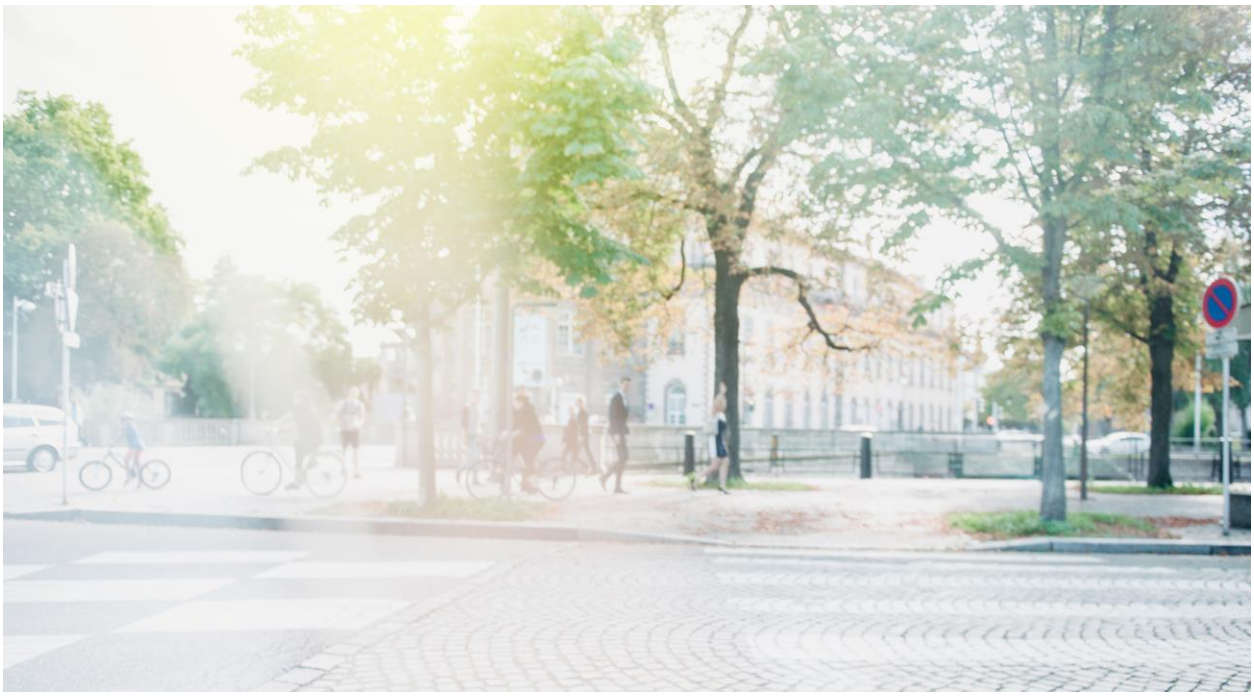

Policy Actions to Tackle Extreme Heat and Urban Heat Islands

Urban areas are particularly susceptible to the cumulative effects of extreme heat and the Urban Heat Island (UHI) effect. The prevalence of dense buildings, dark-colored roofs, asphalt-covered roads, and a lack of vegetation causes the UHI effect. These factors lead to increased absorption of the sun's heat and raise urban temperatures 5-9°F higher than surrounding rural areas [1].

UHI and extreme heat mitigation are both climate adaptation *and* climate mitigation strategies since they protect people from extreme heat while reducing the amount of heat trapped in the atmosphere that exacerbates global warming.

Extreme heat/UHI mitigation strategies include cool roofs and walls, cool and permeable pavement, trees and vegetation, and mandatory cooling. By leveraging codes, ordinances, and programs, jurisdictions have the power to reduce the effects of UHIs and extreme heat.

On the journey to curating successful policy action, this factsheet provides leaders with actionable climate adaptation and mitigation strategies for UHI/extreme heat in their communities. By leveraging the strategies included, jurisdictions can reduce the effects of the UHI effect.

Policy Pathways

Jurisdictions can mitigate the effects of UHIs in a number of ways through policy. For example, a jurisdiction can mandate cool roofs via its energy, building, or zoning code, or a jurisdiction may choose to start with a pilot program or incentive.

Energy Codes, Green Codes, and Building Codes

Many extreme heat/UHI mitigation strategies can be implemented via energy, green, or building codes. Overall, these three codes have different goals.

1. Energy codes reduce building energy consumption and increase energy efficiency.
2. Green codes aim to reduce the impact of buildings on the environment.
3. Building codes protect the safety and welfare of the occupants and the public.

A jurisdiction can mandate cool roofs via its energy, building, or zoning code, or a jurisdiction may choose to start with a pilot program or incentives customized to a municipality. Jurisdictions often update their building code more frequently than their energy code, while few jurisdictions have a green code. For these reasons, building codes may be the best pathway to implement UHI strategies.

