



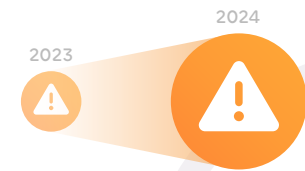
Buildings



Far too slow

Buildings facilitate activities essential for human life and society. Optimising building services, renovating them, and transitioning to renewable technologies are crucial.

4.4 Buildings



Past progress: Progress towards climate neutrality in the buildings sector was **far too slow** – the same as last year’s assessment. This is primarily due to operational emissions from buildings, which are not declining rapidly enough to reach the EU’s 2030 targets. Current renovation rates, especially for deep renovation, are insufficient. In the assessed period, heating energy demand was only slightly decreasing but not sufficiently to reach EU targets for 2030. Additionally, the current transition to renewable energy in buildings is not sufficient to significantly lower emissions. Despite a notable increase in heat pump sales in the EU since 2016, this trend decreased in 2023. While in principle, a fair reduction in the average space per person is the most efficient way to lower emissions, the recent trend shows an increase.

Policy context: In 2023, there were significant changes in policy with revisions to three main directives: Energy Performance of Buildings Directive (EPBD), Energy Efficiency Directive (EED), Renewable Energy Directive (RED). While most of the indicators in this assessment are covered by these directives, it is too early to gauge their impact. The latest version of the EPBD is a compromise: it delays and reduces the ambition for Zero-Emission Buildings (ZEB) and Minimum Energy Performance Standards (MEPS) compared to the EC proposal. However, it still outlines a clear plan for non-residential buildings with MEPS and establishes an energy efficiency trajectory for residential buildings. It also includes provisions to simplify the energy renovation process, e.g., by defining deep renovations and improving access to information and financing renovations.

Areas of action: Action to reduce operational emissions is insufficient and should primarily focus on shifting to renewable energy, particularly through the accelerated deployment of heat pumps. For renovations, an enforcement system should accompany MEPS to monitor their deployment and impacts effectively. Additionally, providing grants through public finance would address the financial barriers faced by low-income and vulnerable households, as well as rental households. Thirdly, establishing national databases for building energy performance is a crucial step to address the lack of centralised, comparable, and up-to-date data. Finally, a reduction target should be set for all embodied emissions, including renovations, such as broadening the definition of ZEB to encompass lifecycle carbon.






















Table 10: Progress in buildings towards the objective and enablers

OBJECTIVE	ENABLERS		
Reducing buildings emissions and limiting material demand 	Reducing demand for heating and cooling 	Facilitate the renovation of buildings 	Accelerate the technology switch

Note: Large circles show the progress classification of this year and small circles the one from last year’s progress assessment. Arrows indicate positive or negative changes in classification. [See Table 35](#) for further information.

Source: ©ECNO.

Table 11: Details on indicators' past progress and required change

2023 ▼	2024 >	Historical data			Required change	
		Time period	Relative change p.a.	Absolute change p.a.	Benchmark	Absolute change p.a.
OBJECTIVE: Reducing buildings emissions and limiting material demand						
		GHG emissions from buildings [Mt CO ₂ e]	2017–2022 (EEA, 2023b)	-1.8% per year	-9.3 Mt CO ₂ e per year	216 Mt in 2030 (EC, 2020d) -33.2 Mt per year (2023–2030) → 3.6 times faster
		Demand of cement or concrete blocks and bricks [M tons]	2017–2022 (Eurostat, 2023j)	7.2% per year	4.1 Mt per year	n/a n/a
ENABLER 1: Reducing demand for heating and cooling services						
		Average space per capita [m ² /capita]	2015–2020 (EC, 2023l)	1.1% per year	0.8 m ² /capita per year	n/a n/a
		Demand for heating and cooling [kWh/m ²]	2010–2015 (Mantzos et al., 2018)	-1.3% per year	-1.5 kWh/m ² per year	87.2 kWh/m ² by 2030 (EC, 2020d) -1.3 kWh/m ² per year → on track based on old data
		Demand for heating of residential buildings [kWh/m ²]	2016–2021 (ODYSSEE, 2024)	-0.3% per year	-0.3 kWh/m ² per year	96.1 kWh/m ² by 2030 (EC, 2020d) -1.4 kWh/m ² per year → 4.7 times faster
ENABLER 2: Facilitating the renovation of buildings						
		Investments for energy renovation [billion EUR]	2011–2016 (EC, 2023l)	5% per year	13.2 billion EUR per year	n/a n/a
		Average renovation rate [%]	2016	n/a	n/a	double between 2020 and 2030 (EC, 2020d) n/a
		Deep renovation rate of residential buildings [%]	2016	n/a	n/a	n/a n/a
		Deep renovation rate of non-residential buildings [%]	2016 (DG Energy et al., 2019)	n/a	n/a	n/a n/a
ENABLER 3: Accelerating the technology switch						
		Share of renewable energy in heating and cooling [%]	2017–2022 (Eurostat, 2023i)	3.2% per year	0.7%-points per year	49%-points in 2030 (RED III) 3.0 %-points per year (2022–2030) → 4 times faster
		Heat pump sales [Million units]	2016–2021 (EHPA, 2024)	17.2% per year	0.22 M units per year	4.7 M units in 2030 (EC, 2024m) 0.28 M units per year → 1.3 times faster

