

The Affordability Crisis of Carbon-Intensive Heating: Assessing the Impact of EU ETS-2 on Households in Austria

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1 ABSTRACT

In 2023, the European Union's second Emissions Trading System (EU ETS-2) was launched and is planned to take effect in 2027 (European Union, 2023). This scheme will cover buildings and the road transport sector and represents a critical turning point for housing affordability in Austria. This regulatory shift introduces a market-based carbon pricing mechanism that will cover the building sector, fundamentally altering the cost structure of heating. Under current Austrian legislation (Republic of Austria, 2022), there is no regulation for cost-sharing between landlords and tenants, unlike in neighbouring jurisdictions of Germany. This stands in sharp contrast to the regulatory framework in Germany, where the Kohlendioxidkostenaufteilungsgesetz (BGBI. I S. 2154) has established a tiered liability model. While this German statute forces landlords to assume up to 95% of carbon costs in energy-inefficient buildings to incentivise retrofitting, the Austrian system currently transfers the full financial weight of rising carbon prices directly to tenants. Consequently, the full financial weight of rising carbon prices will be transferred directly to tenants, exacerbating the financial burden on households already struggling with energy costs, unless they are protected by the Social Climate Fund (European Union, 2023).

As energy cost were in the recent past significant rising and contributing significantly to Austria's inflation, the regulatory gap exacerbates the financial burden on households already struggling with energy costs, creating a "double penalty" for low-income tenants, which already reside in buildings with the highest carbon intensity and energy consumption as described in the statistic Austria's report on energy poverty (Statistik Austria, 2024). Since the year of strong inflation in Austria, the cost of living is moving stronger in the concern of the Austrian: 50% of respondents are concerned about how to finance the cost of living in future, and 66% stated that affordable housing plays an important role in their voting decision (FORESIGHT, 2024). These figures emphasise the social significance of affordable housing and illustrate the consequences if housing costs strain households further due to ETS-2, while wages may struggle to keep pace. The aim of this paper is to understand how a potential change in policy from the current Austrian "the tenant pays anyhow for it" to a cost-splitting approach, as in Germany, would affect the critical affordability requirements for renters set by many landlords.

Methodologically, the study combines a comparative legal analysis with a dynamic financial simulation. First, the Austrian legislative framework (NEHG) is contrasted with the German Kohlendioxidkostenaufteilungsgesetz to define the structural "Liability Gap" between the two jurisdictions. Second, the research performs a longitudinal stress test on a representative sample of Austrian residential listings, stratified by energy efficiency and heating source. By assuming a "lock-in" scenario where a tenant rents an apartment in 2025, the model projects the total cost of occupancy through 2035 under rising EU ETS-2 carbon prices. The core metric analysed is the "Break-Even Wage Growth" – the annual income increase required for a household to maintain housing costs below the critical 40% affordability threshold. The analysis compares this required growth rate against Austria's historical wage inflation, identifying the specific "affordability gap" created by the decoupling of carbon costs from income trends in the area of decarbonising the Austrian housing stock.

Keywords: EU ETS-2, Affordable Housing, Decarbonisation, zero carbon heating, zero carbon cooling

2 INTRODUCTION

The baseline for energy reduction within the European Union is set by the European Green Deal's objective to achieve climate neutrality by 2050. As a result of this target, the "Fit for 55" legislative package was released as the critical policy framework to align EU statutes with the first milestone target of reducing net greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. Therefore, energy efficiency is elevated to a "first principle", as set in the Energy Efficiency Directive (European Parliament, 2023), which mandates significant reductions in final energy consumption across all EU member states. This systemic shift

