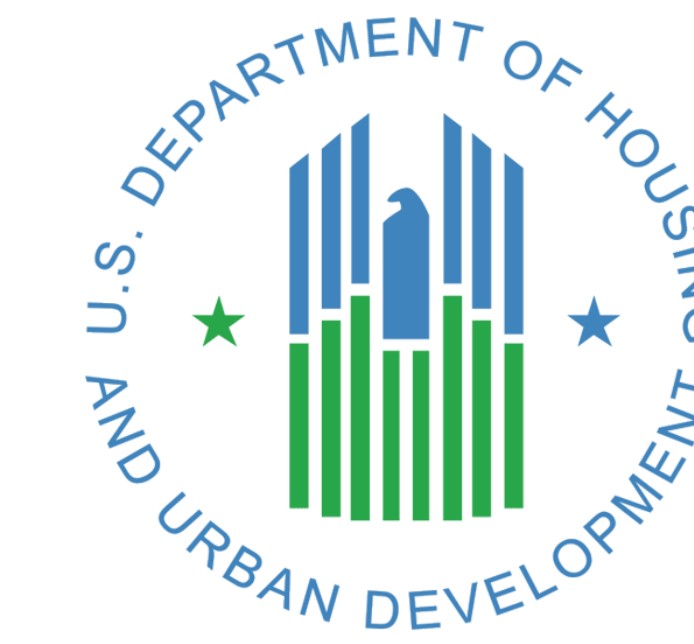


Zoning regulation as a tool for climate resilience



Louanne Cooley & Kayla Vargas
UConn CIRCA



How Zoning Can Reduce Urban Heat

Regulations for landscaping

Trees and green spaces help ameliorate the impact of increasing high temperatures by creating shade and through evapotranspiration. Zoning regulation can require planting of species adapted for specific conditions to ensure there is a good match for conditions and to increase survivability.

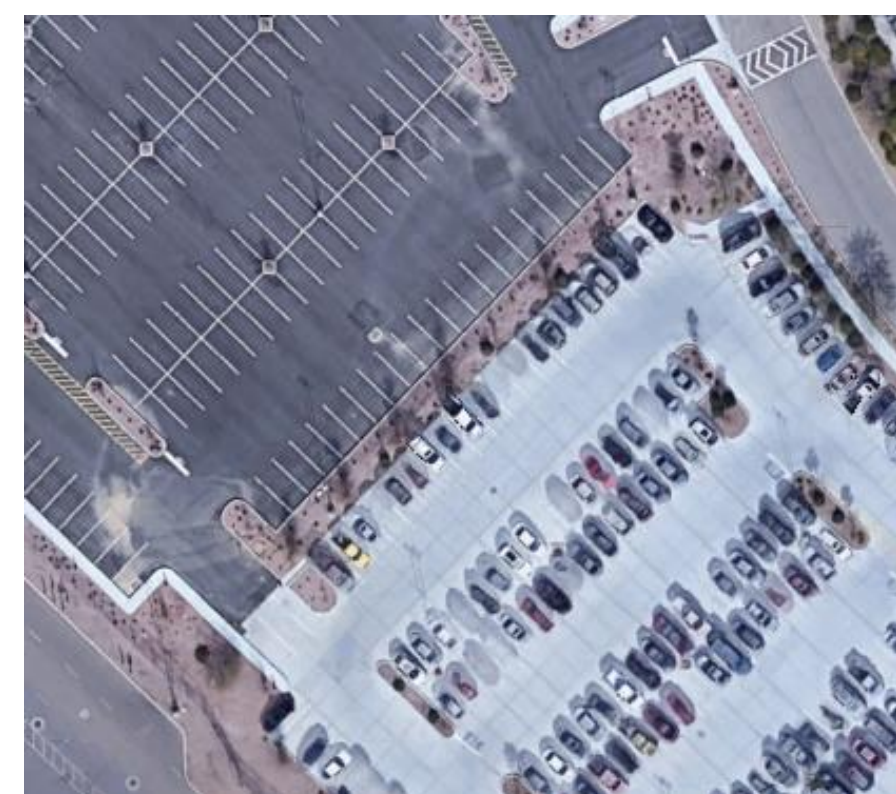
Requiring vegetated buffers on frontages, and around waterways increase permeable surfaces which can absorb excess rain in addition to providing more cool surface area. Hartford's award-winning zoning code is an excellent example of resilient zoning designed to reduce urban heat island effects and mitigate the impacts of climate change through the use of landscaping.



Urban trees can reduce surface level heat 5-10° F and are important components in making "third place" public spaces feel safe and welcoming.

