph Pitschke and Nina Kusenberg, AFIRE Summit, Fall 2019.
13. "Climate Emergency Retrofit Guide," LETI.

GHG targets
for 2030, versus 1990



GERMANY

Germany aims to reduce greenhouse gas emissions by 40 % by 2020 and by at least 65 % by 2030 compared to 1990 emission levels.[14]

UNITED KINGDOM

The United Kingdom government has announced that it will reduce the nation's greenhouse gas emissions by 68% by 2030, compared to its 1990 levels.[15]

UNITED STATES

USA aims to reduce greenhouse gas emissions 52% below its 2005 levels by 2030. This figure is 43% when measured with a 1990 baseline.[16]

14. https://www.umweltbundesamt.de/en/data/environmental-indicators/indicator-greenhouse-gas-emissions#at-a-glance
15. https://www.nytimes.com/interactive/2021/04/22/climate/new-climate-pledge.html
16. https://www.climatechangenews.com/2020/12/03/uk-announces-stronger-2030-emissions-target-setting-bar-ambition-summit/

European Union

Public housing plays a key part in the European Union's Renovation Wave strategy and its priority to tackle energy poverty. The European Union's Renovation Wave aims to double the annual rate of building renovations by 2030. Retrofitting the European Union's large footprint of public and social sector buildings also presents a tremendous opportunity to achieve health and socio-economic benefits alongside large reductions in energy usage and GHG emissions.

Germany

In Germany, the top 25 residential property owners had portfolios of 30,000 or more apartments as of late 2018. Combined, they owned more than 1.9 million rental units, or around 8-9% of the rental apartment stock. While nine of the top 25 owners are private companies, seven of them are among the ten largest apartment owners.

The two largest apartment owners in Germany are Vonovia, with around 363,500 apartments, and Deutsche Wohnen, which owns around 163,100 apartments. Both are listed companies and operate throughout Germany. Property company LEG Immobilien in North Rhine-Westphalia also owns more than 100,000 apartments.[17]

Deutsche Wohnen's practices and reporting are guided by ESG ratings systems and standards, including those of the Sustainability Accounting Standards Board (SASB). The European Public Real Estate Association (EPRA) awarded Deutsche Wohnen its Sustainability Gold distinction for the fifth consecutive time in 2021. In its 2020 Sustainability Report, LEG's CEO points out, "the company as a whole and our investors are paying increasing attention to ESG criteria. LEG's sustainable investment initiatives focus on climate protection and measures to enhance the energy efficiency of its portfolio. [18]

The opportunity for retrofitting public buildings has also been recognised in Germany. In an open letter, 48 associations of the construction trade, industry and environmental protection sectors called on the federal government to use European Union aid to invest in the energy-efficient refurbishment of schools, as well as training and continuing education for construction workers.[19]

17. "The largest apartment owners in Germany," Matti Schenk, Savills, 19 March 2019.
18. "The value of living: Sustainability Report," LEG, 2020.
19. "Federal government should lead the EU Renovation Wave," Gebaude Energieberate, 12 November 2020. https://www.geb-info.de/nachrichten/bundesregierung-soll-bei-eu-renovierungswelle-vorangehen

United Kingdom

Improving the energy efficiency of homes and social housing is a key priority in the United Kingdom. Many of the country's social housing associations have shown considerable initiative with adopting ESG initiatives and seeking to implement retrofit projects. Clarion Housing Association issued the first Sustainability Bond from the sector in January 2020 to fund the development of new energy-efficient, affordable homes.

The report 'Scaling Up Retrofits 2050,' observes, "Social housing is an easier market to access than private rental or owner-occupied, as the owners have an explicit social goal, and can be encouraged to take a longer-term view of housing quality and performance than other sectors."[20]

According to the final report of the ESG Social Housing Working Group, "social housing has become an established and widely recognised asset class which is of increasing interest to a wide range of United Kingdom and international institutional investors, including asset managers, pension funds and insurance companies. Social housing is well-suited to pension fund and insurance company investment with its long-dated returns, underpinned by government benefit payments and secured by property."[21]

United States

Several factors contribute to making multifamily housing a strong entry point for retrofits in the United States residential sector. Many larger multifamily buildings feature simpler layouts and geometries as well as consolidated ownership structures, especially among public and affordable multifamily developments. Many buildings also already need interventions considering the prevalence of deferred maintenance backlogs, particularly in affordable and workforce housing.[22]

Within the United States residential sector, some property managers and investors regard "essential housing" as an attractive ESG opportunity. Essential housing is targeted at households earning more than 60% of an area's median income (AMI) (above the cut-off for a public housing subsidy), but less than 140% of AMI (below the threshold for luxury housing). This type of housing accounts for a large share of the US' shortage of 5.24 million homes. While most new essential housing will be new construction, property developers may also explore opportunities to repurpose and retrofit existing buildings.[23]

20. "Scaling Up Retrofit 2050," The Institution of Energy and Technology and Nottingham Trent University, 2020, p. 7.
21. "The Sustainability Reporting Standard for Social Housing," The ESG Social Housing Working Group, November 2020.
22. "Market Opportunities and Challenges for Decarbonising US Buildings," Fisler, Diana et al., Advanced Building Construction Collaborative, July 2021.
23. "Special Report: 3 Keys to Unlocking ESG Potential in Real Estate," Grubb Properties, Institutional Investor, 3 February 2022.

04 Retrofit Landscape and Markets in the European Union, Germany, United States and United Kingdom.

European Union: Leading the Way

Policy Environment and Initiatives

The **Fit for 55 climate package** unveiled in July 2021 builds on European Union's ambitious climate targets for 2050 to cut climate emissions 55% by 2030 from 1990 levels.

Retrofits are ideally suited to the vision behind the **European Union Green Deal and ambition to Build Back Better** in the wake of the COVID-19 pandemic. They address a major source of GHG emissions while creating demand and new jobs that can help fuel the growth of an inclusive, green economy.

As a key component of the European Union Green Deal, the European Union's Renovation Wave aims to double the annual rate of building renovations by 2030 and foster deep renovation. The Renovation Wave strategy has three priorities:

- Tackle energy poverty and the worst-performing buildings
- Renovate public buildings
- Decarbonise heating and cooling

> **"With nearly 34M Europeans unable to afford to heat their homes properly, renovation also tackles energy poverty.[24]**

The European Union's first **Energy Performance of Buildings Directive (EPBD)** introduced Energy Performance Certificates (EPC) in 2001 to make the energy performance of buildings more transparent. EPCs are used to measure and rate the energy performance of buildings in bands from lowest to highest. In 2010, the updated EPBD introduced several measures to improve the system for EPCs, including: quality control, penalties for non-compliance, the obligation to display the energy label in advertisements, and a mandatory requirement to hand out a copy of the EPC in sale and rent transactions.

