Resilient Connecticut Synthesis Report
Appendix E

Factsheets and Case Studies

UCONN UNIVERSITY OF CONNECTICUT
CIRCA
CONNECTICUT Department of Housing
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
CONNECTICUT ENERGY & ENVIRONMENT

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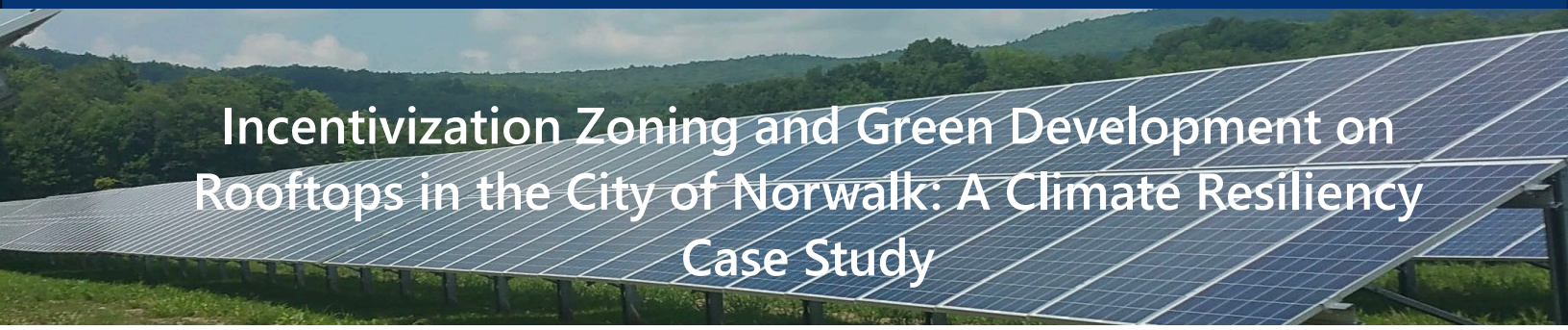

Incentivization Zoning and Green Development on Rooftops in the City of Norwalk: A Climate Resiliency Case Study

Heating needs have decreased in Connecticut while the need to cool down buildings and communities has increased. As average temperatures rise, Connecticut residents will experience a greater need for cooling rather than heating. Modern buildings often easily absorb heat from solar radiation. With rising temperatures from climate change, costs for air-conditioning will rise for tenants, homeowners and businesses. Increased air conditioning increases energy consumption, which in the case of fossil fuels and natural gas, contributes even more to carbon emissions that created climate change. Since 1950, the average temperature in Connecticut has increased by 2.2 degrees Fahrenheit (Quincy, 2020). As a result of this heat increase, Connecticut will face more health concerns including from disease, clean air, and water quality. A means of cooling exists in raising the "albedo" of rooftops. Albedo is the amount of light or solar radiation reflected by a surface. The rest of the solar radiation is absorbed by the surface, and in doing so causes it to heat up. Dark colored roofs don't reflect a lot of solar radiation; in fact, they absorb a lot and that generates heat! That results in the warming of the building. Fortunately, energy- and cost-efficient solutions exist for cooling down buildings. Cooling down or making buildings more energy-efficient starts from the top: the roof. Roofs can be designed to absorb solar energy, or to cool down buildings without expending more energy or dollars. These solutions are generally known as white roof, green roof, blue roof, and installing solar panels.

One of the leading municipalities in efforts to cool down buildings, or otherwise make them energy efficient comes from a recent action enacted in Norwalk. This action from Norwalk's 2020 Plan of Conservation and Development (POCD) was "Develop and promote strategies to mitigate increased heat. Actions can include "cool roofs" programs to paint roofs white or other light colors to reflect sunlight and increase albedo; green roofs (vegetated roofs); tree planting; and green parking lots that use surfaces that reduce heat production." (Norwalk, POCD, 2020). This project was placed under the authority of the Emergency Management; Economic and Community Development as well as Public Works.

Changing Zoning Codes

In 2021, Connecticut Public Act No. 21-29 Sec. 4(c)(3) called for changes in zoning regulations to advance greater climate adaptation and/or mitigation: "Require or promote (A) energy-efficient patterns of development; (B) the use of distributed generation or freestanding solar, wind and other renewable forms of energy; (C) combined heat and power; and (D) energy conservation."

Given this push towards sustainable living, it was then up to motivated and knowledgeable town planners and zoning boards to apply the Act to their towns. Now from this Act, zoning boards may require or promote energy efficient development, something that in the past could only be encouraged. Along with this, the Act gives developers a new class of incentives for renewables, water, and energy conservation. For example, now that vehicle miles traveled (VMT) calculations can be included, so there is another type of information for approving or denying projects. If a project would generate a lot of VMT, then it could be denied on environmental grounds lest it is mitigated with pedestrian or bike paths. See "Resources" for more on utilizing VMT. There were not a lot of pre-established guidelines or suggestions for how to evaluate and implement such a policy before. To this day, it comes down to having motivated, curious, and dedicated town staff and their surrounding community to make such changes. Municipalities like Norwalk took a leading role in Connecticut to develop ways to incentivize and change their zoning policy to make their town greener.

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Motivating Zoning Changes

Norwalk's Planning and Zoning Commission and Common Council–which governs Norwalk's sustainable infrastructure push–was motivated to introduce sustainable development standards including to implement cooling on the roofs of new developments. To bring aboard other stakeholders who may not have the same motivation to take on climate action, Norwalk determined it would be easier to mandate roof cooling actions when the rezoning or amending of zoning text would be in someone's favor. So, an incentivization point system was created in Norwalk for new developments to encourage and make the shift to more environmental rooftops that would be accepted by other stakeholders in Norwalk, especially developers. Norwalk implemented such climate action requirements for roofs on new developments within updates to Article 50 "Using Regulations Controlling Business Zones" in the zoning regulations for certain development areas in Norwalk. This would balance the desires of developers with desires for certain public amenities prospects and resilient development standards.

How Do Incentive Zoning Systems Work?

Zoning incentive systems trade-off between a community and a private developer. Often, the developer is allowed to build a project that may otherwise be unpermitted such as a larger, higher-density project or one with modified standards for height, setback, or other in exchange for providing some aspect of development in favor of the community's interests otherwise not required by the developer (Morris, 2000).

Originally, zoning incentive systems were experimented with, and became attractive for cities and towns in the late 1950s and early 1960s. Cities desired to encourage private developers to improve the appearance of the community without using public funds. As a result, planners began breaking out of rigidly defined land use as separate, which is known as Euclidean zoning, so that a piece of land would meet social objectives including affordable housing and day care. Under Connecticut's General Statutes, Section 8-2g(a) within inclusionary zoning legislation, local governments can allow special exemptions to developers within zoning in exchange for promoting some value of the community, such as including climate adaptations as part of the development project (Morris, 2000).

More information on Incentive Zoning can be found here:

Incentive Zoning - Meeting Urban Design and Affordable Housing Objectives

Requiring Green Infrastructure Development

Some developmental areas in Norwalk require application of "green" infrastructure. Most recently this is stated in their Article-50 update for development parks on the west side of Glover Avenue and within northern Norwalk for an area where there is the construction of a renovated and improved train station at Merritt/7. These are requiring:

The site is designed with following minimum LID/"green development" techniques:

a. all buildings must provide a minimum of 25% of either green roofs, blue roofs, or contain solar panels for that portion of such roof not used for recreation area improvements or utilities

b. all surface water shall be handled through onsite retention. the use of rain gardens and bioswales is recommended and encouraged where feasible.

c. all parking lots and parking structures must include electric vehicle charging stations

d. sheltered bike parking and storage must be provided

e. all landscaping shall be native species, except that perimeter screening may contain alternate species as approved by the Commission

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The Point System

Next, Norwalk created means of incentivizing required sustainability through a point system for the construction of a development park in the East Norwalk Village Transit-Oriented Development. Now, a certain number of points must be achieved for the area to meet sustainability requirements. Zoning rewards exist for meeting this requirement. This is similar to the point system for sustainable amenities in another area for Norwalk's Central Business District.

Article-50: The point system

1. if 15 points are achieved, provided that at least ten points must be sustainable amenities:

a. the height of the building may be increased from 2 1/2 stories (35 feet) to 3 1/2 stories (45 feet)

b. the residential density may be increased from 1 dwelling unit per 1,650 square feet of lot area to 1 dwelling unit per 1,250 SF of lot area

2. if 20 points are achieved, provided that at least thirteen points must be sustainable amenities:

a. the height of the building may be increased from 2 1/2 stories (35 feet) to 3 1/2 stories (45 feet)

b. the residential density may be increased from 1 dwelling unit per 1650 square feet of lot area to 1 dwelling unit per 825 square feet of lot area (City of Norwalk, Article 50, pg. 27, 2022).

Exploring Rooftop Green Infrastructure in Norwalk's Point System

Cooling in infrastructure contexts involves engineering parts of the building to lower the overall temperature of the building. Dark colored roofs and structures absorb more solar radiation than lighter colored surfaces. The color light reflects more solar radiation (heat) back to the atmosphere (Kotecki, 2018). Raising the albedo of roofs has been shown to be a valuable means of decreasing the urban heat island effect. Lighter colored roofs have the potential to lower the temperature of urban environments by reflecting more solar radiation rather than absorbing it. The results are decreasing the temperature of both the reflecting surface and the surrounding air (Jacobson and Ten Hoeve, 2011). Light-colored roofs can slow the effects of climate change without as much risk of negative impacts like from practices like geothermal engineering, though if done properly, geothermal engineering has merit (Oleson et al., 2010).

One study has shown that increasing the surface albedo–having lighter colored surfaces–across ten cities in the United States reduced the "near surface daytime summer air temperature by 0.5 to 1.5°C and decreased peak electricity demand by up to 10%." (Oleson et al., 2010).

Green or Blue Roof (minimum of 50% of roof area)		**2 points for every 1,000 SF. Max of 6 points**

Excerpt from Article 50 on point incentive for implementing green or blue roof on design project (City of Norwalk, *Article 50*, p. 89)

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"Cool" Blue and Green Roofs

Green roofs aid in reducing the temperature of roofs by installing and maintaining a vegetative layer on top of a rooftop. These topside gardens provide environmental and cost-benefit considerations by lowering the temperature and energy demand of a building and have social benefits for its aestheticism and presence. Green roofs have been shown to moderate the heat island effect, reducing city-wide ambient temperatures by up to 5 F (EPA, 2022).

Green roofs in Connecticut match the color and–from that, albedo of the forest environment that makes up much of Connecticut, which relays to the building underneath of the green roof a similar temperature.

Benefits of Green Roofs

Green roofs improve economic, social, and environmental conditions for the building and surrounding area. Economically, though they have high initial costs, green roofs have long life expectancy. They are ideal for projects emphasizing on saving energy, lifecycle costs, and broader public and environmental benefits within limited budgets. Socially, green roofs improve human health and comfort by increasing indoor comfort and reducing heat stress related to heat waves (EPA, 2022). These also improve quality of life through aesthetic value from the plant and animal species that make-up green spaces and increase the amount of interaction humans have with natural environments. These human-nature connections have been shown to "benefit human physical and mental health and productivity and reduce blood pressure and hospital stays," (EPA, 2022) though only if the roof is accessible to people.