is driven by the dual necessity of the urgent need to decarbonise the European economy to mitigate impacts from climate-related risks, and, on the other hand, the strategic imperative to enhance energy security by reducing reliance on volatile, carbon-intensive energy in international commodity markets (European Commission & Draghi, 2024). A central pillar of the “Fit for 55” strategy is the expansion of the existing carbon pricing system (ETS) to the residential and transport sectors through the establishment of the EU ETS-2 (Directive (EU) 2023/959). By internalising the environmental externalities of fossil heating fuels, the EU creates a market-based incentive for deep renovations and the adoption of carbon-neutral heating technologies. However, as the building sector accounts for approximately 40% of the EU's energy consumption and 36% of its energy-related greenhouse gas emissions, this transition poses a significant challenge to strained housing affordability, as the cost of carbon-intensive heating is expected to rise (Perdana & Vielle, 2026). To address the resulting socio-economic disparities, the package includes also the so called “Social Climate Fund” (SCF), which has the intention to mitigate financial challenges of vulnerable European households, which are expected to be strongly exposed during this transition phase towards the EU's carbon neutrality pathway (European Parliament, 2023) with at least EUR 86.7 billion over the 2026-2032 period. In the context of the Austrian real estate market, these directives necessitate a fundamental reassessment of asset viability, as mandatory efficiency improvements through retrofitting and heating system changes, along with the rising costs of carbon on the other hand, may establish a new economic reality where carbon and energy performance become critical factors in a property's long-term financial and social sustainability.

3 REGULATORY FRAMEWORK

The fundamental change ahead for the Austrian residential market is a shift in heating costs that current national legislation does not address. The European Union's “Fit for 55” package introduces a market-driven carbon pricing system via the EU ETS-2 to incentivise the decarbonisation of the real estate sector. But as of yet, it is not completely clear how sustainable the current cost-sharing framework of the ETS2 scheme in Austria will be, as it shifts the financial decarbonisation liability of rented real estate from the landlord to the tenant. But tenants usually can't control the decarbonisation of the real estate they rent, nor do they receive retrofitting subsidies from European and national funds, funded by EU ETS-2 earnings. These funds shall provide in the EU approximately “EUR 23.7 billion, of which app. EUR 19 billion are earmarked for renovations” (Implementation of ETS2 and the Social Climate Fund, 2025).

Unlike the German regulatory model (CO₂KostAufG) (Bundesamt für Justiz, 2022), which implements a tiered liability system, forcing landlords to assume a significant portion of carbon costs in energy-inefficient buildings, Austrian law (Nationalrat, 2022) currently allows for the pass-through of these expenditures to the tenant through their energy bills. As of today, Austrian tenants shall fully be held accountable for the financial impact of their energy and carbon consumption, based on a “Polluter-Pays Principle” (Verursacherprinzip) – therefore, since the implementation of the NEHG, carbon taxes can be found on Austrian energy bills to be paid by tenants and subject to 20% VAT. In comparison, the German CO₂KostAufG, since 2023, represents a targeted regulatory intervention designed to resolve the classic “split incentive” problem within the real estate market. Unlike traditional carbon taxes that function merely as consumption surcharges in Austria, the CO₂KostAufG introduces a dynamic, ten-level, staged model that allocates carbon costs between landlords and tenants based on a building's specific energy performance. This model calculates the building's carbon intensity in kilograms of CO₂ per square meter of rental space per year. In properties with the highest energy efficiency, defined as emitting less than 12 kilograms of CO₂ per square meter, the tenant continues to bear the full financial weight of the carbon price, as the building's infrastructure is already assumed to be optimised.

However, as the building's efficiency decreases and its carbon footprint grows, the landlord is required to carry an increasing share of the costs. In the least efficient buildings, which emit more than 52 kilograms of CO₂ per square meter, the landlord must carry 95% of the carbon costs, leaving only 5% to the tenant. This framework effectively internalises the climate risk into the landlord's operational expenses, transforming the carbon price into a direct financial incentive for building retrofits and heating system upgrades, as recommended in the recast of the Directive (EU) 2023/1791 (European Parliament, 2023), which refers to the idea of “split incentives”. This split incentive addresses “the lack of fair and reasonable distribution of financial obligations and rewards relating to energy efficiency investments among the actors concerned, for

example, the owners and tenants or the different owners of building units, or owners and tenants or different owners of multi-apartment or multi-purpose buildings”, as stated under article 2 of the directive.