In practice, the implementation of EPCs has varied considerably across European Union member states and research has turned up several

24. EU Renovation Wave Strategy - https://ec.europa.eu/energy/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en

shortcomings of the system. While EPCs still guide or inform retrofits in many countries, experts have noted the lack of detailed information and specific advice needed to overcome barriers and advance retrofit initiatives.[25]

> **For every 1 million invested in energy renovation of buildings, an average of 18 jobs are created in the EU. These are local, long-term jobs that will stimulate economic activity across the EU.**
>
> - Buildings Performance Institute Europe (BPIE) research for Renovate Europe Campaign

> **Zero energy buildings are the future. A revised Energy Performance of Buildings Directive is crucial to delivering the European Green Deal.**
>
> - Ciaran Cuffe, MEP

The most recent 2018 update of the EPBD set the objective for all European Union member states to achieve "a highly energy efficient and decarbonised building stock by 2050."[26] In its next review of the EPBD, the European Union Commission is expected to recommend gradually introducing minimum energy performance standards for buildings and extend requirements for building renovation to all levels of public administration.[27]

The European Union also committed to protect vulnerable consumers and made energy poverty a policy priority in the 2019 **Clean energy for all Europeans** package. Under the program, European Union countries' National Energy and Climate Plans (NECPs) are required to measure energy poverty and address any cases identified.

Opportunity and Market Sizing

The potential market and demand for retrofits is enormous considering the scale of existing building stock and the extent of improvements in energy efficiency required to achieve European Union and national climate goals. In total, **some 70% of the European Union's 220 million buildings need to be renovated** to achieve the European Union's target for reducing energy-related GHG emissions.[28] The European Union's Renovation Wave strategy aims to upgrade **35 million buildings by the end of 2030.**[29]

25. "The Concept of the Individual Building Renovation Roadmap," BPIE – Buildings Performance Institute Europe, January 2018.
26. "Towards a Decarbonised EU Building Stock: Expert Views on the Issues and Challenges Facing the Transition," Buildings Performance Institute Europe (BPIE), 2018, p. 1.
27. "How do we get the renovation wave rolling in Germany," Andreas Kuehl, Energy Efficiency in Industrial Processes (EEIP), 1 March 2021.
28. "Unlocking the Trillions: Public-private innovation to deliver the EU's renovation wave ambition," Green Finance Institute, November 2021, p. 4.
29. Ibid., p. 2.

Standards and Performance Measures

Many countries in the European Union have adopted Minimum Energy Performance Standards (MEPS) to accelerate and enforce requirements for improvements in energy efficiency. MEPS are designed to tackle the worst-performing buildings first.

MEPS in many European countries are based on ratings from EPCs. Countries using EPCs as the basis for MEPS include: Belgium (Flanders), France, Great Britain and the Netherlands. An EPC certificate includes two ratings: one for energy efficiency based on heating and lighting costs and one for environmental impact (EIA), which shows carbon emissions from heating and lighting.

LETI cautions against relying too heavily on EPCs since they do not provide a reliable calculation of unregulated energy use. "A high (good) EPC score does not necessarily indicate a building with high levels of energy efficiency." Instead, their recommended metrics for energy performance include: space heating demand; hot water demand; energy use intensity and use of renewable energy.[30]

Funding Opportunities

The European Union's Renovation Wave aims to ensure accessible and targeted financing, including incentives for private financing. The EU's **Social Climate Fund** provides financial support that can help advance retrofits for vulnerable, low income or energy poor households.

Case Study

Green Finance Institute: "Unlocking the Trillions"

Financing is one of the biggest barriers to advancing retrofits. A massive injection of capital is needed to realize the ambitions of the European Union's Renovation Wave and Fit for 55 initiatives. The Green Finance Institute launched the Coalition for the Energy Efficiency of Buildings Europe (CEEB Europe) in 2018 to help address this challenge.

The GFI's analysis reveals an estimated investment gap of €275bn annually until 2030 and highlights the critical need to combine public and private funding to renovate the European Union's building stock. This gap remains even after accounting for the €750bn of Next Generation European Union (NGEU) funding available to meet climate goals. European Union funding must stimulate private investment and move away from one-time grants to provide a viable long-term approach to financing retrofits.

"Public investment cannot close this gap alone. With pandemic recovery investments and climate at the top of the EU's agenda, now is a unique opportunity and crucial moment to mobilise private finance and investment in renovation."

-Green Finance Institute, November 2021[31]

30. "LETI Climate Emergency Retrofit Guide," London Energy Transformation Initiative (LETI), October 2021.

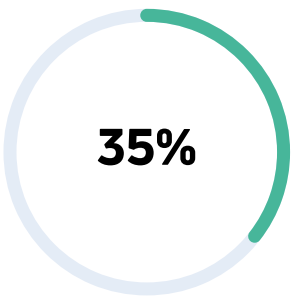
31. "Unlocking the Trillions: Public-private innovation to deliver the EU's renovation wave ambition," Green Finance Institute, November 2021.

GERMANY

Germany

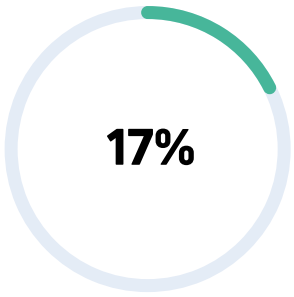
Policy Environment and Initiatives

Buildings account for 35% of total energy use and 30% of greenhouse gas emissions in Germany.[32] Residential energy usage makes up 26% of overall energy consumption and 17% of the country's carbon footprint, with heating and hot water accounting for 85% of household energy.[33] Thermal retrofitting is essential given that 80% of Germany's existing building stock will be in use beyond 2050. However, the pace of retrofitting has been well short of the government's annual target rate of 2%.[34]



Buildings account for 35% of total energy use

Buildings account for 30% of greenhouse gases



Residential energy creates 17% of the country's carbon footprint

Germany seeks to make its building stock virtually climate-neutral by 2050. The German government committed to reducing the primary energy demand of buildings by 80% by 2050 from 2008 levels, with a 20% reduction by 2020.[35]

In May 2021, Germany adopted a draft of the First Act Amending the Federal Climate Action Act, which sets higher national reduction targets for 2030 (at least 65%) and 2040 (at least 88%) and the goal of achieving net greenhouse gas neutrality by 2045 (five years ahead of the original 2050 date).[36]

Germany's **Energy Efficiency Strategy for Buildings** covers electricity, heat and energy efficiency, providing a policy framework for the energy transition of the buildings sector.[37] Regional governments in Germany initially drove development of the Sanierungsfahrplan (SFP), which includes an energy audit instrument used to guide retrofit projects. **The Individueller Sanierungsfahrplan (iSFP)** was then launched at the national level in 2017. The iSFP is Germany's version of an individual building renovation roadmap.