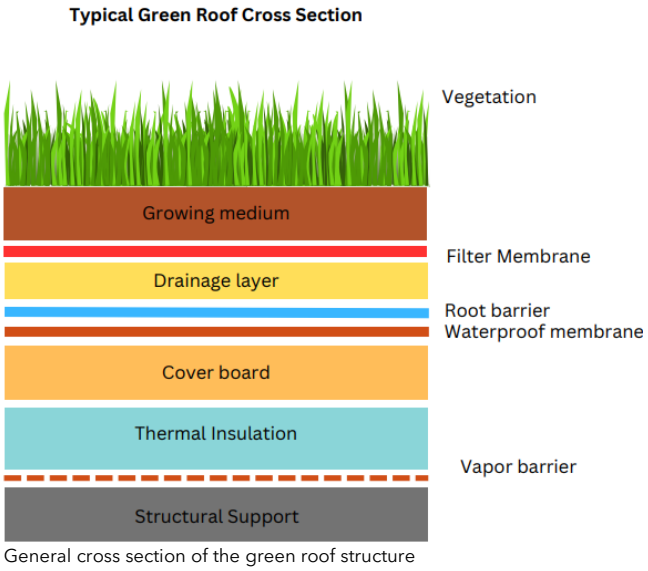
Environmentally, green roofs "lower surface and air temperatures," as well as reduce and filter stormwater runoff while "absorbing pollutants and CO2, providing natural habitat," and even can work as recreational green spaces (EPA, 2022). Less energy is expended to lower the temperature of the building through air conditioning, causing fewer greenhouse gas emissions. Green roofs remove heat from the air through evapotranspiration, while acting as insulators to the building, which decreases the energy needed for both cooling and heating (EPA, 2022). The vegetation too will act to draw down carbon dioxide from the atmosphere, possibly storing it through dry deposition. By slowing down the stormwater runoff into the urban environment, green roofs provide a number of benefits.

Green Roof Impacts on Stormwater

DEEP identified a number of mechanisms by which Green Roofs can contribute to stormwater management, a pressing problem for municipalities across Connecticut, including through

- "Reducing local flooding
- "Reducing the need for sewer upgrades by reducing the amount of stormwater entering sanitary sewer lines
- "Reducing heating and cooling costs
- "Reducing greenhouse gas emissions
- "Improve water quality
- "Create wildlife habitat
- "Provide "green" public [or private] spaces" (DEEP stormwater).

Green roofs can absorb precipitation with vegetation and soil, which helps to manage stormwater and associated runoff water from storms. Storms can contribute to erosion, flooding, and polluting of groundwater through pollutants such as sediment, nutrients, bacteria, and chemicals that threaten aquatic health and limit areas available to water dependent recreational activities.



General cross section of the green roof structure

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Blue Roofs are specifically engineered systems that provide stormwater detention by controlling the discharge rate of captured precipitation, which in turn reduces negative impacts of otherwise uncontrolled stormwater. Orifices and weirs among other devices are examples of technology for managing rooftop runoff.

This type of roof is most effective where roofs constitute many impervious surfaces on a site or for sites that have little space available to build other types of best management practices (BMP). Roofs that are relatively flat are best for this type of system. Steeper roofs create greater "ponding depths." (Government of New Jersey, p. 2, 2021). The strength and bearing capacity depends on the foundation. Evaluating these aspects of the roof and structure is important to see if it can bear a blue roof system. Blue roofs can be implemented on recently built buildings or built on existing structures through retrofits. Surroundings around the building must also be considered; blue roof outlets can be clogged from trees or other types of sources that create debris to the system.

Evaluation and compliance with state law through a maintenance plan is important when attempting to incorporate a blue roof into a building's structure and surroundings. For example, regarding downstream stormwater management facilities, blind connections (the point where a storm sewer connects to another but not through a helpful structure such as a manhole) are prohibited. Before installing a blue roof, connections must have entry points for inspection ports and manholes that ensure "visual inspection and maintenance, as appropriate, to prevent blockage of flow and ensure operation as intended." (Government of New Jersey, p. 6, 2021). All entrance points should be in agreement with "Federal, State, County and municipal safety standards such as those for confined space entry." (Government of New Jersey, p. 6, 2021). Privately owned roofs may require protection for their blue roofs by legal measures such as deed restriction, ordinance or easement to ensure updated maintenance plans are in effect that prevent negligence, adverse alteration or the removal of the blue roof.

Blue roofs and green roofs can be used jointly as "blue-green" roofs to capture precipitation and modulate the temperature of the rooftop and building below.

White roofs, though a form of rooftop cooling, are not included in the Norwalk incentivization point system. White roofs have a higher albedo than the natural Connecticut environment typically has, making them a point of discussion on the cooling effects of the roof come wintertime; would cooling benefits in the warmer months be offset by higher heating costs in the winter? In what environment are white roofs most efficiently applied for net benefits to buildings and the planet?

For a discussion and to read more please see Brian Kahn (2022) White Roofs May Partially Offset Summer Warming by 2100. Climate Central. https://www.climatecentral.org/news/white-roofs-provide-summer-climate-benefits-to-cities-17054 and Mark Z. Jacobson and John E. Ten Hoeve (2011) Effects of Urban Surfaces and White Roofs on Global and Regional Climate. Dept, of Civil and Environmental Engineering, Stanford University. http://web.stanford.edu/group/efmh/jacobson/Articles/Others/HeatIsland+WhiteRfs0911.pdf.

Solar Panels on Rooftops

Solar panels generate renewable energy and notably, lower the temperature of rooftops. Efficiency of solar panels has improved from a previous average of 15% to now about 22% (Svarc, 2022), as photovoltaic technology has made advancements. Far from the original 250W power rating of solar panels, 370W is the typical power rating of a panel. Overall panel efficiency rests on this individual photovoltaix (PV) cell efficiency, as well as total panel efficiency, which is determined by "the maximum power rating under standard test conditions divided by the total area of the panels (in meters)." (Zito, 2023). The most powerful solar panels now achieve rates of 700W (Svarc, 2022).

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Rooftop Solar (minimum of 50% of roof area)		**1 point for every 1,000 SF. of roof area Max of 5 points**

Point system description for solar panel implementation and reward. (SF=square foot). (Article-50, City of Norwalk, p. 89, 2022).

Additionally, it has been found that solar panels have a cooling effect on buildings. A study from the UC San Diego Jacobs School of Engineering discovered that 38% less heat reached into the building; a building's ceiling was 5 degrees Fahrenheit cooler during the day under solar panels than under an exposed roof. Meanwhile at night, the panels aid in trapping heat, reducing heating costs during the winter (University of California, San Diego, 2011).

Within Norwalk, certain businesses have adopted solar panels and green infrastructure that improve their overall design. Over the Summer 2022, new headquarters for vinyl tile supplier HMTX in Norwalk became one of the greenest buildings in Connecticut. Along with solar panels that "provide more than enough power for the building," the building has "rainwater storage systems for plumbing," and rests on stilts that allow wildlife to move across the property without inhibition (Soule, 2022). The building will be the first in Connecticut to submit an application for certification by the Living Building Challenge.

A number of programs exist in Connecticut regarding solar panel installation. These may provide incentives or cost-free programs if eligible. If interested in adopting a program or providing resources to buildings or homeowners, here are some suggestions for starting.

Example of Including Rooftop Cooling in Zoning and Development Projects

The following is an excerpt from the "North 7" master plan that originated from Norwalk's POCD for a 14-acre development project. The Department of Transportation (DOT) is building a new train station and adding another 1,300 housing units. The project is an excellent example of requiring local municipal values of sustainability while potentially giving developers "points" from this kind of implementation to permit development in ways normally not afforded to them by the municipality's zoning and development regulations.

1. Roofs

a. Not less than 50% of all roof area is to be dedicated either to tenant amenity space, green space, or solar panels

b. all roof area not dedicated to amenity space or needed for mechanical equipment, including venting, shall consist of green roof, blue roof or solar panels; provided that a minimum of 20% of each building roof area must be green roof, blue roof, and/or solar panels

c. parking garage shall be roofed and treated as usable space as specified in (a) above

2. Design outdoor public and recreation space to maximize solar exposure. 75% of such space shall have a minimum of 4 hours of sun exposure daily throughout the year. (City of Norwalk, *Article 50*, 2022).

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Such actions align with community efforts to become more sustainable, mitigate greenhouse gasses, and be better adapted to climate change. Following this plan will also afford the DOT points to permit types of development normally unallowed, such as to increase building height or decrease required lot area per unit.

Recent Citywide Sustainability Efforts in Zoning Regulation

Further developments in Norwalk necessitate application of "green" infrastructure as stated in their Article-50 for development parks on the west side of Glover Avenue and within northern Norwalk for an area where there is the construction of a renovated and improved train station at Merritt/7 in northern Norwalk. These are requiring:

Section 6.11 of Norwalk's "Zoning Regulations Update" reads:

A. Requirements.

Unless demonstrated by the Applicant that the proposed Use(s) or Building Construction makes it unfeasible, all new Construction, including Parking Structures and Parking Lot, with an area of twenty-five thousand (25,000) square feet or greater, shall at a minimum, have at least 25% of that area contain Solar Panels, a Green Roof or a Blue Roof. If the Applicant indicates that this is unfeasible, the City may seek, at the applicant's expense, review from a third party architect or engineer, to evaluate the proposal. All new Construction with a footprint of twenty-five thousand (25,000) square feet or greater shall also include stormwater management strategies identified in Section 6.11.2.C and the LID Site Planning and Design Strategies in the City of Norwalk Drainage Manual and Low-Impact Development Appendix of the latest Connecticut Stormwater Quality Manual, unless demonstrated by the Applicant that it is unfeasible.

Similar to the requirements to East Norwalk, these recently introduced regulations would promote measures that strengthen the area's climate resiliency capacity through requirements for sustainability in new developments. The values being pushed forward emphasize long-term community wellbeing for now and future generations in addition to preservation of the local values and character.

Conclusion

Norwalk and other towns are leading the way for green development in Connecticut. By creating systems for incentivizing changes made to zoning, the town created a positive transition to mandated green infrastructure that will benefit the individual building and surrounding community. Adapting to and mitigating climate change from the roof has benefits beyond reducing energy expenditure and associated costs—it creates aesthetic spaces and provides benefits to the surrounding natural environment, whether through removal of pollutants, natural habitat, or better control and erosion prevention caused by stormwater runoff. Municipalities in Connecticut with the motivation to implement a similar system can similarly study and adapt such means to their own municipality's needs and culture that would improve the resiliency of their own communities and inspire others.

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Resources

Susan Quincy (2020) *Connecticut: Our Changing Climate*. Connecticut Department of Energy and Environmental protection. https://portal.ct.gov/-/media/DEEP/education/kellogg/CT-Changing-Climate-Booklet.pdf/.

City of Norwalk (2019) *Norwalk Citywide Plan: 2019-2029 Plan of Conservation and Development.* https://tomorrow.norwalkct.org/wp-content/uploads/2020/10/Norwalk-Citywide-Plan.pdf.