This economic divergence in Austria is not just a technical issue but also acts as a significant socio-political catalyst. Recent data highlights public concern over rising housing costs; the Volkshilfe Sozialbarometer (Foresight, 2024) shows that 50% of respondents see the overall cost of living as their main worry, and 66% consider affordable housing a key factor in their voting decisions. These figures highlight the political instability connected to the ongoing energy transition, as pressure on affordable housing in Austria continues to rise. Notably, heating problems are increasingly impacting lower-income households and are associated with discussions on income inequality. Additionally, heat waves and rising temperatures increase demand for cooling, particularly in urban areas. Alexandra Wegscheider-Pichler et al.’s findings on existing energy poverty, combined with rising urban thermal stress, suggest that the “tenant-pays-all” policy approach may soon hit a socio-economic limit.

Maintaining a policy that disconnects rising operational costs from landlord investment incentives risks the financial stability of lower- and middle-income households and could undermine the democratic legitimacy of the climate transition for many voters. Furthermore, pressure on Vienna’s housing market – driven by a growing population and fewer building permits – will increase difficulties for median- and lower-income households, as rents for new apartments have risen in recent years, especially in Vienna’s private rental sector (CBRE Austria, 2025).

4 METHODOLOGY

The rollout of the EU ETS 2 in 2028 marks a significant regulatory change within the "Fit-for-55" initiative. Unlike EU ETS 1, which mainly targets industrial and power sectors sensitive to price fluctuations, EU ETS 2 shifts focus to buildings, road transport, and small industrial facilities. These sectors are known for high marginal abatement costs, path dependencies, and structural market failures. Recent scientific studies (2023–2025) emphasise that market prices are influenced not only by supply and demand but also by the overall European policy environment and technological replacement cycles. The predictability of price trajectories in the EU ETS 2 varies significantly because researchers use different modelling frameworks. Rickels et al. utilise the Computable General Equilibrium model DART to quantify the efficiency gains of EU-wide trading, particularly in the context of the Effort Sharing Regulation (ESR). Conversely, the PRIMES model, utilised by Günther et al. (Günther et al., 2025), provides a high-resolution simulation of technological substitution – such as the adoption of heat pumps and electric vehicles – in response to marginal cost signals. Market-oriented simulations like Bloembergen’s EUCPM 2.0 Bloomberg NEF (2025) enhance these projections by accounting for the expectations and hedging actions of fuel distributors, which are expected to lead to significant price premiums during the system’s initial stage.

A fundamental consensus emerging in contemporary research is the conceptualisation of the carbon price as a "residual variable" (Günther et al., 2025a). This theory suggests that since the emissions cap remains constant, the equilibrium price is inversely related to the effectiveness of non-priced energy efficiency policies (EPs). For example, strong enforcement of the Energy Performance of Buildings Directive (EPBD) and tight CO₂ fleet standards for vehicles decreases the amount of emissions that need to be reduced through price signals. In a "Weak Policy" scenario, the carbon price must bear the brunt of abatement efforts, reaching about € 261/tCO₂ by 2030. In contrast, a "Strong Policy" scenario, with high renovation rates and rapid electrification, could keep the price lower at around € 71/tCO₂.

Wien Energie, the city-owned energy provider (Compass Lexecon, 2026), warns that households relying on fossil gas for heating could face two financial shocks. These stem from fluctuations in energy prices and the ongoing push toward decarbonisation, including a transition from natural gas to biogas. Their research indicates that direct carbon costs might increase from about € 13/MWh in 2026 to over € 50/MWh by 2040. Simultaneously, decreased network usage is expected to quadruple grid fees to above € 130/MWh, raising concerns about the affordability of gas heating. However, this situation could change, as affordability thresholds for residential properties generally limit housing costs to no more than 30% of income.

