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# The market alone won't fix it: the dilemma of climate-neutral real estate

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Allianz Research

# Content

# Executive Summary


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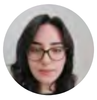
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- **The residential real estate sector is a major yet often underestimated contributor to greenhouse gas emissions in Europe.** Decarbonizing housing is crucial for achieving carbon neutrality but presents complex challenges due to the region's outdated building stock, high renovation costs and fragmented ownership structures. In major European economies (Germany, France, Italy, Spain and the Netherlands), direct emissions from homes account from 7% (Spain) to 14% (Germany) of national totals, on par with or even exceeding industrial emissions. When indirect emissions are included, this share can double, underscoring the sector's systemic climate impact.
- **Short-term pain, long-term gain: Under a net-zero scenario, house prices could be 10bps (France) to 50bps (Germany) higher.** In a net-zero scenario, by 2030, the effective carbon tax in the real estate sector is expected to be 80% higher on average relative to the likely scenario (mid-way between the two NGFS scenarios Below 2°C and NDCs), as still-high emissions contend with elevated carbon prices. However, as decarbonization efforts, such as retrofitting, fuel switching and efficiency improvements, take effect, real estate emissions will fall and the effective carbon tax decline. By 2040, the sector would become more cost-efficient under the net-zero path than in a likely scenario, reducing exposure to future carbon costs. This transformation has direct implications for investment activities in the real estate sector. By 2050, housing market activity (investment in renovation, construction of new energy-efficient buildings etc.) under the net-zero scenario exceeds the likely scenario by 38% to 58% across major European economies. As a result, house prices are projected to be 10bps (France) to 50bps (Germany) higher than in the likely scenario.
- **Under a net-zero real estate transition, GDP could rise by EUR120.7bn in Germany, EUR39.4bn in Italy, EUR26.3bn in the Netherlands, EUR25.8bn in France and EUR12.3bn in Spain.** While the early years (2030–2040) see only modest gains in gross value added (GVA) of the real estate sector, about 5% above the likely scenario, this changes markedly from 2040 onward as operational costs fall, demand rises and energy efficiency improves. Between 2041 and 2050, real estate GVA is projected to exceed the baseline by 20–30%, especially in Spain and the Netherlands. Cumulatively, the sector could generate nearly EUR1trn in additional value in Germany alone by 2050. The transition also acts as a job engine, with real estate employment growing 9% annually under the net-zero pathway, adding over 345,000 new jobs across Europe's five largest economies (106,600 additional real estate jobs in Germany, 98,300 in France, 70,800 in Spain, 52,400 in Italy and 16,800 in the Netherlands). Overall, the net-zero real estate transition could lower unemployment by an average of 0.2pp and increase GDP by EUR120.7bn in Germany, EUR39.4bn in Italy, EUR26.3bn in the Netherlands, EUR25.8bn in France and EUR12.3bn in Spain.

- **Achieving net-zero targets by 2050 will require a substantial investment of approximately EUR3trn in cumulative energy-related renovations across the continent's four largest economies.** This equates to an annual investment of around EUR121bn. Investment requirements vary considerably among countries due to differences in climate, building age and existing energy-efficiency levels. With the highest demand, Germany requires EUR1382bn for the residential sector alone, plus an additional EUR103bn for commercial properties. France follows with an estimated investment need of EUR936bn by 2050. In contrast, Italy and Spain, which have smaller building stocks and more favorable energy consumption profiles, have a combined lower investment requirement of EUR604bn.
- **Energy savings alone will not foot the bill for renovations. Much higher carbon prices are crucial, but unrealistic.** Assuming renovations align with a 1.5°C pathway, energy savings over a 20-year period can reduce overall expenses by 41-77%, resulting in discounted net costs of EUR677bn in Germany and EUR80bn in Spain. While energy savings provide some financial relief, they alone cannot incentivize the necessary increase in renovation activity. Carbon prices have to play a pivotal role in bridging the investment gap. Our analysis of various carbon price scenarios indicates that only high price levels, projected at approximately EUR350/tCO2 by 2035, can effectively offset the initial expenditures required. However, such price levels seem political and social infeasible.
- **Solving the dilemma of climate-neutral real estate requires a policy mix of higher carbon prices, targeted financial support and enhanced policy frameworks.** Addressing funding and incentivization gaps is crucial as current cost savings and projected emission pricing may not suffice to cover high upfront investment costs. Establishing accessible one-stop shops for tailored guidance and financial support, along with fast-track certification programs for critical roles, can help overcome barriers and accelerate renovation efforts. On the energy supply side, binding timelines for phasing out fossil fuel boilers and targeted subsidies for heat pumps are essential to drive the transition toward cleaner energy solutions. Policymakers should allow carbon prices to rise more swiftly to reduce the need for market-distorting measures like bans and subsidies. In this case, timely and transparent communication is crucial to ensure stakeholders can effectively adjust and invest in necessary renovations.

# Energy and emissions in Europe's current building stock

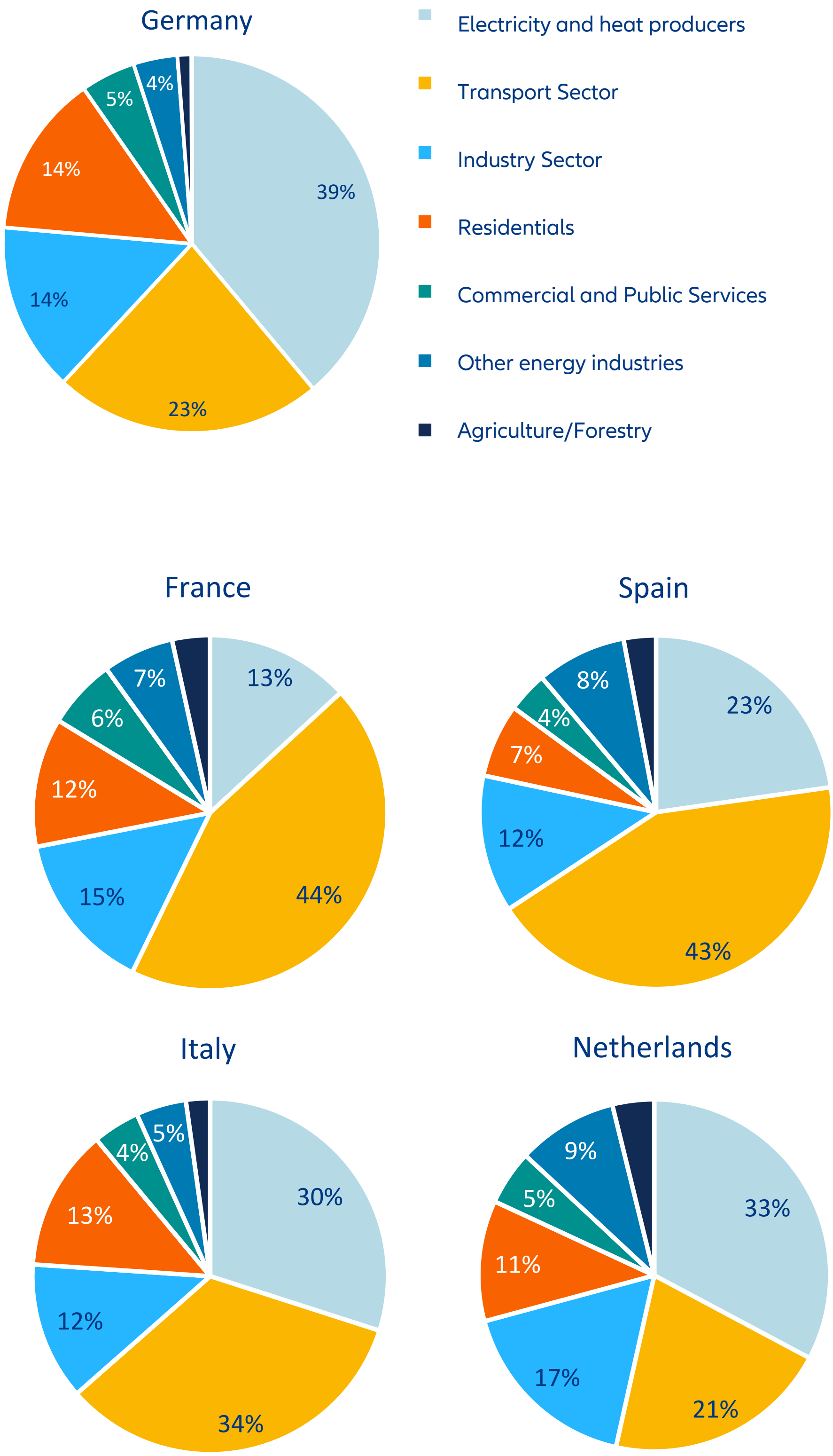
**A successful transition to a carbon-neutral economy will not be possible without tackling emissions from the real estate sector, especially housing.** Yet, making residential buildings carbon neutral is anything but simple. Much of Europe's building stock is decades old, poorly insulated and expensive to renovate. On top of that, fragmented ownership and mixed incentives make large-scale upgrades slow and difficult[1]. Decarbonizing homes isn't just about technology; it requires aligning policies, financing tools and everyday behaviour with long-term climate goals.

**The residential sector accounts for a significant share of national emissions across Europe's five largest economies (Figure 1).** In Germany, residential buildings are responsible for 14% of total emissions, comparable to the industrial sector and second only to transport. Italy and France follow closely, with residential emissions making up 13% and 12% of their national totals, respectively. Even in countries like the Netherlands (11%) and Spain (7%), where electricity is cleaner or heating demand is lower, homes still represent a meaningful portion of emissions. Importantly, these figures reflect only direct emissions, those associated with space and water heating, cooling, ventilation, lighting and household appliance use. When indirect emissions are taken into account, the carbon footprint of the residential real estate sector increases substantially. These include emissions from upstream and downstream activities such as the production of construction materials, building processes, maintenance and waste generation. According to the OECD's 2023 report[2], the share of residential real estate in total emissions across OECD countries rises from 11% to 23% when both direct and indirect emissions are included. This broader view highlights the systemic nature of the sector's climate impact.

[1] Homes and commercial buildings need substantial investments to become more resilient and sustainable. Who pays for these investments has important equity implications.

[2] Home, green home: Policies to decarbonise housing | OECD

**Figure 1:** Sectoral breakdown of direct CO2 emissions in major European economies (2022)

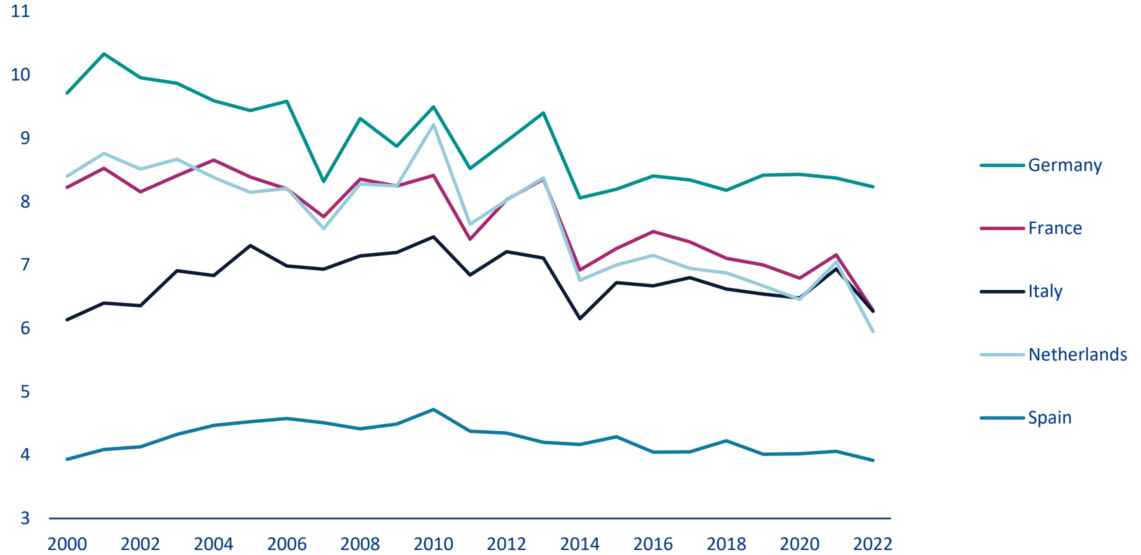



Sources: IEA, Allianz Research

**Since 2000, all major European economies have made measurable progress in reducing $CO_2$ emissions from the real estate sector (Figure 2).** France has led the way with a -51% reduction, followed by the Netherlands (-40%) and Germany (-30%). These emission cuts have been driven by a combination of improved energy efficiency, the gradual replacement of oil-based heating systems and the increasing decarbonization of electricity supply, particularly in France, where residential energy is largely powered by low-carbon nuclear and renewables. In contrast, Spain and Italy have recorded more modest declines, partly due to already lower per capita residential emissions and slower renovation rates. While the overall trend is encouraging, the pace of carbon abatement has decelerated in recent years, especially in Germany and Italy. Globally, energy intensity improvements in residential buildings slowed to just 0.5% in 2020, well below the historical average of 1.5–2%[3].

