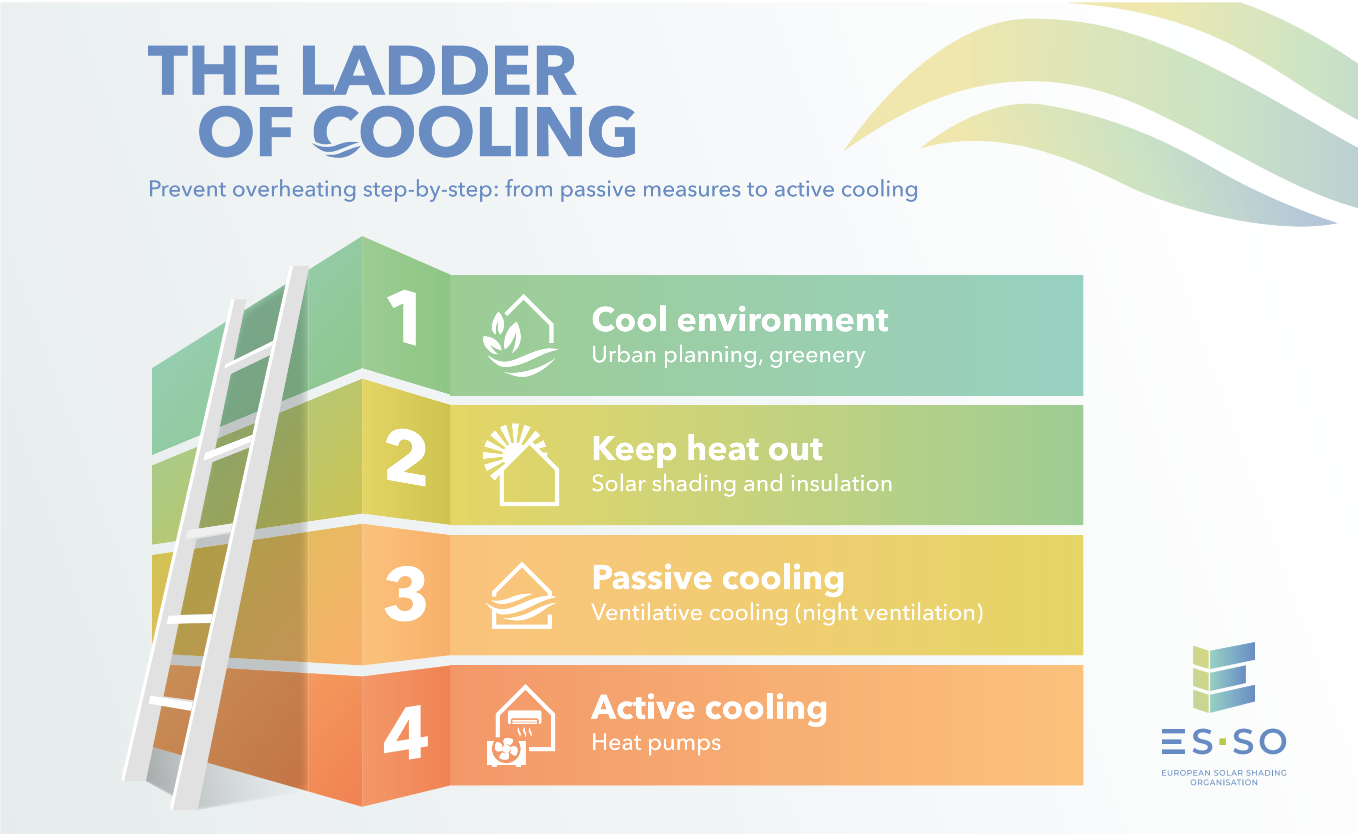
Integrating the "Ladder of Cooling" into EU building energy policy to deliver summer thermal comfort and prevent overheating.

1. Executive summary

Extreme heat and the risk of overheating in buildings are becoming increasingly important to EU energy policy because they affect health, liveability, resilience and the electricity systems, particularly through higher peak cooling demand. Europe is already experiencing higher average temperatures, more frequent and intense heatwaves, and longer summer periods, trends that are projected to intensify further as a result of climate change[1].