The German government also implemented the second version of the **National Action Plan on Energy Efficiency (NAPE 2.0)** to help drive improvements in energy performance. NAPE expands the eligibility criteria for funding energy-efficient construction and retrofitting. It also increases and widens the reach of funding for the **CO2 Building Modernisation Programme**.

32. "Considering minimum energy performance standards for Germany", Regulatory Assistance Project, March 2021, p. 5.
33. Saving Energy at Home, German Energy Agency- https://www.bmwi.de/Redaktion/EN/Dossier/energy-efficiency.html
34. "Climate-neutral building stock by 2050: A highly ambitious goal", Deutsche Bank, March 2021.
35. The Climate Policy Initiative is a German think tank that advises governments, businesses and financial institutions to "drive economic growth while addressing climate change."
36. "Germany sets tougher CO2 emission reduction targets after top court ruling", Reuters, May 2021.
37. "Enhancing Energy Efficiency in Buildings", Federal Ministry for Economic Affairs and Climate Action- https://www.bmwi.de/Redaktion/EN/Dossier/enhancing-energy-efficiency-in-buildings.html

Opportunity and Market Sizing

There are about 19 million residential buildings and 2.7 million non-residential buildings in Germany, according to Deutsche Bank Research. This includes around 15.7 million single- and double-family homes and roughly 43 million residential units.[38] Private renters account for about three-quarters of Germany's 19 million multifamily residential buildings.

Germany's property market is characterised by significant differences across regions as well as urban and rural areas. Private companies tend to focus on independent cities, owning more than a fifth of rental apartments in just 31 districts. The public sector owns at least a fifth of all rental apartments in 64 districts, of which around 80% are located in eastern Germany.[39]

Over 70% of residential buildings were constructed prior to 1990. Around 50% of all residential buildings were constructed during 1945-1990, and close to 20% were built prior to 1945. About two-thirds of the buildings in Germany were constructed before the first Thermal Insulation Ordinance came into force in 1977.[40]

Standards and Performance Measures

In Germany, EPCs are required for all existing and new buildings when rented, sold or undergoing major energy renovations. The energy performance of buildings is rated on a nine-point scale from H (lowest) to A+ (highest). There is a "strong culture of on-site energy auditing" that results in detailed reports of up to 150 pages on a building's energy performance. In contrast, "EPCs are not considered reliable enough to stimulate renovation and are often viewed as an administrative obligation."[41]

In 2020, large housing provider LEG moved to measuring CO2 emissions directly rather than extrapolating from energy certificates, thereby setting a new benchmark for the industry in LEG's estimation.[42]

Funding Opportunities

The German Government provided more than **17 billion euros of funding** for implementing energy-efficiency measures to private households, companies and municipalities through 2020.

Germany's development bank, the German Reconstruction Loan Corporation or KfW, provides substantial **financial incentives to support energy-efficiency retrofits for existing buildings, covering up to 40% of costs.** The program promotes retrofits that can achieve higher levels of energy-efficiency by offering higher levels of assistance.

In February 2022, Germany approved **9.5 billion euros** to resume the temporarily suspended KfW funding program for energy-efficient building refurbishment. Germany's plan to promote energy-saving buildings includes 5 billion euros in subsidies.

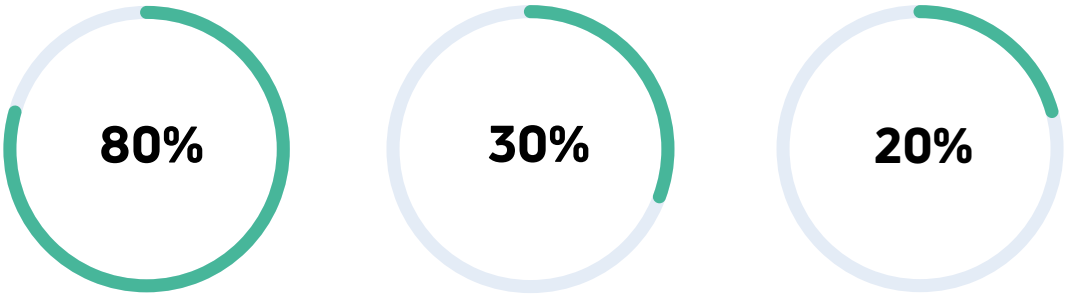
38. "Climate-neutral building stock by 2050: A highly ambitious goal", Deutsche Bank, March 2021.
39. "Germany: a nation of rental apartments," Matti Schenk, Savills, 20 March 2019.
40. "How do we get the renovation wave rolling in Germany," Andreas Kuehl, 1 March 2021.
41. "The Concept of the Individual Building Renovation Roadmap," BPIE – Buildings Performance Institute Europe, January 2018.
42. "The Value of Living, Sustainability Report", LEG, 2020.

UNITED KINGDOM

United Kingdom

Policy Environment and Initiatives

The United Kingdom's Climate Change Act (2008) set the legally binding target to reduce carbon emissions at least 80% by 2050 against a 1990 baseline level. Domestic energy consumption accounts for about 30% of total energy and 20% of United Kingdom greenhouse gas emissions. The Carbon Plan declared all buildings need to have low-to-zero carbon emissions by 2050 to meet the country's climate targets. Under the United Kingdom's 2015 Fuel Poverty strategy, all homes should have an EPC rating of B or C by 2030.



Aims to create an 80% reduction in carbon emissions by 2050

Domestic energy use accounts for 30% of total energy consumption

Domestic energy accounts for 20% of total GHG

The COVID-19 pandemic has highlighted the importance of housing to the health and well-being of families in the United Kingdom and around the world. According to The Good Home Inquiry report by the Centre for Ageing Better:

> **"The pandemic has added a new layer of understanding of the profound effect that unsafe, low-quality or unsuitable housing can have on our physical and mental wellbeing – on our ability to live healthily, to work effectively and to look after our families.[43]**

Many local governments are taking a leading role in pursuing Net Zero and low-carbon growth. **Hundreds of local authorities have declared a climate emergency**. Flagship initiatives include the Mayor of London's Retrofit Accelerator Initiative.

43. "The Good Home Inquiry: Good homes for all – A proposal to fix England's housing," Centre for Ageing Better, September 2021, p. 5.

The London Energy Transformation Initiative's (LETI) network of over 1,000 built environment professionals is working together to put London on the path to a zero-carbon future and provide guidance to support the United Kingdom's overall transition.