**Residential energy use remains a major component of total final energy consumption across Europe's largest economies (Figure 3).** In Germany, the residential sector represents the largest share of energy demand at 27%, followed closely by industry (25%) and transport (24%). France and Italy display similar patterns, with residential use accounting for 24% and 26% of total energy consumption, respectively. While the residential share is somewhat lower in Spain (17%) and the Netherlands (17%), it still constitutes a substantial portion of national energy demand. These figures highlight the structural importance of the residential sector in shaping energy policy and planning. A large share of household energy use is driven by space and water heating, especially in countries with colder climates such as Germany. This makes the sector particularly sensitive to seasonal demand peaks and fossil fuel dependency for heating. It is important to note that high residential energy consumption does not automatically equate to high emissions. The carbon intensity of household energy use depends heavily on the underlying energy mix.

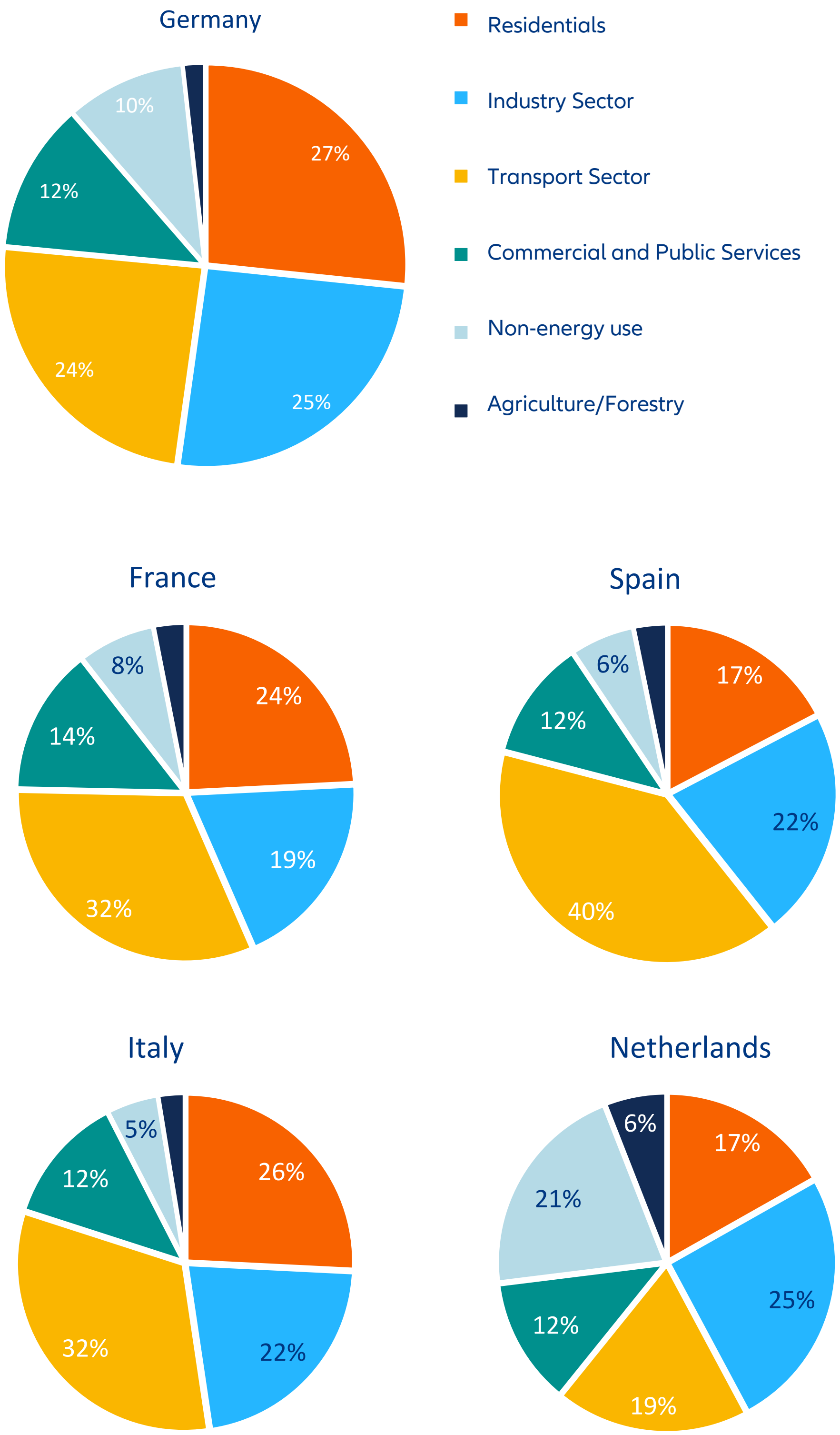
**Figure 2:** Trend of CO2 emissions in the residential sector in major European economies (per capita, tCO2)




Sources: IEA, Allianz Research

[3] Energy Efficiency 2022

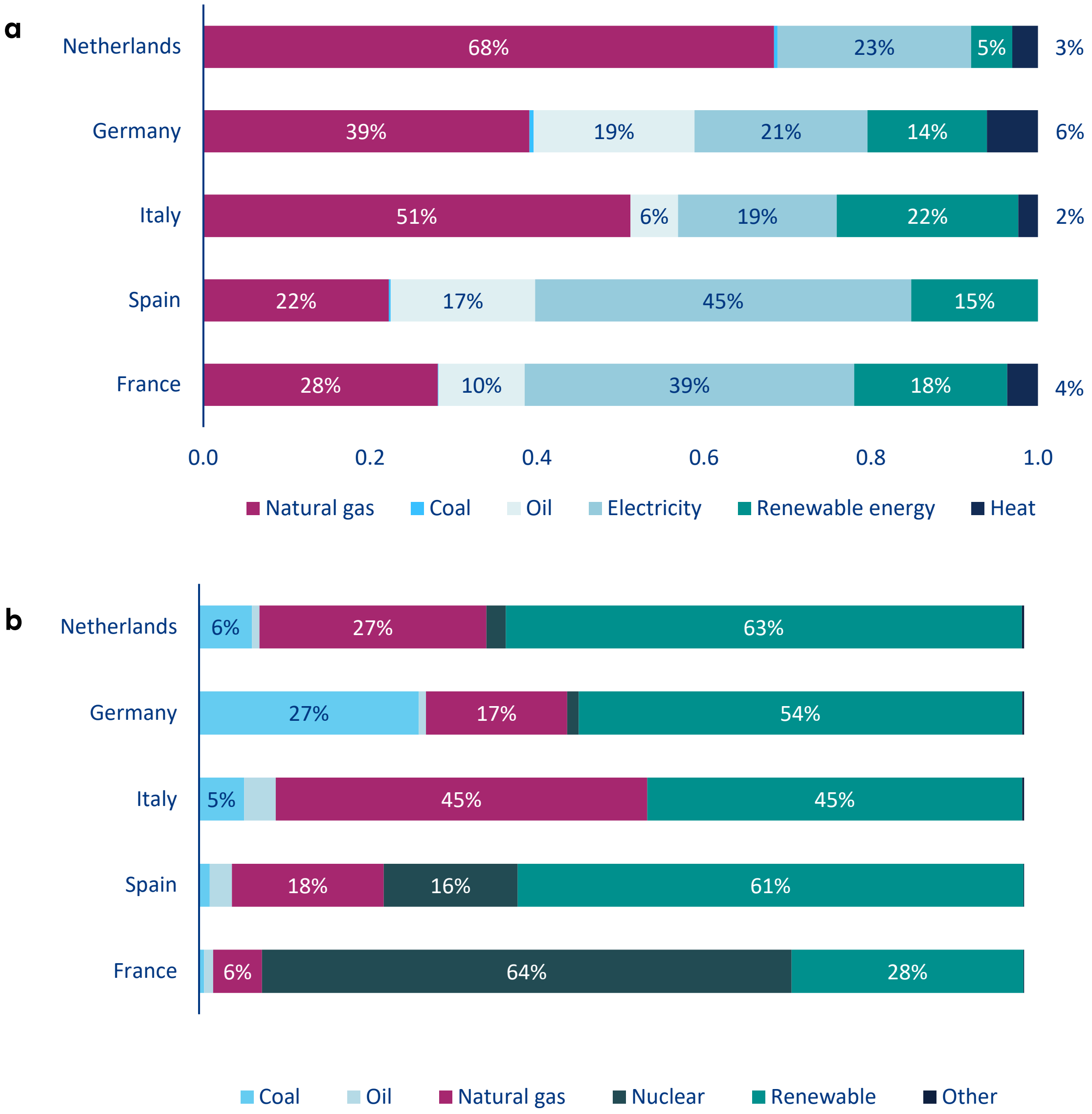
**Figure 3:** Sectoral breakdown of final energy consumption in major European economies (2022)




Sources: IEA, Allianz Research

**The European residential real estate sector remains heavily reliant on fossil fuels, with an average of 53% of the energy mix coming from either natural gas or oil (Figure 4a).** This high dependence significantly contributes to direct $CO_2$ emissions from households, especially in countries such as the Netherlands, Germany and Italy, where fossil fuels account for more than 50% of residential energy consumption, respectively. In contrast, Spain and France present more diversified and cleaner energy profiles. Spain sources 45% of its residential energy from electricity and 15% from renewables, while France combines 39% electricity use with an 18% share from renewables. This higher rate of electrification, coupled with decarbonized power generation, is a key reason for their relatively low per capita emissions (Figure 2). In 2022, 91.3% of France's and 70.2% of Spain's electricity came from low-carbon sources, nuclear, hydro and renewables, substantially lowering the emissions intensity of residential energy use (Figure 4b). Germany and Italy, although showing progress in electrification, still rely more heavily on fossil fuel for electricity generation (44.6% in Germany and 54,3% in Italy, 2022). Reducing fossil-fuel reliance in home energy use, particularly through electrification and the expansion of clean power generation, will be critical to achieving further emissions reductions across the real estate sector.

