

ZONING PRACTICE

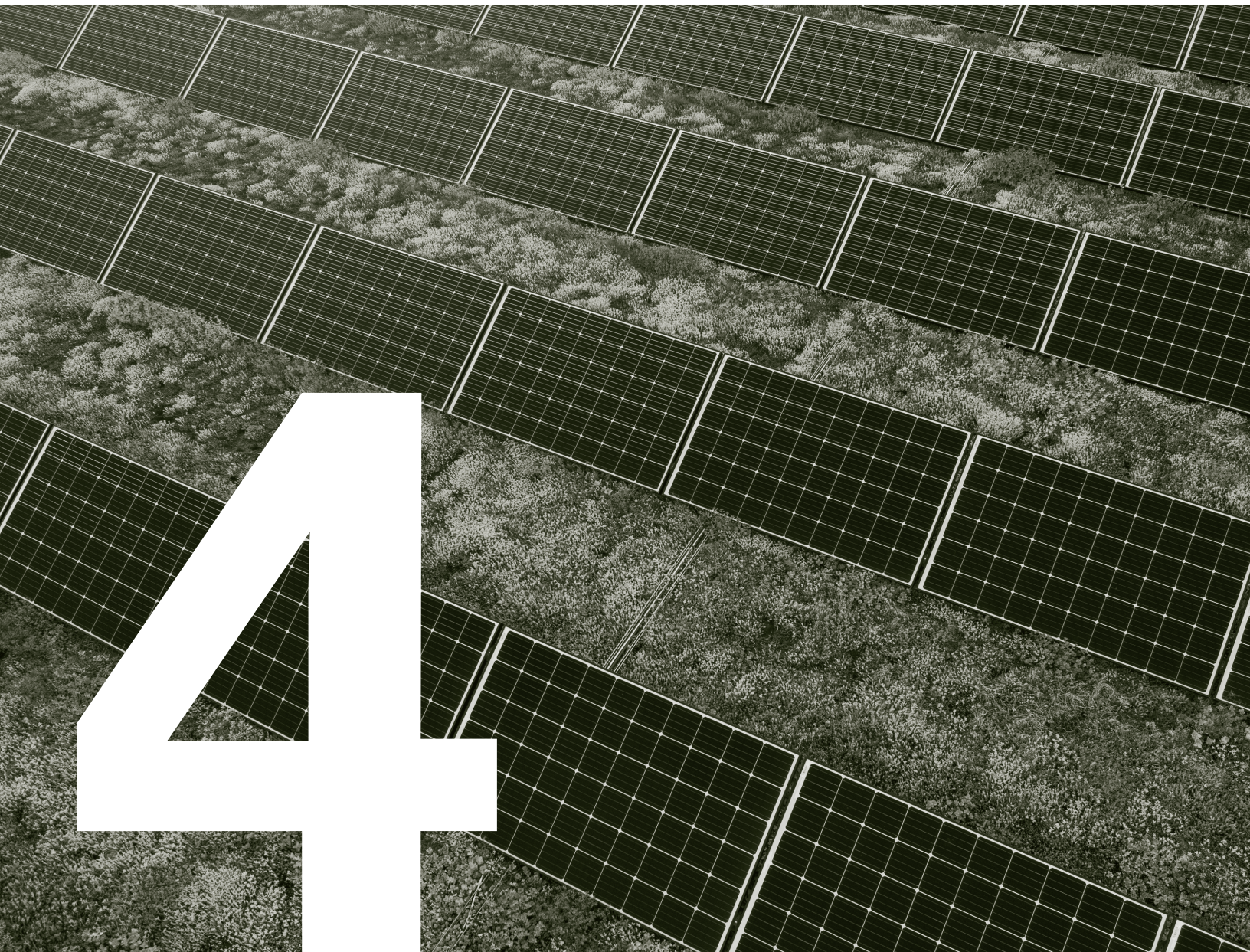
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PRACTICE CLIMATE CHANGE MITIGATION



Low-Carbon Land-Use Laws

By Meg Byerly Williams

A recent report on climate change impacts, adaptation, and vulnerability by the Intergovernmental Panel on Climate Change's Working Group II warns how, without immediate intervention, continued greenhouse gas (GHG) emissions at today's levels will result in increased global average temperatures of 2.7 degrees Fahrenheit above pre-industrial levels over the next 10 years (IPCC 2022). The report details how higher global temperatures will lead to extreme heat waves and drought, the spread of diseases like malaria, extreme flooding, increased storm events, and sea level rise that will engulf island nations.