City of Norwalk (2023) *Zoning Regulations Update*. p. 345 https://www.norwalkct.gov/DocumentCenter/View/29515/Norwalk-Building-Zone-Regulations-Final-Public-Draft-March-2023.

Jason Svarc (2022) *Most Efficient Solar Panels 2022.* Clean Energy Reviews. https://www.cleanenergyreviews.info/blog/most-efficient-solar-panels.

Barbara Zito (2023) *The Most Efficient Types of Solar Panel of 2023.* Forbes. https://www.forbes.com/home-improvement/solar/most-efficient-solar-panels/.

City of Norwalk (Updated 2022) *ARTICLE 50, Use Regulations Controlling Business Zones*. https://www.norwalkct.org/DocumentCenter/View/355/ARTICLE-50?bidId=.

Peter Kotecki (2018) *New York City has painted over 9.2 million square feet of rooftops white – and it could be a brilliant heat-fighting plan.* Business Insider. https://www.businessinsider.com/new-york-city-painted-6-million-square-feet-of-rooftop-white-2018-8.

K.W. Oleson, G.B. Bonan, J. Feddema (2010) *Effects of white roofs on urban temperature in a global climate model.* Advancing Earth and Space Science. https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2009GL042194.

See Planning and Development Committee (2021) H.B. No. 6107 // Public Act No. 21-29. Connecticut General Assembly https://www.cga.ct.gov/asp/cgabillstatus/cgabillstatus.asp?bill_num=HB06107&selBillType=Bill&which_year=2021 for information regarding utilizing vehicle miles traveled standard for zoning regulation and further see Connecticut Department of Transportation (2019) 2030 VMT Goal and Strategies. https://portal.ct.gov/-/media/DOT/documents/dpolicy/VMT-Reduction-Target.pdf for VMT objectives related to carbon emissions and building climate resiliency in Connecticut.

Additional Resources

Readings on Green Roofs

- Using Green Roofs to Reduce Heat Islands
- *Estimating the Environmental Effects of Green Roofs*
- Chapter 3 of EPA's *Reducing Urban Heat Islands: Compendium of Strategies*
- Rainfall as a Resource: A Resident's Guide to Green Roofs in Connecticut

Readings on Blue Roofs

- New Jersey Stormwater Best Management Practices Manual - 1.1 Blue Roofs
- Stormwater Management Practice Guidance - 4.6 Blue Roofs
- Blue-Green Systems: Impact of design variables on hydrologic and thermal performance of green, blue-green and blue roofs

Readings on Solar Panels

- Norwalk building opens among greenest in CT
- Solar Panels Keep Buildings Cool

Contact

To learn more about CIRCA visit circa.uconn.edu and the Resilient Connecticut project for more climate resilience planning tools: resilientconnecticut.uconn.edu

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Photos sourced from CIRCA and courtesy of the City of Norwalk.

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Bridgeport Climate Action Case Study

Image of Living Shoreline in Bridgeport (CIRCA)

Information on Municipal Climate Action

In May 2022, CIRCA launched a research project to investigate how climate actions are being implemented in municipalities across Connecticut. Climate actions are defined as activities planned or proposed to address the causes and impacts of climate change through such means as climate adaptation, mitigation, and increasing [in this case] a municipality's resiliency. Bridgeport climate actions were identified from their active plans including Plans of Conservation and Development (POCDs), Natural Hazard Mitigation Plans (NHMPs), Metropolitan Transportation Plans, and the Regional Framework for Coastal Resilience (RFCR). CIRCA has worked with Bridgeport before on *Resilient Bridgeport*, which focuses on creating more climate resiliency in the City. Climate resiliency is accomplished through a combination of environmental and community preparation measures. The goal of this case study was to provide examples of climate strategies that may work for other engaged communities by showcasing policies and enactment strategies that could be adopted and fitted for other towns and cities, as well as the process and resources involved in implementing these kinds of actions. Bridgeport exemplifies resiliency values soundly throughout their plans and was selected for this CIRCA case study due to the quality of their responses from city staff responsible for such projects, and further for the applicatory nature of their climate work to other municipalities.

Bridgeport provided significant detail and insight into their climate actions within their active plans, indicating whether the action was underway, or if the action has not yet been acted upon. More about the methods used for collecting a report on the municipality's climate actions can be found in the last section of this case study. Additionally, this case study may help identify potential barriers that municipalities may face when tackling climate challenges within their own respective communities.

Notably when developing this case study, it came to light that prioritization and action for working on climate resiliency projects was impacted by community and stakeholder involvement in collaboration with the City staff. The influence of the constituents that cared about Bridgeport's climate change preparedness made an apparent difference for the number and type of climate actions that the City has underway, and through their efforts emphasized the overall values, both environmentally and culturally, of the City. Though these efforts of citizens and businesses of Bridgeport may not be directly responsible for the initiating and completing of projects, these following climate actions undertaken and possible for the future reflect the wishes of both city staff and constituents of the community for climate resiliency.

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Community Resiliency Underway – Neighborhood-specific climate action

As the City of Bridgeport is located along the coastline, implementing projects regarding our changing climate conditions is a priority for the municipality, particularly for the wellbeing of the community. Coastal, community-oriented climate actions underway from Bridgeport's 2019 Plan of Conservation and Development (POCD) included ones focused on protecting vulnerable neighborhoods to the effects of sea level rise and worsening storms through individualized plans:

- **Encourage the creation of neighborhood-specific coastal resiliency plans that embrace broad City policy goals while recognizing the unique assets and importance of each waterfront neighborhood.**
- **Prioritize the creation of neighborhood-specific coastal resiliency plans for economically disadvantaged neighborhoods.**

Bridgeport is approaching this focus with three main actions outlined in their POCD, starting with reviewing Bridgeport's 2019 NHMP actions specific to their neighborhoods. Next, Bridgeport is submitting these actions to their Neighborhood Revitalization Zones (NRZs) for their input, furthering the involvement of relevant stakeholders and affirming the priorities of neighborhoods and their leaders, as well as the individual approach to the different settings. A full list of the NRZs are found *here*. Finally, Bridgeport intends to implement the strategies and plans created for neighborhood-specific coastal resiliency in collaboration with the NRZ at the local and legislative levels (POCD, 2019, p. 71). This process will likely include collaboration with Resilient Bridgeport, MetroCOG, DEEP, along with constituents of these neighborhoods (POCD, 2019, p. 83).

- **Support the Rebuild by Design: Resilient Bridgeport/Natural Disaster Resilience Competition project efforts to create a comprehensive flood protection system throughout the South End neighborhood.**

The action relies on interdepartmental communication and design teams to finalize design proposals and create projects that would protect their communities from hazards they are likely to face. (POCD, 2019, p. 82). Community input and development of NRZ vision is important in creating effective strategies for protecting Bridgeport neighborhoods and realizing future aspirations of these communities. Through the federal recovery awards of Resilient Bridgeport "Flood Risk Reduction Project" and "Rebuild by Design" Bridgeport has done significant work on the South End of the City with efforts to address flood risk and create a drainage system that more effectively prevents significant ponding. For an example of a Neighborhood Revitalization Zone Plan, see the *Upper East Side Neighborhood Revitalization Zone Community Vision*.

TRANSITIONING THE CITY TO GREEN INFRASTRUCTURE

The City of Bridgeport embraced the consideration of different types of green infrastructure (GI) about ten years ago as methods of addressing stormwater-related flooding such as by using rain gardens, street planters, pervious pavement, etc., and preventing shoreline erosion by using living shoreline techniques among others. In the survey, Bridgeport respondents identified a green infrastructure climate action from their MetroCOG HMP Annex (2019) that is underway:

- **Pursue a target of 30 additional GI installations on City-owned land and along streets in the 2019-2024 planning timeframe. Select some locations from the Regional Framework for Coastal Resilience**

A few green infrastructure concepts were approved and constructed, including the rain garden at Beardsley Zoo and recently, structures at City Hall and 999 Broad St. Many of these potential projects were described and listed in the *Regional Framework for Coastal Resilience* which was published in 2017. More GI are anticipated to be implemented in the future.

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Changing Neighborhood Character: Knowlton Park

"*This is much more than just a park. It's a symbol for a city that is coming back, going for greatness*." –U.S. Senator Richard Blumenthal. (Daily Voice, 2015).

One prominent action that was built upon from previous work done by the city in the past was to "**Replace with other – Pequonnock River Greenway/Knowlton Park Shoreline Enhancement**." Knowlton Park is a reclaimed brownfield that was converted into a park from several industrial plots donated to the City from their former business owners. This 5-acre space includes a basketball court, playground, river walkway, pavilion and tables that double as chess boards (Daily Voice, 2015). In 2015 when the park had its grand opening, Bridgeport Mayor Bill Finch was quoted saying they aimed to "recapture the waterfront property along the Pequonnock River." (Daily Voice, 2015). The creation of the park transformed the character of the neighborhood and improved the quality of life for the residents. From a place once filled with garbage, weeds, and a beaten down fence, what one resident described as "scary," the park is now a pleasant site for residents and visitors to go for a walk or recreate.

The summer of 2022 saw further expansions to the park, which revolved around enhancing the Pequonnock River Greenway and the Knowlton Park Shoreline. The City entered a public-private partnership with "The Knowlton" to create a public art park and event space along the water and installed a kayak launch from the Park. Bridgeport is now preparing to design improvements to Barnum Avenue spanning from the Knowlton Park to the Pequonnock River to create greater waterfront access. This work benefits Bridgeport's community environment by making it both more resilient and socially and culturally inviting.

HAZARD MITIGATION ACROSS BRIDGEPORT

Several other compelling "underway actions'' in the works contribute to improving climate resiliency through plans to create additional hazard mitigation across Bridgeport, "**Require hazard mitigation plans for all plants, factories, and industrial uses that are either in a FEMA flood zone or handling toxic material**." (Bridgeport POCD, 2019, p. 56). This action is part of Bridgeport's Goal 5 of its "Bridgeport is an Equitable City" Principle to protect economically-disadvantaged neighborhoods in the city and ensure that they are not disproportionately impacted by climate change, nor other environmental hazards (POCD, 2019, p. 36). It is in the initial stages of development and largely overseen by the Emergency Operations Center. The expected timeframe for progressing on the action is indicated in Bridgeport's POCD as relatively short. Bridgeport has listed three major steps within their POCD for completing this action:

1. Create an ordinance that requires regularly updated hazard mitigation plans for all plants, factories, and industrial uses that are either in a FEMA flood zone or handling toxic materials.

2.Track and enforce the creation of required hazard mitigation plans.

3. Monitor compliance with update requirements.

This action dedicated to planning for area-specific climate vulnerability needs is in the early stage of implementation and being addressed further in another related action that is underway, "**Encourage the creation of neighborhood-specific coastal resiliency plans that embrace broad city policy goals while recognizing the unique assets and importance of each waterfront neighborhood.**" (Bridgeport POCD, 2019, p. 87). Bridgeport's neighborhoods face specific challenges based on their locations; given what their proximity is to the Long Island Sound. For example, Bridgeport's South End neighborhood is located on a peninsula characterized as low-lying and bounded by several prominent water bodies, which include Long Island Sound, Black Harbor, Cedar Creek, and Bridgeport Harbor. (Regional Frameworks for Coastal Resilience, 2019, p. 37). This area is highly vulnerable to storm surge and sea level rise (Surging Seas Risk Finder, n.d.). A number of projects have been initiated and received funding to elevate and protect this area as part of the identified climate actions already described.