The United Kingdom's Construction Leadership Council (CLC) has called on the government to support a £525bn retrofit programme to make the United Kingdom's 28 million homes greener over the next two decades. The CLC advised launching a national communications campaign to educate households and the wider housing industry on the benefits of retrofitting. These benefits include boosting the economy through low-carbon growth and increases in disposable income from savings on energy bills. The CLC estimates the existing workforce would need to more than double to 500,000 workers to achieve these goals.[44]

Opportunity and Market Sizing

Social housing can play a key role in catalysing the market for retrofits and energy efficiency measures. **In the United Kingdom, there are close to 4 million social housing units.**[45] Over 4 million United Kingdom homes also fall short of the basic minimum in the Decent Homes Standard, and almost half of their residents are over the age of 55.

Standards and Performance Measures

The British Standards Institute (BSI) established **'PAS 2035 Retrofitting Dwellings for Improved Energy Efficiency - Specification and Guidance.'** PAS 2035 combines a framework and guidance intended to ensure delivery of high-quality retrofit projects. It requires property managers to involve accredited professionals – including a Retrofit Coordinator – to oversee the retrofit project. From June 2021, all retrofit projects receiving funding from the United Kingdom's central government were scheduled to require compliance with PAS 2035.[46]

United Kingdom housing providers have also started using the **Sustainability Reporting Standard for Social Housing**, designed in partnership with investors. The standard includes 12 themes and 48 criteria for ESG reporting by housing associations. Criteria are aligned to international frameworks and standards including the UN SDGs, Global Reporting Initiative, SASB, ICMA and LMA Principles.[47]

44. "Construction leaders call for £525bn national retrofit programme," Tom Lowe, Housing Today, 17 December 2020.
45. "Proportion of households occupied by social renters in England from 2000 to 2021,"Statista- https://www.statista.com/statistics/286509/england-number-of-social-rented-households/#:~:text=In%202021%2C%20around%204%20million,were%20recorded%20as%20socially%20rented.
46. "Climate Emergency Retrofit Guide," LETI, p 194.
47. "The Sustainability Reporting Standard for Social Housing," The ESG Social Housing Working Group, November 2020.

Funding Opportunities

The Social Housing Decarbonisation Fund (SHDF) will allocate £3.8bn over a 10-year period to improve the energy performance of social rented homes. Wave 1 of the United Kingdom's Social Housing Decarbonisation Fund (SHDF) used the framework of the three principles below for prioritising retrofit projects:

- **Fabric first** – ensures heat loss prevention measures are installed before other energy efficiency measures
- **Worst first** – prioritise and allocate spending to homes with lower EPC bands that are most in need of improvements
- **Lowest regret** – minimise the potential for rework on the journey to Net Zero

However, it's important to consider how these priorities fit with other objectives. For example, there may be a strong case to prioritise the units of residents living in energy poverty or who are older and face greater health risks.

Case Study

Clarion Housing Group

Clarion Housing Group is the largest social landlord in the United Kingdom, with more than 80% of 125,000 homes in social housing. In March 2021, Clarion participated in the Social Housing Decarbonisation Fund demonstrator project, securing £9 million of investment. The funding was used to upgrade 115 of its least energy efficient properties with EPC ratings of D or below. Homes were retrofitted with external wall and loft insulation, triple glazed windows, green technologies such as air source heat pumps, photovoltaic (PV) panels and centralised mechanical ventilation.

"In just 12 months working on Clarion's demonstrator project, the innovations that have come out in just that short space of time have already probably saved us around £480 million over 30 years, with residents saving between £300-£500 on their energy bills annually." – Paul Norman, Head of Asset Management at Clarion Housing Group

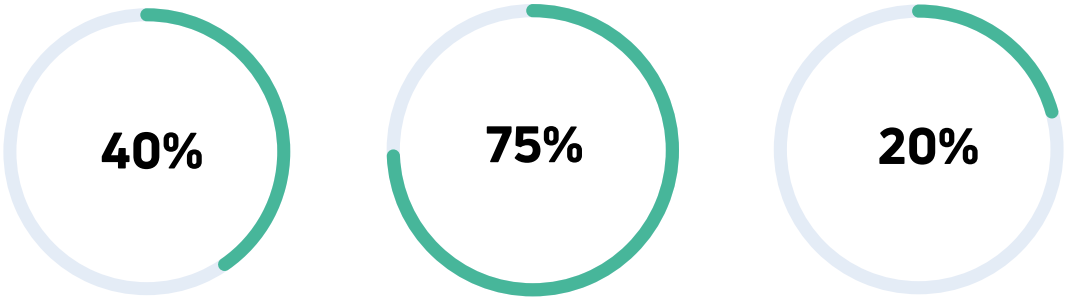
Whilst saving on energy bills is undoubtedly positive, it's only a partial solution to resolving fuel poverty. According to Norman, retrofitting tends to be an asset-driven process that targets the least energy efficient buildings first. However, accounting for whether residents can afford their bills should be a consideration when prioritising properties to retrofit.


UNITED
STATES

United States

Policy Environment and Initiatives

Buildings in the United States consume around 40% of the country's total energy and account for 75% of electricity use. Twenty percent of greenhouse gas emissions come from residential energy use. While large homes tend to use more energy, lower income households tend to be less energy efficient and more expensive to heat and cool.



Buildings use 40% of the country's total energy

Buildings account for 75% of the country's overall electricity use

Residential energy use accounts for 22% greenhouse gas emissions

Retrofitting could help to tackle some of America's biggest health, social and environmental issues. During Spring 2019-20, 25% of low-income households struggled to pay their energy bill. Many families were forced to spend less on food or medicine to pay for their bills or endure low temperatures.

The United States has set a goal to have Net Zero greenhouse gas emissions by 2050. The American Rescue Plan Act of 2021 includes energy efficiency measures designed to "provide economic, health and climate benefits in single-family and multifamily homes, including in low-income housing." The Build Back Better plan would create jobs to build a modern, sustainable infrastructure and deliver an equitable clean energy future. The proposed investment could contribute to upgrading millions of buildings and homes, while creating more than a million jobs.

Many city governments across the United States have adopted Minimum Energy Performance Standards (MEPS).[48] Some examples include: Ann Arbor, Michigan; Boulder, Colorado; Reno, Nevada; St. Louis, Missouri; and Washington DC. Boulder introduced its SmartRegs policy in 2010 to improve the energy efficiency standards for rental housing, which makes up over 50% of the city's housing. The policy achieved over 99% compliance within just six months of enforcement.[49] In many cases, cities

48. "Considering minimum energy performance standards for Germany", Louise Sunderland and Andreas Jahn, Regulatory Assistance Project (RAP), March 2021.

49. "Better Rentals, Better City: Policies to Improve Your City's Rental Housing Energy Performance," Petersen, A. and Lalit, R. 2018.