These effects of climate change occur at the local level, affecting people where they live and work and disrupting lives from flooding, storm surge, wildfires, drought, extreme heat, and mudslides, among other catastrophes (Liptak 2021). Natural disasters have also led to declining property values in communities throughout the U.S. (Nolon 2021). In 2012, Hurricane Sandy resulted in extreme flooding along the New Jersey and New York coasts, damaging property that never recovered its full value, in part due to high rebuilding costs and lender hesitancy (Kaysen 2014). In Paradise, California, the 2018 Butte County Camp Fire demolished thousands of structures, costing over \$16 billion dollars in damage and killing 85 people (Braga 2019). Drought and warmer temperatures in Morton County, Kansas, have reduced and destabilized the region's aquifer and shifted the growing area for corn away from this primarily agricultural locality (Coulter 2018).

Such impacts on citizens and local businesses motivate local jurisdictions to respond in ways that will help reduce climate change and its effects. As described in *Choosing to Succeed: Land Use Law & Climate Change*, local governments have the authority they need to adopt land-use regulations to help mitigate climate impacts (Nolon 2021). State zoning enabling acts authorize local officials to adopt laws that encourage the "most appropriate use of land," which

includes zoning, as well as other land-use laws like site plan and subdivision regulations, to shape settlement patterns in a way that most benefits the community.

Cities, towns, and counties can use this authority to mitigate climate change by adopting local land-use regulations that help reduce GHG emissions associated with new development. It is estimated that buildings contribute about 35 percent of carbon dioxide (CO₂) emissions in the United States, and transportation sources contribute about 19 percent of CO₂ emissions (Nolon 2018). Conversely, the vegetated environment, including agricultural lands, forests, meadows, pastures, and urban trees and green infrastructure, sequesters about 18 percent of CO₂ emissions in the U.S. (Nolon 2018). Although the novel coronavirus pandemic resulted in a 10 percent reduction in domestic GHG emissions in 2020, emissions rose by six percent in 2021 and continue that trajectory (Plumer 2022).

This article explores how cities, towns, and counties can use land-use regulations to respond to climate change by implementing low-carbon land-use strategies that reduce GHG emissions associated with new development. Low-carbon land use comprises energy-efficient and zero-emission buildings; development patterns that encourage walking, bicycling, and transit use in lieu of personal automobiles; and preservation of existing green space and natural resources, as well as the creation of new green infrastructure.

BUILDING STRATEGIES

To reduce GHG emissions associated with energy use in buildings, local governments can amend their energy, building, and zoning codes to incentivize or require energy-efficient buildings.

Energy Codes

Energy codes can help improve energy efficiency in buildings by requiring or allowing "design and construction techniques that reduce heating, cooling, ventilating, and

lighting loads" (ESMAP 2014). Generally, states adopt model building and energy codes that, in many states, local governments must enforce. In some states, local jurisdictions may obtain state permission to amend the energy code with stricter local standards. In these states, as well as those that allow cities, towns, and counties to adopt stricter code standards outright, local legislatures can incorporate energy efficiency standards in their energy codes to help reduce energy consumption in buildings and associated GHG emissions. Most states have adopted the International Code Council's International Energy Conservation Code, which is updated periodically to strengthen energy efficiency requirements (Nolon 2018). New York State developed the NYStretch Code – 2020 Version 1.0 (NYStretch-2020), a more stringent supplement to the state's energy code that local governments may adopt. NYStretch-2020 improves the state's energy code effectiveness by 10 percent (NYSERDA 2022).

Energy Efficiency in Building Codes & Zoning

Cities, towns, and counties can also amend their building or zoning codes to incentivize or require new development to meet minimum energy efficiency standards for its internal equipment and appliances, as well as energy-efficient upgrades for significant renovations.

Marin County, California, amended its building code to require both residential and commercial development to meet California's 2019 Building Energy Efficiency Standards, which align with the American Society of Heating, Refrigerating, and Air-Conditioning Engineers' (ASHRAE) 90.1 2017 national standards and include provisions for attics, walls, water heating, and lighting (§19.04.140). These energy efficiency requirements increase with development size.

Greenburgh, New York, adopted home energy conservation requirements that require new residential dwellings to achieve a score of 70 or less on the Residential Energy Services Network's Home Energy

Rating System and comply with the Building Performance Institute's combustion safety testing standards (§100-20). Residential development also must include a controlled mechanical ventilation system that complies with the ASHRAE 62.2 standard for whole-house ventilation.