The well-known “30% Rule” was introduced in 1937 in the US, stemming from the United States National Housing Act of 1937. It states that households should spend no more than 30% of their income on housing costs, which include rent, energy, and operational expenses charges. This guideline continues to be a

benchmark for housing affordability in the US today (Schwartz & Wilson, 2008). Compared to these US standards, European statistics pertain to a certain level. 30% (GSC, 2025) to 40% (Eurostat, 2025). According to Deutsche Bank Research Institute, Vienna's average affordability rate is at 37%. Meanwhile, the OECD reports that rental housing costs for Austrian households nationwide are about 19, 4%, which is slightly below the European average (20, 5%). Furthermore, housing cost overburden rates in Austria have decreased in the private sector from 10, 6% in 2019 to 10, 1% in 2024, and in the subsidised sector from 7, 7% to 5, 8%. (OECD, 2025). The above-mentioned Deutsche Bank Research Institute report highlights that Vienna's utility costs are among the highest globally, ranking 6th in 2025. The report notes that cities like Warsaw, Vienna, and Prague have been significantly affected by Russian gas imports in recent years. In 2020, Vienna's utility expenses were similar to those in London or Hong Kong, implying that energy prices are not the only factor influencing costs. Statistik Austria also reports that Viennese renters pay 5% more than the national average, making it the second-highest in Austria. As a result, it is expected that renters, especially in the private and communal sectors, which dominate Vienna's rental market, generally view their rental costs negatively. (Statistik Austria, 2025).

In this paper's simulation, a random sample of 386 apartment rental ads from the real estate portal "derstandard.at" in Vienna was analysed. These ads were examined for rent, EPC data, and heating type, and their data consistency was checked. Seventeen per cent lacked references to the heating system's energy performance certificate and were discarded. The remaining ads were grouped by heating type (ETS-2 relevant or not). This dataset was used in simulations to assess potential exposure under different carbon pricing scenarios aligned with those of Günther et al.'s ETS-2 scenarios.

These scenarios, driven by strong EU policy implementation, include a "strong" decarbonisation pathway, a "limited", and a "weak" pathway, with ETS-2 prices projected between € 63-279/ton CO₂ in 2028, € 180-418/ton CO₂ in 2035, € 324-522/ton CO₂ in 2040, and approaching € 564/ton CO₂ by 2050. The scenarios set ETS-2 prices per square metre per year, based on each asset's CO₂ intensity per square metre, forming the first price layer. The second layer is defined by the current annual rent per square metre, including service charges and VAT, which increases by 2% annually, aligning with the ECB's target inflation rate. Merging these layers yields a future rent series until 2040, indicating tenants' future rental burden if they sign a lease in January 2026. A 20% VAT was added to the ETS-2 costs, as required by law, to maintain price consistency with annual tenancy.

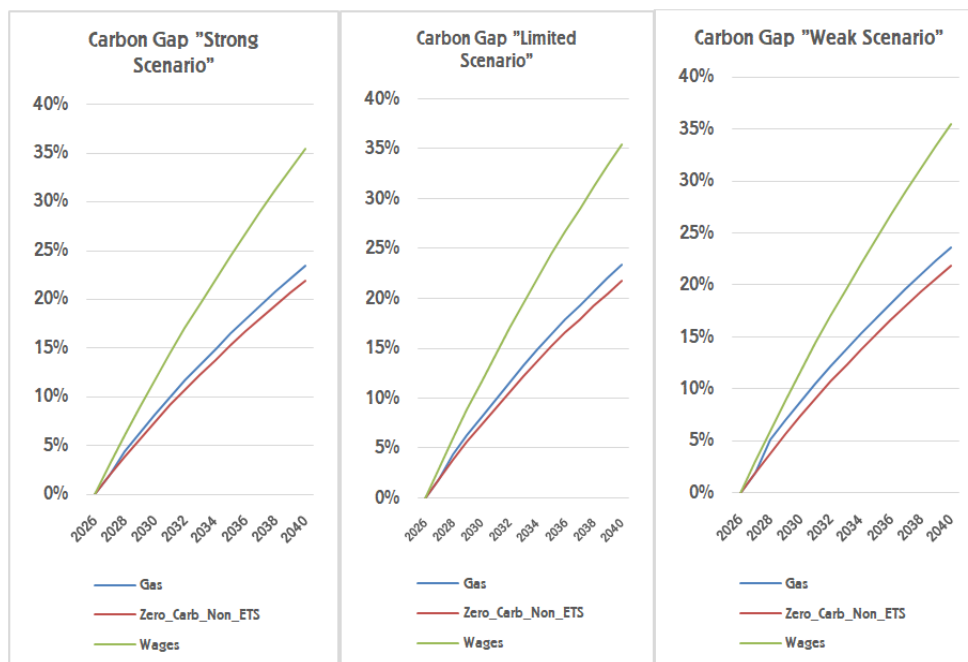


Fig 1: development of ETS-2 scenarios,

5 RESULTS

This research primarily investigates whether ETS-2 poses a threat to rental affordability for potential tenants in Austria, as scenarios for energy costs were excluded. The simulation results and data sets suggest no