Note: Icons indicate progress classification of this year's progress assessment and coloured lines the change in classification; See Table 35 for further information. n/a indicates that data are not available.

Source: ©ECNO.

Objective: Reducing buildings emissions and limiting material demand

Past progress: The EU fell short of its target to cut buildings' GHG by 60% by 2030 compared to 2015 levels (EC, 2020d). To meet the target, emissions reductions in the buildings sector need to more than triple from 2023 to 2030, reaching 33 Mt CO_{2e} per year compared to 9 Mt CO_{2e} per year between 2017–2022. Constructing buildings and related works in the EU accounted for 9.4% of all domestic GHG emissions in 2019 (EC, 2021p). While there is no EU target, improved material efficiency could potentially reduce 80% of these emissions (EC, 2021p). However, the demand for cement or concrete blocks and bricks, essential for constructing new buildings, increased by an average of 7% annually between 2017 and 2022, indicating a trend in the **wrong direction**.

Indicators:

- GHG emissions from building
- Demand of cement or concrete blocks and bricks

Policy context: The main EU policies relevant for these objectives are the Energy Performance of Buildings Directive (EPBD) and the Energy Efficiency Directive (EED). Both were revised in 2023, with only the EED having been formally adopted. The EPBD is the main legislation for the building sector. Detailed insights into the revised EPBD, particularly concerning renovation obligations, are outlined in enablers 1 and 2. Additionally, the REPowerEU initiative aims to install 30 million hydronic heat pumps by 2030, compared to 2020 levels (EC, 2024p). The subsequent sections outline the key elements of the revised directives and their associated goals. The revised EPBD includes a requirement to calculate and disclose Whole Life Carbon emissions for new buildings larger than 1000 m² by 2028, and for all new buildings by 2030. Member States (MS) are obligated to publish and notify the Commission of a roadmap by January 2027, outlining the implementation of limit values on the total cumulative life cycle of all new buildings. These limit values should set targets for new buildings from 2030, following a progressive downward trend.

Areas of action: This section focuses on the policy gaps in embodied emissions from buildings, while operational emissions are covered in the following sections. Deploying low-carbon measures in renovation and new buildings can prevent a sharp increase in embodied emissions by 2050, while maintaining an annual renovation rate of at least 3% (Le Den et al., 2023). While progress is being made in assessing the overall carbon impact of new buildings through the EPBD review, there is still no equivalent measure for the renovation of existing buildings. In its next revision in 2027, the EPBD should be reinforced with additional actions, including broadening the definition of zero-emission buildings to encompass lifecycle carbon (BPIE, 2022). In addition, to prevent deep renovations from causing high emissions, a cap on the embodied emissions associated with renovations should be set, as it is done in Nordic countries for constructing new buildings (Nordic Sustainable Construction, 2024). This would complement renovation goals, explained in the following section. Finally, alternative methods for reducing material demand before usage include urban and territorial spatial planning (ESABCC, 2024).