**Figure 4:** Energy source composition in residential and electricity sectors across major European economies (2022): (a) displays the share of final energy consumption in the residential sector by energy source; (b) presents the electricity generation mix

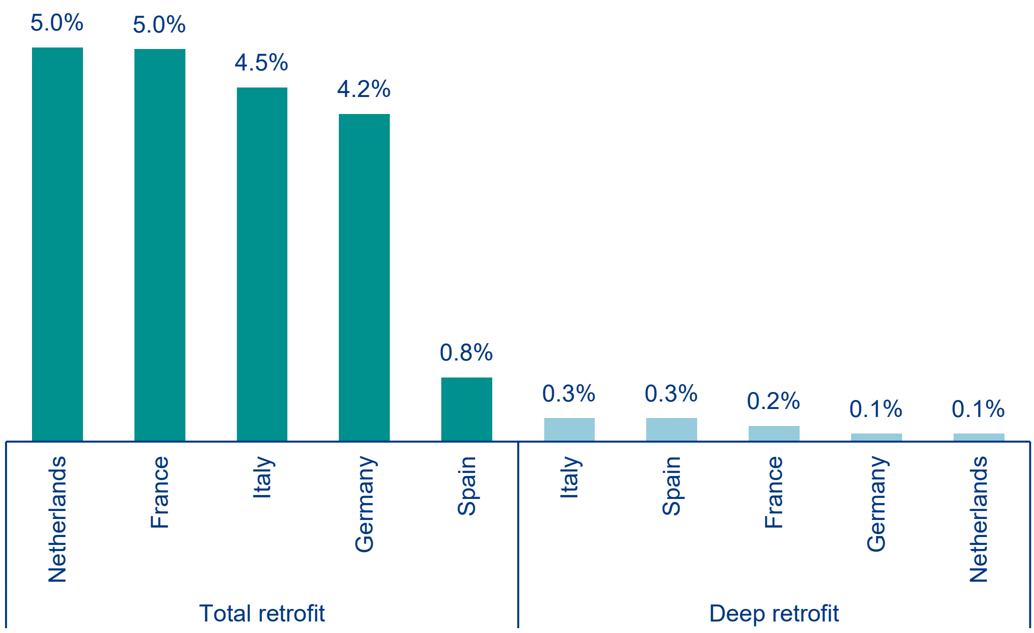



Sources: IEA, Allianz Research

**Recent efforts to decarbonize the building sector have increasingly focused on accelerating energy-efficient renovations.** But progress remains uneven across countries. Retrofit rates vary significantly, both in terms of scale and depth (Figure 5), reflecting a mix of policy ambition, market maturity and structural challenges. France and the Netherlands lead in total retrofit activity, with annual rates around 5%, followed by Germany and Italy. However, deep retrofits , which are critical to achieve meaningful energy savings and emissions reductions, remain extremely rare, averaging only 0.1% to 0.3% annually across all of the five largest European economies. This slow uptake is rooted in persistent barriers. According to respondents of the 2020 European Commission's Open Public Consultation , 92% identified limited financial resources as the main obstacle to building renovation, while 80% pointed to the lack of immediate payback as a disincentive. Additionally, over 70% highlighted difficulties related to split incentives between owners and occupants, and the complex planning, permitting and financing processes, especially in multi-apartment buildings. These findings underscore the need to go beyond headline retrofit targets and address the systemic and behavioural constraints that hinder deep renovation. Unlocking the full decarbonization potential of the building stock will require targeted financing tools, simplified administrative procedures and strong policy coordination to overcome both economic and governance bottlenecks.

**As Europe accelerates its transition toward climate neutrality, heat pumps have emerged as a cornerstone solution for decarbonizing space and water heating, particularly in the residential sector.** Heat pumps are not only significantly more energy-efficient than traditional systems, delivering up to four units of heat for every unit of electricity consumed, but they are also crucial for aligning residential energy use with the growing share of renewables in the power sector. However, adoption patterns across Europe reveal strong disparities. Between 2012 and 2023, sales of heat pumps quadrupled in most major economies, with France leading by far, reaching 720,000 units sold in 2023 (Figure 6a). Italy and Germany

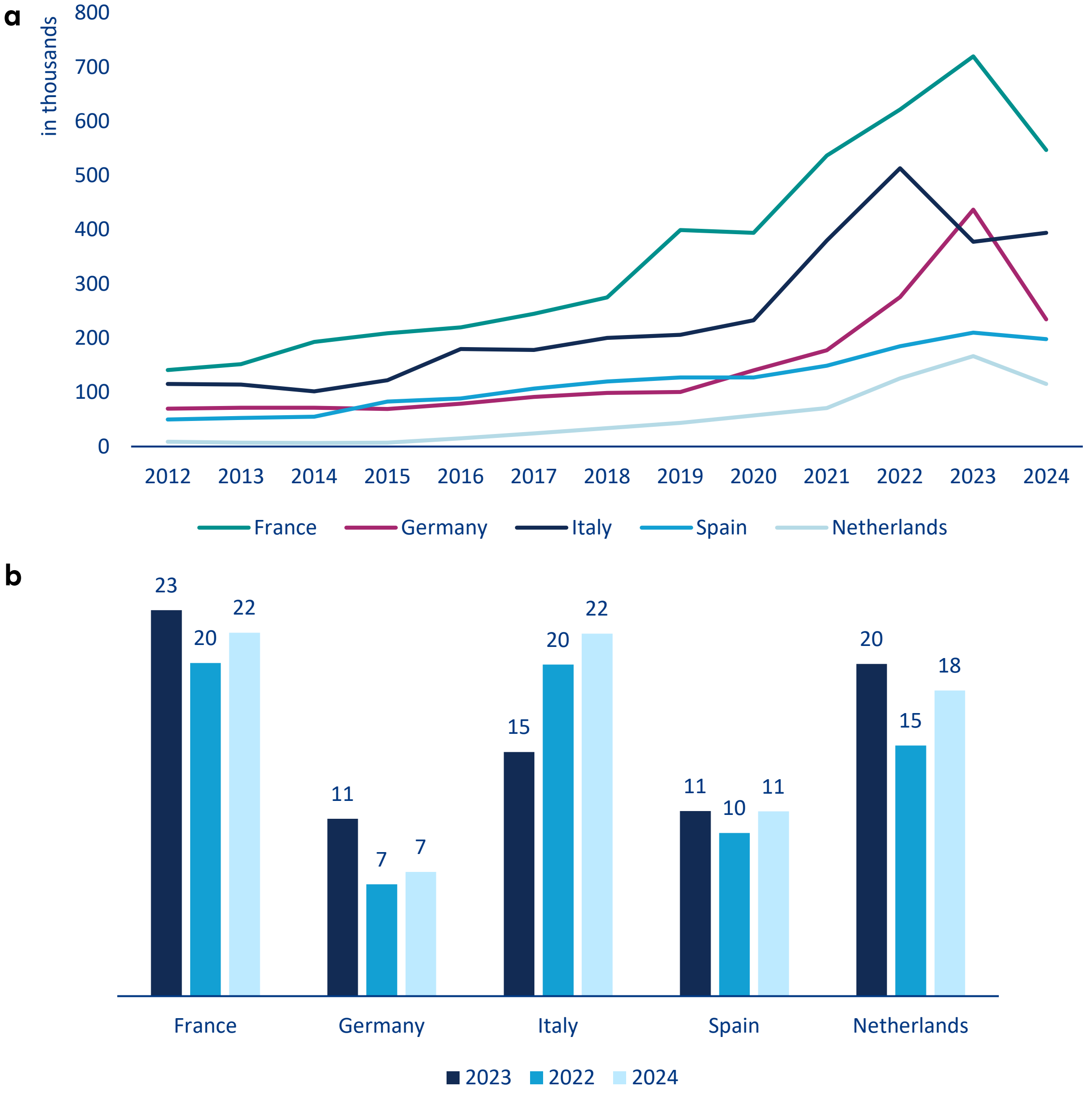
**Figure 5:** Annual retrofit rates in the residential building sector across major European economies (2016)




Sources: BSO, Allianz Research

followed, with around 378,000 and 437,000 units respectively. Yet, in 2024, most of the European countries, mainly Germany and France, experienced a marked decline in sales, underscoring how sensitive adoption is to both policy signals and economic conditions. A key factor in this uptake is the electricity-to-gas price ratio, which significantly shapes consumer decisions. According to a recent study , heat pumps are more attractive where electricity is relatively cheap compared to gas. In Germany, for example, electricity was four times more expensive than gas in 2022, leading to relatively modest adoption rates, just 11 heat pumps sold per 1,000 households in 2023 (Figure 6b). The study estimates that halving electricity prices or doubling gas prices could nearly double heat pump sales. These findings highlight that boosting heat pump adoption will require more than subsidies; it demands structural price reform, targeted electricity tariffs and stronger policy consistency, such as higher carbon taxation for fossil energy.

**Figure 6:** Evolution of heat pump sales in the five major European economies: (a) Total sales of heat pumps by country; (b) Heat pump sales per 1,000 households




Sources: EHPA, Allianz Research

[4] A deep retrofit involves a thorough renovation of a building to drastically reduce energy demand, typically by 50% or more.

[5] Renovation wave

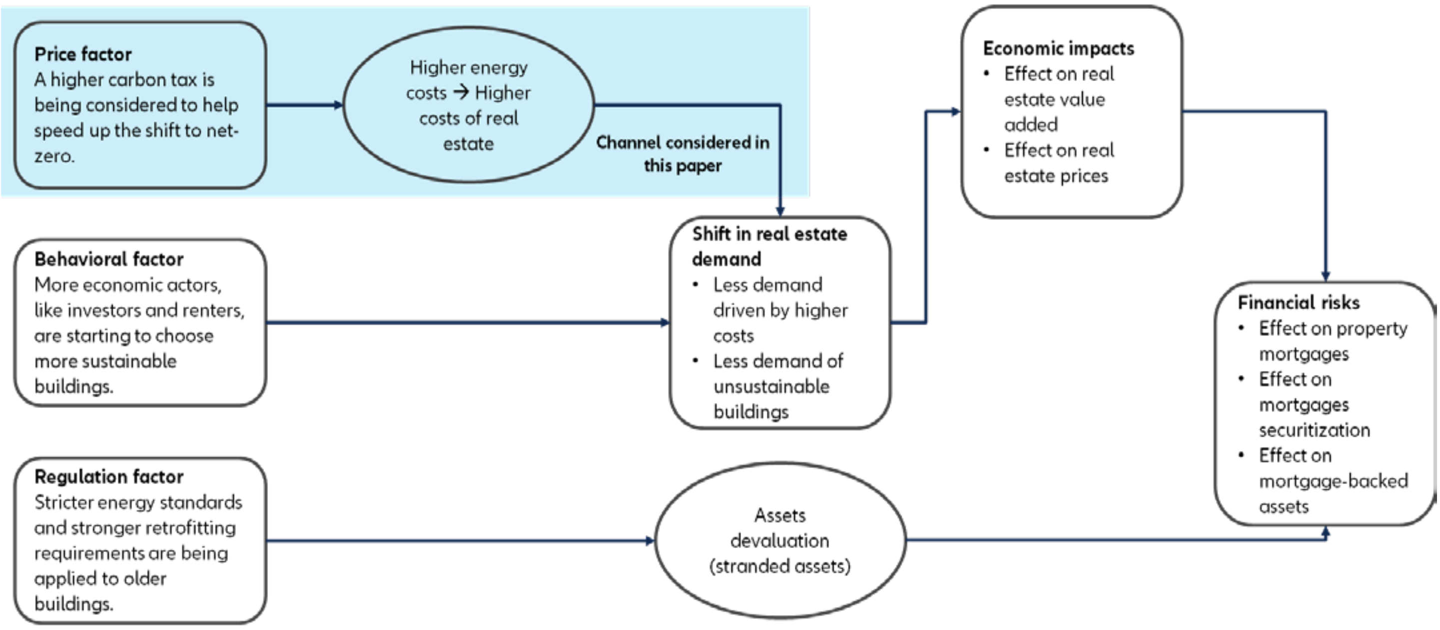
[6] KfW Research: Halving power prices could double heat pump sales in Germany | KfW

# Economic consequences of a carbon-heavy real estate sector

**While the real estate sector is not typically classified as hard-to-abate[7] , achieving climate neutrality in Europe's building stock presents significant challenges.** These stem primarily from the high share of outdated buildings, many of which lack adequate insulation and continue to rely on fossil fuel-based heating systems, particularly natural gas and oil[8]. The scale of retrofitting needed to meet climate targets is substantial and may entail considerable upfront investment. However, the economic cost of inaction, in the form of escalating energy bills, stranded assets and growing climate risks, could prove far greater and ultimately unsustainable in the long term.