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FUTURE OPPORTUNITIES FOR BRIDGEPORT

The following are a few compelling actions across Bridgeport's plans that have not yet been acted upon. There are several major reasons that may delay or inhibit progress on climate actions in the short term. For example, prioritization of certain actions over others is often a pragmatic step municipalities must take – given financial, personnel availability, and time resources that can be allocated to the project; whether all necessary stakeholders are involved, or unexpected delays prevent a given municipality to begin or complete a project. Data collected through CIRCA's climate action survey helps to understand what kinds of actions generally are difficult to undertake, as well as specifically why a municipality or constituency may be facing barriers to progressing on particular climate actions, and how outside organizations can assist with implementation.

View from under Bridge in Bridgeport, CT (free image: Canva).

LIMITING DEVELOPMENT IN HIGH RISK FLOODPLAINS

"Bridgeport has seen the face of climate change and it is wet." – Jan Ellen Spiegel, CTPost, 2019.

One of the greatest challenges Bridgeport will likely face in the upcoming years and decades is "**Restrict[ing] development in high risk floodplains**," as identified by the City's POCD. Though mounting sea level rise threatens existing coastal homes and businesses particularly within floodplains, across the nation FEMA-designated 100-year floodplains are typically popular for development. FEMA notes that "Continued development in flood-prone areas and changing climate conditions increase the challenges" facing municipalities in charge of protecting the wellbeing and prosperity of their communities. It can be a massive effort to bring on the businesses and members of the community that may see reduced property values as a result of limitations on development in the areas adjacent to where they currently inhabit. Meanwhile, flooding is increasing in frequency and severity, jeopardizing current and existing properties, and most importantly, the safety and wellbeing of the people who live and work within high risk floodplains.

According to Risk Factor, the City of Bridgeport has a "moderate risk of flooding over the next 30 years, which means flooding is likely to impact day-to-day life within the community." Currently, 3,662 properties are determined to be at risk. In the next 30 years, 4,179 properties are anticipated to be at risk. As a project that is unlikely to have immediate widespread support, it will be up to motivated, long-term minded individuals within the community and municipal leadership to further engage community concern and develop mechanisms that limit or effectively address issues of balancing development and environmental risks that will grow over time within a coastal environment subject to the effects of climate change.

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ECOSYSTEM ENHANCEMENT SERVICES

There were several shoreline enhancement projects that may be acted upon in the future. For example, "**Enhance - Bass Pro Shop Store Shoreline Enhancement**" (Regional Framework for Coastal Resilience, 2017, p. 191). This project involves bank protection through enhancement activity such as beach nourishment and revegetation on the nearby shoreline. Located on Cooks Point, the area is currently already undergoing environmental remediation, including along some of the armored coastal bank adjacent to the Bass Pro Shop.

An environmental land use restriction is being applied to this area, including to a "long, relatively uniform established riprap bank at the water's edge," that is noted as needing to be maintained and enhanced (RFCR, 2017, p.164). The riprap bank in Bridgeport is an example of utilizing green infrastructure on the coastline. Largely, this will be done by enhancing the revetment with vegetation, with a small part of the area being enhanced as wetland to mitigate activities adjacent to the site (RFCR, 2017, p. 164). In general, this area will be undergoing redevelopment and restoration through prioritizing the enhancement of natural habitats and restoration of the city's waterfront and water bodies (Bridgeport, POCD 2019, p.52).

More information on this form of restoration can be found at *Riprap Bank Protection.*

Image of West Branch Johnson Creek Living Shoreline (CIRCA, MetroCOG-Designing Resilience, n.d.)

LIVING SHORELINES

Ecosystems are critical to protect and enhance the services of, especially for the benefits of thriving coastline ecosystems on surrounding human communities. Living shorelines enhance both environmental and human wellbeing. Many actions of the Regional Framework for Coastal Resilience of 2017 focused on Living Shoreline enhancement, such as "**Create – West Branch Johnson Creek Living Shoreline**." (RFCR, 2017).

A living shoreline is a "protected and stabilized shoreline that is made of natural materials such as plants, sand, or rock." (NOAA Fisheries, n.d.). These areas prevent the erosion of the shoreline, absorb storm surge shock, act as habitat for juvenile fish and other marine organisms, and filter pollution out of the water. They are recognized to be typically superior to hardened structures for preventing erosion and damage from the sea and storms.

Located in Bridgeport's East End, Johnson's Creek Living shoreline is described as situated in a troubled area at a low elevation such that it is at risk of flooding and has further been hurt by disinvestment and historic environmental degradation (CIRCA, MetroCOG-Designing Resilience). Living shorelines in Bridgeport are expected to improve waterfront access for the neighborhood in addition to wetland habitat and flooding mitigation. Additional benefits of the living shoreline include:

- "Reducing the grade of bank slopes to allow vegetative stabilization and support potential wetland migration. If sea level rises one foot within the design life of the wetland's edge, the vegetation could move up the bank into the bioswale areas.
- "The removal of debris and invasive species and habitat creation for marsh species.
- "Improved public access to the waterfront and views of the waterfront, including a boardwalk for passive recreation." (Sloan, 2018, p. 5).

More about this action can be found with the *Johnson Creek Living Shoreline Report.*

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ABOUT CIRCA'S CLIMATE ACTION CASE STUDY

For this CIRCA research project, municipal planners and their fellow staff were asked to answer a survey regarding the status of thirty-three identified climate actions. For each action, City of Bridgeport planners and the staff this was distributed to indicated whether the action was completed, underway, or had no action. Following this was a column to explain or provide details regarding the action's status, and next to this was a column for following-up with a person who would be able to provide more information if CIRCA wanted to inquire further. The object of this study was to understand what climate actions the City was having success accomplishing, why these actions were identified as objectives or priorities or more effective than others, as well as the barriers faced in accomplishing their goals.

Bridgeport Survey Responses

Plan // Number of Actions…	Underway	No Action	Not indicated
MetroCOG HMP 2019 (4)	2	2	--
POCD 2017 (15)	9	5	2
RFCR 2017 (14)	2	12	--

For Bridgeport, the POCD has the most identified climate actions that are underway. The RFCR 2017 lists nearly as many actions but does not have as much underway currently. The RFCR is a collection of potential projects and initiatives that is basically owned by the COGs that participated (MetroCOG and SCRCOG) as well as The Nature Conservancy (TNC). Since it serves as a shopping list, its purpose is to provide ideas to NGOs and other entities to apply for grants to advance living shorelines and GI. A great example is Save the Sound, which won $500,000 from NFWF to advance the design for a living shoreline in Guilford that was in the RFCR. In contrast, a POCD provides a basis for a municipality to take its own actions. The two could work together. For example, the POCD could say "The City should continue to select projects to advance from the RFCR, such as the Johnson Creek living shoreline."

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Resources

Municipalities of the MetroCOG Region (2019) *Natural Hazard Mitigation Plan Update*. https://media.circa.uconn.edu/docs/NHMPs/MetroCOG%20MJ%2C%20Bridgeport%2C%20Easton%2C%20Fairfield%2C%20Monroe%2C%20Stratford%2C%20Trumbull%20NHMP%202019.pdf.

MetroCOG, SCRCOG, and The Nature Conservancy (2017) *Southern Connecticut Regional Framework for Coastal Resilience*. https://media.circa.uconn.edu/docs/Framework/SC_RFCR_Final_Report_6-2017.pdf.

William R. Rath, Christopher P. Kelly, and Kristie A. Beahm (2018) *Floodplain Building Elevation Standards - Current Requirements & Enhancement Options for Connecticut Shoreline Municipalities*. UConn School of Law Center for Energy & Environmental Law. City of Bridgeport (2010) *Energy Efficiency and Conservation Plan*. Regional plan Association. https://www.bridgeportct.gov/filestorage/341650/341652/347099/EECS_Final_-_Energy_Plan.pdf.

City of Bridgeport (2019) *Plan of Conservation and Development: Plan Bold * Plan Smart * Plan Bridgeport*. https://media.circa.uconn.edu/docs/POCDs/METROCOG%20POCDs/Bridgeport%20POCD%202019.pdf.

State of Connecticut (n.d) *Resilient Bridgeport*. https://resilientbridgeport.com/about/.

Connecticut Department of Energy and Environmental Protection (2022) *Bridgeport Harbor Station: Title V Proceedings*. https://portal.ct.gov/DEEP/Air/Permits/Bridgeport-Harbor-Station---Title-V-Proceedings.

Meghan A. Sloan (2018) *Johnson's Creek Living Shoreline, Bridgeport: Final Report to the Connecticut Institute of Resilience & Climate Adaptation (CIRCA)*. https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/01/MetroCOG-CIRCA-Johnsons-Creek-Final-Report.pdf.

Connecticut Institute of Resilience and Climate Adaptation (CIRCA) (n.d.) *MetroCOG – Designing Resilience: Living Shorelines for Bridgeport*. https://circa.uconn.edu/metrocog/.

Jan Ellen Spiegel (2019) *Bridgeport building barriers after swamped by stormwaters*. ctpost. https://www.ctpost.com/local/article/Bridgeport-building-barriers-after-swamped-by-14455055.php.

Additional Resources

Reducing Risk in the Floodplain (FEMA)
Risk Factor: *Does Bridgeport have risk?*
Surging Seas Risk Finder
FEMA Base Flood Elevation (BFE)
NOAA Understanding Living Shorelines
CTPost: Drone photos show Bridgeport neighborhoods from above
Building Homes in Flood Zones: Why Does This Bad Idea Keep Happening?
Bridgeport's Waterfront Master Plan
South End Neighborhood Revitalization Zone Strategic Plan – 2014

Contact

To learn more about CIRCA visit circa.uconn.edu and the Resilient Connecticut project for more climate resilience planning tools: resilientconnecticut.uconn.edu

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Photos sourced from CIRCA and Resilient Bridgeport

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Energy Resilience for Connecticut Municipalities

Text & Design by Christine O'Neill, Advised by Kirt Mayland

CT Public Act 20-5 defines resilience as "the ability to **prepare for and adapt to** changing conditions and **withstand and recover** rapidly from deliberate attacks, accidents or **naturally occurring threats or incidents**, including, but not limited to, threats or incidents associated with the i**mpacts of climate change.**"

What does this mean for towns?

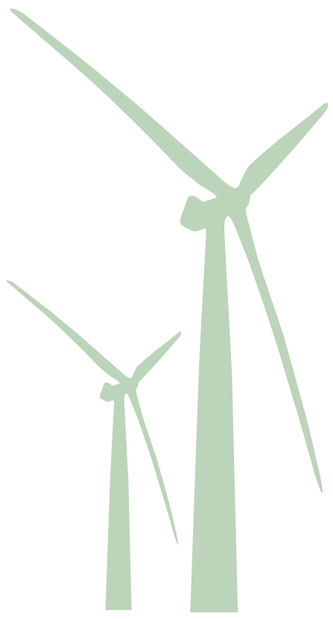
Comprehensive energy planning for both government operations and the town as a whole is a necessity. Climate change is only one of the reasons this is important.