Blooming Grove, New York, amended the major subdivision provisions for rural residential districts in its zoning code to allow increased development density in exchange for adherence to New York State Energy Star guidelines (§235-14.1.A(3)).

Passive Energy Efficient Buildings

Passive solar building design orients buildings to have unobstructed access to the sun on their south side, positions windows to collect maximum sunlight, and uses building materials that retain and store heat from sunlight, either to help heat or cool its interiors depending on the season. Passive daylight and heating or cooling features help reduce energy consumption in these buildings (U.S. DOE 2022).

Boulder, Colorado, adopted a solar access law that divides the city into four solar access areas to maximize solar access protection consistent with development densities, topography, and lot orientations (§9-9-17). The law forbids the construction of structures that would shade protected lots in the solar access areas and requires new planned unit developments and subdivisions to orient residential units to maximize solar access and be structurally capable of supporting solar collectors.

Distributed Energy Generation

Distributed energy generation facilities generate electricity at or near where it will be used, such as combined heat and power, thus reducing GHG emissions related to transferring energy from where it is generated to where it is consumed (U.S. EPA 2021).

Pittsburgh has used district energy systems for years. More recently the city has begun updating those systems; developing new sites for district energy, microgrids, and combined heat and power; and interconnecting those systems into a grid of microgrids (Wood 2017). Pittsburgh reinforces its commitment to district energy in its zoning code.

The city's Uptown Public Realm Mixed-Use Urban Core Subdistrict requires structured parking to include site features



Nick Amosato / Flickr (CC BY 2.0)



Uptown in Pittsburgh as viewed from Mount Washington.

such as combined heat and power with battery storage, connection to a district energy system or connection to a smart/micro-energy grid (§908.04.D.1(c)). Similarly, the city offers points toward zoning incentives for developments that connect to distributed energy systems (§915.07). Pittsburgh defines these systems as “a range of smaller-scale [fossil and renewable energy] technologies designed to provide electricity and thermal energy closer to consumers,” including on-site energy storage, existing district energy facilities, combined heat and power systems, microgrids, fuel cells, and batteries.

Renewable Energy Generation

Renewable energy is harnessed from natural sources or processes that continually renew, including sunlight, wind, and the earth's core. Solar energy systems collect sunlight and convert it to solar power, while wind energy systems create energy from blowing wind and geothermal systems capture heat from the earth and convert it to power. Buildings that use power from renewable sources reduce GHG emissions associated with traditional electricity generation facilities, like coal powered plants (NRDC 2018).

To encourage renewables, local governments can adopt land-use regulations that allow or mandate these systems in appropriate zoning districts. For example,

Dover, New Hampshire's mixed-use CBD General Sub-District includes a building standard that requires all buildings to be solar ready and mandates commercial and mixed-use buildings over 25,000 square feet to incorporate solar panels and a green roof on at least 30 percent of the roof area (§170:13).

More commonly, cities, towns, and counties amend their zoning to allow solar energy systems, like Marion, Massachusetts, which adopted a Municipal Solar Overlay District that allows construction of ground-mounted solar photovoltaic systems, subject to minor site plan approval (§230-8.13). Marion also has a solar farm regulation that allows ground-mounted solar farms in residential districts if they meet certain area requirements and obtain a major site plan approval and special permit (§230-16.11).

TRANSPORTATION STRATEGIES

In addition to facilitating energy-efficient development that reduces GHG emissions associated with buildings, local governments can adopt zoning and other land-use regulations that enhance the pedestrian realm in urban centers and around transit stations to encourage walking, bicycling, and transit use and reduce dependence on personal automobiles, which contributes to climate change.

Pedestrian-Oriented Design

Walkable places showcase a mix of residential and commercial land uses in close proximity and share several urban design features that attract pedestrians and bicyclists. Pedestrian-friendly areas are recognizable and memorable, featuring diverse buildings, architecture, and landscape elements. They have pedestrian-friendly street walls defined by buildings, trees, and other structural elements that provide a comfortable, safe walking environment. These areas also offer transparent views through public spaces and buildings with an adequate number of windows and connect destinations both visually and physically so that pedestrians can efficiently move from one destination to another (Ewing and Bartholomew 2013). To encourage pedestrian-oriented development, cities, towns, and counties can adopt zoning regulations that require these urban design features and allow a mix of land uses that enable people to live, work, and play in the same places.

