National Building Renovations Plans (NBRP): A Powerful tool for a just and climate-resilient built environment

Building renovation as the driver of heating and cooling decarbonisation

CAN
CLIMATE ACTION NETWORK
Europe

The purpose of this guide

Climate change is already reshaping our lives, and the urgency to prepare for a climate-resilient future has never been greater. These changes will impact all aspects of our lives, particularly where we spend most of our time: the buildings where we live, study or work, and access services and goods.

As a result, the way buildings consume and manage energy is receiving increased attention, also evident in European legislations as part of the so called FitFor55 package, which sets out the rules and conditions for the EU to achieve a 55% net emission reduction by 2030, ensuing policies and actions at national and local levels. While policies push for greater efficiency and transition away from fossil fuels, the compounding effects of climate change on both natural and human-made systems, further complicate this challenge. Furthermore, the efforts to address the climate crisis are framed by wider socio-economic and geopolitical shifts, underscoring the uncertainty and transformations shaping our era. As a result, questions about what energy buildings use to meet our needs, how they use it, and how we live and how well we live, have become critical. These questions demand urgent, adequate and well structured answers.

The 2024 recast of the Energy Performance of Buildings Directive (EPBD) is providing a set of parameters and tools that will shape how Member States (MS) are going to respond to this challenge. Amongst its key requirements is the first draft of the National Building Renovation Plans (NBRPs), to be delivered by the end of 2025. These plans, which will be updated every five years, will guide national efforts to transform their building stock to take full advantage of emerging opportunities due to technological advancements and rising social awareness. At the same time, they should safeguard society against deteriorating living conditions and create the prerequisites for increased social cohesion, founded on inclusive and socially just processes and outcomes. This is an important opportunity that must not be missed.

To support this opportunity, the present guiding document will focus on the heating and cooling of buildings, one of the most critical areas in terms of both the carbon footprint of the built environment and society's exposure to energy poverty, driven by rising energy prices, fossil fuel dependencies and growing energy demand. Moreover, the objective of decarbonizing heating and cooling, provides an excellent framework to promote an integrated and holistic approach when planning building renovations. A necessary course of action, especially in times when the incremental changes brought by the efforts until today are clearly not enough. This document is

conceived as a guiding framework aligned with the ambition of limiting global warming to 1.5 °C, setting a course for deep and meaningful transformation.

In stark contrast, what is needed are inclusive strategic plans that deliver climate ambitious solutions that epitomize efficiency and have a consequential positive impact on the everyday lives of the majority of European people, starting from the usually least favored segments of the population.

With the objective to facilitate such planning this guiding document, will provide insights on:

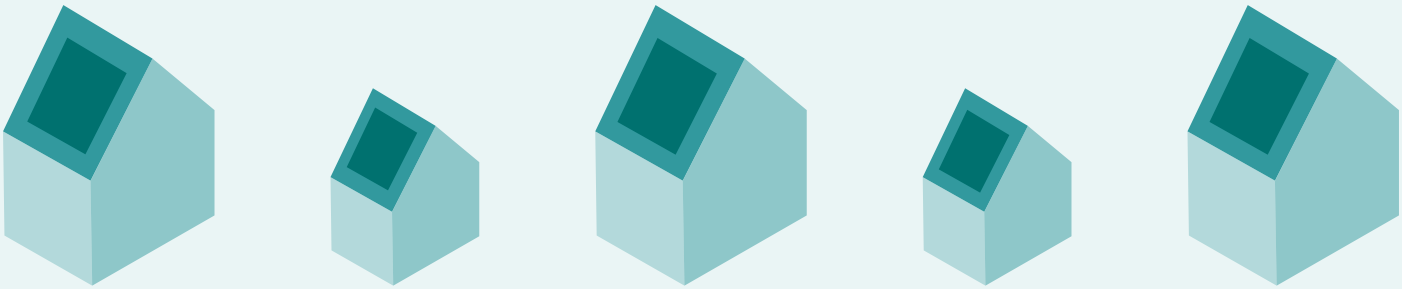
A) **How the renovation of buildings can and should go hand in hand with the decarbonization of heating and cooling and why such an approach will lead to the results needed.**

B) **How NBRPs can become the key tool for major renovations that integrate heating and cooling, while protecting the people most in need.**

C) **How NBRPs can be a powerful tool to drive forward a just and resilient transformation of our built environment.**

To do so this document will synthesize information from existing but fragmented research and policy publications on the climate transition in the building sector, energy poverty and housing affordability. It will showcase inspiring examples at the local, regional and national scale and provide an overview of the needs regarding the decarbonization of heating and cooling as defined by relevant EU Directives. It will also endeavour to map key challenges and discrepancies across and within MS, both in terms of present conditions and future climate scenarios.

Finally, this document will conclude with a set of policy proposals aimed at national stakeholders involved in drafting the NBRPs, outlining tactics and priorities that will bolster the social and climate impact of this opportunity.



Why do we need a more holistic approach to decarbonizing heating and cooling in buildings?

Heating & Cooling across the EU and its role in the climate crisis

The magnitude of the challenge in the building sector seen through the lens of climate change is enormous.

Buildings account for 40% of final energy consumption (FEC) in the EU and 36% of its energy related greenhouse gas (GHG) emissions[1]. Numbers that succinctly illustrate the sector's role in intensifying, and stemming, the climate crisis. To align with CAN Europe's Paris Agreement Compatible Scenarios[2] (PAC Scenarios), GHG emissions from buildings in the EU must be reduced at least by 68% by 2030, compared to 2020 levels. Failure to meet this benchmark will make it impossible not to over-exceed the 1.5°C threshold, above which climate change impacts become irreversible and increasingly severe, threatening life supporting ecosystems and exacerbating social and economic damages[3],[4].

Heating and cooling account for the largest share of the building sector's carbon footprint, consuming 50% of the energy consumed in the EU, with the majority still produced using fossil fuels[5]. While rising temperatures are already affecting the balance between heating and cooling needs[6], space heating still consists almost the 65% of FEC of EU households[7], representing 30% of EU's total CO2 emissions[8].

The heating sector in the EU is quite diverse, with technologies varying depending on local and national conditions. As a consequence, while overall the sector is dominated by fossil gas boilers that represent 45% of the installed heaters in the region, 75% of these installations are concentrated in Germany, France, Spain and the Netherlands alone[9]. In other MS, the dominant choice for space heating is oil and coal boilers (Poland and Greece), district systems using a high percentage of Renewable Energy Sources (RES) and biofuels (Denmark[10], Sweden and Lithuania), or individual wood burners (Croatia, Bulgaria and rural Romania)[11].

As far as cooling is concerned, it currently represents only 0.6% of the FEC of EU hou-

[1] European Union. Directive (EU) 2024/1275 of the European Parliament and the Council of 24 April 2024 on the energy performance of buildings (recast) (text with EEA relevance). 8 May 2024 (access)
[2] CAN Europe. Paris Agreement Compatible Energy Transition Scenarios. November 2024
[3] IPCC. 2018. Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Cambridge University Press (access)
[4] UN.1.5°C: what it means and why it matters
[5] EU Commission, 2024. Decarbonisation of buildings' heating system with heat pump technologies: an overview of EU policies and projects. 03 January 2024 (access)
[6] IEA.2018. The future of cooling: opportunities for energy efficient air-conditioning. May 2018
[7] Eurostat - Disaggregated final energy consumption in households - quantities
[8] BPIE. 2021. Deep renovation: shifting from exception to standard practice in EU policy. November 2021
[9] Toleikyte, A. Reina, J. C. Volt, J. Carlsson J. Lyons L. Gasparella A. Koolen D. De Felice M. Tarvydas D. Czako V. Koukoufikis G. Kuokkanen A. and Letout S. The Heat Pump Wave: Opportunities and Challenges. Publications Office of the European Union. 2023 (access)
[10] Danish Energy Agency. 2019 Energy statistics (in Danish)
[11] Eurostat - Persons heating their dwelling with other than district heating by used energy source, household composition and degree of urbanisation (access)

seholds, but it has more than tripled between 2013 and 2022[12]. A 2019 report projects that even under an effective implementation of existing policies, cooling needs will continue to rise and by 2050 represent 8-9% of FEC in the entire building sector[13]. It is important to note that the rise of cooling needs is notable across all EU MS, with the exception of the Alps, Scandinavian and Baltic countries as well as Ireland[14]. Nonetheless, it exhibits a significant geographical propensity, as cooling is already a substantial portion of households' FEC in countries of the European South, namely Malta (15%), Cyprus (11%) and Greece (4%)[15]. Looking ahead, predictions[16] estimate that 81% of EU annual energy use for cooling in households will be consumed in Italy, Spain, Greece, France and Portugal alone.

The condition of the EU building stock, living costs and vulnerabilities

The need for ambitious and effective interventions in the heating and cooling sector becomes even more evident, as 75% of the total EU existing building stock is deemed energy inefficient[17], largely because the majority of EU homes has been built before the introduction of modern thermal standards[18].

Further accentuating the inadequacy of EU buildings to deliver efficiently heating, is the fact that more than half of the approximately 90 million installed boilers in the EU is considered inefficient, thus consuming a lot of energy to deliver thermal comfort[19]. On the other hand, while air conditioners have a shorter lifespan and smaller upfront costs than boilers, leading to quicker substitutions and better overall efficiency, rising temperatures are hampering their efficiency[20], increasing overall energy demands.