Goals of Resilience

- **Reliable**: Every time you turn the switch, the lights come on.
- **Sustainable**: The strategies you're using now will still work in 10, 25, or 50 years. This means not relying on non-renewable resources.
- **Affordable & accessible**: Everyone in the community should have access to power.
- **Mindful**: The energy sources we use should not be making climate change worse - that is self-defeating.

Strategies

- Distributed generation
  - Renewables
  - Microgrids
- Electrification
- Efficiency
- Storage
- Demand-Response



Resources

- Federal Grants for Resilience Activities
- EnergizeCT for Towns
- DOE's Efficiency-Resilience Nexus
- Resilient Power Planning Guide

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What does a good energy plan look like?

State: The State completed its latest Comprehensive Energy Strategy (CES) in 2018, and is currently working on its 2023 update.

Large cities: Hartford's 2017 Climate Action Plan | New Britain's 2016 Energy & Innovation Roadmap for the Future | West Hartford's 2020 Energy Plan

Mid-size communities: Simsbury's 2019 Energy Plan | Middletown's 2019 Energy Plan | South Windsor's 2019 Municipal, Residential & Business Energy Plan

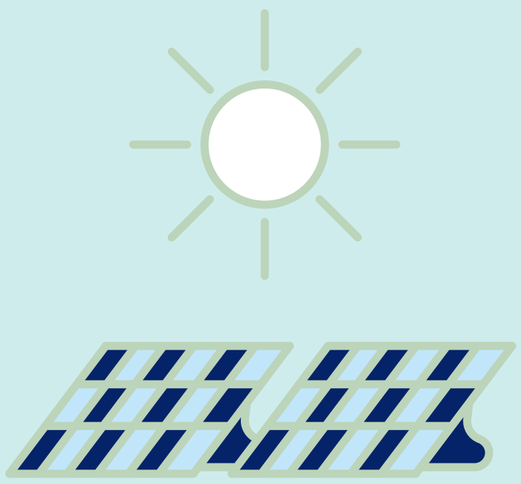
Small towns: Ashford Clean Energy Task Force's 2019 Municipal Action Plan

Distributed Generation: Renewables

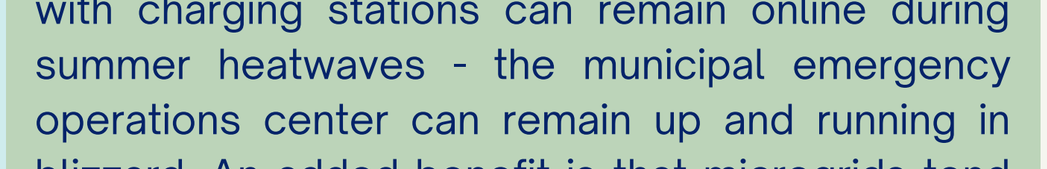
The electrical grid - the term we use for the network of cables, substations, and other infrastructure that deliver electricity - is outdated and overburdened, especially during windows of peak demand. To take some of the stress off the grid, municipalities should invest in creating their own power with renewables. These small operations that create energy in the same place it is being consumed (like a wind turbine on a farm or solar panels on a roof) are referred to as distributed generation.

Drawing electricity from the grid also means that power must travel long distances over cables, which are highly susceptible to being knocked down by winds or falling trees in storms. With climate change amplifying the frequency and intensity of such storms, towns are increasingly likely to face outages when reliant on the grid.

Renewables also have important co-benefits, like the fact that they are sustainable in the long term as opposed to non-renewable fossil fuels.



Distributed Generation: Microgrids

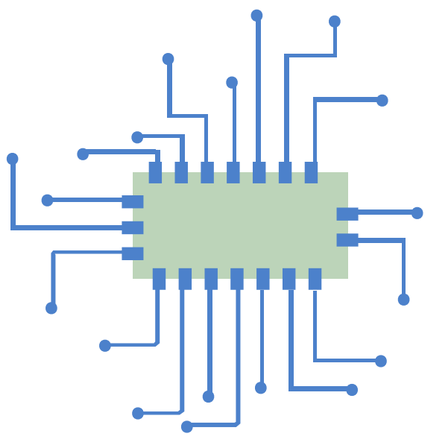


The U.S. Department of Energy defines microgrids as "a local energy grid with control capability, which means it can disconnect from the traditional grid and operate autonomously." The scale of a microgrid could be a few buildings, or an entire neighborhood. They are popular on university campuses (like the University of Bridgeport) or municipal complexes (like Fairfield, Woodbridge, and Milford).

In the climate change era, an energy source able to function independently of the grid is extremely valuable for municipal resilience. Cooling centers with charging stations can remain online during summer heatwaves - the municipal emergency operations center can remain up and running in blizzard. An added benefit is that microgrids tend to have opportunities for “smart grid” tech, such as the Wi-Fi connected thermostats or energy storage capabilities. Even if a microgrid only serves a small portion of your community, it removes strain and demand from the electrical grid, better allowing it to serve other residences and facilities.

Connecticut DEEP even has a Microgrid Grant & Loan Program to help you get started.

Electrification



New England is moving towards a decarbonized, more renewable-based grid, which is better for environmental and economic sustainability. In order to access these benefits, municipal buildings and vehicles should electrify. By continuing to use oil to heat a recreation center or gas-fired stoves in cafeterias, municipalities remain dependent upon harmful fossil fuels.

CT DEEP committed in their 2022-2024 Conservation and Load Management Plan to transition their Residential New Construction program into an all-electric offering, with their CHEAPR rebate making fleet electrification more affordable as well. Electrification also pairs perfectly with distributed generation and microgrids, as it allows facilities and fleets to subsist on energy produced at the source rather than on oil and gas delivered from other sources. With pipeline attacks making recent headlines, and it makes sense for municipalities to build resilience against such threats.

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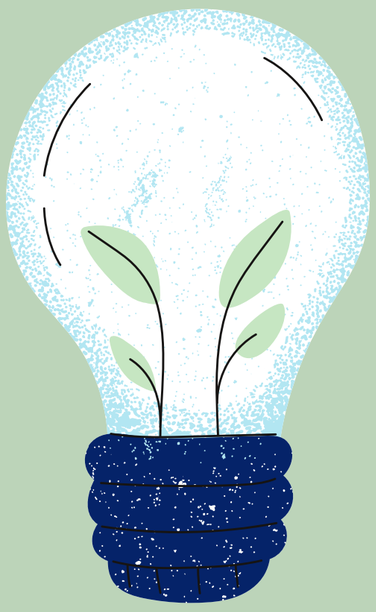
Efficiency

Energy efficiency is the use of less energy to perform the same task or produce the same result. It is quite likely that your municipality has already engaged in some kind of efficiency measure - whether it was replacing CFL lightbulbs with LEDs, adding weather stripping to maintain indoor temperatures, or adding a fuel-efficient vehicle to the fleet. The U.S. Department of Energy describes efficiency as "one of the easiest and most cost-effective ways to combat climate change, reduce energy costs for consumers, and improve the competitiveness of U.S. businesses."

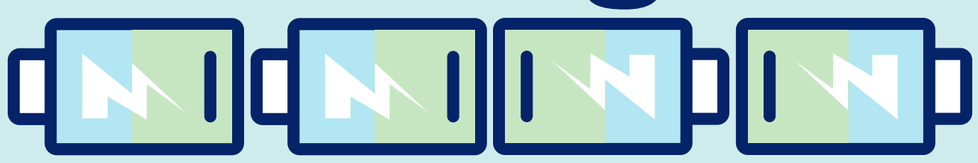
Because energy efficiency is in everyone's best interest, the State of Connecticut codified in Section 33 of Public Act 11-80 an Energy Conservation Management Board that assists electric utilities in providing incentives and programs to save energy. Energize CT is a vehicle for much of this work, in partnership with the CT DEEP and the Connecticut Green Bank. Before beginning work on public projects, it is well worth reaching out to these entities to understand if funding or guidance is available to your municipality.



Energy Star (ES) is the EPA-backed certification program for energy efficiency in appliances and technology. It can be an excellent tool in identifying upgrades to existing buildings from small scale (lightbulbs, computer monitors) to large scale (heating systems, data center equipment). For instance, switching from conventional phones to ES phones can result in 40% energy savings, while upgrading to ES ductless heat pumps can cut heating costs by 60% and cooling costs by 30%. The EPA's "Energy Efficiency in Local Government Operations" strategy guide contains excellent planning resources for crafting your own energy efficiency program.

Just like with any other commodity, the less energy you use, the smaller your bill is. Efficiency isn't just resilient - it makes economic sense.

Storage



Energy sources that can be deployed specifically when needed are referred to as "dispatchable." Oil, coal, natural gas, and nuclear are dispatchable; but wind and solar are not, instead called "intermittent." This becomes an issue when there is a mismatch between supply (no sun shining at night) and demand (subzero weather, where everyone has the heat running). The key to making these intermittent resources available when demand spikes is energy storage.

Energy storage allows ongoing power when an extreme weather event disconnects a facility from the grid. It is also a great way for municipalities to save money. When demand is high but supply is low, if you are on a peak pricing plan, your prices go up. Having a reserve of power to use at these critical times means municipalities can avoid peak pricing, while also reducing strain on the rest of the community's supply.

There are several types of storage including fuel cells and lithium-ion batteries. New technologies in this field are still emerging, and one of the most important areas of research is how to scale energy storage to accommodate more capacity.

Demand Response

Local energy resilience can also come from encouraging residents and businesses to lower their power usage during stressful times for the grid - such as hot, humid summer afternoons. This encouragement typically involves a utility increasing prices during these peak periods thereby discouraging power consumption.

Communications from the utility or even a municipality, often through social media, to its customers or residents has proven to be helpful in reducing consumption when it is the most needed. Municipalities could work with utilities on communicating with residents and local businesses in this regard similar to how they do with water companies and drought guidelines.

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There are numerous federal and state incentives for municipalities to implement these strategies. For more information, click here to contact CIRCA.

Energy Opportunities for Connecticut Municipalities in the Inflation Reduction Act

The Inflation Reduction Act ("IRA"), signed into law on August 16, 2022, was the largest climate change/clean energy investment bill ever passed in the United States. While private industry celebrated IRA's passage, it also includes significant benefits, both direct and indirect, for municipalities. Especially when applied in concert with the various Connecticut energy incentive programs, IRA provides an opportune moment for municipalities to consider local energy resilience and clean energy projects.

Investment Tax Credits – Solar

Prior to IRA, direct participation in solar development was, for the most part, available exclusively to private industry. This participation was incentivized primarily by one main federal benefit offered to the solar industry – an investment tax credit ("ITC") of *up to* 30% of project costs. Without a federal income tax bill, an entity could not take advantage of the ITC, and in most circumstances, it was too valuable an incentive to leave out of project economics, meaning that it was not of any use to municipalities.

IRA resets the amount of the ITC so that it is stabilized at 30% for at least the next 10 years, **and allows certain tax-exempt entities, such as municipalities, to receive cash instead of tax credits.** This is accomplished through "direct pay," a refund process which paves the way for municipalities to build their own projects. Furthermore, the direct pay provision is not restricted exclusively to solar and can be applied to other renewable projects as well. Nearly 50% of the components for these projects, however, must come from companies that have manufactured them domestically.