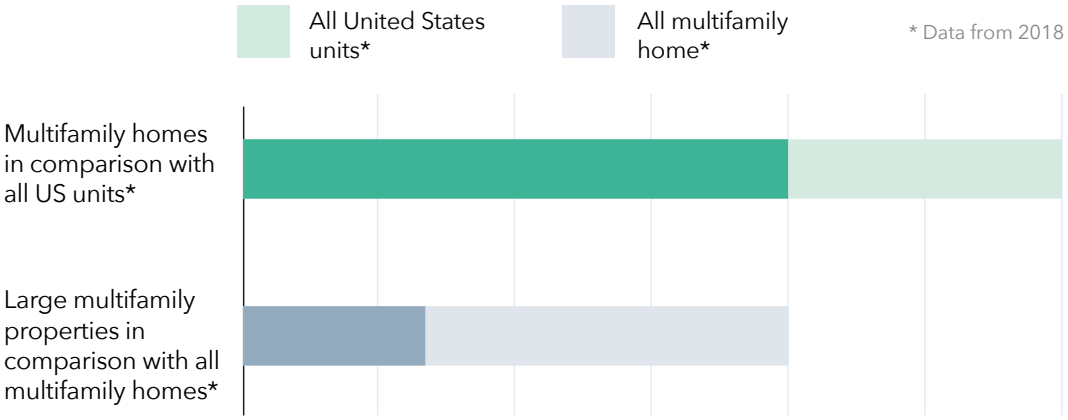
use MEPS to help deliver on their carbon targets. Standards in the United States generally target large buildings with energy performance results below the building stock average.

The United States Department of Energy (DOE) and Department of Housing and Urban Development (HUD) launched **The Better Climate Challenge for multifamily organizations** in February, 2022.[50] The Challenge is a voluntary, market-based platform for setting GHG emissions reduction goals and showcasing steps to address climate change. Partnering organisations commit to reducing their scope 1 and 2 GHG emissions by at least 50% within 10 years and set an energy efficiency target, typically 20%.

Opportunity and Market Sizing

In the US, the total potential addressable market for retrofitting all buildings constructed prior to 1980 is approximately 160 billion square feet. Including buildings constructed prior to 1990 increases that figure to 204 billion square feet.[51] The United States has around 140 million multifamily and single-family housing units.

Roughly 35 million households live in multifamily buildings.[52] In urban areas, multifamily buildings account for a large share of buildings and energy consumption, marking a significant opportunity for energy-efficiency upgrades.[53] Multifamily homes accounted for about two-thirds of the country's 47.2 million units in 2018.[54] There were over 10 million large multifamily properties with 20 or more units.[55]



50.. "HUD and DOE Launch Better Climate Challenge, Announce Inaugural Multifamily Partners," HUD Exchange, 28 February 2022. https://www.hudexchange.info/news/better-climate-challenge/

51. "Market Opportunities and Challenges for Decarbonising US Buildings," Fisler, Diana et al., Advanced Building Construction Collaborative, July 2021, p. 16.

52. US Census Bureau 2020.

53. "Deep Retrofits for Multifamily: Experiences in Scaling to Zero Energy," Earle, L et al., National Renewable Energy Laboratory (NREL), US Department of Energy, August 2020.

54. "America's Rental Housing 2020," Joint Center for Housing Studies of Harvard University, 2020, p. 13.

55. Ibid.

There are around 1 million households living in public housing units in the US, which are managed by some 3,300 housing associations. HUD sets the eligibility requirements for residents with lower incomes at 80% and residents with very low income limits at 50%, respectively, of the median income for the county or metropolitan area.[56]

Standards and Performance Measures for Retrofits

Home Performance with ENERGY STAR® is a Department of Energy (DOE) program that works with state and local program operators. The program uses a "whole-house" approach to improve the energy efficiency of single-family and low-rise multifamily homes. It connects homeowners with a network of over 1,300 home performance contractors and utility and nonprofit energy efficiency program administrators to make upgrades that save energy and improve the comfort, health and safety of homes.[57]

The DOE's **Weatherization Assistance Program (WAP)** is a long-standing initiative for upgrading the energy performance of homes for households with low and moderate incomes. Around 55% of households in both large and small multifamily units are eligible for WAP. [58] In a given year, the program leads to average household energy savings of $283, supports 8,500 jobs and provides weatherproofing services to approximately 35,000 homes.[59]

Funding Opportunities

The DOE's Home Performance program offers rebates for energy efficiency upgrades. In December 2021, the DOE announced a new funding opportunity to help state, local, and tribal governments enhance the residential WAP and help lower energy costs for consumers. The "Enhancement and Innovation Funding Opportunity Announcement (FOA)" will provide $18.6 million in 2022 and up to $25 million each subsequent year through 2025. Each award will provide a maximum of $2 million over a three-year performance period.[60]

56. "HUD's Public Housing Program," US Department of Housing and Urban Development (HUD). https://www.hud.gov/topics/rental_assistance/phprog

57. "DOE Upgrades One Million Homes as Bipartisan Infrastructure Deal Provides Massive Investment in Energy Efficiency," US Department of Energy (DOE), 10 November, 2021.

58. "Multifamily Retrofit Tools and Workforce Resources", Weatherization and Intergovernmental Programs Office, Office of Energy Efficiency and Renewable Energy- https://www.energy.gov/eere/wipo/multifamily-retrofit-tools-and-workforce-resources

59. "Weatherization Assistance Program," Office of Energy Efficiency & Renewable Energy-https://www.energy.gov/eere/wap/weatherization-assistance-program

60. "DOE Announces $18.6 Million to Expand the Weatherization Assistance Program," US Department of Energy (DOE), 15 December 2021.

05 Retrofit Approaches and Best Practices.

By definition, retrofits focus on existing buildings rather than new construction. The ease with which a building lends itself to retrofitting depends on a variety of factors, including: building form, age and type of construction. For example, cavity-wall buildings are cheaper and easier to retrofit than solid-wall buildings.

In Germany, multifamily housing is almost exclusively built with concrete and brickwork construction, and most multifamily housing units have an economic useful life of 70 to 100 years. In the US, rental properties are mostly built from timber frame construction and have a typical economic useful life of 50 to 60 years.[61]

In the United Kingdom, multifamily formats that can make good candidates for retrofitting include flats, mid-terraces and semi-detached housing. Older buildings, such as Victorian-era housing in the United Kingdom, often pose greater challenges for retrofitting that make projects more costly and time-consuming. Heritage constraints that can make retrofits impractical or not feasible apply to about 25% of United Kingdom housing stock.