immediate danger. In every scenario modelled, assumptions about historical wage growth outperform the projected costs of carbon pricing. This trend holds across all scenarios, regardless of how aggressively carbon prices increase. Even under a scenario with weak policy enforcement and a significant rise in carbon costs – such as an annual ETS-2 increase of 3.91% for gas-heated apartments – the ETS-2 costs would only constitute about 26.67% of the gross rent (excluding energy bills) by 2040.

Since affordability appears unaffected by ETS-2 pricing scenarios, it would be valuable to explore the quantification of the “carbon gap”. According to Rebonato et al. (2024), climate value on risk is defined by comparing a scenario without ETS-2 pricing to the “Weak Scenario.” This comparison involves evaluating rental costs with and without carbon costs to determine the carbon gap. The table below shows the total rental costs per square meter accumulated over the periods from 2026 to 2040 and from 2026 to 2050, including 20% VAT.

		Strong Scenario		Limited Scenario		Weak Scenario	
		2040	2050	2040	2050	2040	2050
Gas_No ETS	[€ /sqm]	4.213	7.638	4.213	7.638	4.213	7.638
Gas_ET5	[€ /sqm]	4.503	8.211	4.532	8.249	4.532	8.249
Carbon Gap	[€ /sqm]	290	573	319	612	319	612
		6, 44%	6, 98%	7, 05%	7, 41%	7, 05%	7, 41%

Table 1: Comparison of the Carbon Gap across different scenarios.

In this most extreme scenario, the carbon gap increases by 7, 41% of rental expenses. Since this level does not appear to threaten affordability across the sample set, which has an average annual rent per square meter of € 246, 37 for gas-heated, € 262, 48 for district-heated, and € 300, 84 for geothermal-heated apartments, the next question is at what price points the ETS-2 curves would intersect the affordability curves. Backward calculations show that if the ETS-2 price is approximately € 600 per ton of CO₂ in 2028 and around € 3200 per ton in 2040, the affordability curves would be crossed.

6 DISCUSSION AND POLICY IMPLICATIONS

The findings of this paper raise several questions. Firstly, there seems to be a link between rental levels and the discussed ETS-2 pricing risk: in a strong housing rental market with high rents, such as Vienna, affordability ratios remain stable. This is supported by Austria's wages generally increasing faster than both index-linked rents and ETS-2 pricing scenarios. Based on the sample used, this may not apply to regions with lower rents, where the rent-to-ETS-2 price ratio differs from the sample used in this paper. The same may apply to stressed office and commercial property markets, which currently experience low tenant demand due to oversupply or Austria's weak economy, or a tenant market prevails. Second, the mechanism for ETS-2 cost-sharing between landlords and tenants warrants further discussion. In the sample, properties with ETS-2 risk tend to have lower rents compared to those with low or zero carbon heating, suggesting a possible carbon discount. This is relevant because it could indicate whether a cost-splitting model like Germany's is necessary in Austria to support affordability in markets with strong demand and weak supply as Vienna, or whether a specific real estate market can balance itself. An important aspect of monitoring is whether the additional ETS-2 costs might exceed reasonable rents in a specific submarket, paid by tenants of comparable properties with low or zero carbon heating, meaning that both property types (carbon and carbon-neutral) have the same occupational cost levels.

Regardless of whether ETS-2 prices surge or remain stable, it is clear that only carbon-neutral or zero-carbon heating and cooling systems offer strong protection against transition climate risks, providing tenants with a certain cost certainty in their rental decisions.

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