IRA also makes benefits beyond the ITC or direct pay available to developers and municipalities. For example, the ITC/direct pay rate can be increased depending on how a clean energy project is sited. A project sited on certain types of brownfields could earn an additional 10% on top of the 30% ITC. Projects sited in low-income communities bring another 10% and even an additional 20% if the project is part of a qualified low-income residential building project or a qualified low-income economic benefit project. Further, if the steel, iron, or other manufactured products that comprise the project are produced in the United States, an additional 10% could be available. Theoretically, one could have more than half of project costs covered with the direct-pay/ITC option if the project were sited and built in a certain way.

It is important to keep in mind, however, that in order to be eligible for even the base 30% benefit, the project must meet certain prevailing wage and apprenticeship requirements.

In any event, IRA provides a new and improved path forward for towns that want to build their own solar projects. Even if a town would prefer to simply act as a landlord and delegate the project's process to a developer, it could demand better economics than before.

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Storage, Clean Hydrogen and Other Zero Emission Technologies

Batteries are useful to towns for multiple reasons. They can serve as a backup supply for renewable energy generators – supplying power, for instance, during a part of the night when the solar power is not operating, or in the event of a power outage. They also can add to grid resiliency, by supplying "peak power" – power on hot and humid mid-summer days when the grid is strained due to the high volume of power being used. In circumstances where "peak power" is required, batteries obviate the need for inefficient, costly, and polluting gas peaker plants, which are often located in environmental justice and low-income communities.

Depending on the need, batteries could also potentially replace diesel-fueled generators as backup power when a downed wire disconnects a facility from the grid, as may happen during storms. The ITC is no longer a barrier to stand-alone battery storage projects. Previously, battery storage had to be coupled with a solar project in order to be eligible for the ITC. Now the IRA applies the ITC to standalone battery projects, and there is a direct pay option for municipalities if they choose to own and operate the battery themselves. Like the solar benefits included in IRA, the value of the tax credit to a battery project can increase if certain siting and other factors are met. Further, under IRA, projects of other technology types may qualify for the credits if the facility's carbon emissions are at or below zero. There are also new tax credits for hydrogen-based projects (fuel cells).

Interconnection Costs

Most energy projects in Connecticut are under 5 MW in size, meaning that they are considered smaller projects. IRA provides a few boosts for these smaller projects, one of the more significant being the application of the ITC to interconnection costs. Costs that a town or private developer is required to pay the utility to tie a project into the grid are termed "interconnection costs." These costs can be prohibitively expensive and are often the reason projects fail. IRA's application of the ITC to the price of interconnection means that these problematic costs are reduced by 30%. In theory, lowering these costs will allow towns to reallocate those savings to other improvements. One example would be to bury the lines that connect a generator to the grid and put the equipment on a cement pad instead of hanging it from new utility poles, thus insulating them from severe weather events that often take down these overhead lines.

Microgrid Controllers

IRA put in place a new 30% tax credit for qualified microgrid equipment. To qualify, the equipment must be part of a microgrid, with a generating capacity of between 4 and 20 MW, capable of operating both in connection with the electrical grid, and independently of the electrical grid. These systems enable both energy resiliency in the event of grid outages and can lower costs in the "peak power" situations mentioned above.

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Incentives to Watch

Other incentives CIRCA is watching as guidelines and EPA regulations are developed:

Greenhouse Gas Reduction Fund

Another valuable IRA provision is its greenhouse reduction fund. This fund, among other things, will make money available to help establish state and local financing programs that deploy low- and zero-emission technologies. For example, it will make $7 billion available for state, local, and nonprofit programs to directly install zero-emission distributed technologies in low-income and disadvantaged communities. This fund also includes $2 billion for state, local, and nonprofit programs to install zero-emission vehicle charging infrastructure.

Climate Pollution Reduction Grants

IRA also makes funds available for specifically climate related pollution mitigation. $5 billion will be available to states, municipalities, or air pollution control agencies for greenhouse gas air pollution planning and implementation grants. $250 million of this amount will go to Greenhouse Gas Air Pollution Planning Grants, while $4.75 billion will go to Greenhouse Gas Air Pollution Implementation Grants. Funding for both planning and implementation grants will be awarded to at least one entity in each state to develop programs, policies, measures, and projects that will help reduce air pollution caused by greenhouse gases. The structure and administration of this grant will need to be further defined through the EPA's regulatory process.

Environmental and Climate Justice Block Grants

Under IRA, $3 billion will be available as block grants to fund environmental justice projects for disadvantaged communities. Eligible projects include those that address environmental harms in low-income and disadvantaged communities related to pollution monitoring, investment in zero-emission infrastructure, transportation emissions reduction, climate resiliency, pollution prevention, and deployment of low- and zero-emission energy technologies. The structure and administration of these block grants will need to be further defined through the EPA's regulatory process.

For more information on IRA and its benefits for Connecticut municipalities, please contact
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Photos courtesy Norwich Utilities and Kirt Mayland and Louanne Cooley, University of Connecticut

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Implementing New Flood Prevention, *Climate Resilience*, and Erosion Control Boards

In 2021, the passage of Public Act 21-115 modified the name and authority of Flood Prevention and Erosion Control Boards to include "Climate Resilience". Municipalities now have a substantial tool to address the increasing pressure on landscape and infrastructure from rising sea levels, storm surge, and intensified precipitation, flooding and subsequent erosion.

Flood Prevention, Climate Resilience and Erosion Control Boards have expanded authority and new reporting requirements. Municipalities should be aware of the greater responsibilities when determining how best to integrate the expanded Board into their climate resilience strategy. Though state statute does not require towns to have a Board, towns with increasing flood risk may find having a discrete Board composed of members with technical and fiscal expertise can be an effective and efficient way to address growing problems.

While the Board does not have regulatory authority, land use commissions that do have authority can consult with their Board on applications impacting flood or stormwater management, erosion control measures or other related climate resiliency issues.

What Changes Have Been Made as a Result of P.A. 21-115?

Four New and Expanded Authorities:

The Board can now address certain infrastructure needs both within town boundaries and cooperatively among towns through joint agreements. With the approval of each town's legislative body, two or more towns can create a joint Board with jurisdiction over each municipal party to the joint agreement. A joint Board allows towns to coordinate cross jurisdictional flood prevention needs and more efficiently cooperate on projects. Joint efforts will be important for a watershed approach and working toward regional solutions to increased precipitation and flooding in adjacent communities.

In addition to planning, constructing, maintaining, and managing flood prevention, climate resilience, and erosion control systems, *Boards may now operate a system*. Previously, a "system" was defined as a dike, berm, dam, piping, groin, jetty, sea wall, embankment, revetment, tide-gate, water storage area, ditch, drain or other structure or facility. Now, Boards may include nonstructural and nature-based measures including removal, relocation or modification of existing structures, floodplain restoration, living shorelines and other less environmentally damaging solutions. The focus on nature-based solutions follows recommendations from the Governor's Council on Climate Change, January 2021, Phase 1 Report and Executive Order 21-3.

The revised statute now expands the options for financing Board activities. As previously, Boards have authority to issue bonds, establish a taxing district, or request a special assessment where revenue collected is used to prevent potential flooding hazards. Boards may now also receive federal, state, or private grants, or draw funds from a municipal Climate Change and Coastal Resiliency Reserve Fund.

Boards also now have the authority to contract with municipalities on navigation improvement projects in addition to the state and federal government. Formerly, the board could form agreements with the Commissioner of CT DEEP only on construction projects relating to flood or erosion control. Now, projects designed to prevent other climate change impacts are included.

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New Requirements:

Boards must issue a biannual report, accessible on all involved towns' websites with a detailed inventory of the system managed by the Board including the extent and value of all property, infrastructure, and natural resources protected by the system. The Board must provide an analysis of how vulnerable communities are prioritized and protected and include a budget with revenue and expenditures of the Board.

To coordinate planning efficiency, Boards shall consider municipal plans of conservation and development, municipal and regional hazard mitigation plans, and resilience plans. In the interest of equity, Boards must be aware of identified "vulnerable communities" within their jurisdiction and evaluate how their communities will be impacted by the Board's activities. Finally, to stay abreast of current climate change science, Boards may consult with UConn CIRCA on how best to implement plans that address flooding, erosion, and resilience.

How to Implement a Board:

A municipality with an existing Flood Prevention and Erosion Control Board or one wishing to create a Board, can do so by a vote of the municipality's legislative body to adopt C.G.S. Sec. 25 85-94 as amended by PA 21-115. Municipalities may include provisions specifying competencies for Board members in engineering, flood or stormwater management, or finance. Questions towns should ask when considering enabling a Board are:

1. What are the current or anticipated needs of the town regarding flood prevention, climate resilience, or erosion control?
2. Should the Board members be required to have certain credentials or qualifications?
3. Can, and should, the Board of Selectman act as the Flood Prevention, Climate Resilience, and Erosion Control Board?
4. How will the Board fit into the existing political structure of the town?
5. Who does the Board report to or consult with?
6. What type of budget is needed for the Board's activities?

A comparison of the function and actions of municipal Authorities, Boards, and Commissions related to climate resilience.

	Regulates	Advises leg. or reg. body	Operates/ maintains systems	Can assess fee or tax	Planning function	Can address flooding	Policy/ action on climate resilience
FPCREC Board		Yes	Yes	Yes	Yes-for systems	Yes	Limited to Flood related action
Zoning Commission	Yes				If combined w/planning commission	Yes	Limited to zoning authority
Resiliency Commission		Yes			Yes	Yes	Focused broadly on municipal climate resilience
Stormwater Authority			Yes	Yes	Yes-for stormwater systems	Yes	Limited to stormwater related action

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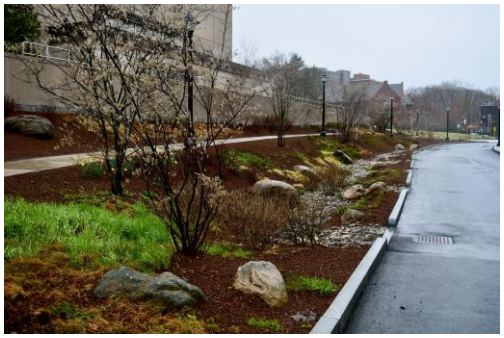
Example Actions A Board Could Take to Address a Flooding Scenario

A town with increasing development in a watershed, and a greater expanse of impervious pavement, notices downstream areas are flooding more frequently as storm precipitation increases. The Flood Prevention, Climate Resilience, and Erosion Control Board could:

1. Commission a study of the watershed including mapping of flood prone areas and the town stormwater management systems.
2. Consult with adjacent town to determine if joint action is needed.
3. Determine where the system could be improved by replacing pipes or catch basins, constructing bioswales, infiltration ponds, or rehabilitating marshlands or other infrastructure improvements.
4. Develop a plan of action with consideration of hazard mitigation and resilience plans, impacts on vulnerable communities, and town plans of conservation and development.
5. Consult with organizations that provide technical assistance, including UConn CIRCA.
6. Determine how to fund the work needed, whether from the municipal budget, grants, bonding, special assessment, or drawing on funds from the municipal Climate Change and Coastal Resiliency Reserve Fund.
7. Consult with legal authorities about just compensation for landowners if the flood management action will require taking of property for public use or purpose.
8. Construct, manage, operate, and maintain the flood management system.
9. Evaluate the effectiveness of the system; consult with the planning and zoning authority on regulation to mitigate future issues, if applicable.