**This dynamic is illustrated in Figure 7, which provides a simplified representation of transition risk in the real estate sector.** One core pathway considered in this analysis is the price channel, where the introduction of a higher carbon tax increases energy costs, thereby raising the operating costs of real estate. This, in turn, triggers a demand shift, with reduced market interest in carbon-intensive or energy-inefficient properties. At the same time, behavioural and regulatory pressures are reinforcing this shift. Investors and renters are increasingly opting for more sustainable buildings, while policymakers are tightening energy performance standards and retrofitting requirements, particularly for older stock. Together, these factors contribute to the devaluation of inefficient assets, which may ultimately become stranded. The downstream impacts are both economic and financial. On the economic side, reduced demand and higher operating costs can lead to declines in the global value-added (GVA) of the real estate sector and market prices (Box 1 discusses the example of commercial real estate). Financially, this creates vulnerabilities across mortgage portfolios, securitized assets and other real estate-linked financial products. If unmanaged, these risks could propagate through the financial system

**Figure 7:** Simplified overview of transition risk channels in the real estate sector




Sources: Allianz Research

[7] New MPP tracker reveals heavy industry transition has started but needs to accelerate sevenfold to meet 2030 climate targets

[8] Carbon neutrality in the residential sector: a general toolbox and the case of Germany | npj Climate Action

## Box 1: The price of climate inaction: financial costs of non-compliance in European commercial real estate

**European commercial real estate (CRE) faces mounting financial risks if it fails to meet emerging climate policies.** Regulations on carbon emissions, energy efficiency and sustainability are tightening across the EU: the recast Energy Performance of Buildings Directive (EPBD) will introduce Minimum Energy Performance Standards (MEPS) that force upgrades of the worst-performing stock. Poorly rated buildings therefore risk becoming stranded assets, unable to attract tenants, buyers or financing. In parallel, the Emissions Trading System (ETS) is being extended to cover buildings, and many member states now tax the carbon content of heating fuels. These measures will lift operating costs for inefficient properties, squeezing profit margins. Yet around 70% of EU buildings still have poor energy performance, in large part because 80% of the stock predates 2000. For CRE owners in major markets such as Germany, France, Italy, Spain and the Netherlands, failing to retrofit today's assets could translate into sharp capital-value depreciation and sustained profitability erosion in both the near and long term.

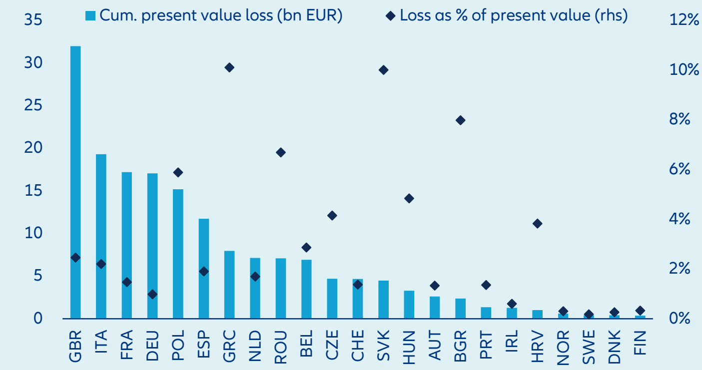
**The cost of inaction is already materializing: "brown" properties are losing value and trading at discounts relative to "green" ones.** As investors and tenants increasingly screen for climate credentials, properties with poor Energy Performance Certificate (EPC) ratings suffer not only thinner buyer pools and longer marketing times, but also weaker pricing. Recent transactions and appraisal across Europe show 5-15 % capital-value discounts for buildings with poor EPCs or high carbon intensity compared with similar low-carbon stock, and the spread is likely to keep widening. Short-term value at risk is greatest in markets that have imposed early minimum standards, most notably the Netherlands and France, and in countries with large retrofit backlogs, such as Germany, where a high share of post-war stock still must be upgraded to meet the 2025–2027 EPC hurdles.

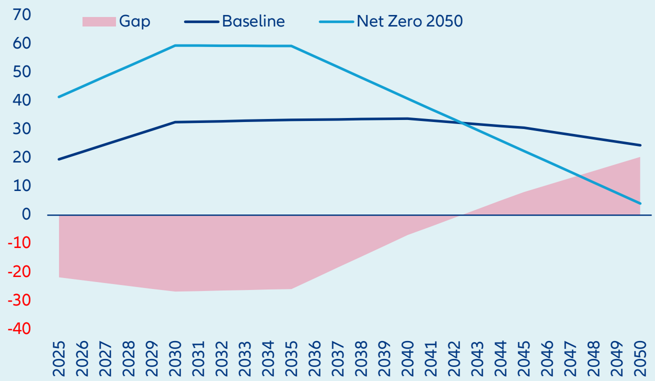
**If owners continue to postpone retrofits, many brown properties will cross regulatory red lines and become stranded assets, triggering steep write-downs over the long run**. Climate regulations could lead to abrupt shocks to property valuations globally, with non-compliant buildings becoming impossible to rent or sell if they don't meet standards. Without deep retrofits, a large share of today's building stock will overshoot future carbon budgets, translating into substantial value impairment. By 2050, such brown assets might effectively be valued at land value minus demolition cost. As the EU is pursuing one of the world's most aggressive transition paths, the hit is especially severe: we estimate that climate inaction could erode at least 2% of the accumulated present value of Europe's EUR8.5trn CRE market by 2050 (Figure 8, left). The effective carbon-tax gap between our baseline and a net-zero pathway turns positive in 2043 and keeps widening, reaching EUR21.3bn by 2050, which is far above the EUR3.4bn projected under the net-zero scenario (Figure 8, right).

**Beyond the hit to capital values, profit margins for non-compliant buildings are being squeezed on two fronts: higher running operating costs and declining rent income.** Carbon pricing and soaring energy costs directly raise utilities expenses, which disproportionately hurts energy-inefficient buildings. Owners who cannot pass those costs through to tenants see net operating income deteriorate. At the same time, occupancy risk is growing: Climate-conscious tenants are increasingly unwilling to lease space in high-emission buildings. This can lead to higher vacancy for brown buildings, further cutting into cash flows.

**The profitability erosion will only intensify over the long term.** By 2050, carbon prices are expected to surge under our baseline scenario compared to the net-zero path, which would drastically raise the operating costs of any buildings still using fossil fuels. Combined with carbon taxes and looming bans on fossil-fuel heating, laggard buildings would face crippling utility bills or retrofit penalties that might wipe out profits altogether. By then, a market likely dominated by climate-aligned investors and tenants will leave energy-inefficient buildings with little occupier demand. The concept of "margin compression" could further extend to "margin elimination" as these assets could fall out of the income-producing stock.

**Figure 8:** Cumulative present-value loss in European CRE from non-compliance by 2050 (left) and total effective carbon taxes under baseline vs net-zero scenarios (right)




Sources: NGFS, EPRA, Allianz Research

**Reaching net-zero emissions in line with the 1.5°C climate target will require a sharp policy shift in the near term, most notably through the introduction of higher carbon pricing.** As shown in Figure 9, the effective carbon tax  in the real estate sector is expected to spike across major European economies in the early phase of the transition. By 2030, this effective tax is projected to be from 60% (Germany) to 100% (Spain) higher than under the likely trajectory , reflecting both elevated carbon prices and the sector's currently high emissions profile. However, the picture changes significantly over time. From 2035 onward, the effective carbon tax begins to decline under the net-zero pathway. This drop is primarily driven by accelerated emission reductions across the building stock, achieved through a combination of retrofits, fuel switching and energy-efficiency investments. By 2040, the sector is expected to approach climate neutrality. As a result, its effective carbon tax would fall below that of the likely scenario. This transformation would have important economic implications. While the early phase of transition may entail higher operational costs, from 2040 onward, real estate would become more cost-efficient under the net-zero pathway than if no additional climate action is taken. In this way, decarbonizing buildings not only supports climate goals but also enhances the sector's long-term economic resilience, reducing future exposure to carbon costs and helping sustain market demand.

**An increase in the effective carbon tax has a direct impact on energy prices, ultimately raising the operational costs of real estate[11]**. To understand how these rising costs affect real estate market activities, we developed a regression model grounded in historical data, capturing the relationship between operational expenditures and real estate market investment in major European economies. The results confirm a clear trend: higher operational costs are associated with a decline in real estate market appetite . However, the long-term dynamics differ significantly depending on the transition pathway pursued. Figure 10 compares the evolution of real estate investment under a net-zero transition with the likely scenario. In the mid-term, between 2030 and 2035, both pathways exhibit similar demand trajectories, reflecting the immediate cost pressures from carbon pricing and early-stage retrofitting efforts. Beyond 2035, however, market activity under the net-zero scenario begins to diverge positively. As buildings become more energy efficient and less exposed to fossil fuel price volatility, operational costs decline, boosting investments in new efficient buildings under the net zero scenario. This structural advantage supports a strong recovery in market dynamics, which continues to accelerate toward mid-century. By 2050, total real estate money flows under the net-zero trajectory outpace the baseline by a substantial margin, ranging from 38% to 58% in France, Italy, Germany, the Netherlands and Spain.

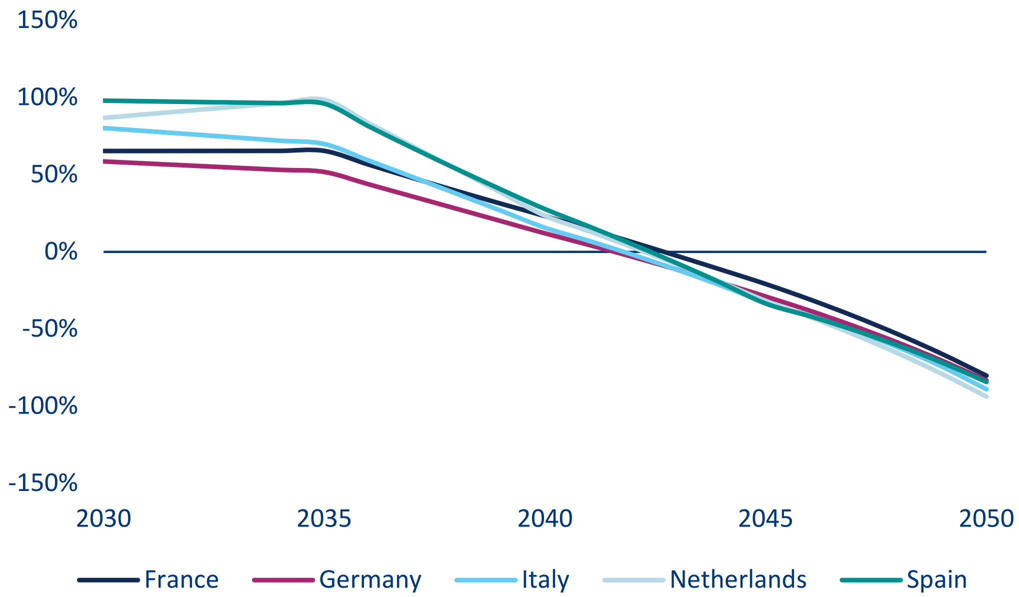
9  Effective carbon tax is defined as the product of a building's carbon emissions and the carbon tax (USD/ton of $CO_2$) set by governments.

[10] The likely scenario is assumed as the mid-way between the two NGFS scenarios: Below 2°C and NDCs.

[11] Would carbon tax policy promote real estate prices? - ScienceDirect

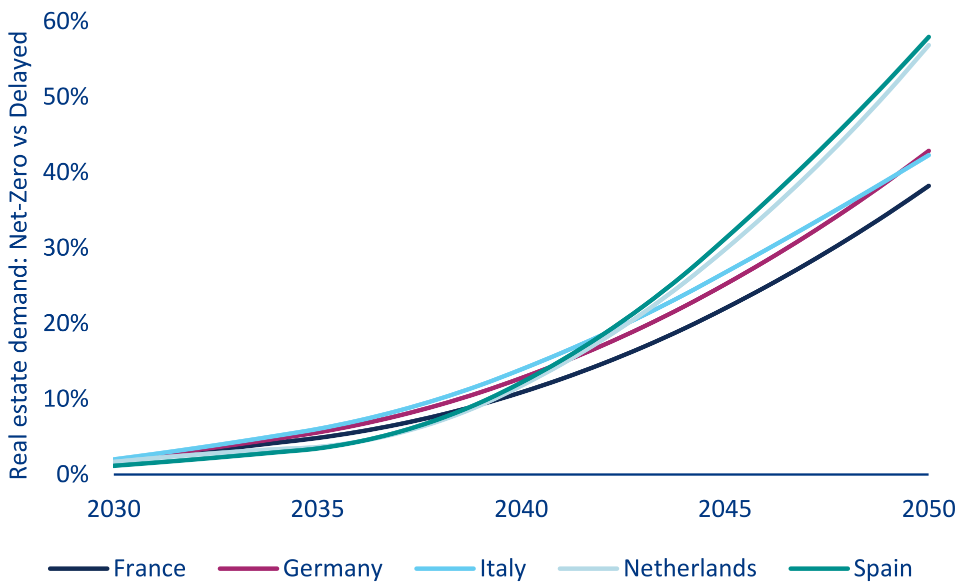
[12]  We estimate a random fixed effects panel regression considering total real estate investment and operational costs index from 1980 to 2023. The results show: total investment = -0.0002*operational costs + 0.0414, both values are statistically significant.