The recast Energy Performance of Buildings Directive - Directive (EU) 2024/1275 explicitly places building performance in a broader framework that includes climate adaptation, indoor climate, as passive heating and cooling measures, solar shading, indoor environmental quality, and the urban heat island effect.

This position paper proposes that EU and Member State implementation should adopt the "**Ladder of Cooling**" as a guiding framework for future cooling strategies. It does not introduce a new requirement, target, or technology mandate.

Instead, it proposes that EPBD implementation and guidance should reflect a clear hierarchy of measures:

1. **Cool environment**
   urban planning, greenery
2. **Keep heat out**
   solar shading and insulation
3. **Passive cooling**
   ventilative cooling (night ventilation)
4. **Active cooling**
   heat pumps

→

[1] [Why are Europe and the Arctic heating up faster than the rest of the world? | Copernicus]

Beyond comfort, the Ladder of Cooling strengthens building resilience by improving passive survivability: the ability to maintain safe indoor conditions during heatwaves, including where access to active cooling is limited or energy supply is constrained. It also supports energy system resilience by reducing peak cooling demand and associated stress on electricity networks.

The Ladder of Cooling originated in passive building physics and bioclimatic design, was formalised through low-energy cooling guidance, implemented in UK planning policy (notably the London Plan 2016[2]), and was adopted in the Netherlands by the OSKA platform (Consultation Standards Climate Adaptation) as a robust framework for adapting new construction and renovation standards to the impacts of a changing climate. This concept has since evolved into a recognised overheating-prevention and climate-adaptation framework[3] that is increasingly relevant to EU energy performance policy. It offers a coherent approach for future cooling strategies in resilient and energy-efficient buildings and aligns fully with EPBD references to shading, passive cooling, indoor environmental quality and the urban heat island effect. Why this supports DG ENER and Member States:

- It **prevents divergent national interpretations** where compliance defaults to air conditioning.
- It **supports the energy efficiency first principle** by reducing cooling demand at source.
- It **strengthens electricity system efficiency and peak load management**, without affecting Member State competence.
- It **provides practical guidance to policy authors and inspectors**, instead of abstract principles.

In short: the Ladder of Cooling does not increase the level of ambition already agreed in the EPBD. Instead, it provides a practical framework for delivering that ambition while improving health outcomes, reducing overheating risk and building level and system level resilience.

2. From Winter Efficiency to All-Season Performance

The EU building stock is being upgraded to reduce heating demand. However, without a comparable policy focus on summer performance, there is a risk of unintended consequences: highly insulated and airtight buildings can face higher overheating risk if solar gains, shading, ventilation strategy, and thermal inertia are not properly addressed in design and renovation choices.

Changing climatic conditions are increasing cooling needs across large parts of the EU, including regions where overheating risk was historically considered a limited risk, thereby reinforcing the need for buildings to perform adequately under both current and future summer conditions.

These trends also raise a resilience challenge: buildings and energy systems are increasingly exposed to simultaneous summer peaks and heat-related health risks. (There are more deaths from overheating than from winter cold and that is increasing). Measures that reduce heat gains and cooling demand at source therefore deliver a resilience dividend alongside energy performance benefits.

The EPBD recast already anticipates this by requiring that measures take account of climatic conditions, climate adaptation, and by explicitly referencing the indoor climate in the framing of energy performance measures. In parallel, EU policy has elevated Indoor Environmental Quality (IEQ) as a formal concept in the EPBD context, linking energy upgrades to occupant health and comfort, including thermal comfort and ventilation.

This provides a strong legal and policy basis for treating overheating prevention as an integral component of "better buildings": not as an optional comfort feature.

There are more deaths from overheating than from winter cold and that is increasing

[2] Policy 5.9 Overheating and cooling | London City Hall
[3] Climate adaptation video as an example for COP 2021

3. The Ladder of Cooling

THE PRINCIPLE

The Ladder of Cooling is a hierarchy of measures that prioritises prevention and passive performance before active systems. It represents a future-proof cooling strategy for resilient and energy-efficient buildings. The framework is technology neutral and compatible with the EPBD's emphasis on annual performance, real operating conditions, and a methodology that accounts for passive cooling elements, solar shading, indoor environmental quality, and the urban heat island effect

STEP 1 — COOL ENVIRONMENT URBAN PLANNING AND GREENERY

Urban planning interventions, greenery, shade, wind washing (ventilation corridors).