Deep vs. Step-by-Step Retrofits

While there are many different ways to renovate buildings for energy efficiency, common approaches to retrofits can generally be grouped into three categories:

- "Deep renovations" or "whole-building" retrofits
- Deep renovations via staged or step-by-step retrofits
- One-off and serial retrofits

"Deep" or whole-house renovations occupy the other end of the spectrum from one-off or serial upgrades. Deep retrofits consist of an integrated approach to upgrading the collective system of components that contribute to a building's overall energy performance. The rapid expansion of deep retrofits is essential to achieving national climate goals according to research by BPIE and others.

Proponents argue that deep retrofits are often higher quality and more likely to avoid issues that can plague more incremental approaches. LETI cautions that a piecemeal approach of serial upgrades can have the unintended consequence of locking in constraints and limiting future opportunities for energy efficiency. For example, installing a new fitted kitchen could prevent installing adjacent floor or wall insulation later, or make it necessary to tear out the kitchen for future retrofitting.

61. "Comparing German and US Multifamily Housing," Dr. Christoph Pitschke and Nina Kusenberg, AFIRE Summit, Fall 2019.

Others point out that deep retrofits may not be practical in many cases under the current set of policy, funding and organisational constraints. Fortunately, new players like Energiesprong United Kingdom are offering alternatives to overcome these obstacles through new business models and innovative approaches to offsite manufacturing.

Fabric First Approach

For both deep and step-by-step retrofits, a "fabric-first" approach is widely considered to be the most effective way to improve a building's energy efficiency. A building's fabric encompasses the "envelope" of walls, cladding, fixtures and other components that form the exterior of the structure. The fabric largely determines a building's capacity for energy efficiency. If the fabric does not retain heat, the benefits of other energy efficiency measures will be limited. Specific components and features of a building's fabric include: walls, floors, roof, windows, glazing, air tightness and thermal bridging.

The fabric-first approach to retrofits is used by Passivhaus, Energiesprong, PAS 2035 and other leading building performance standards and retrofit initiatives. The energy performance of the façade or fabric of a Passivhaus building often goes well beyond country building regulations.[62]

Case Study

Nottingham City Homes & Energiesprong United Kingdom

Nottingham City Homes (NCH) is a leading social housing provider that manages 27,000 homes in partnership with Nottingham City Council (NCC).[63] The organisation's Environmental Strategy endeavours to reduce fuel poverty to create safe, sustainable, and affordable homes for their residents.

To reach these goals, NCH is collaborating with Energiesprong United Kingdom to conduct innovative deep renovation projects. First developed in Holland, the Energiesprong approach requires a retrofit to pay for itself within 30 years, complete an installation in under 10 days and deliver guaranteed energy savings and investment.[64] The Pay As You Save (PAYS) model enables tenants to pay a set fee or a "comfort charge" rather than bear the cost and risk of fluctuating energy bills. Fixed fees help customers to manage their budgets, helping NCH work towards its goal of alleviating fuel poverty.

The Energiesprong approach enables properties to achieve 2050 Net Zero requirements in "one jump," while the financing model "pays for the retrofit out of energy savings and reduced maintenance costs."

62. "Scaling Up Retrofit 2050," The Institution of Energy and Technology and Nottingham Trent University, 2020.
63. Ibid.
64. "Passivhaus: Creating a Roadmap to Net Zero Carbon," Bryden Wood.

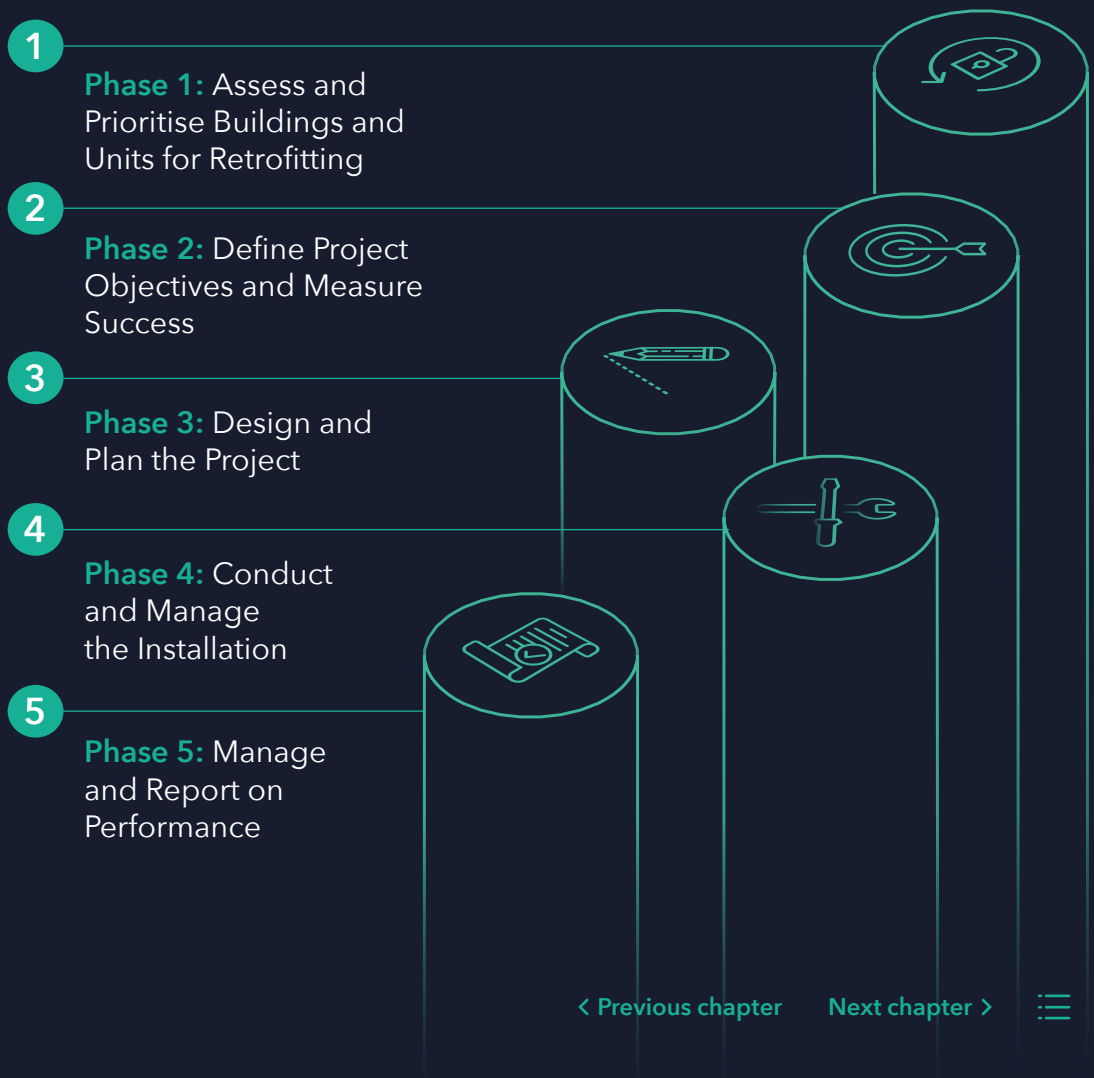
06 Retrofit Project Lifecycle, Phases & Best Practices.