Under such conditions, European households remain trapped due to structural reasons, in circumstances that impede their ability to adequately heat and cool their homes. According to Eurostat[21], overall energy poverty seems to have decreased since 2013, partly due to improvements in the economic situation, as a report from the EU Commission suggests[22]. Nonetheless, a report[23] published by the Joint Research Center (JRC) in 2025 paints a different picture, linking energy poverty directly to house quality and outdated heating systems. In 2023, 18.5% of EU households did not have sufficient insulation or heating systems to keep their dwelling comfortably warm during winter, with households suffering a high housing cost burden being affected the most.

These trends disproportionately affect people with limited options, most often due to low income, general poverty conditions, inelastic energy needs and an inability to improve their household energy efficiency[24]. The segments of the population usually living in such conditions are:

>> tenants in private markets, as they have experienced the highest housing cost increases over recent years and live in the least renovated part of the housing stock[25],

[12] Eurostat - Disaggregated final energy consumption in households - quantities
[13] Hotmaps, 2019. Heating & Cooling outlook until 2050, EU-28. March 2019
[14] Spinoni J. Vogt J.V. Barbosa P. Dosio A. McCormick N. Bigano A. and Füssel H.M. 2017. Changes of heating and cooling degree-days in Europe from 1981 to 2100. International Journal of Climatology. Volume 38 (access)
[15] Eurostat. Disaggregated final energy consumption in households - quantities. (access)
[16] Jakubcionis M. and Carlsson J. 2017. Estimation of European Union residential sector space cooling potential. Energy Policy. Volume 101 (access)
[17] Recital 6 of EPBD, Directive 2024/1275
[18] Cornelis M. 2025. Framing summer energy poverty: insights and recommendations for a resilient future. Publications Office of the European Union. January 2025 (access)
[19] Feantsa. 2024. Affordable and clean heating for all EHPA. 2023. Heat pumps in Europe: key facts and figures
[20] Alawahdi M. and Phelan P. E. 2022. Review of Residential Air Conditioning Systems Operating under High Ambient Temperatures. Energies. Volume 15 (access)
[21] Eurostat - Population unable to keep home adequately warm by poverty status
[22] EU Commission. 2020. Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. 13 October 2020 (access)
[23] JRC. 2025. Addressing Housing Affordability and Energy Poverty: A Dual Challenge for the EU
[24] Eurofound. 2023A. Surviving Wint-Her: A gendered analysis of energy poverty factors, drivers and outcomes (access)
[25] Eurofound. 2023B. Unaffordable and inadequate housing in Europe

>> low income households in rural areas, more likely to own large, deteriorating homes with leaks, dampness, and rot[26], while lacking access to cheaper energy sources[27] and often a higher share of energy expenditure[28], in some cases reaching even 20% to 50%[29] of income,

>> "single mothers, who represent 85% of single parent families, as well as single women, women with disabilities and elderly women living alone", as they are disproportionately affected by energy poverty[30],

>> pensioners living in aging big homes they can no longer afford to maintain[31] and

>> ethnic minorities living in old accommodations with low energy efficiency and outdated appliances[32],[33].

The energy renovations of the EU building stock to date

Against this backdrop, over the past two decades, the European building stock has been targeted by a multitude of EU policies, with the objective primarily to reduce its GHG emissions.

With energy efficiency measures now a central component of the renovation and maintenance market in the construction sector, these policies have been a major boost for the sector, as renovations reached 54% of the overall volume of sector activity in 2022.

Investment in renovation represent 30.3% of its total investment in construction and an annual revenue of €850bn[34],[35]. These numbers corroborate Eurostat's[36] estimations that 1 in 4 people in the EU live in dwellings, whose energy efficiency has been improved[37] during the last five years. However, despite this apparent progress, a closer look reveals that the overall impact remains insufficient.

The share of deep renovations, defined as achieving energy savings of 60-90%, remains alarmingly low. As of 2019, their annual uptake was just 0.2% in the residential sector and 0.3% in non residential buildings, with overall energy renovations at 12% and 10% respectively[38]. This demonstrates the continued dominance of light and very light renovations, leading to average energy savings of only 9% in residential buildings and 17% in non residential ones.

These figures succinctly highlight the significant risk of the missed opportunities because of insufficient and sporadic measures. Furthermore, as energy poverty continues unabated, it becomes clear that even where renovations occur, their benefits are not reaching those who need them most. The persistently very low uptake of deep renovations points to a serious issue of accessibility, with meaningful energy upgrades remaining out of reach for large segments of the population.

The latest EU Buildings Climate tracker, published by BPIE (2024)[39], further highlights how current progress falls short of the milestones required to align with the EU's 2050 climate neutrality target:

[26] Eurofound. 2023A (see above)
[27] CAN Europe and ECODES. 2024. Planning a fair and ambitious Renovation Wave: tools and practices to build better lives through the implementation of the Fit for 55 strategy (access)
[28] SEI. 2022. The impact of the new EU Emissions Trading System on households: how can the Social Climate Fund support a just transition? (access)
[29] Feantsa. 2024. Affordable and clean heating for all
[30] European Union. 2023. Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023 establishing a Social Climate Fund and amending Regulation (EU) 2021/1060. 16 May 2023 (access)
[31] Feantsa. 2024. Affordable and clean heating for all
[32] Anguelovski I. Kotsila P. Lees L. Triguero-Mas M. and Calderón-Argelich A. 2024. From heat racism and heat gentrification to urban heat justice in the USA and Europe. Nature Cities.
[33] Eurofound. 2023A (see above)
[34] van Sante M. 2023. Renovation is taking centre stage in the construction sector. ING Corporate Sector Coverage. 3 July 2023 (access)
[35] FIEC. 2023. Statistical Report
[36] Eurostat. 2024. Energy efficiency improvements in EU dwellings
[37] according to the methodological guidelines of this estimation: "All renovations that have had an effect on the dwelling's thermal conditions should be considered and counted. For instance, even if only one window in the dwelling was replaced in the last 5 years, as opposed to all the windows, the information should still be accounted for this variable."
[38] EU Commission. 2019. Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU (access)
[39] BPIE. 2024. EU buildings climate tracker 3rd edition

>> carbon emissions from buildings declined by less than 15% between 2015 and 2022, compared to the 27.9% reduction needed over the same period to stay on track.

>> Final Energy Consumption in buildings decreased by just 2.8%, far below the 6.5% reduction target

Regarding heating systems, the installation of heat pumps is currently leading the way of the energy transition in the building sector. By 2022, nearly 20 million heat pumps were installed in the EU, supplying 16% of heating and cooling needs in residential and commercial buildings[40]. However, despite their high efficiency and decarbonization potential, evidence suggests that their deployment in renovations remains limited[41],[42],[43].

Contrarily, the prevailing market trend is of new gas boilers replacing old gas boilers, as well as oil and coal boilers . More specifically, during 2012-2020 the sale of gas boilers increased, and in 2020 alone over 4 million condensing gas boilers were sold across the EU[44]. This trend accelerated in 2023 with 10 million new units entering the market[45]. While condensing gas boilers are around 30%[46] more efficient than traditional gas boilers and provide improved thermal comfort, they lock in volatile fossil fuel for at least another 20-25 years, considering their average lifetime[47], obstructing progress towards a climate neutral world.

Regarding district heating systems,while Europe is a world leader, with district heating systems supplying around 12% of all households, service and industry customers, renewable energy supplies 20% of most district heating systems that continue to predominantly depend on fossil fuels and increasingly biomass or waste incineration[48],[49].

[40] EHPA. 2023. European heat pump market and statistics report 2023
[41] EHPA. 2022. Heat pumps in renovation: the most flexible technology when renovating any kind of building (access)
[42] BPIE. 2023. Introducing the heat pump readiness indicator: how to make Energy Performance Certificates fit for heat pumps (access)
[43] Electrification Alliance. 2024. Recommendations for an electrification action plan
[44] Toleikyte, A. Reina, J. C. Volt, J. Carlsson J. Lyons L. Gasparella A. Koolen D. De Felice M. Tarvydas D. Czako V. Koukoufikis G. Kuokkanen A. and Letout S. The Heat Pump Wave: Opportunities and Challenges. Publications Office of the European Union. 2023 (access)
[45] EHI. 2023. Heating market report 2023
[46] Eurofound. 2023A. Surviving Wint-Her: A gendered analysis of energy poverty factors, drivers and outcomes (access)
[47] Öko-Institut e.V. 2021. Phase-out regulations for fossil fuel boilers at EU and national level
[48] CEE Bankwatch Network and Beyond Fossil Fuels. 2023. Cleaning up District Heating Best technologies and real-life examples (access)
[49] European Union. Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652. 31 October 2023 (access)

kg/capita GHG emissions for H&C, 2023

Largest - Luxembourg 1256, Belgium 1104, Ireland 1007

Lowest - Sweden 29, Malta 76, Finland 116

EU 607

Share of RES & biofuels in non district residential space heating, 2023

Largest - Sweden 35.8%, Finland 25%, Slovenia 24.5%

Smallest - Cyprus 0.2%, Hungary 0.7%, Malta/Denmark 0.9%

EU 6.2%

Share of population that Improved energy efficiency of their homes in the last 5 years, 2023