This step directly reduces the external heat load that buildings face, including local microclimate impacts such as the urban heat island effect, which the EPBD recast explicitly recognises as relevant in the calculation methodology context.

STEP 2 — KEEPING HEAT OUT SOLAR SHADING AND INSULATION

Insulation, (external) solar shading, airtight envelope, glass ratio, orientation, and thermal mass.

This is the core building-scale prevention layer, focused on limiting solar heat gains before they create cooling demand. Effective control of solar radiation - through external solar shading, glazing properties (g-value and area), orientation, and façade design - is therefore the primary determinant of summer performance. Where properly integrated, thermal mass can help moderate indoor temperature peaks by temporarily absorbing heat, provided that solar gains are limited and that accumulated heat can be dissipated through appropriate ventilation or purge strategies.

The EPBD methodology explicitly recognises solar shading and passive cooling elements, confirming that envelope design choices must be assessed as energy-performance determinants across seasons. While Insulation and airtightness remain essential for winter energy efficiency, they support summer comfort only when applied within a coherent design strategy ensuring effective solar radiation prevention and heat removal strategies. In the absence of such complementary measures, summer comfort outcomes cannot be ensured solely through envelope performance parameters.

Summer-resilient envelope design therefore depends on the coordinated interaction of solar gain reduction, envelope performance, and heat dissipation strategies, rather than any single measure in isolation. This integrated approach ensures that measures intended to improve energy performance do not inadvertently increase overheating risk under summer conditions.

STEP 3 — PASSIVE COOLING VENTILATIVE COOLING

Night ventilation, cross ventilation, natural draft.

Passive cooling strategies reduce overheating and improve comfort with limited energy input. These measures complement the EPBD's inclusion of passive elements and the Directive's broader objective that energy performance improvements should consider the indoor climate and climate adaptation conditions.

Where external constraints (noise, air pollution or security) limit window opening, guidance should encourage robust passive or hybrid approaches that maintain summer comfort and indoor air quality without defaulting to energy-intensive cooling.

STEP 4 — ACTIVE COOLING ENERGY EFFICIENT SYSTEMS, LAST STEP

Heat pumps.

Active cooling can be appropriate where residual risk remains for example in buildings occupied by vulnerable users or in buildings with high internal loads. However, active cooling should be considered only after opportunities to reduce cooling demand through the first three steps have been fully addressed.

This approach aligns with the EPBD's emphasis on the efficiency of technical building systems in the overall energy performance concept and on modernisation/system integration.

4. Consistency with the EPBD recast

This section indicates where and how the Ladder of Cooling supports or operationalises the EPBD recast requirements and themes, drawing directly from the Directive text and Commission/technical summaries.

4.1 CLIMATE ADAPTATION AND INDOOR CLIMATE AS MANDATORY CONSIDERATIONS

The EPBD recast states that measures to improve energy performance should take account of climatic conditions, including adaptation to climate change, and the indoor climate.

4.2 ENERGY PERFORMANCE CALCULATION METHODOLOGY

The EPBD recast states that the calculation methodology should include factors such as the urban heat island effect, passive heating and cooling elements, solar shading, and indoor environmental quality, and should cover annual energy performance rather than only the heating season.

- Step 1 addresses the urban heat island effect and local microclimate impacts.
- Steps 2 and 3 provide a structured framework for implementing solar shading and passive cooling elements as first order performance levers.
- The hierarchy reinforces an "annual performance" perspective: preventing summer overheating avoids an unintended increase in cooling demand that could undermine energy performance outcomes.

4.3 "ENERGY EFFICIENCY FIRST" AND SYSTEM EFFICIENCY

The EPBD recast references the "energy efficiency first" principle and emphasises that energy performance reflects both envelope performance and system efficiency.