Zoning Codes

Zoning codes allow jurisdictions to implement UHI/extreme heat mitigation strategies on a local scale. For example, jurisdictions can implement parking lot shading and cool roof/wall requirements in specific zoning overlays of the city. A zoning code can be a viable alternative if a local jurisdiction is not permitted to have a local energy code.

Ordinances

Extreme heat/UHI mitigation strategies can also be implemented as an ordinance. Legislative bodies such as city councils will enact ordinances that become law enforceable within the city's boundary; for example, an ordinance may require all city-funded new buildings to incorporate cool roofs/walls or for all new public housing to incorporate cooling systems.

Other Policy Pathways

Other policy pathways may include incentive programs, such as permitting and density bonuses for cool roofs and walls, funding for planting shade trees, pilot programs for cool pavements, and other UHI strategies.

Local Jurisdictional Power

Before a local jurisdiction can decide which extreme heat/UHI mitigation strategy they will implement and the policy pathway they will take, jurisdictional staff need to verify the rights the state has given to jurisdictions and what they're allowed to legislate.

For example, some states don't allow cities to create local energy codes that are more stringent than the state code. In such situations, jurisdictions can implement UHI mitigation strategies via the zoning code or other strategies. Furthermore, suppose a jurisdiction does not have the power to require cool roofs and walls or any other mitigation strategy. In that case, they can create a required performance approach for UHI mitigation that requires buildings to achieve a certain number of points through a combination of mitigation strategies. This method is similar to the Green Standard that the City of Cambridge, MA has implemented in their zoning code [2], [3].

Don’t Take the Heat—Mitigation Strategies

Cool Roofs

Cool roofs reflect more sunlight back into the atmosphere than conventional roofs, keeping the building surface and interior cooler throughout the day.

Cool roofs are typically lighter in color than conventional roofs and come in a wide range of shades and hues, such as brown, red, and grey.

Strategic Messaging

- In single-story buildings, cool roofs can reduce mechanical cooling needs by 15% [4].
- The ‘winter heating penalty’ is the theory that having cool roofs in northern/colder climates will increase winter heating costs more than reduce summer cooling costs. When it comes to cool roofs, the ‘winter heating penalty’ is not a big concern because:
    - » Roofs in northern climates are more likely to be covered in snow in the winter, reflecting most of the sunlight.
    - » The winter sun is at a lower angle, leading to less heat absorption.
    - » Winter days are more likely to be cloudy, reducing radiating heat reaching the roof.
- Energy cost savings from cool roofs have been observed in regions as north as Climate Zone 7 [5].
- A Baltimore, MD, study (climate zone 4A) showed that implementing cool roofs and pavements would lead to a 10:1 benefit/cost ratio over 20 years [6].

Examples

- The Los Angeles, CA, building code includes Solar Reflectance Index (SRI) requirements for residential and commercial low-sloped and steep-sloped roofs [7]. SRI is a common metric for solar reflectivity (how cool/reflective a roof is).
- Baltimore, MD requires low-sloped roofs to have an SRI of 78 and steep-sloped roofs to have an SRI of 25 [8].

Cool Walls

Cool walls are externally-facing, light-colored walls that reflect sunlight back into the atmosphere, helping keep the building surface and interior cooler.

Strategic Messaging

- Cool walls reduce annual HVAC energy costs in climate zones 1-4 [9].
- While walls receive less direct sunlight compared to roofs, walls are 50% less thermally insulated than roofs. According to LBNL, lighter-colored exterior wall surfaces are comparable to light-colored roofs in terms of energy cost savings per surface area [10, p. 4].
- According to LBNL, glare from cool walls is unlikely unless the surface is a shiny metal or extremely bright white. [11].

Examples

- ASHRAE 90.1 [12] and 189.1 [13] incorporate cool wall requirements. However, cool walls are less common in the US than cool roof requirements.
- The Hawaii Energy Building Code provides an exception for certain wall insulation requirements for commercial and residential buildings when the walls have Solar Reflectance (SR) of at least 0.64 [14, p. 4].

Cool and Permeable Pavement

Cool pavements reflect more sunlight into the atmosphere than their conventional counterparts. Porous pavement allows water to be absorbed into the ground, cooling the surface.

Strategic Messaging

- Permeable pavements have multiple co-benefits, including reducing stormwater/rainwater runoff, cooling pavement surfaces via evaporation, and cleaner and cooler water that runs off into streams, which helps wildlife.
- Due to smaller temperature fluctuations, cool pavements may have a longer lifespan than conventional pavements [15, p. 24].
- Pavements comprise around 30-45% of many cities' land use in the US, making them a significant factor in urban heat island mitigation [16].