**Figure 9:** Comparison of effective carbon pricing trajectories in net-zero and the likely transition pathways (2030-2050)




Sources: NGFS, Allianz Research

**Figure 10:** Projected difference in total real estate investment under net-zero vs. likely climate scenarios (2030–2050)

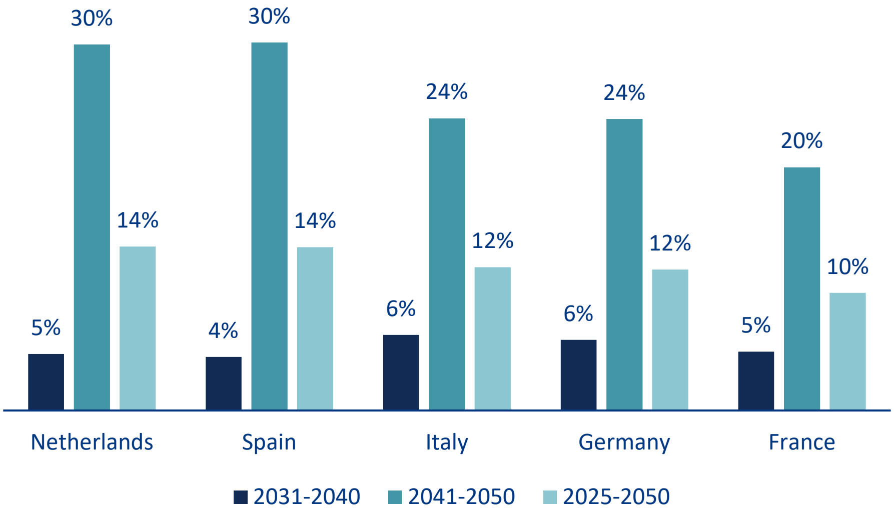



Source: Allianz Research

**The trajectory of real estate demand under a net-zero transition directly influences the sector's contribution to the economy, as reflected in its gross value added (GVA).** Figure 11 compares the GVA outcomes for two climate pathways, net-zero and likely, across different time horizons and major European economies. In the mid-term (2031–2040), the higher effective carbon tax under the net-zero scenario leads to a modest divergence, with GVA rising only 5% above baseline levels. This initial impact reflects the transitional costs of decarbonization, particularly for older, high-emitting building stock. However, as the transition accelerates and market confidence grows, the real estate sector begins to benefit substantially from lower operational costs, improved energy efficiency and rising demand for sustainable assets. From 2041 onwards, the gap widens significantly. Between 2041 and 2050, real estate GVA is projected to exceed the baseline trajectory by 20% to 30%, with Spain and the Netherlands showing particularly strong gains (Figure 11a). These increases signal the sector's growing economic resilience under ambitious climate policy, fueled by proactive investment in building upgrades, retrofitting and innovation. The long-term economic impact is considerable. Cumulatively between 2025 and 2050, the real estate sector is expected to generate an additional EUR982bn in Germany, EUR902bn in France, EUR738bn in Italy, EUR450bn in Spain and EUR154bn in the Netherlands, compared to a likely transition (Figure 11b). These figures underscore that climate ambition is not just an environmental imperative; it is also a substantial economic opportunity for Europe's built environment.

**Figure 11:** Real estate gross value added (GVA) under net-zero vs. likely scenarios: (a) Average GVA difference (%) by time window; (b) Cumulative GVA gain (EUR bn) over 2025–2050

**a**

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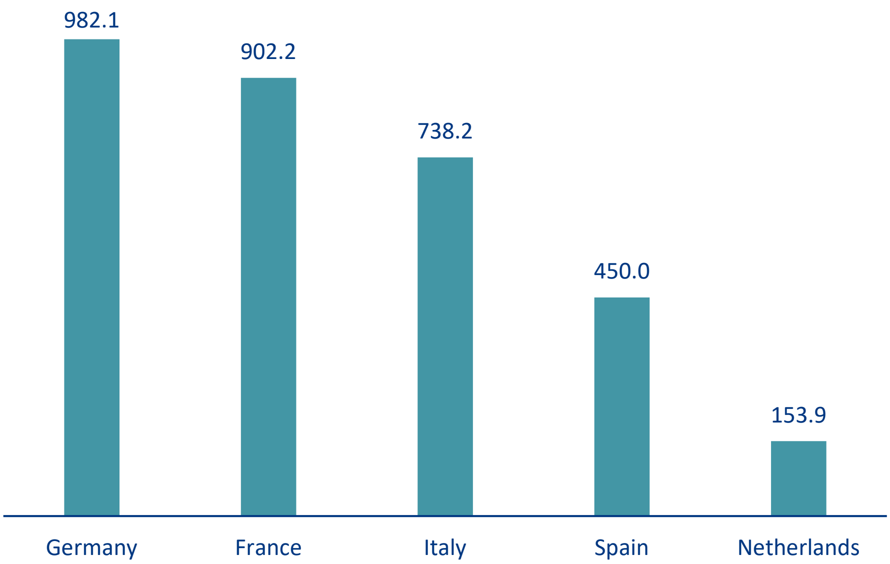
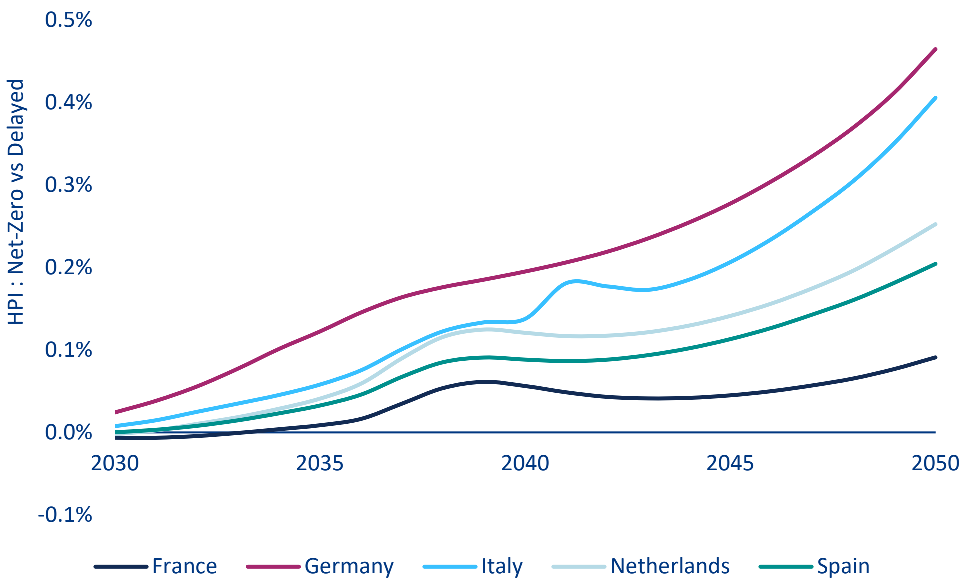



Sources: Oxford economics, Allianz Research

**The net-zero transition is not only associated with stronger economic performance and job creation (Box 2) in the real estate sector; it also supports a more favorable outlook for house price growth.** As illustrated in Figure 12, the House Price Index (HPI) under a net-zero pathway steadily outperforms the likely scenario across all major European economies between 2030 and 2050 . In the early years of the transition (2030–2035), HPI differences remain modest, reflecting the short-term adjustment to higher carbon pricing and retrofitting costs. However, as the sector becomes more energy-efficient and consumer preferences shift toward low-emission, future-proof buildings, the demand for sustainable housing strengthens. This sustained demand, combined with lower long-term operating costs, drives a widening divergence in HPI. By 2050, house prices under the net-zero scenario are projected to be 40–50bps higher than under a baseline transition in countries like Germany, Italy and the Netherlands, with Spain also seeing a marked uplift. France shows a more moderate but still positive trend. These outcomes suggest that climate-aligned buildings may increasingly be viewed as premium assets, commanding higher valuations as regulatory pressure intensifies and investor preferences evolve.

**While the macroeconomic impact of the real estate transition may appear modest at first glance, it nonetheless reveals a consistently positive contribution to GDP under the net-zero pathway (Figure 13).** The relative difference in net-zero GDP compared to the likely scenario is around 0.3% in Germany, the Netherlands and Italy, through 2050 (Figure 13a). These gains are primarily driven by increased real estate GVA, employment growth and higher investment in energy-efficient buildings as the sector shifts toward sustainability. The short- and medium-term effects (2030–2040) show a gradual divergence between the two pathways, with the GDP uplift accelerating in the final decade as the full economic benefits of retrofitting, innovation and energy savings materialize. In absolute terms, the gains are still economically meaningful. Between 2025 and 2050, the cumulative increase in GDP attributable to the net-zero real estate transition is estimated at EUR120.7bn in Germany, EUR39.4bn in Italy, EUR26.3bn in the Netherlands, EUR25.8bn in France and EUR12.2bn in Spain (Figure 13b). These figures confirm that even a sector-specific transition can support broad-based economic growth, provided it is paired with the right policy and investment frameworks.

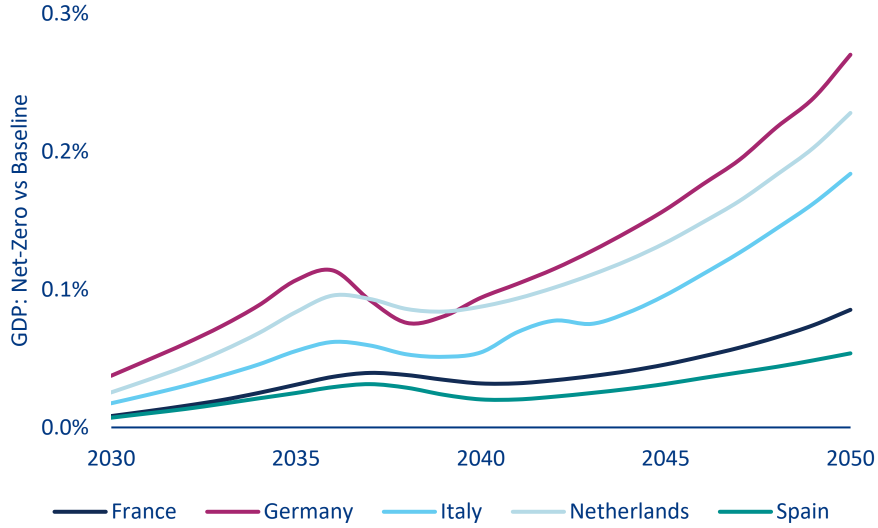
**Figure 12:** Comparative trajectory of the House Price Index (HPI) in net-zero vs. likely climate pathways (2030–2050)