Largest - Netherlands 58,5%, Estonia 46,7%, Latvia 36,7%

Smallest - Malta 8,4%, Greece 11.4%, Cyprus 14,6%

EU 27.5%

Share of population unable to keep home adequately warm, 2023

Largest - Portugal 38%, Ireland 34,3%, Greece 28,5%

Smallest - Austria 3,7%, Estonia 4,3%, Slovenia 4,7%

EU 17.9%

Share of population unable to keep home adequately cool, 2012

Largest - Bulgaria 49.5%, Portugal 35.7%, Malta 35.4%

Smallest - Ireland 4%, Sweden 7%, Luxembourg 10.2%

EU 21.4%

Share of RES & biofuels in district residential space heating, 2023

Largest - Sweden 100%, Ireland 64.3%, Belgium 42.7%

Smallest - Greece/Croatia 0%, Poland 0.2%

EU 16.6%

Average increase of house prices 2015-2023

Largest - Hungary 172.5%, Lithuania 114.2%, Czechia 111.7%

Smallest - Finland 5.4%, Italy 8.3%, France 31.3%

EU 48.1%

Average housing cost as % of disposable income, 2023

Largest - Greece 35.2%, Denmark 25.9%, Germany, 25.2%

Smallest - Cyprus 11.6%, Malta 12%, Slovenia 13%

EU 19.7%

Percentage of tenants at market price spending more than 40% of their disposable income on housing costs, 2023

Largest - Netherlands 47.9%, Romania 44.2%, Hungary 42.5%

Smallest - Austria 13%, Germany 14.9%, Finland 15.3%

EU 20.3%

Percentage of people with below 60% of median income living in flats 2020

Largest - Germany 71%, Austria 68%, Sweden 68%

Smallest - Romania 9%, Ireland 12%, Croatia 14%

EU 51%

Facts and figures on heating and cooling in buildings, living conditions and housing markets across EU MS (Sources: Eurostat; European Parliament. 2024. Rising housing costs in the EU: the facts; FEANTSA. European index of housing exclusion 2024)

NBRPs as drivers of the just transition in the built environment

A well designed transposition and timely implementation of the recast EPBD[50] can significantly advance the transformation of Europe's building sector, moving away from the dominant paradigm of shallow to medium energy renovations towards deeper ones. However, to be truly aligned with a 1.5°C-compatible trajectory, Member States must go beyond the minimum requirements of the directive, putting in place ambitious national strategies, robust regulations, and inclusive enabling frameworks that drive systemic change on the ground.

Driven by the objectives of the European Commission's Renovation Wave Strategy, the EPBD aims to at least double the annual renovation rates by 2030, enabling the renovation of 35 million buildings by 2030 and ensuring that all existing buildings transition to zero-emission buildings status by 2050. A major focus is tackling the 43% worst-performing residential buildings, which must account for at least 55% of total energy savings. In line with the energy efficiency first principle, reducing energy demand while integrating renewables is essential to achieving the Directive's strategic objectives of GHG reduction and energy poverty alleviation. Achieving this double objective requires an integrated approach that couples the phase-out of fossil fuels in heating and cooling with the implementation of Minimum Energy Performance Standards (MEPS). At the same time, to ensure that this transformation is socially just, the Directive acknowledges that renovations must not lead to evictions but rather secure affordable and sustainable housing for all. This means that regulatory tools must go hand in hand with financial incentives and social safeguards prioritizing vulnerable households and those affected by energy poverty.

To transpose these ambitious goals at the MS level, the recast EPBD positions NBRPs as the central strategic tool to achieve renovations at the national level. NBRPs have the potential to become a structured, long term planning instrument, scaling up renovation rates and the decarbonization of the building sector, while ensuring alignment with other relevant Directives[51], National Energy and Climate Plans (NECPs) and Social Climate Plans[52] (SCPs). Moreover, by guaranteeing the active participation of social stakeholders can help to connect these strategies with the circumstances and barriers faced by different social groups, especially the most vulnerable segments.

Building on the experience of Long-Term Renovation Strategies (LTRS), introduced by the Directive 2012/27[53] and revised in the 2018 EPBD[54], the NBRPs stemming from the recast EPBD 2024 are providing a more pragmatic, structured and elaborated strategic framework for action. In this regard, key improvements are:

[50] European Union. Directive (EU) 2024/1275 of the European Parliament and the Council of 24 April 2024 on the energy performance of buildings (recast) (text with EEA relevance). 8 May 2024 (access)
[51] most prominently the recast of the RED and the EED
[52] In order to gain access to the funds provided by the Social Climate Fund, that aims to alleviate the impacts on vulnerable households of the new Emissions Trading System on the buildings and transport sectors, Member States must submit by June 2025 their SCPs, describing existing and planned measures.
[53] Article 4 - European Union. Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (text with EEA relevance). 14 November 2012 (access)
[54] European Union. Directive (EU) 2018/844 of the European Parliament and the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency (text with EEA relevance). 19 June 2018 (access)

>> a five year update cycle, replacing the previous three year requirement, allowing to focus planning on the mid-term,

>> roadmaps with nationally established targets and measurable progress indicators, including the reduction of the number of people affected by energy poverty,

>> mandatory thresholds regarding GHG emissions and energy demands of renovated and new zero-emissions buildings, as well as MEPS for non-residential buildings,

>> national trajectories for the renovation of the residential building stock, including the 2030 and 2035 milestones for decreases in primary energy use expressed in kWh/(m2. year)

>> a standardised template (Annex II) to use for drafting the NBRPs that includes an extensive list of mandatory and optional indicators,

>> explicit financial, as well as administrative requirements, supporting effective implementation.

It should be apparent by now that if Member States fully leverage this tool, they can drive deep renovations, decarbonize heating and cooling, and protect the most vulnerable, and accelerate emission reductions.

The next section will elaborate on key strategic principles for the decarbonization of buildings to turn this vision into a reality.

Beyond compliance: A holistic path to decarbonized buildings

The pathway for a fully decarbonized building stock, requires more than just meeting EU-mandated decarbonization targets—it demands a strategic, integrated, and socially just approach. To ensure that renovations deliver meaningful climate and social benefits, NBRPs should be guided by seven key strategic principles:

>> Renovating for climate and justice, ensuring that climate goals are impactful for people and the planet.

>> Facilitate renovations that are planned in an integrated way, addressing heating, cooling and structural upgrades holistically.

>> Increase the adaptability and resilience of the existing building stock and its users, preparing them for a warming planet.

>> Accelerate district and neighbourhood approaches and prioritise specific segments of the population

>> Take a more comprehensive approach to tackle energy poverty, understanding structural and social barriers to energy upgrades

>> Reinforce housing as a fundamental human right, preventing renovation driven displacement and speculation.

>> Mobilize social and administrative capital, ensuring upgrades based on local contexts and inclusive processes.

Renovating for climate and justice

While the EPBD and other EU Directives set clear decarbonization targets, NBRPs should go beyond mere compliance, considering the poor climate related results of renovations till today. Specifically, they can and should adopt a more ambitious and proactive approach, when planning for the phase out of stand alone boilers and the penetration of renewable energy and heat pumps in the energy upgrades of buildings.

At the same time, NBRPs must deliver tangible and substantial improvements in people's lives. This means reducing energy needs together with dependence on fossil fuels. The

focus should shift from energy affordability alone to ensuring thermal comfort and long-term housing security. To push for tangible results where they are needed most, over the next five years, priority must be given to households trapped in a cycle of impoverishment, driven mostly by rising energy needs and costs and an increasingly unaffordable housing market. In this way, NBRPs will act as a catalyst for systemic change, making energy renovations a powerful tool for both climate action and social justice.

Facilitate renovations planned in an integrated way

NBRPs need to acknowledge that deep renovations succeed when the multiple and interdependent parts of such a task are addressed in unity. This is the only way to reach the energy efficiency and living standards required, while unlocking the full potential of housing decarbonization. This section is meant to highlight existing and game changing opportunities. In the end, what will be included in a building's energy upgrade will be decided based on parameters like available budget, users' needs, availability of space, building's location etc.

Upgrading a building's envelope in synergy with the decarbonization of heating and cooling infrastructure. First and foremost, because improving the envelope in many cases is not enough to safeguard users from energy poor situations, as they may still struggle to afford the energy needed to reach an appropriate level of thermal comfort, especially if they remain dependent on carbon intensive energy sources. Secondly, reducing heating and cooling demand through an envelope upgrade, enables the more efficient and cost effective deployment of low carbon infrastructure and the electrification of heating and cooling, while also lowering strain on the electricity grid. It is important to note that especially in southern European countries that face heatwaves and prolonged periods of hot weather, an upgrade of a building's envelope does not consist only of the upgrade of insulation and windows, but also the enhancement of other passive cooling systems, like shading, green roofs and vegetation cover.

Supporting the deployment of heat pumps and photovoltaics in existing buildings depends largely on lowering the envelope's conductivity sufficiently. For heat pumps, this holistic approach, beyond easing the strain on electricity grids, can, if implemented properly, turn a building into low-temperature ready[55]. In practical terms, this means downsizing the required heat pump capacity and minimizing modifications to the existing heating infrastructure (e.g. radiators and piping)[56], ultimately reducing considerable installation and operation costs. Pairing heat pumps with solar PV installations increases even further the energy autonomy of the building, while reducing the burden on the electricity system. In addition, when planning for rooftop photovoltaics (RTPVs), roof renovations and insulation are often a prerequisite for their deployment[57], turning the building into "solar ready". A more holistic approach, linking building renovations with solar installation, can also provide the opportunity for a wider application of integrated photovoltaic systems, expanding the available "artificial and built surfaces"[58].