- Steps 1–3 reduce cooling demand at source, which is an "efficiency first" approach in summer conditions: it lowers the need for active energy input and supports electricity system efficiency by reducing peak loads.
- This prevention-first approach also supports resilience by reducing reliance on active cooling during extreme events and mitigating coincident peak demand that can challenge system adequacy and network operation.
- Step 4 preserves the role of energy efficient systems where needed, but prevents policy from defaulting to equipment as the first response supporting system wide efficiency outcomes.

4.4 IMPLEMENTATION TIMELINES AND TRANSPOSITION CONTEXT

The revised EPBD entered into force on 28 May 2024 and required transposition by 29 May 2026.

- The Ladder of Cooling provides a clear organising principle for national implementation through transposition choices in methodologies, minimum requirements, renovation plans, and guidance, improving coherence across energy, health, and resilience objectives within the 2026 transposition window.

5. Legislative ready recommendations

The recommendations below are formulated in line with the EPBD recast and associated methodological frameworks.

5.1 RECOGNISING OVERHEATING RISK AND SUMMER COMFORT AS CORE PERFORMANCE OUTCOMES

Clarify that energy performance policies, building requirements, and renovation measures should safeguard summer thermal comfort and address overheating risks, consistent with the EPBD recast's treatment of indoor climate, health, and climate adaptation considerations.

5.2 EMBEDDING A HIERARCHY OF MEASURES IN NATIONAL METHODOLOGIES AND GUIDANCE

Provide that overheating risk is addressed through a structured and prioritised sequence of measures, reflecting the Ladder of Cooling as a long-term cooling strategy for climate-resilient buildings: the surrounding environment and urban context → limitation of heat gains → passive cooling strategies → efficient active cooling where necessary, in line with the EPBD methodology's inclusion of solar shading, passive cooling elements, and urban heat island mitigation. This hierarchy prioritises resilience and reduces unnecessary dependence on active cooling during heatwaves.

Indicative checklist for guidance authors and assessors

In addressing summer comfort and overheating risk, guidance may encourage a logical assessment process that considers whether:

- external heat loads have been minimised as a first step;
- envelope and glazing design with effective solar shading contribute effectively to summer performance;
- passive cooling and ventilation strategies are feasible under local conditions; and
- active cooling, where proposed, is justified by residual risk and designed for additional use only when extra cooling is needed.

5.3 ENSURE CALCULATION METHODOLOGIES REFLECT THE REAL DRIVERS OF SUMMER PERFORMANCE

Strengthen national calculation methodologies and compliance guidance so that they adequately capture the main determinants of summer performance, effective solar shading, passive cooling measures, and indoor environmental quality, within annual or integrated energy performance assessments, supporting robust outcomes under current and future climatic conditions.

Member States should also review the approval and calibration of modelling software where there is evidence that the benefits of dynamic solar shading are not accurately represented

5.4 LINK ACTIVE COOLING CHOICES TO ENERGY EFFICIENCY AND SYSTEM INTEGRATION

Where active cooling systems are installed, promote solutions that deliver high energy efficiency and are supported by appropriate control and monitoring. Such approaches are consistent with the EPBD's provisions on the modernisation of technical building systems and its broader indoor environmental quality objectives while reducing unnecessary installed cooling capacity and reducing peak loads during extreme heat events.

CONCLUSION

As heating, transport, and industry electrify, unmanaged growth in cooling demand risks creating a new generation of summer electricity peaks. Preventive cooling measures as shown in the ladder of cooling therefore support both decarbonisation and long-term energy system resilience.

The European Solar Shading Organisation (ES-SO) represents the interests of the dynamic solar shading industry across Europe, promoting solutions that address overheating, energy efficiency, and indoor environmental quality (IEQ) in buildings.

With Europe facing record-breaking heatwaves and rapid warming, ensuring thermal comfort and healthy indoor environments is essential for decent, affordable, and sustainable buildings.

CONTACT

ANN VAN ECKEN
Secretary General

Vilvoordelaan 126
1930 Zaventem, Belgium
Tel. +32 2 313 99 44
e-mail: ann.vaneycken@es-so.com
Transparency Register Id: 298346594841-42