For example, Grand Rapids, Michigan, adopted mixed-use commercial zoning that created three types of mixed-use districts: high density city centers with diverse uses and a diversity of uses, linear commercial areas that pass through multiple neighborhoods on major streets, and core commercial areas focused around particular intersections with defined edges adjacent to less intense uses (§5.6.01). Proposed developments in these zones must contribute to placemaking by being easily convertible into a variety of uses, including a variety of housing, creating potential for a mix of uses integrated within and among buildings, and exhibiting “high-quality and enduring” architectural character.

The regulations require additional placemaking elements for each type of mixed-use zone, including the creation or maintenance of a continuous street wall, off-street parking located at the rear or side of main buildings where it will not interrupt the pedestrian realm, and adequate sidewalk space (§§5.6.02–05). Required building elements include increased transparency via windows that add visual interest, building entrances and storefronts oriented to the street, and articulation of longer building façades into more human-scale increments (§5.6.08).

Transit Oriented Development

Transit oriented development (TOD) builds on these concepts, centering land-use variety and urban design elements around transit. According to the Federal Transit Administration, TOD is “a mix of commercial, residential, office and entertainment centered around or located near a transit station,” creating dense and walkable development that “attracts people” and “adds to vibrant, connected communities” (FTA 2019). To facilitate alternative modes of transportation associated with fewer GHG emissions, cities, towns, and counties can amend their zoning around mass transit to allow mixed uses, including a range of residences, retail, offices, and personal and civic services, as well as denser development that supports transit.

Minneapolis adopted a Pedestrian Oriented (PO) Overlay District ordinance that established PO overlay districts around existing and proposed transit stations (§§551.60–180). The PO Overlay District promotes street life and activity in commercial areas by regulating building orientation and design and parking facilities and by barring automobile-oriented uses. In particular, the PO Overlay District prohibits drive-through facilities, automobile service uses, and transportation uses. It further requires building placement to “reinforce the street wall, maximize natural surveillance and visibility, and facilitate pedestrian access and circulation” and includes a minimum setback of eight feet for first floors. Building façade standards require a minimum amount of windows and encourage awnings and canopies, while accessory parking standards mandate that parking be located to the rear or interior side of a site, within the principal building, or entirely below grade.

GREEN SPACE PRESERVATION STRATEGIES

Cities, towns, and counties can further help mitigate climate change by reducing development impacts on local open space. Protecting green space like forests, pastures, meadows, croplands, urban trees, and green infrastructure safeguards the natural environment that sequesters carbon emissions. For decades, local jurisdictions have adopted local environmental laws that limit development impacts on their natural resources and enhance important environmental features (Nolon 2001).

These regulatory strategies include local ordinances that protect environmentally sensitive areas, forests, and trees, as well as erosion and sedimentation control ordinances, steep slope regulations, and stormwater management laws. More recently, local governments have begun to adopt local laws that require sustainable landscaping and green infrastructure elements, which also contribute to the sequestering environment.

Environmentally Sensitive Area Designation

Environmentally sensitive area ordinances preserve and protect a local jurisdiction’s unique environmental features, such as wetlands, floodplains, watercourses, or important wildlife habitat.

Penfield, New York, adopted an Environmental Protection Overlay District (EPOD) ordinance that established, in part, a Woodland Protection District (§250-6.1). Developers must obtain an EPOD permit for any projects proposed within the district and must demonstrate that the proposed activity will not adversely impact soil stability, rate of surface runoff, and existing drainage systems, among other factors.

Similarly, Tampa, Florida, adopted an Upland Habitat Protection Ordinance to protect the city’s remaining large contiguous environmentally sensitive areas and to preserve existing habitat diversity and wildlife corridors (§27-287 et seq.). The ordinance established an Upland Habitat Overlay District that requires rezoning, subdivision, site plan, and building permit applicants for any proposed development within the district to have an approved upland habitat plan that protects any significant or essential wildlife habitat on the effected parcel during construction. The ordinance also includes general standards and guidelines for upland and significant wildlife habitat protection, including prevention of wildlife corridor fragmentation, routing new road rights-of-way away from significant wildlife habitat where possible, designation of preserved areas as conservation areas on all development plans and plats, a management plan agreement ensuring continued management of the site, and preservation of off-site habitat when on-site preservation cannot be sufficiently managed.

Timber Harvesting

Timber harvesting ordinances ensure proper forest management while protecting and

improving forest ecosystems and their essential values, including wildlife habitat, water filtration, soil retention, and carbon sequestration.