Upgrading the electrical system of buildings is a crucial yet often overlooked aspect of renovations, particularly considering that more than half of the residential building stock in

[55] Roca Reina J.C. Toleikyte A. Volt J. and Carlsson J. 2024. Alternatives for upgrading from high-temperature to low-temperature heating systems in existing buildings: challenges and opportunities. Energy and Buildings. Volume 323.
[56] Roca Reina J.C. Carlsson J. Volt J. and Toleikyte A. 2025. Alternatives for decarbonising high-temperature heating facilities in residential buildings. Energies 2025. Volume 18 (access) by Juan Carlos Roca Reina *,Johan Carlsson *,Jonathan Volt andAgne Toleikyte
[57] CAN Europe. Energy Cities. EPG. ECOS. Eurocities. Avere. EBC. ECI. EEB. EHPA. Europe On. Friends of the Earth Ireland. Kyoto Club. Legambiente. REScoop. smartEn. Solar Heat Europe. Solar Power Europe. 2022. Joint statement: an EU-solar mandate for energy-positive, system-integrated and efficient buildings, at the core of a resilient energy system (access)
Kapsalis V. Maduta C. Skandalos N. Bhuvad S. D'Agostino D. Jing Yang R. Udayraj. Parker D. and Karamanis D. 2024. Bottom-up energy transition through rooftop PV upscaling: Remaining issues and emerging upgrades towards NZEBs at different climatic conditions. Renewable and Sustainable Energy Transition. Volume 5.
[58] Article 15c - European Union. Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652. 31 October 2023 (access)

the EU has obsolete electrical installations[59]. For buildings to fully participate in the shift towards an electrified and decarbonized energy system, transforming into active energy hubs, their electrical installation must be modernized and adequately dimensioned. Similarly, energy storage and demand response technologies can support the building sector's electrification pathway, by balancing supply and demand, reducing reliance on expensive peak-time energy and contributing to grid efficiency and energy savings.

It becomes evident that to fully unlock most of these possibilities, NBRPs must prioritize the upgrade of entire buildings rather than building units. This approach is particularly crucial given that 46% of Europeans live in multi-apartment buildings[60]. Such a strategy is even greater when considering low income households, as the proportion of living in multi-apartment buildings rises sharply among those earning below 60% of the median income, in some countries (71% in Germany, 68% in Austria and 68% in Sweden)[61].

Increase adaptability and resilience of building stock

NBRPs must take into account that buildings renovated today must be able to **accommodate the needs of their users in a rapidly warming world.** Over the past decades, heating needs have significantly declined, with heating degree days (HDD) in the EU decreasing by 19% during 1979-2022. Meanwhile, cooling degree days (CDD) have increased fourfold[62]. As heat waves intensify, 72% of European cities are expected to experience a rise both in the number of heat wave days and maximum temperatures[63]. The risks are not equally distributed, with heat related deaths already six times more frequent in Southern Europe than in the north[64]. Vulnerable groups such as the elderly, low-income households, renters, the homeless, children, people with chronic illnesses and marginalized communities face the greatest risks[65].

Building renovations must certainly target **the passive cooling systems of the building,** strengthening resilience against rising temperatures, while reducing reliance on mechanical cooling. Upgrading the passive elements, including roof and wall insulations, natural ventilation, external and internal shading, vegetation cover like green roofs and reflective materials, such an approach will improve thermal comfort. By minimizing heat absorption and maximizing natural cooling, these measures provide long-term protection for building users against prolonged heat. However, an effective cooling strategy should extend beyond the individual building and **consider broader impacts and opportunities at the neighborhood and city level.** Incorporating urban greening, shaded public spaces, reflective street materials, and interconnected cooling corridors can amplify the benefits of building-level renovations, contributing to cooler and more climate-resilient urban environments.

Accelerate district and neighbourhood approaches and prioritise specific segments of the population

NBRPs must **be strategic** and focus upgrades on the segments of the building stock that can lead to the most tangible, long-term and meaningful results, sparking the necessary avalanche of renovations beyond 2030. To achieve this, they should promote the aggregation of projects, not only at the building level but also at the neighbourhood and district scale. Public buildings have an important role

[59] FEEDS. 2024. Energy performance of buildings directive implementation guidelines: recommendation on electrical safety (access)
[60] Eurostat - Distribution of population by degree of urbanisation, dwelling type and income group
[61] In many countries of CE Europe this segment of the population is living predominantly in detached houses (Romania 90%, Croatia 77%, Hungary 72%).
[62] Eurostat. 2024. Heating and cooling degree days - statistics
[63] SWECO. 2024. Building heatwave resilience in European cities
[64] García-León D. Masselot P. Mistry M. Gasparrini A. Motta C. Feyen L and Ciscar J.C. 2024. Temperature-related mortality burden and projected change in 1368 European regions: a modelling study. Lancet Public Health 2024. Volume 9.
[65] Cornelis M. 2025. Framing summer energy poverty: insights and recommendations for a resilient future. Publications Office of the European Union. January 2025 (access)

to play in scaling up district renovations, while they have the added potential of being connected with upgrades of urban spaces that can foster climate and community resilience. This broader perspective enables a wider and more cost-effective planning beyond individual buildings, such as the integration of district heating and cooling systems, or central air-conditioning (at the building level) and reducing the heat island effect. Additionally, this aggregated approach enhances overall energy flexibility and efficiency.

Another strategy that can further reinforce the impact of NBRPs, is targeting energy upgrades on the households mostly exposed to structural energy poverty. Not only can this drive greater project aggregation, but most importantly, it will lead to the most explicit results, allowing the decarbonization of buildings to move ahead on solid ground.

Approach energy poverty comprehensively

NBRPs must acknowledge that one of the main barriers to impactful renovations is the persistent inaccessibility of measures for those most in need. Energy poverty, including summer energy poverty, is not an isolated issue as it is deeply interwoven with broader socio-economic inequalities that leave many households vulnerable. At its core, energy poverty is closely linked to financial poverty, driven by low wages, high living costs and unemployment, that prevent households from being able to cover unexpected financial expenses[66]. For many, energy costs are not just a financial burden but a structural constraint, limiting their ability to maintain adequate heating, cooling and living conditions. Moreover, energy poverty intersects with health, disability and social exclusion, disproportionately affecting those with chronic illnesses, disabilities and limited mobility, for whom stable indoor temperatures are essential for well being. Additionally, unpaid care work, often carried out by women, intensifies the burden, as those spending more time at home are more affected by inadequate heating and cooling. Recognizing these deep rooted connections, NBRPs must go beyond technical renovations and integrate transformative social and economic support mechanisms.

Reinforce housing as a fundamental human right

NBRPs must ensure that energy upgrades do not contribute to the growing commodification of housing. Between 2010 and 2019, housing costs in the EU increased by 8% for homeowners and 23% for tenants, with some countries, like Portugal, Poland, Greece, Bulgaria, Estonia, and Latvia, experiencing increases of over 40%[67].

As large-scale public and private investments flow into building renovations, housing affordability concerns must be actively addressed. To date, €127 billion has been spent annually on energy renovations[68], while the EU's Climate Target Plan Impact Assessment estimates that reaching the climate target by 2030 requires an additional €220-300 billion in investments in the residential and tertiary sectors[69], every year until 2030. Meanwhile, in March '25 the European Investment Bank committed €10 billion towards affordable and sustainable housing[70]. However, past experiences show that renovation programs can drive rent hikes, renovictions, and real estate speculation, benefiting institutional investors while displacing vulnerable residents[71]. Therefore, it is crucial that NBRPs explicitly protect low income households and actively

[66] According to Eurostat data, in 2023 1 in 3 Europeans could not face unexpected financial expenses, a rate that in some countries (Bulgaria, Romania, Latvia, Greece) reached almost 1 in 2.
[67] Eurofound. 2023B. Unaffordable and inadequate housing in Europe
[68] BPIE. 2022. Report on the evolution of the European regulatory framework for buildings efficiency
[69] EU Commission. 2020. Commission staff working document - Impact assessment accompanying the document "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Stepping up Europe's 2030 climate ambition investing in a climate-neutral future for the benefit of our people". 17 September 2020 (access)
[70] EU Commission. 2025. European Commission and EIB group lay foundations for a new pan-European investment platform for affordable and sustainable housing (access)
[71] Zancanella P. Bertoldi P and Boza-Kiss B. 2018. Energy efficiency, the value of buildings and the payment default risk. Publications Office of the European Union (access)

support community led initiatives and the non profit sector, which counterbalance the inflationary pressures of the market.

Mobilize social and administrative capital

NBRPs must move beyond traditional actors like energy services companies, energy providers, private and public partnerships, institutional investors, and banks. While these stakeholders play a crucial role, a more inclusive, locally anchored approach is essential to ensure that energy upgrades reflect community needs and promote energy democracy.

Heating and cooling are fundamentally local matters, shaped by regional climate, spatial constraints, and socio-economic realities. Decarbonization strategies must be tailored to local contexts to be both effective and equitable[72]. Only locally embedded actors, like energy communities, local authorities, social housing providers, and civil society organizations, can truly engage citizens and ensure lasting impact. Their involvement fosters trust, long-term engagement, and democratic legitimacy, while also providing cost-effective advisory services without requiring large upfront investments. Additionally, these initiatives can help tackle deep energy deprivation issues, such as indebtedness, energy disconnections, and lack of access to affordable energy[73], challenges that require holistic social support.

One-stop shops[74] can play a key intermediary role, offering households integrated technical, financial, and administrative support tailored to local conditions, while connecting them with trustworthy actors and accessible renovation pathways.