Regulations for reflective surfaces

Zoning codes can address heating through regulations on reflective surfaces. Large impervious surfaces like rooftops or parking area can retain heat raising the base temperature in the local area. Reflective surfaces however absorb much less heat leading to cooler surface temperatures compared to darker or non-reflective surfaces. New Haven CT adopted zoning regulations requiring any new site or expanded site with a half acre or more of impervious surface area (not including roofs) to be at least 50% shaded or be constructed of a reflective material.



Parking lot with light colored pavement is 40% cooler than dark pavement parking area. © Google Earth 2022

Green roofs

A low impact design way to alleviate heat from roof is to cover the roof with low maintenance drought resistant vegetation. Green roofs can reflect heat, insulate the building and absorb precipitation and stormwater. Cost of green roofs can vary and may be prohibitive for residential structures. However, several municipalities in Connecticut have used inclusion of a green roof as a development bonus to incentivize green infrastructure on new construction or extensive renovation. Stamford, New Haven and Hartford have used green roofs as a development bonus in their zoning codes.



The green roof covering the Whitney Water Treatment Plant in New Haven is the largest in the state at 30,000 sq. ft. © Greenroofs.com

What is Resilient Zoning?

Zoning regulations can target the protection of natural buffering features and green infrastructure, incentivize development density in specific areas, and specify resilient design to reduce impacts of storms, sea level rise, and increasing heat and precipitation.

Towns in Connecticut are authorized by the state government to regulate how land can be used through zoning under C.G.S. §§ 8-2 to 13a. Each town's legislative body can adopt the provisions in the statute detailing the powers of a zoning commission, its make up, and the extent of the zoning commission's authority. Guided by planning and development staff, and consistent with the town Plan of Conservation and Development, zoning commissions pass regulations to describe land uses in particular areas, with the intent to protect the health and safety of the public. As climate change threatens people, infrastructure and the environment, municipalities can implement strategic land use planning and zoning regulations to improve local climate adaptation and resilience and direct development away from vulnerable areas.

As the changing climate increases vulnerability and intensifies risk, zoning commissions should be aware of state, regional, and local hazard mitigation plans and localized vulnerability assessments when determining land uses. Policies like transportation-oriented development can help climate change mitigation by reducing transportation needs (and thus fossil fuel use) while furthering housing and development goals. Adaptation policies can avoid sprawl and site development away from climate-vulnerable areas like flood zones. By evaluating current and future climate vulnerability, development can be sited in appropriate, low hazard areas, and be designed and built to standards to withstand predicted climate risks.

Zoning regulation can also be used to meet overlapping municipal priorities, like environmental justice and increasing affordable housing options while minimizing hazard risk. For example, reducing minimum lot size in certain zones can help concentrate density in less climate risky places while increasing affordability for lower income property buyers. Affordable housing options can be integrated into projects that also meet resilient design criteria helping municipalities avoid climate risk and meet obligations under C.G.S. 8-30g's affordable housing land use appeals procedure.

Resilient Design Standards

Design standards are used in zoning to convey acceptable construction parameters in terms of materials, quality, or aesthetics. Resilient design standards advance climate resilience for municipalities by providing practical guidance on building structures or using land to withstand natural hazards in a changing climate. The use of design standards in Connecticut municipal land use authority derives from state statute that allows for regulation of "the erection, construction, reconstruction, alteration or use of buildings or structures and the use of the land." The resilient design standards listed below are intended to motivate creative thinking on how to address climate in existing, new construction, and redevelopment to ensure stable shelter from environmental impacts like sea level rise, flooding, and excessive heat, wind, or precipitation.