Examples

- The Street Transportation Department in Phoenix, AZ, has implemented a cool pavement program, transforming over 118 miles of roads from a Solar Reflectance (SR) of 0.12 to about 0.30 [17]. The new asphalt is cooler than traditional asphalt at all times of the day. The biggest temperature difference is during noon and afternoon hours when the reflective pavement is 10.5-12°F lower than conventional pavement.
- Washington, DC, offers rebates to property owners that replace concrete, asphalt, or brick pavement with permeable pavers or vegetation [18].

Trees and Vegetation

Trees and vegetation are a natural way to provide shade, cool and clean the air, and mitigate stormwater runoff.

Strategic Messaging

- Trees and vegetation provide cooling through shading and evapotranspiration.
- During the summer, only about 10-30% of the sun's energy reaches the ground below the tree, "with the remainder being absorbed by leaves and used for photosynthesis, and some being reflected back into the atmosphere" [19, p. 2].
- Studies have shown that old suburbs with mature trees are 4-6°F cooler than new suburbs without trees [19, p. 3].

Examples

- Sacramento's zoning code requires 50% of parking lots to be shaded by trees [20].
- The Seattle Green Factor is a point-based policy that sets minimum tree and vegetation requirements for new development [21].

Maximum Indoor Temperature Setpoint

A maximum indoor temperature setpoint requires buildings to have adequate cooling.

Strategic Messaging

- Extreme heat is the most dangerous climate event in the US, about four times more fatal than cold [22]. However, while the building, residential, and mechanical codes have a minimum indoor temperature requirement to protect people during cold weather, there is not yet a maximum indoor temperature requirement in the model codes and most jurisdictions.
- Passive cooling strategies like cool surfaces, trees, vegetation, and shading can reduce outside air temperature and inside buildings. However, most regions in the US are increasingly prone to heat waves that can lead to dangerously high indoor temperatures if mechanical cooling isn't provided.
- Most people prefer to shelter in place during heat waves, whether they have cooling or not, due to pets, medical needs, and lack of transportation. Therefore, providing cooling in residences can save lives.

Examples

- The 2024 British Columbia Building Code requires cooling facilities to maintain an indoor air temperature of not more than 26°C (79°F) in at least one home's room [23, p. 989].
- The District of Columbia's DC Housing Code of Standards requires that air conditioning be provided from at least May 15 through September 15. The indoor temperature must be 78°F, or at least 15°F less than the outside temperature [24].
- North Las Vegas, NV has a maximum indoor temperature setpoint in its Uniform Housing Code requiring heating and cooling to maintain 70°F in dwelling units, guest rooms, and congregate residences [25].

Moving forward

Urban areas are particularly vulnerable to the effects of the Urban Heat Island (UHI) effect, which leads to higher urban temperatures than surrounding rural areas.

Jurisdictions must employ different strategies for mitigating UHI and extreme heat. This includes but is not limited to curating policy to ensure the implementation of cool roofs, cool walls, cool and permeable pavement, trees and vegetation, and mandatory cooling.

With the different policy pathways for implementing these strategies, such as energy codes, green codes, building codes, zoning codes, ordinances, and incentive programs, jurisdictions can start moving their communities forward.

For more information, review our additional resources below or email us at comms@newbuildings.org to learn more.

Additional Resources

Codes, Programs & Standards - Cool Roof Rating Council (coolroofs.org)

This includes a list of cool roof and wall requirements in energy, building, and zoning codes around the US CRRC. It also includes a cool roof directory and wall directory that tracks products by their solar reflectance values.

The Heat Action Platform - Heat Action Platform (onebillionresilient.org)

The Heat Action Platform provides worldwide policy strategies for Extreme heat/UHI mitigation and case studies.

NBI's Extreme Heat/UHI Code Overlay

This provides code language for implementing extreme heat/UHI mitigation strategies in model building, energy codes, and standards.

Heat Island Community Actions Database | US EPA

This is a database of mandatory and voluntary policies related to UHI and extreme heat mitigation across the US.

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Codes for Climate is an initiative of NBI to deliver the climate-aligned building codes and standards needed by U.S. states and cities in the face of the pressing demands of policy goals. To scale greenhouse gas reductions in the buildings sector to be in step with a 1.5ºC future, the initiative works to support policy makers at multiple levels to move codes and standards forward, making significant reductions in energy consumption and GHG emissions from buildings possible and effective. “Policy Actions To Tackle Extreme Heat And Urban Heat Islands” supports the goals of the Codes for Climate Initiative.

New Buildings Institute (NBI) is a nonprofit organization driving better energy performance in buildings. We work collaboratively with industry market players—governments, utilities, energy efficiency advocates, and building professionals—to promote advanced design practices, innovative technologies, public policies, and programs that improve energy efficiency and reduce carbon emissions. We also develop and offer guidance and tools to support the design and construction of energy-efficient buildings.