The Tavros project, Athens (Greece). More info: Showcasting Cooling section (pag 27)

[72] CAN Europe. 2023. Embracing a renewable heating revolution in our buildings! Overcoming barriers and going beyond fossil- fuel heating (access)
Energycities. 2023. EU tracker - local heating and cooling planning in EU Member States: findings and policy recommendations (access)
[73] EmpowerMed. 2023. Collective advisory assemblies Social innovation for empowering people affected by energy poverty (access)
[74] Article 22 - European Union. 2023. Regulation (EU) 2023/955 of the European Parliament and of the Council of 10 May 2023 establishing a Social Climate Fund and amending Regulation (EU) 2021/1060. 16 May 2023 (access)

Aligning NBRPs with the EPBD: Requirements and Opportunities

The 2024 recast of the EPBD provides the central legislative framework guiding how MS will shape their NBRPs. While the Directive includes binding requirements, it also offers structured opportunities to drive ambitious, socially just renovation strategies. This chapter focuses specifically on the EPBD, outlining the key provisions that NBRPs must incorporate, while distinguishing between mandatory obligations and optional measures that can be used to enhance national strategies and deliver greater climate and social impact.

Applying MEPS and targeting the worst performing buildings

A central pillar of the EPBD framework is the implementation of MEPS and targeted renovation strategies for the worst-performing buildings. These measures aim to facilitate structured and measurable reductions in energy consumption, especially where inefficiency is most concentrated.

According to Article 3(2) of the EPBD, NBRPs must include both MEPS for non-residential buildings and national renovation trajectories for the residential building stock.

For non-residential buildings, Article 9(1) requires that Member States define maximum energy performance thresholds (in kWh/m²/year) based on their building stock as of January 1, 2020. These thresholds must be set so that 16% and 26% of the stock exceed the defined limits (the “16%” and “26%” thresholds respectively). Member States must ensure that by 2030, all non-residential buildings are below the 16% threshold, and by 2033, below the 26% threshold.

For residential buildings, Article 9(2) mandates national trajectories that reduce the average primary energy use (compared to 2020 levels) by:

>> At least 16% by 2030, and

>> At least 20–22% by 2035.

At least 55% of this reduction must come from renovations targeting the 43% worst-performing residential buildings.

In addition, Article 9(3) allows Member States to adopt optional complementary indicators to measure progress, such as:

>> Non-renewable and renewable primary energy use, and

>> Operational GHG emissions (expressed in $kgCO_2eq/m^2/year$).

To facilitate compliance, the EPBD also recognizes that renovations completed since 2020 can count toward these goals. However, it is recommended that NBRPs clearly distinguish between completed and planned renovations to maintain transparency and prevent any dilution of ambition.

Deep renovations: transforming existing buildings into zero-emission buildings

The EPBD mandates a structured pathway for deep renovations, ensuring that existing buildings transition toward zero-emission standards through nationally established tar-

gets, measurable indicators, and strict energy performance thresholds.

NBRPs must include a roadmap with clear targets for 2030, 2040 and 2050, in line with the pathway to transform the national building stock into zero emission buildings (Article 3, paragraph 2). These targets must cover:

>> Annual energy renovation rates

>> Primary and final energy consumption, and

>> Operational GHG emission reductions

According to Article 2(20), deep renovations must follow a two-phase transition:

>> Before January 2030, deep renovations must convert buildings into Near Zero Energy Buildings (NZEBs), meaning buildings that consume nearly zero or very little energy, and most of it is sourced from renewable energy sources on site or nearby (paragraph 3).

>> After January 2030, deep renovations must transform buildings into Zero Emission Buildings (ZEBs), ensuring that the zero or very small amount of energy produces zero on site fossil fuel emissions and zero or very few operational GHG emissions (paragraph 2).

Where a full renovation to a ZEB is not technically or economically feasible, Article 17(16) allows deep renovations to be defined as achieving at least a 60% reduction in primary energy use, ensuring that substantial efficiency gains are still mandated.

Finally, according to Article 11(7), MS must ensure that the total annual primary energy use of a renovated ZEB is supplied by:

>> Renewable energy sources

>> Efficient district heating and cooling systems

>> Other carbon free energy sources

Heating, Cooling and Energy Sources

Beyond the above zero-emission building requirements, the EPBD establishes additional decarbonization objectives that NBRPs must integrate. These objectives focus on phasing out fossil fuels in heating and cooling, accelerating the deployment of renewables, and setting clear policy measures to support the transition.

Annex II of the Directive requires NBRPs to include concrete policies and measures that:

>> Ensure the decarbonization of heating and cooling and phase out fossil fuels in these systems, aiming for a complete phase-out of fossil fuel boilers by 2040.

>> Promote renewable energy sources in buildings, aligning with the indicative target of at least 49% renewable energy in the building sector's final energy consumption by 2030, as set by Article 15a(1) of Directive (EU) 2018/2001.

The EPBD also introduces direct prohibitions and flexibilities for MS:

>> From January 2025, Article 17(15), prohibits MS from offering financial incentives for the installation of new stand-alone fossil fuel boilers, except for installations pre-approved before 2025.

>> MS may also adopt additional measures under Article 13:

- **>** Set requirements on GHG emissions or minimum renewable energy shares in heating at the building level (paragraph 1).
- **>** Set requirements that facilitate the effective installation and operation of low temperature heating systems in renovated buildings (paragraph 2).
- **>** Provide financial incentives to support the transition from fossil-fuel-based heating and cooling systems (paragraph 6).

> Implement phase-out strategies for stand-alone fossil fuel boilers in exis ting buildings, in line with national phase-out plans (paragraph 7).

A major component of the EPBD's decarbonization strategy is the deployment of solar energy installations. According to Article 10(3), MS must ensure the installation of suitable solar systems on:

>> All existing public buildings with a useful floor area larger than: (i), 2000m2 by the end of 2027, (ii) 750m2 by the end of 2028, (iii) 250m2 by the end of 2030, and

>> Existing non-residential buildings with a useful floor area larger than 500m2 by the end of 2027, when undergoing a major renovation, or any work that requires an administrative permit, or roof related construction or the installation of a technical building systems

Additionally, NBRPs must include policies and measures to deploy solar installations across all buildings, ensuring the widespread integration of renewable energy solutions into the built environment.

Electrical systems, smart readiness and beyond

To ensure that renovated buildings can support the flexibility, efficiency, and decarbonization goals set by the EPBD, NBRPs must integrate key electrical infrastructure improvements, smart readiness measures, and energy management systems. These requirements aim to enhance building adaptability, support renewable energy integration, and enable smarter, data-driven energy management.

According to Article 11(1), ZEBs must have the capacity to react to external signals and adjust energy consumption, generation and storage accordingly. Additionally, MS are required to promote energy storage solutions for renewable energy in buildings (Article 13, paragraph 6).

Improved energy management is further supported by Article 13(9) that requires MS to ensure that specific non-residential buildings are equipped with Building Automation and Control Systems (BACS). Furthermore, Article 13(11) mandates measures to monitor and improve system efficiency, including smart control functionalities and readiness for dynamic energy use.

Finally, Article 24(1) mandates that all building inspection reports must include safety issues detected during the inspection process, ensuring that modernized buildings meet both energy and safety standards.

Addressing energy and housing vulnerabilities

In addition to focusing energy upgrades on the worst-performing buildings, which disproportionately house low-income and vulnerable households, the EPBD introduces a set of measures aimed at alleviating energy poverty and regulating housing unaffordability. These measures provide NBRPs with the necessary policy tools to ensure that they protect those most exposed to energy and housing vulnerabilities.

According to Article 3(2), each NBRP must include an overview of the national building stock, with specific attention to the share of vulnerable households, alongside targets and indicators for reducing energy poverty. In this context, the EPBD (Article 2(28)) defines vulnerable households as "households in energy poverty or those that are particularly exposed to high energy costs and lack the means to renovate the building that they occupy".

To support these households, Article 17(18), requires MS to prioritize financial incentives for vulnerable groups, including those living in social housing.Further obligations under Article 9(2) specify that compliance with MEPS must be accompanied by:

> Financial assistance, particularly targeting these groups,
> Technical assistance, such as one-stop shops, with a focus on these po pulations.
> Actions to address non-economic barriers, such as split incentives.
> Monitoring of social impacts.

To overcome upfront cost barriers, MS are required to assess and implement support tools such as on-bill financing, pay-as-you-save schemes, or energy performance contracting (Article 17(3) and (19)). They must also ensure that Energy Performance Certificates (EPCs) and Renovation Passports are affordable and consider providing direct financial support for vulnerable households wishing to renovate (Articles 12(2) and 19(4)).

The rental sector is a particular focus, with several provisions aimed at protecting tenants. MS must:

>> Avoid disproportionately exempting rental buildings from renovation efforts (Article 9(2)),

>> Ensure incentives benefit both owners and tenants in rented units (Article 17(19)), and

>> Guarantee that digital EPCs are issued and accessible during rental processes, including in advertisements (Article 20(1), (2), (4)).

Last but not least, acknowledging the risk of renovation-driven evictions or disproportionate rent increases, the EPBD sets clear safeguards:

>> *"MS* **shall** *address the eviction of vulnerable households caused by disproportionate rent increases following energy renovations of their accommodation"* (Article 17(17)).

>> MS **must** introduce effective protections, including rent caps or direct rent support, to ensure that renovations do not result in displacement especially of vulnerable households (Article 17(19)).

Project aggregation and district level renovations

In addition to its provisions for targeting the worst performing and public buildings, the EPBD opens the door for NBRPs to explore project aggregation as a strategic tool for delivering cost efficient, large-scale renovation outcomes.