Enabler 1: Reducing demand for heating and cooling

Past progress: The trend for reducing the surface area of buildings, which reduces energy demand, was heading in the **wrong direction** between 2015 and 2020 with an annual increase of 0.8 m²/capita in average space per person (Table 11). Thermal renovation and electrification, the two other main ways of reducing energy demand, are specifically covered by enablers 2 and 3. Between 2010 and 2015, there was an annual decrease of 1.5 kWh/m² in energy consumption for heating and cooling. More recently, and on a smaller scope that only includes household heating, the annual decrease fell to just 0.3 kWh/m² per year between 2016 and 2021. This indicates insufficient progress towards achieving the Renovation Wave target of an 18% reduction by 2030 compared to 2015 levels (EC, 2020d). However, the COVID-19 pandemic restrictions could have affected this indicator in 2020 and 2021. With individuals spending more time at home, it might have resulted in a less significant decrease in the trend (BPIE, 2023a).

Indicators:

- Average space per capita
- Demand for heating and cooling
- Demand for heating of residential buildings

Policy context: The Renovation Wave originated in the revision of the EPBD, approved in December 2023 and adopted in April 2024. The revised EPBD focuses largely on renovation and new buildings' efficiency. It aims to transform the existing building stock into zero-emission buildings (ZEB). By 2030, the directive sets three intermediary goals: firstly, all new buildings should be ZEBs from 2030. Secondly, new buildings owned by public authorities should be ZEBs from 2028. Thirdly, for residential buildings, MS need to establish their own national plans to decrease the overall average primary energy consumption of residential buildings by at least 16% by 2030, compared to 2020, and 20-22% by 2035. MS have the flexibility to employ methods beyond Minimum Energy Performance Standards (MEPS) to achieve this goal, while ensuring that at least 55% of the reduction comes from renovating the least efficient buildings. For non-residential buildings, MS must enforce MEPS, aiming to renovate the 16% worst-performing buildings by 2030. This target will be increased to 26% by 2033. Regarding the last objective on non-residential buildings, particularly on public buildings, the revised EED sets a more ambitious target of achieving an annual renovation rate of 3% and reaching the new ZEB standard.

Areas of action: Progress could be made by providing more clear guidance on how to reduce the floor area through urban or spatial planning. Secondly, effective compliance support and an enforcement system should accompany MEPS to monitor and track their deployment and impacts (BPIE, 2023a). For the MEPS scheme to be effective, accessible, and affordable, it should be integrated into a comprehensive ecosystem of supporting policy instruments tailored to the diverse needs of various target groups (BPIE, 2023b).

Enabler 2: Facilitating the renovation of buildings

Past progress: Data on EU renovations are sparse, hindering implementation tracking. Only outdated data on renovation rates and depth from 2016 exists, and information on average annual energy-related renovation investments is equally outdated (see [Table 11](#)), despite the EU initiative on the Building Stock Observatory. The renovation rate between 2012 and 2016 was around 1% per year and needs to double by 2030 to reach the target of 2% (EC, 2020a). In 2016, shallow retrofits dominated, and deep renovations made up only roughly one fifth of all EU renovations. Renovation rates of 0.2% for residential and 0.3% for non-residential buildings indicate a lack of common deep renovation practices. Since the publication of these figures, the revised EPBD has refined the renovation level needed to achieve deep renovation. Annual investments in renovation increased by 5% per year between 2012 and 2016, or 13 billion EUR per year. Despite the lack of recent data, renovation rates and depth are considered **far too slow** to achieve the goals of the Renovation Wave (BPIE, 2021), as are investments (Calipel et al., 2024).