Flooding & Sea Level Rise

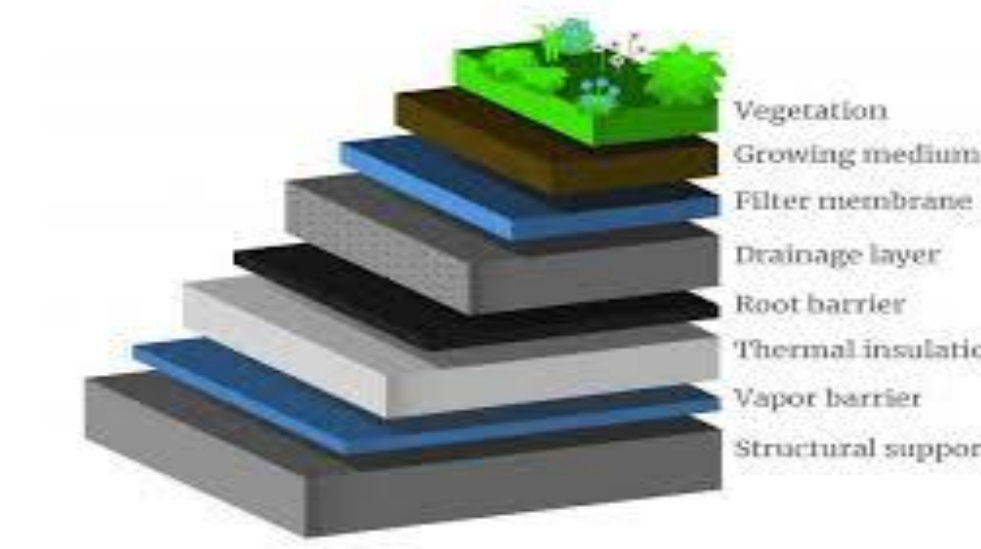
- Exterior dry floodproofing
- Avoid development in flood prone zones
- Use wettable systems/finishes
- Reinforce building corners
- Resilient elevator systems
- Elevate mechanical/electrical systems
- Sewer backflow preventers
- Increase setbacks
- Permeable pavement
- Temporary/permanent flood barriers
- Controlled flooding-bioswales, tree trenches



Temporary flood barriers- Flood Control International

Increasing Heat

- Continuous air barrier
- Adapted Building form & Envelope
- Adapted mechanical systems i.e., air conditioning designs
- Reflective roofs
- Design for increased termite migration
- Reflective materials
- Shaded public spaces
- Drought tolerant landscaping
- Increased tree canopy



Green Roofing to reduce urban heat-EPA

Increasing Precipitation

- Rainscreens
- Green roofing/vegetated façade
- Green infrastructure
- Stormwater infiltration
- Bluebelts
- Permeable pavement



Bioswales & Raingardens-New Haven CT has introduced over 200 bioswales to reduce flood risks & support city storm sewers

Transfer of Development Rights

Transfer of Development Rights (TDR) programs are a regulatory technique allowing development rights to a property to be severed, transferred, and relocated to another parcel of land. The landowner retains the title and other rights to the property and may sell or exchange the land title or development rights separately. The development rights are expressed as a conservation easement recorded in the land records. TDR programs can advance land use management goals of a municipality without causing a financial burden to landowners or restricting needed development. These programs have traditionally been designed to preserve and protect natural or historic resources for the benefit of the public but could be used to **promote climate resilience by prohibiting development in areas of higher climate risk and encouraging development in less sensitive areas.** TDRs have the potential to shift development away from vulnerable areas like shorelines and towards preferred inland areas. Currently, TDRs are used nationally by municipalities mainly for agricultural or open space preservation. However, several municipalities across the nation are evaluating TDRs as a climate resilience strategy. Governments can create disincentives for new development in vulnerable coastal areas, while using TDRs to increase inland density. For example, coastal communities can use TDR programs to retreat from the shoreline by designating parcels along the coast as sending zones, limiting development, and incentivizing development elsewhere.

Overlay Zones

Overlay Zones are established to provide an additional layer regulation in a particular area in addition to base zones to address site-specific concerns. Overlay zones can be used in many contexts such as historic preservation, pedestrian friendly zoning, waterfronts, or flood protection zones. As sea level rise and precipitation patterns change, overlay zones can be an important tool to enhance coastal and floodplain resilience. Overlay zoning can also allow for flexibility of standards, for example, to accommodate the elevation of buildings in a flood zone. Local governments can use overlay zones to better regulate specific adaptive strategies like breakaway walls, setbacks, elevation standards, impervious surface requirements, or development densities with goals such as managing coastal sprawl or limiting development in sensitive areas. Overlay zone standards can be implemented by right or permit to provide a targeted layer of protections for vulnerable areas. Overlay zones can be used to meet federal regulatory requirements for flood hazard protection. The National Flood Insurance Program (NFIP, 44 CFR 59 et seq.) requires minimum flood protection regulation to be enforced by participating municipalities in the 100-year flood zone as delineated on FEMA Flood Maps. Municipalities can use a flood overlay zone to add protective regulations to these areas. However, to address the challenging limitations of FEMA's maps, some municipalities have increased the minimum flood protection requirements above the federal and state level standards to proactively decrease future flood vulnerability in some areas by dividing their 100-year floodplain into defined overlays for more site-specific regulation. A tiered approach can accommodate finer scale hazard risks and fine-tune regulation with greater site specificity.