According to Article 17(11), MS **shall** facilitate the aggregation of renovation projects, to improve investor access and to enable packaged solutions for potential clients. Furthermore, MS **are required** to incentivize large-scale programmes that address a high number of buildings, particularly those targeting the worst performing stock, through integrated district-level renovation initiatives (paragraph 16). These programmes should aim for at least a 30% reduction in primary energy use, with financial, fiscal, administrative, and technical support scaled according to the level of performance achieved.

Mobilizing social and administrative capital

To ensure that NBRPs are grounded in social needs and local contexts, the EPBD outlines provisions aimed at strengthening both administrative capacity and inclusive participation. These measures recognize that successful renovation strategies require local knowledge, institutional support, and the active involvement of civil society.

NBRPs must (Article 3(2)) include an outline of the administrative resources required for the sufficient implementation of the plan. In addition, they must (Annex II) present policies and measures to address skill gaps and ensure the availability of a suitably trained workforce, both in the public and private sectors. To support renovation efforts, Article 29(3) encourages MS to introduce training and su-

pport measures for actors that will be key to implementing the Directive, including:

>> Local and regional authorities

>> Renewable energy communities

>> Citizen-led renovation initiatives

Finally, MS must conduct a public consultation on their draft NBRPs before submission to the European Commission (Article 3(4)), that will involve in particular local and regional authorities, and other socioeconomic partners, including civil society organizations and bodies working with vulnerable households. A summary of the consultation results must be annexed to the draft plan.

Photo Credit: Philippe Ruault, Cité du Grand Parc, Bordeaux (France)

Additional Legislative Foundations: Integrating the EED and RED into NBRPs

While the EPBD provides the core structure for NBRPs, the Energy Efficiency Directive (EED)[75] and the Renewable Energy Directive (RED)[76] contain additional provisions that Member States must consider to ensure alignment, effectiveness, and social fairness.

The EED plays a critical role in shaping the public sector's contribution to energy efficiency. Article 6(1) requires that Member States annually renovate at least 3% of the total floor area of public buildings (over 250m²) to meet near-zero or zero-emission standards. Further, Article 5(9) encourages upgrades in public buildings by replacing outdated heating systems. The directive also introduces clear criteria for efficient district heating and cooling systems (Article 26), establishing a progressive decarbonization pathway that leads to fossil fuel phase-out by 2050.

The EED also focuses on empowering consumers. Articles 13–15 mandate that, where technically and financially feasible, final customers connected to gas networks, district systems or shared heating and cooling networks are equipped with meters to better understand and manage their energy consumption. Meanwhile, Article 11(1) introduces requirements for large enterprises (with over 85 TJ in annual consumption) to adopt energy management systems by 2027.

Importantly, social equity is central to the EED. Article 8(3) mandates that Member States implement energy efficiency measures as a priority among people affected by energy poverty, vulnerable customers, and those living in low-income households or social housing. These measures must avoid negative effects on these groups and leverage available public and EU funding to ensure a just transition.

Crucially, Article 8(3) of the EED mandates that energy efficiency policies prioritise people affected by energy poverty and low-income households, with targeted funding and safeguards against negative impacts. In support, Article 24(3) highlights the importance of fostering technical assistance and enabling financial tools for these groups, including through the involvement of social actors who can support vulnerable customers to actively engage in the energy transition. It also requires Member States to establish expert groups across sectors, to support the design and delivery of inclusive, well-targeted measures and financing tools.

The RED reinforces the decarbonization of heating and cooling. Article 21(1) sets indicative annual targets for renewable energy growth in this sector: 1.3 percentage points per year between 2021–2025 and 2026–2030, or 1.1 pp for Member States with low waste heat usage. These targets are designed to steadily replace fossil fuels with renewables in building-related energy use. Additionally, Article 15(4) of the 2018 RED[77] requires that Member States introduce building regulations that promote the use of renewables in major renovations, where technically and economically feasible.

Together, the EED and RED provide a strong framework for ensuring that NBRPs are not only climate-aligned, but also socially equitable and forward-looking. By integrating these directives alongside the EPBD, Member States can better deliver on decarbonization targets while supporting those most in need.

[75] European Union. Directive (EU) 2023/1791 of the European Parliament and of the Council of September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (text with EEA relevance). 20 September 2023 (access)
[76] European Union. Directive (EU) 2023/2413 of the European Parliament and of the Council of 18 October 2023 amending Directive (EU) 2018/2001, Regulation (EU) 2018/1999 and Directive 98/70/EC as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652. 31 October 2023 (access)
[77] European Union. Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (recast) (Text with EEA relevance). 21 December 2018 (access)

Policy Recommendations

Decarbonizing heating and cooling in Europe's building stock is no longer something for the distant future, it is a pressing task with long lasting consequences. NBRPs hold the potential to transform this challenge into a socially just climate success, though only if they are designed to deliver real results for both people and the climate. This policy guide has outlined the scale of the problem, the limitations of past efforts, and the opportunity provided by the updated EPBD, RED, and EED.

What follows is a set of policy recommendations to help MS shape NBRPs that do not just tick boxes but actually move things forward: cutting emissions, protecting those most affected and putting buildings and their heating and cooling systems at the heart of the needed systemic change.

1. Prioritise deep renovations

To meet Europe's climate targets and improve living conditions, deep renovations must become the cornerstone of national energy upgrade strategies. Incremental improvements will not close the performance gap of the EU's aging and inefficient building stock. NBRPs must champion deep, integrated renovations that deliver long-term, meaningful results. To do so, they should:

>> Make deep renovations the gold standard. NBRPs should provide proportionately greater financial, administrative and technical support to deep renovations, ensuring they become the norm not the exception. Public funding should prioritize projects that adopt a whole-building approach, include climate-resilient elements as passive cooling, and achieve high energy savings in a single step or follow a clear staged plan aligned with long term climate targets.

>> Ensure all public buildings undergo deep renovations. Public buildings must lead by example, undergoing comprehensive energy upgrades that align with long term climate goals. NBRPs should prioritise deep renovations of buildings with a strong social purpose, such as schools, medical centers, hospitals, and community facilities, unlocking their full potential to reduce emissions, lower public energy costs and inspire broader uptake across sectors.

>> Support quality deep renovations by ensuring skilled delivery in the short and the long term. NBRPs should actively support the training and upskilling of professionals, not only technical, but also vernacular, and adapted to the new paradigm of **summer energy poverty.** Public support should prioritize projects that foster collaboration between different actors, training professionals, testing solutions, while ensuring quality and inclusivity.

>> Aggregate projects through neighbourhood and district level deep renovation programmes. NBRPs should support the clustering of projects to improve planning, reduce costs, and unlock economies of scale. They should target especially social housing, multi-apartment buildings with a high percentage of tenants and low income owner-occupiers, and neighbourhoods with poor building quality and aging, carbon intensive energy infrastructure such as outdated heating, cooling, or electrical systems.

>> Target urban density and climate vulnerability. Support deep renovation strategies that include passive cooling elements in dense urban areas. Link them with interventions in green infrastructure and other spatial planning measures to reduce the urban heat island effect.

2. Accelerate the replacement of fossil fuel boilers

NBRPs must take clear and determined steps to replace fossil fuel boilers, focusing on the most polluting systems and vulnerable households. This transition must be supported by an integrated strategy that balances urgency with fairness. To move in this direction, NBRPs should:

>> Chart a clear national pathway towards the complete phase out of fossil fuel use in buildings by 2040 at the latest. This target should be backed by intermediate milestones for 2030 and 2035 to track progress and guide planning.

>> Follow a "worst-first" approach, targeting the most inefficient systems and worst performing buildings. Public buildings, multi-apartment blocks and rural households with high energy needs and poor insulation, should be considered as a priority. This phased approach will help build capacity and deliver early benefits where they're needed most, while setting the pace for a broader transition.

>> Link boiler replacements to deep renovations. Ensure that deep renovations, by definition, exclude the installation or continued use of fossil fuel based heating systems. When technically and economically feasible, replacements should happen together with deep renovations to avoid oversizing and ensure cost-effectiveness and long term efficiency. In cases where deep renovations are not immediately possible, particularly for vulnerable households, replacements should still align with long term renovation goals and be designed to remain compatible with future envelope upgrades.

>> Enabling deep renovation (including the integration of renewable heating solutions) through targeted funding. Provide strong enabling measures for holistic deep renovations: increase allocated funding, offer favourable financing conditions, provide priority access to public support schemes, and ensure tailored technical assistance, particularly for vulnerable households and complex renovations like multi-apartment buildings.

3. Enhance the deployment of renewable heating, cooling, and integrated renewable energy systems

To rapidly decarbonise heating and cooling in buildings, NBRPs must promote on-site renewable solutions, electrify systems, and ensure a cost effective and energy efficient deployment tailored to diverse building types and user needs. To do so, NBRPs should:

>> Set national targets for renewable heating and cooling integration. Define short, medium, and long term objectives for deploying renewable-based systems like heat pumps, solar thermal and PVs, across the building stock. In addition to non-residential buildings, target multi-apartment blocks and social housing, while aligning support with national phase out plans for fossil fuel heating and cooling.

>> Link renewable installations with building renovations. Ensure rooftop PV and solar thermal panels and heat pumps are systematically assessed and deployed during major renovations, roof upgrades and heating system replacements. Renovation planning should follow an integrated approach, ensuring the building's envelope and electrical systems are ready to support efficient and cost-effective renewable energy installations.