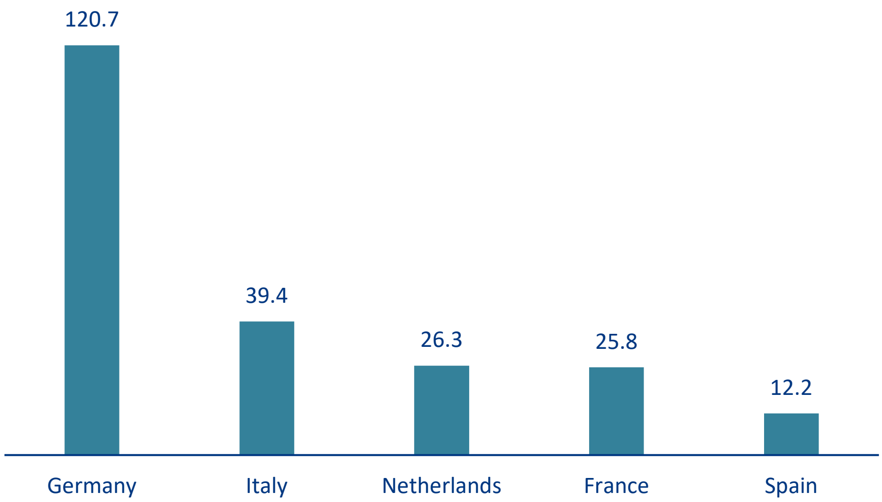

Sources: LSEG Workspace, Allianz Research

**Figure 13:** Economic impact of the net-zero real estate transition on GDP: (a) Projected relative difference in GDP (%) under net-zero vs. likely pathways (2025–2050), driven by real estate demand shifts; (b) Cumulative absolute GDP gain over 2025–2050 (EUR billion) attributable to the real estate transition

a




b



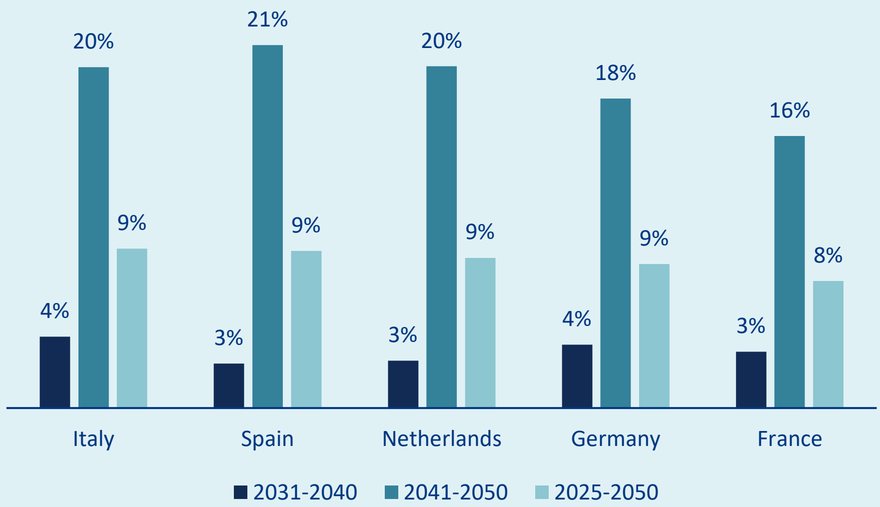

Sources: Oxford economics, Allianz Research

## Box 2: Real estate labor market developments under the net-zero transition

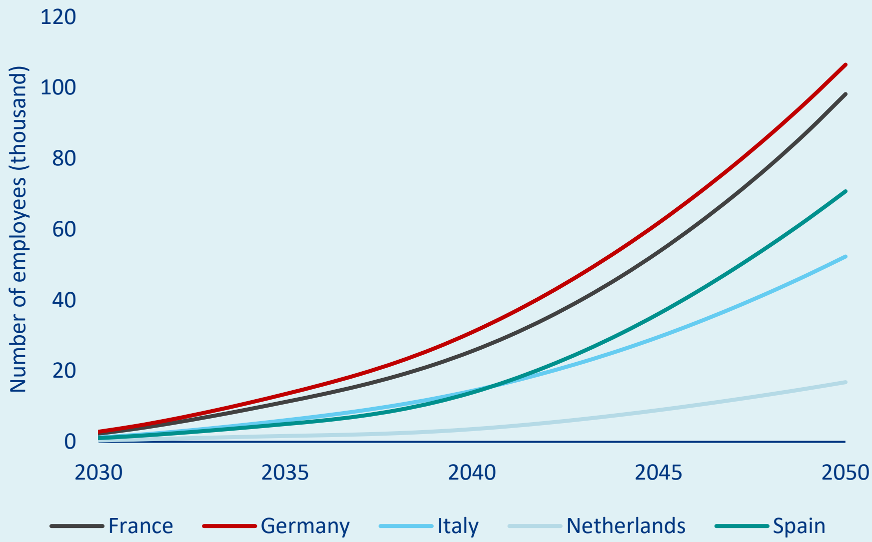
**The net-zero transition not only enhances the economic performance of the real estate sector but also delivers substantial benefits to the labor market.** As illustrated in Figure 14, the shift toward more sustainable buildings and retrofitting activity is expected to generate significant employment gains across major European economies. Over the period 2025–2050, employment in the real estate sector is projected to grow by an average of +9% annually under the net-zero pathway, compared to a likely scenario (Figure 14a). This increase translates into 106,600 additional real estate jobs in Germany, 98,300 in France, 70,800 in Spain, 52,400 in Italy and 16,800 in the Netherlands (Figure 14b). These figures reflect growing demand for construction, renovation and energy-efficiency services, as well as increased investment and activity throughout the building lifecycle. In addition to sector-specific job creation, the broader macroeconomic impact is equally important. As sustainable construction and building upgrades accelerate, the real estate sector contributes to lower overall unemployment rates across the region. Our modelling shows that, on average, the total unemployment rate is expected to decline by approximately 0.2pp under the net-zero scenario compared to the likely pathway between 2025 and 2050 (Figure 14c). These findings highlight that the transition to net-zero can serve as a job engine, offering not only climate and economic benefits but also a pathway to inclusive employment growth.

**Figure 8:** C Employment impacts of the net-zero transition in the real estate sector across major European economies: (a) Average annual employment growth in real estate under net-zero vs. likely (2025–2050), (b) Number of additional real estate jobs created under net-zero, (c) Difference in total unemployment rate compared to the likely pathway (%)

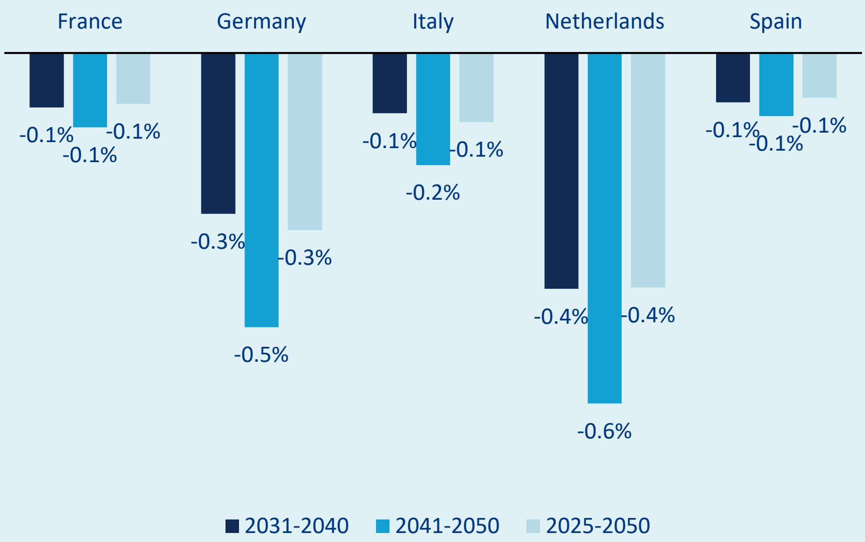
**a**



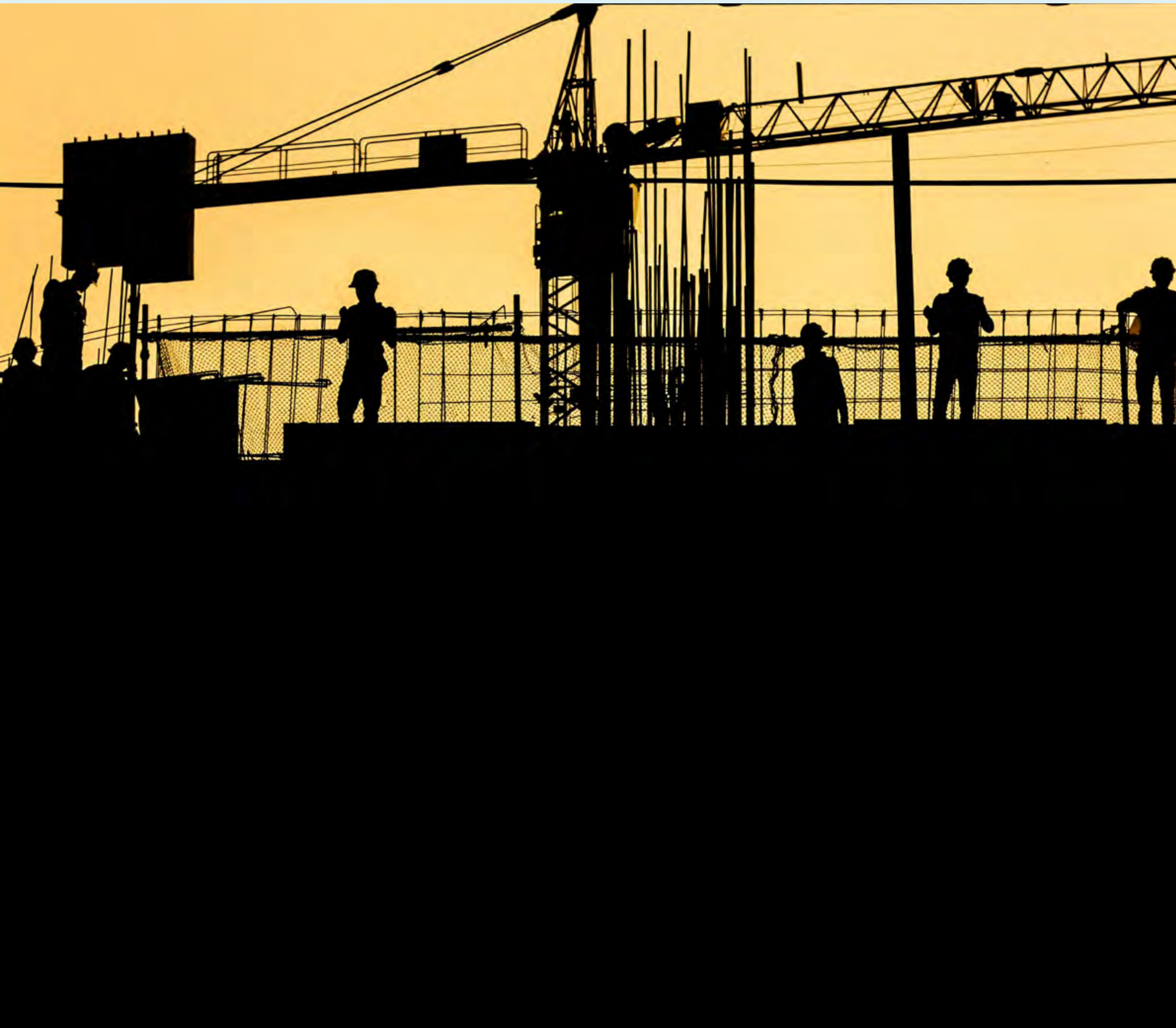

**b**



c




Sources: Oxford economics, Allianz Research

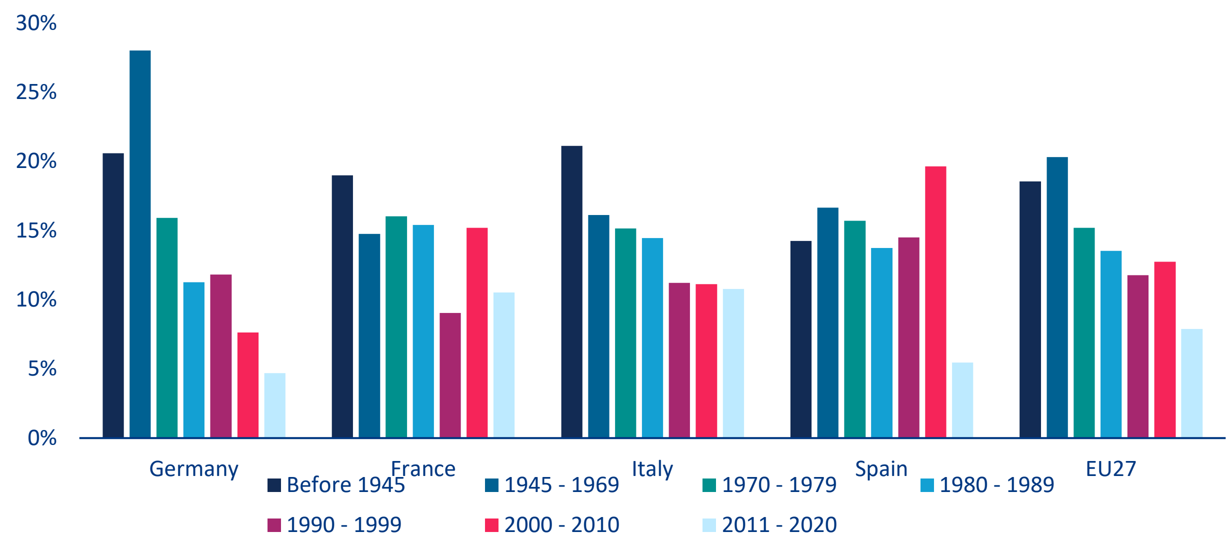


# Investment needs for a net-zero building stock

**Transforming Europe's building stock to meet net-zero targets will require significant investment across the continent, but the associated costs vary considerably between countries.** These differences are shaped by several key factors, including local climate conditions, the age and composition of the building stock, existing energy efficiency levels and the type of energy used. For example, countries in Southern Europe may face lower renovation costs for energy efficiency as their milder climates reduce the need for heating. However, rising temperatures due to climate change could lead to increased demand for cooling, driving up the need for air conditioning installations. Conversely, countries like France – where heat pump adoption is more advanced and electricity generation has a relatively low carbon intensity (approximately 50 $gCO_2$/kWh) – may require less investment in energy efficiency upgrades to decarbonize their buildings. The age of buildings also serves as a useful indicator of renovation needs (see Figure 15). In Germany, for example, 48% of the building stock was constructed before 1970. These older buildings consume, on average, 2.4 times more energy per square meter than those built after 2000. This disparity suggests that Germany may encounter significantly higher renovation and investment needs compared to the European average.