Additional Resources

CIRCA Resilience Planning Inventory

CIRCA Municipal Resilience Planning Assistance Tools

CIRCA Green Infrastructure and Living Shorelines Resources

CIRCA Inland Flooding Resources

CT Sea Grant and UConn CLEAR Factsheet on Flood and Erosion Control Structures

CT Sea Grant and UConn CLEAR Factsheet on Flooding, Eminent Domain, and Government Authority

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Additional Guidance and Assistance

Connecticut municipalities vary in their capacity to address their unique climate challenges. The municipal legal framework has overlapping sources of authority allowing towns and cities to develop a structure to best serve the climate needs of their town. For example, in addition to the expanded authority of this Board, towns may manage flooding issues through the following:

- compliance to Municipal Separate Storm Sewer Systems and State and local stormwater management regulations;
- enabling Stormwater Authorities (New London), Coastal Resiliency Commissions (Madison), Sustainability Committees (North Stonington);
- adopting Resilience Plans (Stonington) and Coastal Resiliency Plans (Stratford); and
- participating in Council of Governments climate resilience planning.

Other sources of guidance are also available. CT DEEP has regulatory authority over water resources in the state including coastal management, dams, and waste and stormwater systems and offers technical and financial assistance to towns through programs like their Watershed Management Program and Office of Climate Planning. Some towns may qualify for federal programs for climate resilience through FEMA or NFWF as well and new programs may result from recent Federal climate legislation. CIRCA also provides resources to help towns incorporate policies, tools, climate data, and projects to improve municipal climate resilience.

Each town must tailor how to achieve resiliency planning and action best suited to its needs, statutory and regulatory requirements, and staff and volunteer capacity. For example, towns currently with effective Flood and Erosion Control Boards comprised of members with technical and financial backgrounds will easily be able to incorporate the expanded authority and reporting requirements of the enhanced Boards (Greenwich, for example). Other towns may be best suited to forming joint boards to address cross jurisdictional issues or to leverage expertise and capacity. In some municipalities, flooding, resilience, and erosion issues are already addressed through other town agencies or authorities. These municipalities should determine if gaps exist that the new expanded authority of a Board could fill (e.g. ability to operate a system; apply for grants; issue bonds; use Climate Change and Coastal Resiliency Reserve Funds). For example, in Stonington, previously the Board of Selectmen served as the Flood and Erosion Control Board, but recently voted to seat a new Board with expanded responsibilities for storm water management on the advice of the town Climate Task Force and town residents.

Contact

To learn more about CIRCA visit circa.uconn.edu and the Resilient Connecticut project for more climate resilience planning tools: resilientconnecticut.uconn.edu

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Stormwater and Climate Resilience

What is Stormwater Runoff?

Stormwater runoff is rain or snowmelt that doesn't soak into the ground but flows over impervious surfaces as runoff into a drainage system. Along the way, this runoff picks up pollutants such as vehicle fluids, metals, trash, yard waste, fertilizers, and other chemicals from pavement and other surfaces. Most stormwater flows through storm sewers untreated into streams, lakes, rivers, and the ocean. Extreme events can overwhelm the capacity of a stormwater system and lead to flooding, erosion, and poor water quality. As the climate changes and precipitation becomes more intense, the impacts of stormwater runoff will become more frequent, severe, and widespread. Regulations to protect the environment require municipalities, developers, industry, and large commercial sites to take action to reduce stormwater entering waterways, but when storms are severe, the existing infrastructure may be inadequate. One way communities can address pollutants in runoff and improve resilience to extreme precipitation events is to upgrade stormwater management practices and infrastructure. But this takes dedicated funding.

What is a Stormwater Authority?

In 2021, acting on recommendations of the Governor's Council on Climate Change (GC3), the Connecticut legislature passed PA 21-115 enabling municipalities to create a stormwater authority to help manage stormwater and improve resilience to climate change by assessing a scaled user fee based on the amount of stormwater runoff a property generates. Funding generated from the user fee can be used to maintain and enhance stormwater treatment measures and resilient infrastructure and provide matching funds for state and federal grants.

There are over 1800 stormwater authorities in the US in 45+ states serving communities both large (Los Angeles) and small (under 1000 residents). Under a pilot program, New London, Connecticut created a stormwater authority in 2018 that generates over $1M annually for stormwater system improvements. Revenue generated by a stormwater fee can be used only for specific purposes related to improving stormwater management and allows municipalities to have a dedicated funding stream to pay for capital improvements to improve stormwater treatment and resilience and aid in Municipal Separate Storm Sewer System (MS4) compliance.

The most common means of implementing a stormwater fee is with a charge assessed by calculating the area of impervious surface on a property, such as rooftops, sidewalks, driveways, parking, or other pavement. Impervious services are those areas, like a parking lot, where water will run-off the surface into drains, the roads, wetlands, grass, etc. Both public and private properties can be subject to the fee. Revenue collected then can be used to provide stormwater treatment measures and reduce flooding by improving municipal stormwater management infrastructure, such as storm sewers, drains, flood control reservoirs, rain gardens or other nature-based solutions. Impervious surface reduction reduces flooding, erosion, and concentrations of sediment, oils, trash, or other pollutants. If property owners decrease the extent of impervious surfaces on their property, or make other improvements to mitigate stormwater runoff, fees are reduced.

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How Can Municipalities Establish a Stormwater Authority?

Communities interested in establishing a stormwater authority can begin by evaluating both the benefits a stormwater authority could bring to the community and if a stormwater program is feasible. One three-step approach that communities might consider includes a quick assessment, a more detailed feasibility study, followed by an implementation period including stakeholder education and engagement.

1. Convene stakeholders for a "Does It Make Sense" (DIMS) quick assessment

DIMS is a one-day workshop to gauge municipal interest, political and stakeholder support, technical needs, staff capacity, and potential implementation challenges. Questions could include:

- Does our community have a need for increased resilience and better stormwater management?
- Has our community been negatively impacted by stream pollution, swimming or beach restrictions, or run-off from floods and increased storms in the last 5 or 10 years?
- Do we have the leadership and capacity to create and manage a stormwater authority?
- If answering Yes, to the above questions, then proceed to a more detailed feasibility study.

2. Conduct a comprehensive feasibility study

- Review existing stormwater facilities and regulatory requirements to determine condition, current operating costs, and areas where the system is inadequate and assess potential improvements.
- Determine if there are problem areas that require immediate or more funding than is currently available to address persistent or projected increased stormwater impacts.
- Identify town / municipal boards, commissions, and agencies currently engaged in stormwater management. Determine if an existing authority will administer the stormwater authority or if a new body will be created. See below for a model enabling ordinance to create a new stormwater authority.
- Review current funding for stormwater management; develop a fee structure (which necessitates understanding and quantifying how much is needed *and* how much can be collected).
- Design stormwater fee models, including fee collection and staff capacity for developing a billing system.
- Identify projects that the fee revenue could fund to decrease stormwater impacts and increase resilience.

3. Begin municipal implementation

- Educate the community about stormwater management, how the system is currently funded, and how fees would be equitably determined.
- Identify specific projects fee revenue would fund including problem flooding areas and resilient infrastructure improvements.
- Ask for ideas for other stormwater projects.
- Explain how fees would be reduced for property owners who make stormwater improvements to their property.
- Explain limits on fees for hospitals and farmland and the appeals process.
- Adopt an authorization ordinance tailored to the community enabling the stormwater authority.
- Develop a process for applying credits for land users that implement stormwater best management practices.
- Create a dedicated stormwater fund and include the fund in municipal budget projections.

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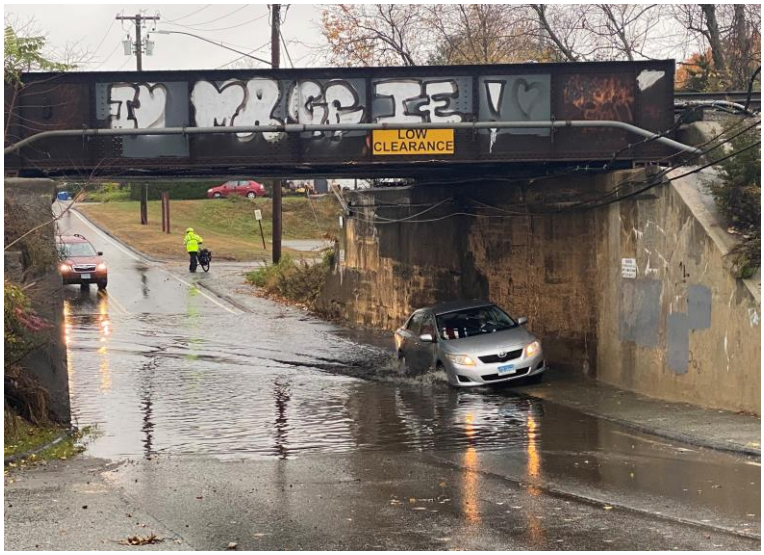
What Kinds of Projects Can be Funded Using Stormwater Fees?

Many municipalities prioritize water and sanitary sewer infrastructure over stormwater drainage resulting in a lack of funding for upkeep and improvement of this vital system. Stormwater management systems can become inadequate to address pollutant and capacity loads from greater precipitation and more frequent storms resulting from climate change. Compliance with MS4 regulation, however, has made stormwater management imperative. Stormwater fees can be a way for municipalities to plan capital improvements that may otherwise be difficult to fund. Just as water and sanitary sewer fees support improvements to their infrastructure, dedicated stormwater funds can be used for infrastructure design, construction, maintenance, and operation of the municipal storm sewer system. Additionally, stormwater funds may be used for public outreach related to stormwater management, program administration, or for critical upgrades to municipal systems. For example, New London, Connecticut used stormwater funds to replace two antiquated pumps in an area prone to repeated and increasingly costly flooding, virtually eliminating the problem. Importantly, this funding expands the capacity of municipalities to address their local resilience financing and project development needs by providing matching funds for state and federal grants.

Modest design changes can greatly reduce stormwater runoff and have a big impact on resilience and environmental quality. Incorporating nature-based, sustainable solutions into sites with large areas of impervious pavement can greatly reduce the amount of stormwater flowing into storm sewers, as well as the pollutants it can carry. Bioretention swales added to parking lots allow for onsite filtration of water. Pervious pavement can be used in appropriate areas to reduce runoff. Combining these efforts with informational signage can educate the public about stormwater and resilience and demonstrate how and where stormwater fees are being used to benefit the community.

How Can UConn Help?

- Grants for stormwater authority feasibility studies
- Public workshops, webinars, and technical assistance, including data and maps
- Model ordinance for stormwater authority implementation



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Model Stormwater Authority Enabling Ordinance

A municipality may prefer to create a new board or commission as a stormwater authority as enabled by C.G.S. 22a-498 (a). A general model for enabling this body is below. The municipality will need to determine if the board/ commission will be compensated, and elected or appointed, and the number and composition of the board and length of term. Additional text is needed If the body recommends establishing a stormwater fee to create a stormwater fund and detail the fee basis and appeal process.