Indicators:

- Investments for energy renovation
- Average renovation rate
- Deep renovation rate of residential buildings
- Deep renovation rate of non-residential buildings

Policy context: EPBD and MEPS were introduced in the previous section. The EPBD defines ‘deep renovations’ as upgrades that turn buildings into nearly zero-energy buildings (NZEB) until 2030, and then into zero-emission buildings (ZEB) starting from 2030. While these tools aim to enhance renovation efforts, it is too early to gauge their effectiveness. Regarding investment in renovation, MS are tasked with providing financing, setup support measures, and other tools to overcome market barriers towards achieving the ZEB target by 2050. Meanwhile, the Commission will enact a Delegated Act in 2025 aimed at incentivising financial institutions to boost funding for renovations. In the revised EED, the Commission will provide guidance for MS and market actors on how to unlock private investment by the end of 2024. Finally, the creation of the Social Climate Fund (SCF) under the EU ETS Regulation will allocate funds to MS, particularly targeting vulnerable groups in the construction industry and other sectors. In addition, ETS 2 will include CO₂ emissions from fuel combustion in buildings. The carbon price under ETS 2 will likely encourage investments in renovations. Yet, the effects of these measures on renovation investment remain uncertain.

Areas of action: National databases for building energy performance should be established and centralised to address the lack of up-to date data at the EU level. Skills training should also be supported at the EU level to enable the creation of much-needed jobs (ESABCC, 2024). The new ETS 2 for energy use in buildings will aid energy retrofits, but additional measures are needed to address barriers related to distribution, organisation, administrative capacity, investment, and data that extend beyond inadequate price signals (ESABCC, 2024). Finally, public finance should provide grants to address the financial barriers faced by low-income and vulnerable households, as well as rental households. Strategies to improve the use of existing funding programmes should be put in place (BPIE, 2023a).

Enabler 3: Accelerate the technology switch

Past progress: Progress in decarbonising heat supply was sluggish, with data indicating an annual increase of renewable energy in heating and cooling of only 0.7% between 2017 and 2022, mostly due to the contribution of biomass and heat pumps (EC, 2024o). This is falling far too short of the required pace to reach the goals of 49% by 2030, as set in the RED III Directive, and complete phase-out of fossil fuels by 2040. To meet the renewable energy target of 49% by 2030, the annual increase between 2021 and 2030 must accelerate to 3.0%, which is 4 times the current rate. Notably, the sale of heat pumps saw significant growth, averaging 17% per year between 2016 and 2021, resulting in an average annual increase of 0.2 million in sales of units. Recent data however suggest that this trend decreased in 2023 (EHPA, 2024). An accelerated trajectory is essential to achieve the target of a 60 million heat pump stock by 2030, as suggested by the impact assessment on the 2040 climate target (EC, 2024m). Under certain assumptions, this target is equivalent to an annual sale of 4.7 million per year by 2030.

Indicators:

- Share of renewable energy in heating and cooling
- Heat pump sales

Policy context: To increase the share of renewables in buildings by 2030, four main strategies have been outlined: firstly, the revised EPBD (EC, 2021i) establishes the ambitious target of phasing out the use of fossil fuels for heating and air conditioning systems in buildings by 2040. To reach this target, MS shall not provide any financial incentives for the installation of fossil-fuel based stand-alone boilers from January 2025. Secondly, the EU Heat Pump Action Plan, a non-legislative initiative by the Commission, seeks a substantial boost in heat pump deployment, projecting over 30 million more hydronic units by 2030 compared to 2020 (EC, 2024p). Thirdly, the Ecodesign Regulation proposed by the EC (2022o) aims for an EU-wide cessation of the sale of fossil-fuel boilers for space and water heating starting from 2029. Finally, under the revised EPBD, Member States must guarantee the installation of suitable solar energy systems on buildings, if feasible both technically and financially. This requirement covers non-residential and new residential buildings, with deadlines ranging from 2026 to 2029, depending on the building type and size.

Areas of action: Insufficiently robust EU standards for heating equipment are causing only small improvements in reducing fossil-fuel emissions and creating lock-in effects. This partly explains why EU policies have not been very successful in shifting away from fossil fuels (ESABCC, 2024). Secondly, the decline in heat pump sales in 2023 was caused by lower gas prices and decreased government support (EHPA, 2024). Publishing the EU Heat Pump Action Plan could help to turn this trend around. In addition, new policies could increase the uptake of heat pumps, e.g., through Ecodesign policies to phase out the sale of fossil-fuel equipment. Finally a clean heat market mechanism, as the UK is employing (DESNZ, 2023), could drive down prices for clean heat technologies and decrease fossil-fuel subsidies.