>> Encourage the full potential of self-consumption and flexibility. NBRPs should unlock and expand opportunities for both individual and collective self-consumption of renewable energy, by supporting diverse models like energy communities, shared systems in multi-apartment buildings

and solutions at the household level. Combining these models with storage and demand side flexibility will strengthen grid resilience and give consumers greater control over their energy use.

>> Minimise current and future cooling demands. NBRPs should prioritize the upgrade of passive cooling systems to increase the climate-resilience of buildings and reduce reliance on mechanical cooling, while also improving the efficiency of active systems through measures like, replacing outdated units with energy efficient models and ensuring proper sizing and maintenance.

>> Aggregate efforts through neighbourhood and district approaches. NBRPs should promote the clustering of projects to support cost effective deployment of shared infrastructure like large scale heat pumps or district heating and cooling systems.This approach allows us to integrate strategies to reduce the heat island effect, which from a building-by-building perspective is not possible. In rural or less densely populated areas, where a street-by-street model may not be feasible, NBRPs should support renewable energy communities and decentralised solutions that match local building types and energy needs.

4. Target vulnerable households and tenants

A socially just renovation wave cannot succeed without deliberately prioritising vulnerable households, including tenants, low-income owner-occupiers and those facing structural barriers to adequate housing.
To do so, NBRPs should:

>> Ringfence financing and build administrative capacity. Allocate dedicated, long term funding streams specifically for low income, energy poor households and tenants especially in unregulated private markets, ensuring funds are not redirected to more profitable or easily accessible markets. Gender responsive budgeting should also be adopted to ensure women in precarious housing situations are adequately supported, even more urgently when compounded by factors such as single parenthood, disabilities and cases of economic insecurity. To make these resources effective on the ground, NBRPs must also strengthen local administrative structures capable of delivering, targeting, and managing support where it's most needed.

>> Guarantee 100% funding for the most vulnerable households. Ensure full coverage of renovation costs (including the replacement of fossil fuel boilers) for households suffering from severe energy poverty, including those with the lowest incomes, people living in poor housing conditions, and those facing multiple hardships (e.g. elderly individuals living alone, people with disabilities, single-parent families, and ethnic minorities). Especially when public funding is involved, these groups should be clearly identified and prioritised through inclusive criteria set at the national level. NBRPs should also address upfront costs for these segments of the population, by offering tailored financial support and simplified access procedures. In addition, NBRPs must be designed in a coordinated manner with SCPs, ensuring consistent objectives, timelines and access conditions. Misaligned processes would risk confusion, reduce effectiveness and could prevent vulnerable households from accessing the full support available.

>> Monitor social impacts and housing outcomes. Establish robust indicators to track the social outcomes of renovation programmes, disaggregated by tenure type, income level and household profile, with particular attention to low- and very low-income groups.

>> Provide a definition of summer energy poverty. Measuring summer energy poverty is the first necessary step to help raise the issue, collect data and set targets to tackle

the problem. To enable better targeting of support, NBRPs should consider integrating assessments of the climate-resilience of buildings and of relevant socioeconomic factors, such as population segments living in urban heat islands, the proportion of income spent on summer cooling and access to public cooling centres or green spaces[78]. This will help ensure that policies reach those most exposed to rising temperatures and limited means to adapt.

5. Prevent energy renovations from exacerbating housing insecurity

Energy efficiency upgrades must not come at the cost of people's right for affordable homes. NBRPs must take proactive measures to ensure that energy upgrades reinforce, rather than undermine, housing stability and affordability. To do so, NBRPs should:

>> Ensure cost neutrality of renovations. Energy retrofits should not lead to higher overall housing costs. NBRPs should promote mechanisms and social safeguards such as rent caps, rent stabilisation policies, or compensation schemes to ensure that rent or mortgage payments after renovation do not exceed what households paid before, including energy bills.

>> Link public funding to affordability commitments. Public funding should only support renovations that help keep housing affordable over time. Recipients of financial support, especially in the rental sector, should commit to fair rent practices, such as keeping rents stable or offering part of the housing to low income households. These commitments could be made through agreements that connect funding to clear, socially beneficial outcomes, like maintaining affordable houses or reinvesting part of the savings into tenant support.

>> Increase transparency and public accountability in housing investments. NBRPs should promote greater transparency around how renovation funding flows into the housing sector, ensuring it aligns with long term public interest goals. This includes encouraging monitoring mechanisms and clearer reporting from private and institutional investors, especially in markets where housing is increasingly treated as a financial asset. By fostering accountability, MS can help ensure that energy upgrades support secure, affordable homes, not speculative profit.

Develop renovation programmes for the non profit housing sector. Target the renovation of social housing, cooperatives, and public rental housing. This focus also enables neighbourhood scale interventions that improve both buildings and public spaces, strengthening community resilience.

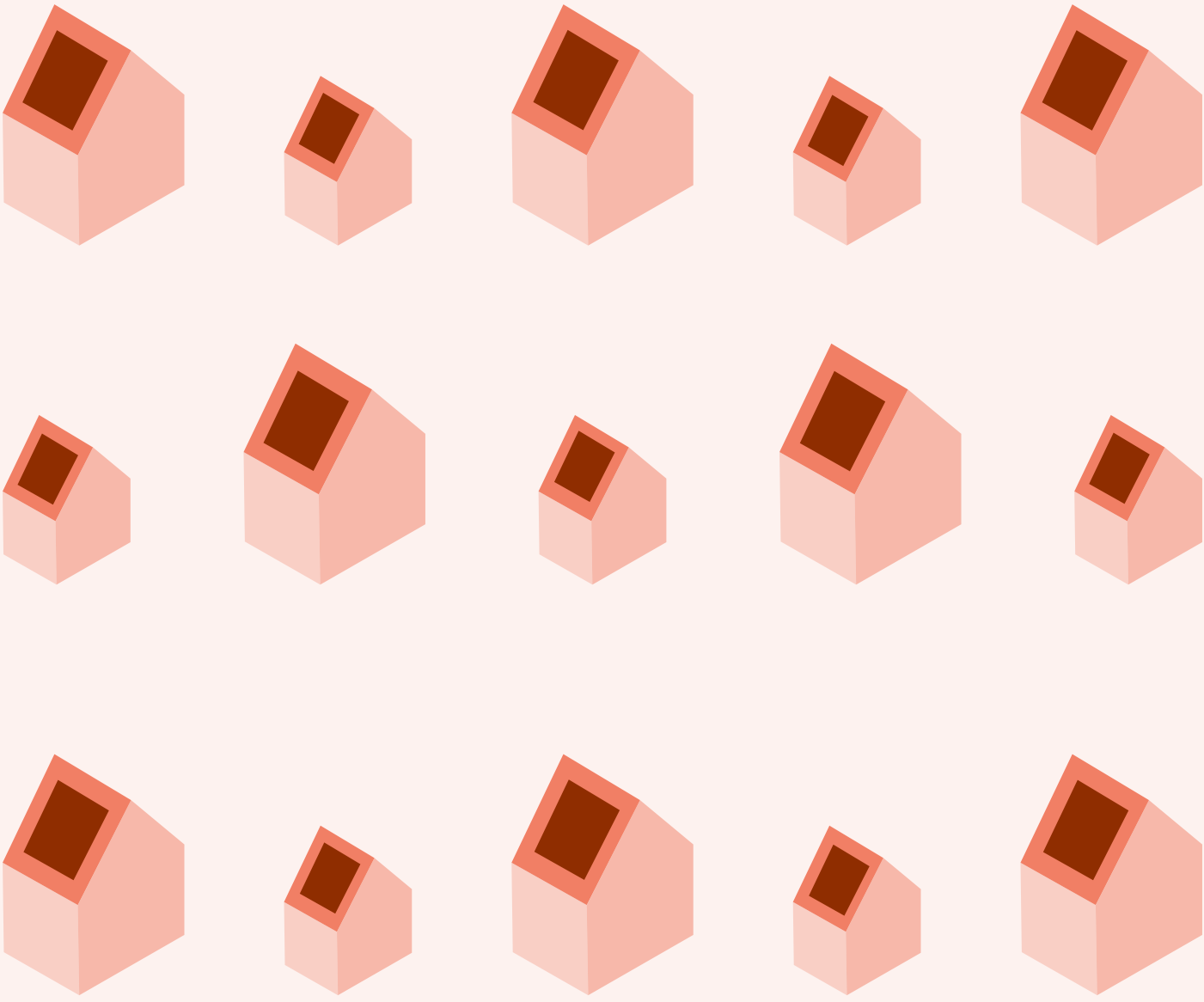
6. Scale up local capacity and community involvement

Delivering inclusive, large scale renovations depends on empowering local authorities, citizen-led initiatives, and communities with the tools, autonomy, and support they need. To do so, NBRPs should:

>> Set concrete targets to strengthen the administrative and technical capacity of local authorities. NBRPs should commit to building long term capacity within municipalities by supporting staffing, technical training and dedicated renovation teams. Smaller and less resourced authorities must receive proportionally greater support, while the collaboration across municipalities should be incentivized. Alignment between different levels of government should be reinforced through continuous consultation and direct access to EU funds.

[78] Cornelis M. 2025. Framing summer energy poverty: insights and recommendations for a resilient future. Publications Office of the European Union. January 2025 (access)

>> Create an enabling framework for citizen-led renovation and energy initiatives. NBRPs should set targets and define measures to increase the participation of energy communities, cooperatives, community organizations, social economy actors and other citizen-led initiatives. This means going beyond one-off public consultations and embedding participation throughout the planning and delivery of renovations. Targets and measures must reflect the actual capacities and needs of these groups, shaped through open and ongoing dialogue. This includes removing regulatory barriers, providing direct access to funding and encouraging partnerships with municipalities for outreach, project delivery and community engagement.