Building renovations can be complex and time-consuming. For property managers, the lack of knowledge or information about what to do and in what order is one of the main barriers to conducting retrofit projects.

This section identifies key phases and tasks involved in designing and implementing retrofit projects. The process outlined below is based on the best practice of taking a structured, holistic approach to the building renovation. The project may either be carried out as one deep, whole-unit or building renovation, or a series of step-by-step renovations over time that ultimately combine to deliver the same finished product and results as completing the entire renovation in one cycle.

The breakdown of project phases and best practices for each phase below is based on a review of several roadmaps and standards for conducting retrofits that have been developed by leading organisations in the building space.

The lifecycle of a retrofit project includes the following phases:



1. **Phase 1:** Assess and Prioritise Buildings and Units for Retrofitting
2. **Phase 2:** Define Project Objectives and Measure Success
3. **Phase 3:** Design and Plan the Project
4. **Phase 4:** Conduct and Manage the Installation
5. **Phase 5:** Manage and Report on Performance

> **As about 85% of the energy renovation measures funded in Germany concern only one building component, iSFP [Individueller Sanierungsfarhplan] puts a strong focus on staged renovation and the interdependencies between the stages.[65]**
>
> - Buildings Performance Institute European Union (BPIE)

Phase 1: Assess and Prioritise Building and Units for Retrofitting

During this initial phase, property managers assess and evaluate buildings to identify and prioritise the best candidates for retrofit projects. As a best practice, the LETI Retrofit Process advises landlords to "consider reviewing all of the stock and creating a retrofit strategy and roadmap for the whole portfolio."[66]

Key steps/tasks during this phase include:

- Collect and analyse data needed on the property portfolio to evaluate and prioritise units and buildings for retrofit projects
- Develop and apply criteria for prioritising units and buildings for retrofit projects
- Engage and consult residents and other building users

On-site surveys are a fundamental part of the process for collecting the data required for retrofit projects. Data collection efforts should aim to understand the circumstances and needs of residents and other building users, as well as buildings' structural characteristics and energy performance. Property managers should ensure these findings are a central part of the approach to evaluate and prioritise buildings for retrofits.

Engaging and consulting residents and building users is a critical exercise throughout the retrofit project lifecycle. In multi-tenure buildings, the consent of individual owners may determine whether a project goes ahead or needs to be modified or cancelled altogether.

Phase 2: Define Project Objectives and Measure Success

In this phase, project owners and stakeholders define the objectives and metrics that will guide the design, implementation and evaluation of the retrofit initiative.

65. "The Concept of the Individual Building Renovation Roadmap," BPIE – Buildings Performance Institute Europe, January 2018.

66. "Climate Emergency Retrofit Guide," LETI, p 96.

Key steps/tasks during this phase include:

- Define and agree on the retrofit objectives and outcomes
- Identify key metrics to measure success and set baselines
- Prepare the business case
- Engage and explain the project to all building users and stakeholders

The right metrics play a key role in defining project objectives and measuring the success of retrofit projects. Metrics should account for the full set of objectives and stakeholders involved in and impacted by the retrofit. Retrofit objectives and outcomes are likely to include criteria and metrics for economic, environmental and social indicators, including: energy performance, health, comfort and the satisfaction of residents and building users.

The business case is critical for gaining buy-in and support from colleagues in finance and senior decision-makers. According to LETI, "the business case should aim to cover the whole life cost [of the project] (including energy and maintenance savings, increased asset value, etc.), the cost of alternatives, and the value of non-financial benefits."[67]

To help the project go smoothly and avoid disruptions, project managers will want to make sure they engage and explain the project plan and aims to residents and all other building users or stakeholders.

Phase 3: Design and Plan the Project

This phase covers the steps that go into designing the retrofit initiative and developing the implementation plan for the project.

Key steps/tasks during this phase include:

- Collect additional data on units and buildings as needed to inform and make the best choices for the retrofit design and implementation plan
- List and evaluate all areas and options for retrofit improvements
- Design retrofit approach based on selected improvements and project objectives
- Develop a phased plan for implementing improvements
- Inform and engage users about the project plan

A key good practice for the design phase is to avoid lock-in effects that can limit future options for the most effective energy efficiency measures to achieve long-term targets and performance improvements.

67. Ibid, p 97.

Phase 4: Conduct and Manage the Installation

This phase is where the rubber hits the road. Property managers engage and depend on a team of external contractors to install the retrofit at the specified properties according to the design and plan established in Phase 3.

Key steps/tasks during this phase include:

- Engage and manage the construction team
- Set up and implement a plan quality assurance
- Coordinate installation with building users
- Train users on the retrofit and any actions they may need to take

As in other phases, proactive engagement and communication with project partners, building users and other stakeholders are key for a smooth and successful project. Project owners will want to make sure the whole team of internal and external partners thoroughly understands the retrofit design and project plan, as well as the roles, responsibilities and tasks assigned to each project partner.

Project managers will also need to provide regular updates to residents and other building users on progress, timings and any changes to the project plan.

Phase 5: Manage and Report on Performance

This phase consists of the ongoing management and reporting activities that take place after the retrofit is completed.

Key steps/tasks during this phase include:

- Survey building users – 3 months after completion to assess their satisfaction and obtain feedback on the retrofit plan and installation
- Monitor and report on performance against metrics identified in Phase 2
- Develop plan for any remedial work that may be needed to meet original objectives and performance metrics

07

Best Case versus Pragmatic Approaches.

Day-to-day decisions in real world operating settings often differ from best-case approaches like deep renovations and fabric-first retrofits. In interview and focus group settings, heads of asset management and sustainability attest to the challenge of balancing competing interests as well as short- and long-term considerations. They have to wear many hats and respond to the needs of different stakeholders, from senior management to residents.

In practice, this can mean:

- Many retrofit projects consist of upgrading just one or a few elements at a time rather than the entire unit or building
- Deeper retrofits and Net Zero are longer term priorities that often need to wait for more immediate maintenance, repair and safety needs
- Meeting near term targets for minimum energy performance standards (such as EPC C) often takes precedence over deep retrofits and Net Zero.

While this section is based on input from and applies most directly to United Kingdom housing associations and their stakeholders, many of the insights also have applicability to retrofits for residential and other properties by other organisations and in different countries.

Real World Barriers to Housing Retrofits

Numerous factors can get in the way of implementing and scaling up retrofit projects. Barriers to retrofits commonly cited by property managers, landlords and other stakeholders can be grouped in the areas below.