Pursuant to Maryland's Forest Conservation Act ([Md. Code. Ann. Nat. Res. §5-1603](#)), Laytonsville, Maryland, adopted a Forest Conservation and Reforestation Ordinance that applies to applications for subdivisions, project plans, grading, or sediment control approvals on parcels 40,000 square feet or greater. It requires applicants to submit a forest stand delineation and forest conservation plan for the affected parcel, using methods provided in the Maryland Department of Natural Resources Forest Conservation Technical Manual, to protect retained forests and trees during construction.

The ordinance includes criteria for developing a forest conservation plan, including plan preparation by a licensed forester, prioritizing retaining existing forest on site, and the creation of a two-year maintenance agreement for applicants required to conduct reforestation. Applicants must establish forested areas based on existing forest cover and land use and must retain contiguous forest, trees in sensitive areas, rare and threatened species, and historic and large trees.

Tree Protection

Tree protection ordinances protect the urban forest, including street trees and trees on private property, preserving the ecosystem services they offer, "including the practical aspects of wind protection and shade for energy savings, higher property values, less soil erosion, and the prevention of wetland siltation" (ADF 2016). Reno, Nevada, has proposed a Tree Protection Ordinance to expand existing tree protection standards related to tree planting, maintenance, and removal (2022). The draft ordinance aims to increase the city's tree canopy through retention of healthy trees and new plantings in line with Reno's *Urban Forestry Management Plan and Sustainability and Climate Action Plan*, which acknowledges that trees and landscaping help improve air quality by reducing carbon emissions and help lower heating and cooling costs and energy consumption.

The ordinance applies to all trees on public property, as well as private trees that meet certain size criteria and requires all on-site trees to be preserved to the extent

possible. When protected trees are removed, the removal must be mitigated through replacement trees. If on-site replacement is infeasible, developers may comply by planting replacement trees off-site on public property or paying an in-lieu fee to the ReLeaf Reno Program in the amount of 100 percent of the value of the removed trees.

Landscaping Requirements

In addition to enhancing the sequestering environment, landscaped areas help conserve energy by reducing heat islands and contribute to a pedestrian-friendly environment by creating attractive spaces and screening parking facilities and building utilities from view.

Recognizing these benefits, Tampa adopted tree preservation, planting, and landscaped area requirements ([§27-284.3.3](#)). This regulation requires protection of certain significant trees and the planting of mitigation trees for any protected tree removals, requires projects to retain a minimum percentage of protected trees by land and use type, and includes tree planting standards for tree type, size, species, and mature crown spread, height, and growth rate. Additionally, development projects must install a minimum amount of landscaping and trees by use type, as well as vegetative screening between different uses. All landscaped areas and plant materials must be 60 percent native plant material or adapted to local conditions, and irrigation systems are not required for retained native plant habitat and drought-tolerant landscape material.

Erosion and Sedimentation Control

Local erosion and sedimentation control ordinances regulate the design, construction, and maintenance of development and other land-disturbing activities to prevent soil, pollutants, and other solid materials from leaving the site and entering wetlands and waterbodies, where they degrade water quality. These regulations are not new regulatory strategies, but they do help contribute to the sequestering environment by requiring protection of existing vegetation during construction activities.

Geneseo, New York, adopted an Erosion and Sedimentation Control ordinance that applies to all development that involves the disturbance of 500 or more square feet and requires these development activities

to obtain an erosion control permit ([§54](#)). Activities that will disturb or uncover 10,000 or more square feet must have an erosion control plan that outlines temporary and permanent erosion control measures. The ordinance includes performance standards that apply to all land disturbing activities, including retention and protection of existing vegetation. Where protection of trees or other vegetation is required, the erosion control plan must show their location, and applicants must adhere to vegetation protection methods outlined in the New York State Standards and Specification for Erosion and Sediment Control. In sensitive areas, sites are required to be seeded with grass upon construction completion.

Steep-Slope Protection

Also relatively common, steep-slope regulations prevent development on steep land that is susceptible to erosion, landslides, and subsidence (We Conserve PA 2022). Like erosion and sedimentation control laws, steep-slope regulations offer another traditional way to protect the carbon sequestering environment.

Pittsburgh adopted a steep slope overlay (SS-O) district to protect its scenic hillsides that contribute to the city's visual character and, in part, to "[m]aintain and enhance natural land features which are environmentally significant or which constitute a natural resource of importance to the community at large, including especially wooded hillsides, river frontages and stream valleys" ([§906.01\(C\)](#)). The ordinance requires developers to submit an application for development that will affect slopes of 25 percent or greater in the SS-O District ([§906.08](#)). Additionally, all development in the SS-O district must maintain natural landforms to the maximum extent possible, must minimize the need for vegetation removal with the exception except for invasive species, and may not remove vegetation solely to create views. Developers must revegetate the site with native plants or those with similar appearance and growing requirements to existing vegetation.