Showcasing Practices for Sustainable Cooling

This final chapter presents a range of existing examples from across Europe that demonstrate how the growing need for cooling can be addressed in fair, practical and sustainable ways. While heating has long been at the centre of decarbonization efforts, cooling is a more recent and rapidly developing challenge and it's important to address it in ways that strengthen the resilience of buildings and the people who use them.

The practices that follow cover multiple scales, from individual buildings to neighbourhoods, city wide initiatives and national strategies. Together they offer inspiration for how NBRPs can reduce cooling needs, improve the efficiency of cooling systems, and tackle rising urban temperatures through systemic approaches.

Reducing the need for cooling in buildings

The Tavros project[79], Athens (Greece)

A retrofit of a 750m² social housing block in central Athens, built in the 1970s is being completed in 2025 to meet the Passive House Standard. Housing eight households facing energy poverty, the project aims to cut heating and cooling demand by 90% and eliminate the building's carbon footprint, without the residents needing to leave their homes during the renovation. Passive House principles, including biobased insulation, airtightness and heat recovery ventilation, will ensure thermal comfort with minimal need for active heating or cooling. Installed PV panels will fully cover energy use, turning the building into a Positive Energy Building[80].

With a budget partly funded by the European project "RINNO" and private companies sponsoring innovative materials, the Tavros project also serves as a living lab: training refugees as Passive House tradespersons, involving residents throughout and hosting educational activities. Furthermore, this renovation is intended to set an example for the deep renovation of 250 identical buildings in the area, housing 4500 people.

Cité du Grand Parc[81], Bordeaux (France)

In 2016, three high rise social housing blocks in Bordeaux's Cité du Grand Parc with 530 dwellings, were transformed also without displacing residents. Prefabricated 3.8 meter winter gardens and balconies were added to each apartment, improving natural light, space, and comfort, while enhancing the thermal performance of the envelope. Floor-to-ceiling windows, thermal and solar curtains, and ventilated facades reduce energy demand. Heat recovery ventilation and full electrical upgrades contributed to a 60% energy savings. The design combined bioclimatic principles with prefabrication to minimize disruption and maximize quality of life. This project turned aging, often vilified social housing into hospitable and efficient homes, offering a replicable model for large scale retrofits that center on dignity, livability, and sustainability.

France's National Climate Adaptation Plan[82]

Published in 2025, France's updated Climate Adaptation Plan sets a clear trajectory for preparing housing for rising temperatures, based on projected warming of 2°C by 2030 and 4°C by 2100. A key measure aims to

[79] Sources: Passivistas, Shape Affordable Housing, RINNO
[80] Energy efficient buildings that produce more energy than they use through renewable energy sources
[81] Sources: Archdaily, Renovate Europe, Vital Neighbourhoods
[82] Sources: PNACC-3, InnovationOrigins

ensure that by 2030, all major renovations receiving public support must incorporate summer comfort criteria. This includes fixed shading, blackout devices (like curtains and blinds), ceiling fans and replacing window frames. The plan also introduces new funding streams to support innovative cooling solutions in homes and non-residential buildings. Efforts to gather better data on summer performance will guide future policy and renovation standards. Public awareness campaigns and integration of thermal comfort into social housing subsidies reinforce the plan's emphasis on preparing homes for intensifying heatwaves, making it a good example of a national policy addressing the cooling challenge.

Boosting the efficiency of cooling systems

Santa Cugat, Catalunya (Spain)[83]
An elementary school built in 1975 has been retrofitted with a geothermal system that now provides both heating and passive cooling. Twelve vertical boreholes (120m deep) feed a 40 kW electric heat pump, which replaced the gas boilers and uses radiant ceiling panels for summer cooling. This system enables "free cooling" by rejecting heat into the ground, reducing both emissions and energy costs. The retrofit also included new insulation, LED lighting, PV panels, and upgraded ventilation. Operated since 2019, the project is part of the GEOFIT initiative, funded by the EU's Horizon 2020 programme. It demonstrates how geothermal systems can meet cooling demands, making it a replicable model for school retrofits in similar Mediterranean climates.

Solar Building XXI, Lisbon (Portugal)[84]
Built in 2006, the Solar Building XXI office uses a ground cooling system that provides comfort during summer. Thirty-two underground tubes (30 cm diameter, 4.5 m deep) cool incoming air, using stable ground temperatures (13–19°C). Fresh air is drawn in 15 m from the building and delivered to rooms via natural or assisted ventilation, reducing indoor temperatures by 2–3°C. This cooling is supported by ventilation via openings in the facade and at the roof level, as well as night ventilation strategies. Additional features, like external insulation, shadings and solar heat recovery in winter, facilitate further energy savings. Solar XXI is part of Portugal's National Laboratory of Energy and Geology research campus and serves as an example of near zero energy design, demonstrating how cooling needs can be met utilizing zero carbon sources.

Photonio Project, Oinofyta (Greece)[85]
Installed in 1999, the "Photonio" project at the Sarantis cosmetics plant near Athens demonstrates large-scale solar cooling in industrial settings. The system uses 2,700 m² of flat-plate solar collectors to meet heating and cooling needs across 22,000 m² of offices and warehouses. Solar heated water (70–75°C) powers two absorption chillers, which deliver chilled water at 8–10°C to a central air conditioning system. With an annual energy demand of 1,940 MWh (1,200 for heating and 740 for cooling) the system cut the total energy consumption in half, particularly reducing electricity use during midday peaks[86]. The total investment was €1.3 million, 50% funded by Greece's national energy programme, while the payback period was just 7 years. This project is among the earliest examples in Europe of solar assisted air conditioning in industrial buildings.

Combating urban heat

Ventilation corridors, Stuttgart (Germany)[87]
Stuttgart's Green Ventilation Corridors is an outstanding example for strategic responses to the growing risks of heat in cities. In 2008, the city published its Climate Atlas, building on decades of in-house research. It mapped wind patterns, flows of cool air, and areas vul-

[83] Sources: Project website, Piccinini et al. 2020, Pieska et al. 2023
[84] Sources: Gonçalves et al. 2012, REHVA, Pcidarch
[85] Sources: Alfasol, 5 year report (in greek), REHVA, Greek Energy Directory 2021
[86] According to Sarantis Group. 2023 sustainability report, in 2024 the capacity of the system was expanded to cover 85% of the factory's electricity consumption.
[87] Sources: EnergyCities, Climate-ADAPT

nerable to heat, helping planners understand how best to protect it. The result is a planning approach that supports natural ventilation. Hillsides, valleys, and open spaces are safeguarded from dense development, while trees are protected to help cool the city. In fact, all trees in the urban core with a trunk circumference over 80 cm are protected. Since 2016, the City of Stuttgart has provided around €2 million annually through a dedicated green funding programme. An additional €12.7 million was allocated for the renovation of urban parks, while for the period 2020–2023, €20 million was also made available to plant trees and hedges, support forest conversion, and promote green facades, courtyards and roofs as part of a broader climate adaptation strategy.

Vacaresti National Park, Bucharest (Romania)[88]

An abandoned reservoir project on the edge of central Bucharest that has naturally transformed into an urban wetland of 183 hectares. Officially protected since 2016, it is now Romania's first urban national park and the largest green space in the city. The park's complex network of vegetation and water bodies supports rich biodiversity and plays a valuable role in regulating the local climate. Acting as green-blue infrastructure, it helps greatly in the management of surface water, reducing the risk of flooding. Vacaresti is also used as a public space and a hub for environmental education, community engagement and scientific research. It shows how nature can reclaim abandoned spaces, providing long term social and environmental benefits through minimal intervention.

Oasis school yards, Paris (France)[89]

More than 130 schoolyards across the city have already been upgraded to create "cool islands", spaces that reduce heat, manage rainwater, and increase vegetation cover into dense urban areas. The approach includes adding shaded areas, drought-resistant plants, permeable surfaces, fountains, and small educational gardens. What started as a pilot with 10 schools from 2019 to 2021 has now been scaled up, receiving direct support by the city. A key element of the project is community participation: students, teachers, parents, and neighbors helped shape the spaces, which are now open to the public outside school hours. With schoolyards covering over 70 hectares across the city, this initiative shows how public infrastructure can be reimagined to improve the microclimate, foster awareness and strengthen community ties.

Spain's National Climate Adaptation Plan [90]

Spain's plan for 2021-2030 places strong emphasis on urban resilience, recognizing that cities concentrate climate risks due to dense populations, aging buildings and limited green infrastructure. The plan highlights how urban sprawl has strained resources and increased vulnerability, while promoting the Mediterranean model of compact, socially mixed, walkable cities as a strength to build upon. To adapt cities to rising temperatures, flooding, and other climate impacts, the plan calls for better information, stronger public engagement, and collaboration across all levels of governance. It proposes the integration of urban climate maps and risk assessments into planning, and prioritizes nature based solutions such as urban forests, permeable pavements, and green-blue infrastructure to tackle heat islands, improve air quality, and manage water more sustainably. As more than half of the Spanish building stock predates energy efficiency regulations, the plan stresses also the need for extensive building renovations.

[88] Sources: Ellen MacArthur Foundation, Dutch Ministry of Agriculture, Fisheries, Food Security and Nature, CEEweb for Biodiversity
[89] Sources: Urban Innovative Actions, C40
[90] Source: Spanish Ministry for the Ecological Transition and the Demographic Challenge. 2020