1. Policy and Financing Challenges
2. Data and Information Gaps
3. Organisational and Management Barriers
4. Sourcing and Supply Chain Hurdles
5. Resident Engagement and Adoption Challenges

Policy and Financing Challenges

- Policy and regulations – a general lack of clear, consistent policy hampers the progress of retrofits. Property managers are faced with trying to make sense of many different, often contradictory policies and guidance from governments and regulatory bodies at local, regional, national and international levels.
- Funding and financing – retrofit initiatives often depend on public funding and other special financing arrangements. Property managers find it difficult to keep up with and navigate complicated application processes. When funding does exist, as with the Social Housing Decarbonisation Fund, the timeline may not be realistic or fit well with managers' planning cycles for improvements. In the past, funding has also been withdrawn midcourse.
- Net Zero – the concept and what it means in practice is complicated and often unclear. Some property managers don't understand it well yet, and many don't have a good sense of what it takes to get there.

Data and Information Gaps

- Information about property condition and characteristics – the task of surveying and collecting data that is needed for retrofits across thousands of properties is overwhelming. Some property managers are conducting thousands of surveys a week. Missing or incomplete documentation is common for older buildings and makes it difficult to carry out retrofits. The only solution is often to send someone onsite to recreate the documentation.

Organisational and Management Barriers

- New construction versus existing stock – property managers point to a common tendency for organisations to favour new construction over improvements in existing buildings that are the focus of retrofits.
- Maintenance and improvement budgets – many organisations have separate budgets for maintenance and improvement work. A lack of alignment and visibility across these budgets can favour the sub-optimal allocation of resources to shorter-term maintenance needs. This can lead to forgoing more strategic and cost-effective investments in retrofits.

Sourcing and Supply Chain Hurdles

- Workforce skills and capacity – retrofit project owners and stakeholders refer to a shortage of skilled and accredited contractors (for example for Wave 1 of the SHDF, all projects were required to be compliant with PAS 2035; contractors must be Trustmark registered and where applicable MCS certified (or accredited to a scheme that BEIS is satisfied is equivalent))

- Sub-contracting – many contractors work with sub-contractors. Property managers often have limited visibility into sub-contracting arrangements and whether they have appropriate qualifications, fully understand project requirements, etc.

Resident Engagement and Adoption Challenges

- Buy-in and acceptance – residents may not be comfortable with proposed energy efficiency measures and resulting disruptions.
- Multi-tenure schemes – blocks of flats can include owners as well as renters. Owners may have different interests and resist retrofits.
- Resource constraints – engaging residents can take considerable time and effort when staff and resources are already in limited supply.

The following studies have informed this report and are helpful resources for learning more about the barriers to retrofits: "Scaling Up Retrofits 2050" and "What are the Barriers to Retrofit in Social Housing?". Please refer to the reference section for more details.

Opportunities to Accelerate and Improve Housing Retrofits

Property managers and other stakeholders offered several ideas for ways that external service providers could support their work and help to drive more retrofits, including:

- Achieve EPC C compliance – help identify easy wins and execute action plans to implement simple energy efficiency measures such as lighting upgrades.
- Prepare the business case and financials – support with preparing the business case and working with the finance department would be helpful for managers whose remit focuses more on ESG/sustainability and retrofits.
- Help navigate and simplify policy and funding challenges - provide user-friendly tools that help managers to efficiently navigate policy requirements and funding sources and to quickly complete application processes for funding retrofit initiatives.
- Facilitate surveys and data collection – better data leads to better retrofit outcomes. Property managers need help with conducting surveys and collecting data needed on building stock to assess and identify buildings for retrofits.
- Revamp maintenance contracts – provide 'Best In Class' guidance describing how to draw up maintenance and improvement contracts.
- Align improvements with repairs – take advantage of times when something breaks or needs repair to implement retrofit measures. This can help to overcome the inertia and mental strain that get in the way of retrofits.
- Help manage projects and contractors – help to manage and coordinate project phases and work across the variety of contractors often needed for retrofit projects. Look for opportunities to combine

> **The best time to take action on retrofits for energy efficiency is often when something breaks. That way there isn't a need to rip out something that's working fine, which just adds mental stress and process strain.**
>
> - Jimmy Jia, Venture Partner, Pi Labs

visits and projects to minimise disruptions and rework. Identify and manage sub-contracting arrangements.

- Help engage and educate residents – property managers need help with engaging, educating and getting buy-in from residents for retrofits.
- Fill gaps in net carbon zero requirements – support property managers with taking action to address emerging issue areas like biodiversity and green spaces.
- Enable pilot projects – experimenting with smaller scale projects can be a great way to learn about and improve the approach to retrofits. Successful pilot projects can help prove out operating and business cases and unlock bigger opportunities to scale up retrofits.
- Provide a plug-and-play solution/one-stop-shop for retrofits – an asset manager would love to be able to set out the retrofit measures and rely on a one-stop service provider to manage everything from there.

Opportunity for Leadership and Transformation

The high stakes and enormous scale of the challenge to advance building retrofits present a tremendous opportunity for leadership. There is an urgent need to transform the pace of retrofits and accelerate the path to deep renovations. The convergence of climate, health and poverty issues is an extremely compelling call to action.

In many ways, the issues at hand are tailor-made for leadership in the ESG space. In housing especially, a strategic, leading approach to advancing retrofits presents a golden opportunity to simultaneously tackle some of the most pressing environmental, social and economic issues facing society. Retrofits can be a powerful engine for building an inclusive, low-carbon economy that leaves no one behind.

08 Conclusion.

This report is primarily intended to provide useful information and serve as a resource for landlords, property managers, their suppliers and other key stakeholders engaging in building retrofits for energy efficiency.

It focuses on raising awareness about key issues, challenges and opportunities related to evaluating, implementing and managing retrofits in the residential property sector. The markets, issues and approaches to retrofits vary by region, country and locality. This report mainly focuses on retrofits in the European Union, Germany, the United Kingdom and the United States.

Plentific works with landlords to transform how they deliver repairs and maintenance services. With over 800,000 properties under management, Plentific is trusted by the biggest, most progressive landlords across the United Kingdom, United States and Germany.

GlobeScan is an independent, international insights and advisory consultancy. GlobeScan collaborates with leading companies, NGOs, and governmental organisations to deliver insights that guide decision-making and build strategies for a sustainable and equitable future.

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- Adam Hackett, Transformation Director – Sustainability, Aster Group United Kingdom
- Elly Hoult, Group Director of Assets, Notting Hill Genesis
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- Jimmy Jia, Venture Partner, Pi Labs
- Catherine McGarry, Energy Officer, The Riverside Group
- Paul Norman, Head of Asset Management, Clarion Housing Group

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Appendix.

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