Stormwater Management & Green Infrastructure

Another familiar local law, stormwater management regulations, offers the opportunity to further protect and enhance



➞ The Canal Street Stormwater Park in Milwaukee.

local green spaces through the installation of green infrastructure, “vegetative infrastructure systems” like green roofs and walls, bioswales, rain gardens, street plantings, wetlands, trees, parkland, and other vegetative systems that capture rain on-site through plant evapotranspiration, soil infiltration, or storage for reuse (WGIN 2022).

To increase local resiliency to climate change impacts, the American Society of Landscape Architects recommends supporting natural systems by incentivizing the “planting of locally/regionally appropriate and biodiversity-supporting vegetation,” protecting and enhancing “natural vegetative buffers, including wetlands and water’s edge plantings, along coastlines and inland waterways,” prioritizing retention and expansion of green space, and preserving wildlands, among other strategies (ASLA 2017).

Milwaukee has adopted Storm Water Management Regulations that incorporate these strategies (§120). In accordance with the city’s *Green Infrastructure Plan*, which recognized that green infrastructure is an effective way to manage stormwater and improve water quality, these regulations require developments and redevelopments of an acre or more to capture at least the first half-inch of rainfall on-site using green infrastructure. Applicants must submit a green infrastructure plan “with a detention volume equal to at least one-half inch multiplied by the total area of new or

redeveloped impervious surface” (§120-7.6.5). The green infrastructure plan may include designs for rain gardens, wetlands, green roofs, bioswales, including dry ponds, landscaping with deeply rooted plants, trees, and the removal of pervious surfaces or structures to allow revegetation or infiltration.

Transfer of Development Rights

To further protect green, open space, cities, towns, and counties can consider adopting laws that allow development rights to be transferred from one area to another. Transfer of development rights (TDR) programs create a process for transferring development rights from a sending district, where land should be conserved, to a more urban, receiving district. The municipality amends the sending district’s zoning standards to reduce allowed development density while awarding these property owners development rights that can be transferred via a development rights bank, at a price, to property owners in the receiving district, who then may apply for zoning incentives to increase the development densities at which they may build (Nolon 2001).

Chesterfield Township, New Jersey, adopted a voluntary TDR program to protect its agricultural and open space (§§130-128–134). Chesterfield’s sending area comprises 10,000 acres of rural and agricultural acres land, and its receiving area includes 560 acres of existing developed areas near Trenton, New Jersey; major transportation corridors; and existing water treatment

facilities. The program awards transfer credits based on existing U.S. Department of Agriculture Soil Conservation Service (now known as Natural Resource Conservation Service) soil maps, with credits awarded based upon a parcel’s soil limitations for accommodating septic disposal (NJHWPPC 2007). Chesterfield’s successful TDR program was awarded a 2003 Smart Growth Award by New Jersey Future for cost effectively increasing the town’s significant farmland preserve (NJF 2003).

NEXT STEPS

The strategies outlined above offer a variety of ways cities, towns, and counties can amend their building, zoning, and other land-use regulations to facilitate low carbon development. Before embarking on a local regulatory effort to mitigate GHG emissions through land-use laws, local governments should begin by forming a policy framework that lays out their goals and process for adopting these strategies. They should consider creating a task force or committee to guide the process by gathering information, exploring strategies, and making recommendations to the local legislature. Additionally, local officials can adopt an executive order, council resolution, or other policy statement to display their commitment to climate change mitigation and outline the initiative’s purpose and objectives. Local governments also should consider amending their comprehensive plan to further lay the groundwork for this initiative and provide a legal foundation for local regulations that will help reduce the community’s carbon footprint. Finally, a robust community engagement program throughout this entire process will help build support for the low-carbon land-use effort.

ABOUT THE AUTHOR

Meg Byerly Williams, Esq., MEM, MS, is in-house counsel for Skeo Solutions, Inc., where she is a regular consultant to the Land Use Law Center at Pace Law School. Williams serves as Editor of the Case Law Digest for the APA’s Planning and Law Division and is the Ex Officio Member of APA’s Divisions Council Executive Committee. This article was written in conjunction with the Land Use Law Center’s Land Use, Equity, and Human Health Project.

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