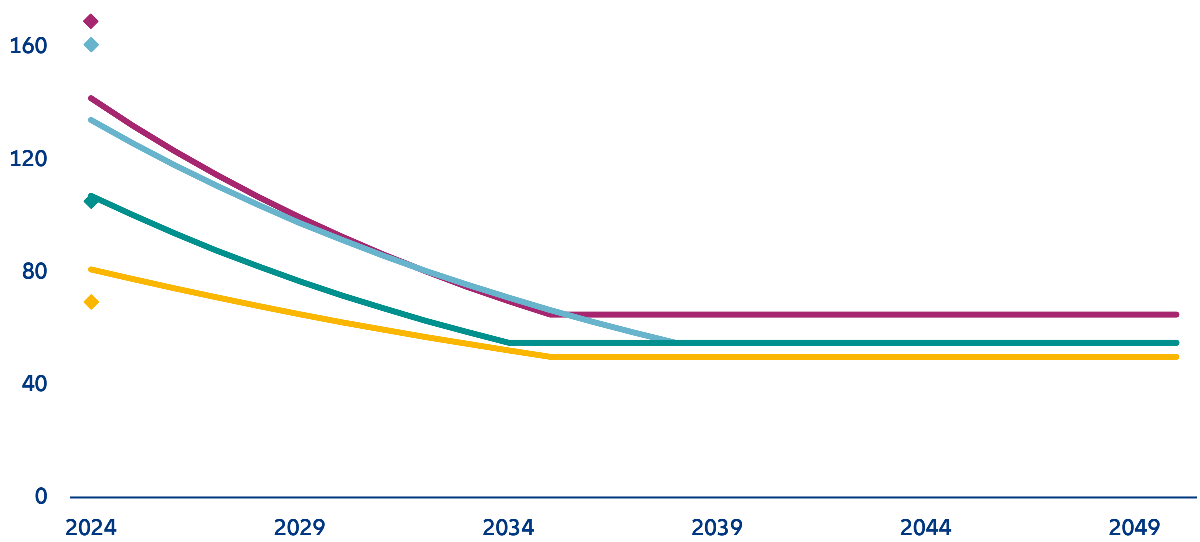
**Assessing investment needs requires an understanding of the current energy efficiency characteristics of the building stock across different countries.** A comparison between existing efficiency levels and the benchmarks defined by the Carbon Risk Real Estate Monitor (CRREM) for a 1.5°C pathway reveals a need for action in all major European economies (Figure 16). However, the initial efficiency gap differs significantly between regions. While Spain and Italy, are currently aligned with CRREM pathway projections for single-family homes, both countries need to continue to improve the energy efficiency of their building stock or risk non-compliance with 1.5°C-aligned performance standards by 2028. France and Germany already exceed the net-zero efficiency levels for the building category and are therefore required to put more effort into and funding behind the decarbonization of their respective real estate sectors. This is also highlighted when looking at the emission gap – the level of current emissions per square meter versus the required emission level along the 1.5°C pathway. Here, Italy and Spain show only a 3-5% current gap while the emission intensity of Germany and France is 31-34% above target. In addition to current efficiency levels, investment requirements are heavily influenced by assumptions around renovation costs. For this analysis, we use inflation-adjusted cost estimates derived from European Commission assessments, which account for both expenditure and expected energy savings across various renovation measures[14]. By focusing on current average prices for energy-related upgrades – considered the most accurate representation of real-world investment needs – we estimate renovation costs in the range of 3.0-4.1 EUR/kWh per kilowatt-hour saved in 2024[15].

**Figure 15:** Share of residential buildings by age category for selected European economies.




Sources: LSEG Datastream, Allianz Research

**Figure 16:** Energy intensity for single-family houses in selected European economies (in kWh/m2).




Sources: LSEG Datastream, Allianz Research

[14] Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU

[15] While a focus on deep renovations could reduce average renovation costs, this analysis relies on historical averages for all energy-related renovations to provide a more realistic estimate of investment needs.

**Considering current energy efficiency levels and CRREM benchmark pathways, cumulative energy-related renovation investment needs in Europe's largest economies are estimated at EUR3trn by 2050 (Figure 17).** This translates into annual investments of approximately EUR121bn for the four countries and is broadly in line with European Commission estimates of EUR300bn per year in required EU-wide expenditures through 2030 [16]. While this represents only about 1.6% of the EU's GDP, the estimated annual investment gap of EUR165bn underscores the significant challenge ahead, necessitating a doubling of energy-related renovation activities across the region. Germany faces the highest investment needs, with EUR1382bn required for the residential sector alone, and an additional EUR103bn for commercial assets such as offices, hotels, restaurants and healthcare facilities. France follows with EUR936bn in required investment by 2050. Italy and Spain, with smaller building stocks – 29% and 55% smaller than Germany's, respectively – and relatively more favorable building age profiles and energy-efficiency baselines, face lower investment requirements, totaling EUR604bn combined.

**However, the biggest challenge may not be the volume of capital required but rather the pace at which renovations must accelerate.** Current renovation rates across the EU average are around 1% per year but reaching decarbonization goals will demand a doubling of this rate to 2%, along with a dramatic increase in deep renovation rates from today's 0.1-0.3% to as high as 3% annually[17]. Without this acceleration, even countries currently aligned with CRREM pathways, such as Spain and Italy, risk falling off track and missing key 2030 milestones. Two of the most pressing barriers are the availability of a sufficiently skilled workforce and the financial capacity and willingness of homeowners to invest in energy upgrades. According to the European Federation of Building and Woodworkers, realizing Europe's Renovation Wave will require more than 486,600 additional workers, along with the replacement of over 1.25mn ageing workers[18]. At the same time, renovation investments must be effectively incentivized – particularly for households and small property owners – while ensuring that these improvements do not result in disproportionate rent increases or displacement effects.

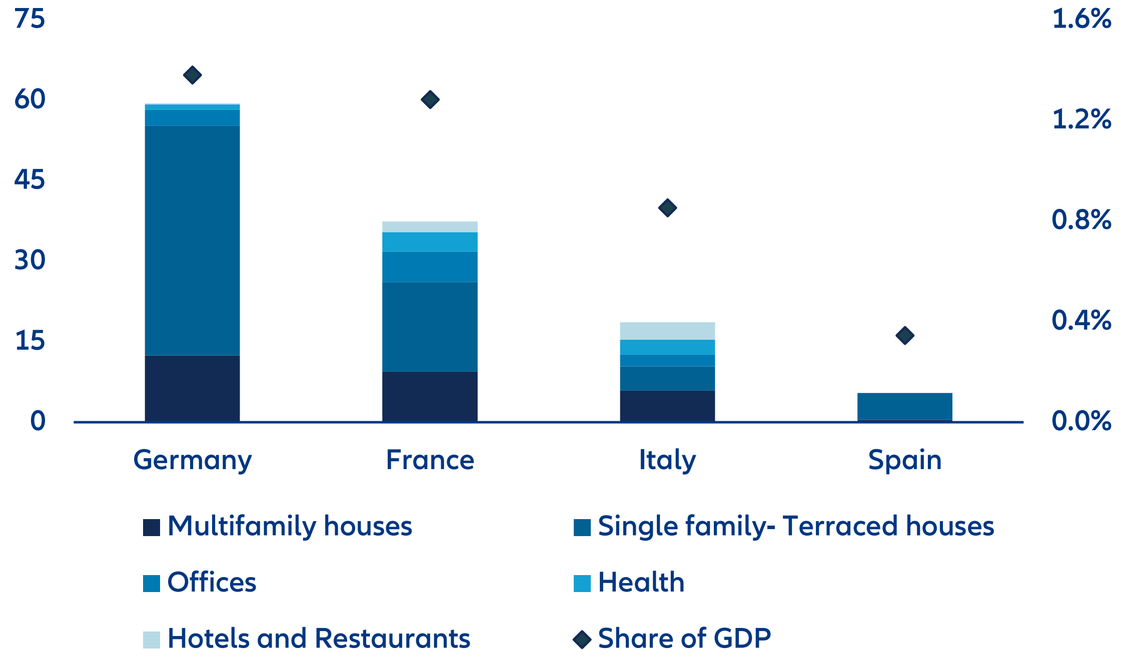
**While the upfront investment in decarbonizing the building stock can be substantial, these costs are significantly mitigated over time through the resulting energy savings.** When assuming renovation efforts along a 1.5°C consistent pathway and energy saving returns realized over 20 years starting in 2030, we find that the net present value of the cost is reduced by between 41-77% (Figure 18). As a result, the effective expenses of energy-efficiency improvements through 2050 amounts to EUR677bn in Germany and just EUR80bn in Spain. The differences between the regions are largely explained by national energy supply structures, energy price levels and assumptions about future wholesale price developments. In countries like Spain, where there is strong potential for low-cost renewable electricity, the shift from fossil fuels to cleaner energy in a net-zero scenario leads to lower overall energy prices. However, this also means that the financial returns from efficiency improvements are more modest, since energy savings are worth less. In contrast, in countries with higher energy prices, such as Italy or France, energy-efficiency upgrades deliver more substantial financial benefits, particularly for renters, by significantly lowering annual energy bills. Recognizing these benefits is essential as they help determine the extent of policy steering and financial incentives needed to achieve alignment with climate targets. While energy savings significantly offset upfront investment costs, they alone are unlikely to trigger sufficient market-driven uptake of renovations at the necessary scale.

[16] European Commission

[17] How to finance the European Union's building decarbonisation plan (Bruegel) and The great green renovation (Allianz Research)

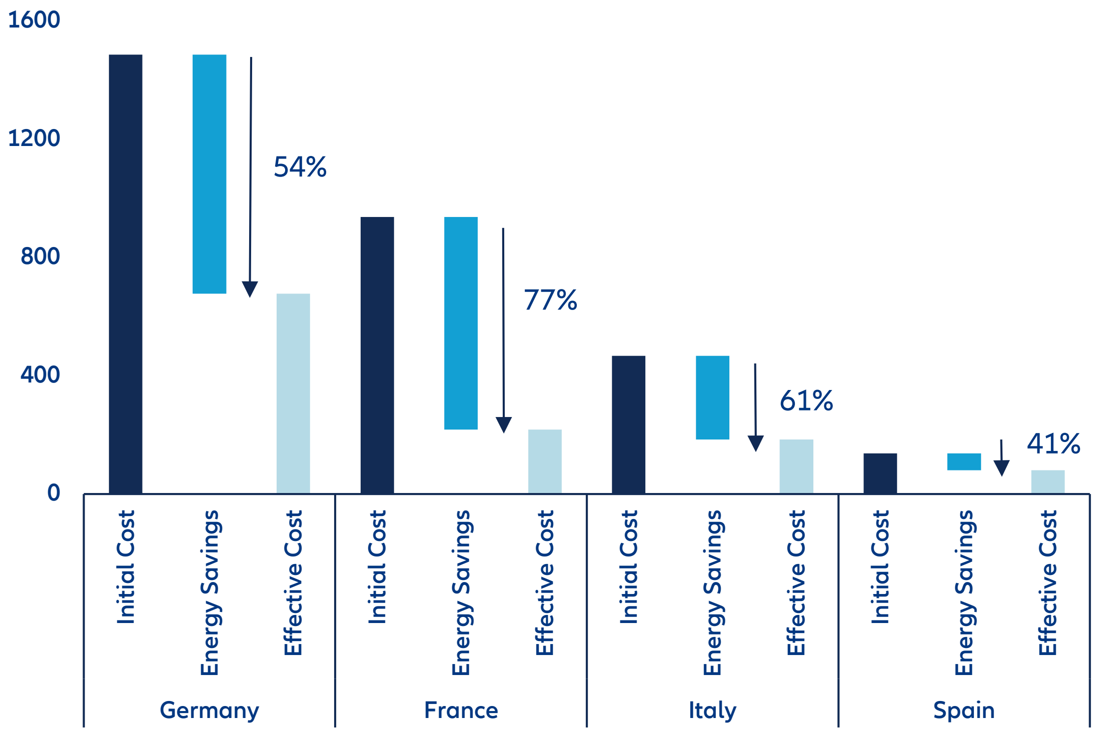
[18] Skills and quality jobs in construction in the era of the EGD and post covid recovery

**Figure 17:** Annual investment in energy-efficiency renovations and associated share of GDP for selected European economies (in EU bn)




Source: Allianz Research

**Figure 18:** Net present value of potential energy savings vs initial renovation cost (in EU bn)



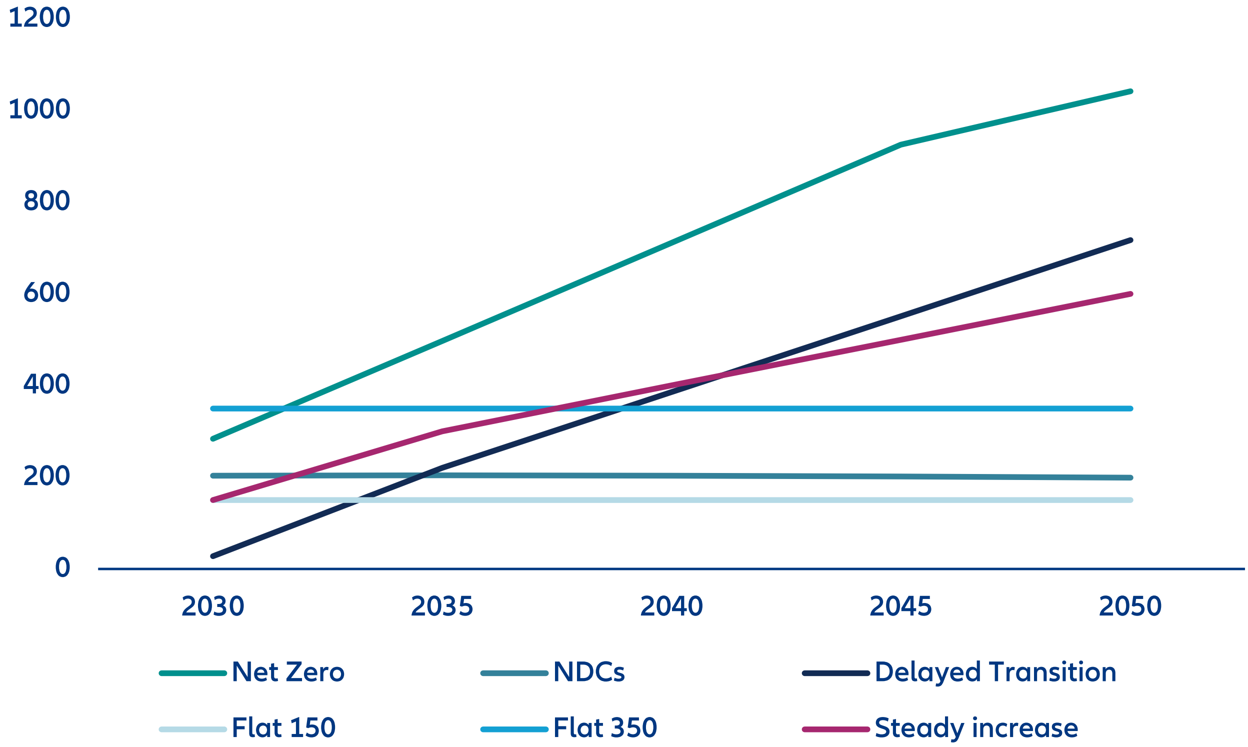

Source: Allianz Research;

Note: Energy savings and investment cost are compared using their Net Present Value; For the energy savings a 20 year window of savings returns is assumed; Energy Prices are calculated as a weighted average of gas and electricity prices which are developing according to Net Zero scenario assumptions of the NGFS remind model.

**As energy savings alone do not fully cover the upfront renovation costs, emission pricing can serve as a critical lever to adjust pricing signals and incentivize required renovation activity.** The EU is addressing this through the launch of its EU ETS 2, which will apply carbon pricing to fuel use in buildings and transport by 2027. Initially, the price is set at around EUR55/tCO2 (EUR45/t in 2020 values), but it is expected that it will increase significantly towards the end of the decade, reaching between EUR70-260tCO2 as early as 2030. To assess the effectiveness of carbon pricing in driving energy renovation investments, we analyze several price scenarios. These include three NGFS scenarios – Net Zero 2050, Nationally Determined Contributions (NDC) and Delayed Transition – each with associated carbon price trajectories. In addition, we compare three stylized reference scenarios: two flat price levels (Flat 150 and Flat 350) and one steadily increasing path (Steady increase), to examine whether realistic pricing frameworks can sufficiently close the remaining investment gap. Figure 19a illustrates the carbon price trajectories across the different scenarios, highlighting the varying levels of policy stringency. The Net Zero pathway imposes the highest carbon price, starting at EUR282/tCO2 and exceeding EUR1,000/tCO2 by 2050. In contrast, the NDC and Flat 150 scenarios reflect the lowest price signals and are therefore expected to deliver the least impact in terms of carbon cost savings. When comparing projected carbon tax savings (Figure 19b) with the remaining renovation cost gap (as shown in Figure 18), it becomes clear that the lower-price scenarios – despite aligning with or even exceeding current short-term expectations (2030–2035) – are insufficient to close the investment gap in Europe's largest economies. The Net Zero scenario, by contrast, provides a strong incentive, generating over EUR1.2trn in cumulative carbon tax savings by 2050, more than enough to offset upfront renovation costs. However, its very steep price trajectory raises questions about political and social feasibility. Other price scenarios come close to bridging the cost gap. However, if lower initial prices are preferred, this would necessitate steeper increases in later years – an effect illustrated by the Delayed Transition scenario. Such delayed pricing not only shifts the financial burden forward but also raises doubts about the credibility and political feasibility of future price hikes, making pathways like Delayed Transition less attractive. Overall, the analysis suggests that a purely market-driven approach to incentivizing energy efficiency renovations through carbon pricing is technically feasible, but only under price levels at the upper end of current projections, reaching around EUR 350/tCO2 by 2035. This would mean, putting a significant burden on homeowners and households already within the next decade. Targeting lower prices such as the ~EUR200/tCO2 in the NDC scenario would require additional instruments such as direct investment subsidies to effectively motivate the necessary renovation investments.

[19] See PIK and BNEF

**Figure 19:** Emission tax savings in different carbon price scenarios: a) Carbon price development (in EUR/tCO2); b) Net present value of emission tax savings until 2050 and renovation cost gap (in EUR bn)





Sources: Allianz Research, NGFS REMIND Model; Net Zero, NDC and Delayed Transition refer to the associated NGFS scenarios . Flat 350 Flat 150 and Steady increase refer to additional price models used for reference.

# Accelerating the decarbonization of Europe's building stock: Policy pathways and priorities

**With the revised Energy Performance of Buildings Directive (EPBD) entering into force last year, the EU has implemented a central cornerstone for making much-needed progress in decarbonizing the real estate sector.** Establishing binding targets to improve the energy efficiency of the residential building stock by 16% by 2030 and 20–22% by 2035 (compared to 2020 levels) is a critical step toward accelerating the pace of energy-efficiency renovations. Additionally, the introduction of National Building Renovation Plans and the gradual implementation of Minimum Energy Performance Standards (MEPS) are key to ensuring a structured, enforceable approach to upgrading the worst-performing buildings and aligning the sector with the EU's 2050 climate neutrality goals.  Complementary measures – such as the net-zero emissions requirement for new buildings by 2030, the gradual phase-out of fossil fuel boilers and the expanded deployment of solar PV systems on non-residential buildings – reinforce the directive's overall climate ambition. At the same time, key enablers like improved Energy Performance Certificates (EPCs), building renovation passports and enhanced systems for data collection and knowledge sharing are intended to strengthen progress tracking, guide investment decisions and support more effective policy delivery. With this policy package, the EU addresses key structural barriers that have long hindered faster progress in building-sector decarbonization – tackling core areas also highlighted in the IEA's recently published Energy Policy Toolkit.[20]

**While the revised directive marks a meaningful step toward decarbonizing Europe's building stock, it may still fall short of driving the scale and speed of change required to achieve net-zero alignment.** One key limitation is the uneven treatment of building segments. While the directive sets clear and binding renovation targets for non-residential buildings – mandating that 16% of the worst-performing buildings be renovated by 2030 and 26% by 2033 – it leaves more flexibility in how member states approach the residential sector. But this also increases the risk of weak enforcement, insufficient ambition or inconsistent progress across countries. In addition, some of the directive's initially more ambitious provisions were scaled back during the legislative process in response to political concerns. For example, early proposals to ban the installation of fossil fuel boilers by 2029 and to introduce binding Minimum Energy Performance Standards (MEPS) for residential buildings were diluted in the final text, which may limit the directive's overall effectiveness. Furthermore, the absence of concrete targets to accelerate the uptake of heat pumps represents a missed opportunity to drive the replacement of fossil-based heating systems with clean alternatives – an essential lever for building-sector decarbonization.

**Most crucially, the EU must address the funding and incentivization gap as neither cost savings from energy-efficiency improvements nor projected emission pricing under ETS 2 are likely sufficient to cover the high upfront investment costs.** While the EU has established a broad range of funding schemes to support building decarbonization – such as the Recovery and Resilience Facility, Cohesion Funds or InvestEU – these programs are often difficult to navigate, and the availability and accessibility of concrete funding options vary significantly between member states. To overcome these barriers, the establishment of accessible, well-resourced one-stop shops has been widely recommended to provide households and building owners with tailored guidance, technical support and streamlined access to available financial instruments[21].  Moreover, financial support schemes should become more comprehensive, targeted and performance-based – rewarding actual emission reductions and energy savings rather than merely subsidizing renovation activity – thereby encouraging deeper, staged renovations that align more closely with societal benefits of a long-term decarbonization. To prevent labor shortages from hampering renovation efforts, governments should establish fast-track certification programs for critical roles such as energy auditors and retrofit coordinators, subsidize or fully fund upskilling courses and facilitate the immigration of qualified workers through streamlined visa and qualification recognition processes. On the energy supply side, governments should set binding timelines for phasing out fossil fuel boilers, accelerate district heating planning and broaden targeted subsidies for heat pumps where they represent the most efficient decarbonization solution – building on successful examples such as France's MaPrimeRénov' and Coup de Pouce Chauffage.

[20] Energy Policy Toolkit 2025 (IEA)

[21] How to finance the European Union's building decarbonisation plan (Bruegel)

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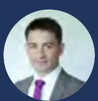

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