The [*chief municipal officer: Mayor, First Selectman, etc.*] shall appoint with the approval of the [*council, board of selectman, etc.*] a stormwater authority consisting of [*XX*] members who shall be electors of [*municipality*].[1] The authority shall have all the powers and duties conferred upon it by law and specifically by C.G.S. 22a-497. The members shall serve without compensation.[2] Each appointment to the stormwater authority shall be for a term of [*X*] years.[3] There shall be no more than 2/3 members[4] from any one political party appointed to any regular or unexpired term on the authority. *[Language addressing need to remove members from office, if needed.*][5]

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1 "If a new board or commission is created, such municipality shall, by ordinance, determine the number of members thereof, their compensation, if any, whether such members shall be elected or appointed…" C.G.S. 22a-498(a).

2 If members will be compensated, insert details here.

3 Terms can be staggard. For example, if terms are for 5 years, the following language could be added: Except that initially two electors shall be appointed for a term of 5 years, two electors shall be appointed for a term of 4 years, two electors shall be appointed for a term of 3 years and one elector shall be appointed for a term of 2 years, and thereafter all appointments shall be for terms of 5 years unless such appointment is to fill a vacancy in an unexpired term.

4 This term may vary depending on municipal charter provisions or state minority representation provisions.

5 The following language can be inserted if desired to address when and how members may be removed from office: The [chief municipal officer] may remove for improper performance of duties, malfeasance or misfeasance in office, a violation of any Code of Ethics of the [municipality] or for any other proper cause, any member of the stormwater authority appointed by it, provided that the member shall have been served with a written notice of intention to remove the member, containing a clear statement of grounds for such removal and of the time and place, not less than ten nor more than thirty days after service of such notice, at which the member shall be given an opportunity to be heard thereon. Such hearing shall be public at the option of the member who may be represented by counsel. The action of the [chief municipal officer] shall be final.

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PA 21-115

An Act Concerning Climate Change Adaptation enables municipalities to fund climate projects in multiple ways, including creating a municipal Stormwater Authority.

- A Stormwater Authority is responsible for developing a stormwater management program including creation of a stormwater authority district and recommending to the municipal legislative body a modest user fee on all real property. The fee is usually based on the amount of impervious cover on a property. The funds generated must be used for stormwater projects in the district.

- Property owners who install approved best practices stormwater runoff mitigation measures like pervious pavement or onsite retention can qualify for fee reductions. Fees generated from hospital properties are capped at no more than 15% of the total amount collected.

Additional Resources

- PA 21-115, An Act Concerning Climate Change Adaptation
- CT MS4 program
- Resilient Cities Rainwater to Revenue webinar
- UConn CLEAR Stormwater Utilities in CT webinar 2019
- UConn CLEAR Stormwater Collaboratives and Utilities webinar 2020
- GZA stormwater finance blog
- Example ordinance New London, Connecticut
- Central Massachusetts Regional Stormwater Coalition
- DIMS example Portland, Maine
- Example model ordinance with explanation, State of Maine
- Western Kentucky University Stormwater Survey

Contact

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Aguas Pluviales y Resiliencia Climática

¿Qué es la escorrentía de aguas pluviales?

El escurrimiento de las aguas pluviales es la lluvia o el derretimiento de la nieve que no se sumerge en el suelo, sino que fluye sobre superficies impermeables como escurrimiento en un sistema de drenaje. En el camino, esta escorrentía recoge contaminantes como fluidos de vehículos, metales, basura, residuos de patio, fertilizantes, etc. y otros productos químicos del pavimento y otras superficies. La mayoría de las aguas pluviales fluyen a través de las alcantarillas de tormenta sin tratar hacia arroyos, lagos, ríos y el océano. Los eventos extremos pueden abrumar la capacidad de un sistema de aguas pluviales y provocar inundaciones, erosión y mala calidad del agua. A medida que el clima cambia y las precipitaciones se vuelven más intensas, los impactos de la escorrentía de aguas pluviales se volverán más frecuentes, severos y generalizados. Las regulaciones para proteger el medio ambiente requieren que los municipios, los promotores, la industria y los grandes sitios comerciales tomen medidas para reducir las aguas pluviales que ingresan a las vías fluviales, pero cuando las tormentas son severas, la infraestructura existente puede ser inadecuada. Una forma en que las comunidades pueden abordar los contaminantes en la escorrentía y mejorar la resiliencia a los eventos extremos de precipitación es mejorar las prácticas de gestión de aguas pluviales y la infraestructura. Pero esto requiere fondos dedicados.

¿Qué es una Autoridad de Aguas Pluviales?

En 2021, actuando sobre las recomendaciones del Consejo del Gobernador sobre el Cambio Climático (CG3), la legislatura de Connecticut aprobó la PA 21-115 que permite a los municipios crear una Autoridad de Aguas Tormentas para ayudar a administrar las aguas pluviales y mejorar la resiliencia al cambio climático mediante la evaluación de una tarifa de usuario a escala basada en la cantidad de escorrentía de aguas pluviales que genera una propiedad. Los fondos generados a partir de la tarifa de usuario se pueden utilizar para mantener y mejorar las medidas de tratamiento de aguas pluviales y la infraestructura resiliente y proporcionar fondos de contrapartida para subvenciones estatales y federales.

Hay más de 1800 autoridades de Stormwater en los EE.UU. En 45 estados que sirven a comunidades grandes (Los Ángeles) y pequeñas (menos de 1000 residentes). Bajo un programa piloto, New London, Connecticut creó una Autoridad de Aguas Tormentas en 2018 que genera más de $1M anuales para mejoras en el sistema de aguas pluviales. Los ingresos generados por una tarifa de aguas pluviales solo pueden utilizarse para fines específicos relacionados con la mejora de la gestión de las aguas pluviales y permiten a los municipios tener un flujo de financiación dedicado para pagar mejoras de capital para mejorar el tratamiento y la resiliencia de las aguas pluviales y ayudar en el cumplimiento de la regulación del Sistema Municipal Separado de Alcantarillado Tormentoso (MS4).

El medio más común de implementar una tarifa por aguas pluviales es con un cargo evaluado calculando el área de superficie impermeable en una propiedad, como techos, aceras, calzadas, estacionamiento, etc. u otro pavimento. Los servicios impermeables son aquellas áreas, como un estacionamiento, donde el agua correrá la superficie hacia los desagües, las carreteras, los humedales, la hierba, etc. Tanto las propiedades públicas como las privadas pueden estar sujetas a la tarifa. Los ingresos recaudados se pueden utilizar para proporcionar medidas de tratamiento de aguas pluviales y reducir las inundaciones mediante la mejora de la infraestructura municipal de gestión de aguas pluviales, como alcantarillas pluviales, drenajes, embalses de control de inundaciones, jardines pluviales u otras soluciones basadas en la naturaleza. La reducción de superficies impermeables reduce las inundaciones, la erosión y las concentraciones de sedimentos, aceites, basura u otros contaminantes. Si los propietarios disminuyen la extensión de las superficies impermeables en su propiedad, o hacen otras mejoras para mitigar la escorrentía de aguas pluviales, se reducen las tarifas.

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Los fondos para este proyecto son proporcionados por el Departamento de Vivienda y Desarrollo Urbano de los Estados Unidos a través del Programa Nacional de Recuperación de Desastres de Subvención en Bloque para el Desarrollo Comunitario, administrado por el Departamento de Vivienda de Connecticut.

¿Cómo pueden los municipios establecer una Autoridad de Aguas Pluviales?

Las comunidades interesadas en establecer una Autoridad de Aguas Tormentas pueden comenzar evaluando tanto los beneficios que una Autoridad de Aguas Tormentas podría traer a la comunidad como si un programa de aguas pluviales es factible. Un enfoque de tres pasos que las comunidades podrían considerar incluye una evaluación rápida, un estudio de viabilidad más detallado, seguido de un período de implementación que incluya educación y participación de los interesados.

1. 1.Convocar a las partes interesadas para una evaluación rápida de "Does It Form Sentido" (DIMS
    a. DIMS es un taller de un día de duración para evaluar el interés municipal, el apoyo político y de las partes interesadas, las necesidades técnicas, la capacidad del personal y los posibles desafíos de implementación. Las preguntas podrían incluir:
        i. ¿Tiene nuestra comunidad la necesidad de una mayor resiliencia y una mejor gestión de las aguas pluviales?
        ii. ¿Ha sido nuestra comunidad afectada negativamente por la contaminación del arroyo, las restricciones de natación o playa, o la escorrentía de inundaciones y tormentas crecientes en los últimos 5 o 10 años?
        iii. ¿Tenemos el liderazgo y la capacidad para crear y administrar una Autoridad de Aguas Pluviales?
    b. Si la respuesta es afirmativa a las preguntas anteriores, proceda a un estudio de viabilidad más detallado.
2. Realizar un estudio de viabilidad integral
    a. Revisar las instalaciones existentes de aguas pluviales y los requisitos reglamentarios para determinar la condición, los costos operativos actuales y las áreas donde el sistema es inadecuado y evaluar las mejoras potenciales.
    b. Determinar si hay áreas problemáticas que requieran fondos inmediatos o más de los que están disponibles actualmente para abordar los impactos persistentes o proyectados de las aguas pluviales.
    c. Identificar las juntas, comisiones y agencias de la ciudad / municipales que actualmente se dedican a la gestión de aguas pluviales.
        i. Determinar si una autoridad existente administrará la Autoridad de Aguas Pluviales o si se creará un nuevo organismo. Vea a continuación un modelo de ordenanza que habilita la creación de una nueva Autoridad de Aguas Pluviales.
    d. Revisar los fondos actuales para el manejo de aguas pluviales; Desarrollar una estructura de tarifas (lo que requiere comprender y cuantificar cuánto se necesita y cuánto se puede cobrar).
    e. Diseñar modelos de tarifas de aguas pluviales, incluyendo el cobro de tarifas y la capacidad del personal para desarrollar un sistema de facturación.
    f. Identificar proyectos específicos que los ingresos de la tarifa podrían financiar para disminuir los impactos de las aguas pluviales y aumentar la resiliencia.

1. Iniciar la implementación municipal.
    a. Crear apoyo público a través de la información y el diálogo con las partes interesadas.
        i. Educar a la comunidad sobre el manejo de las aguas pluviales, cómo se financia actualmente el sistema y cómo se determinarían equitativamente las tarifas.
        ii. Identificar proyectos específicos, ingresos por tarifas que financiaría, incluidas áreas problemáticas de inundaciones y mejoras de infraestructura resiliente.
        iii. Pida ideas para otros proyectos de aguas pluviales.
        iv. Explique cómo se reducirían las tarifas para los propietarios que realicen mejoras en las aguas pluviales de su propiedad.
        v. Explicar los límites de las tarifas de los hospitales y las tierras de cultivo y el proceso de apelación.
    b. Adoptar una ordenanza de autorización adaptada a la comunidad que habilite a la Autoridad de Aguas Pluviales.
    c. Desarrollar un proceso para la solicitud de créditos a los usuarios de la tierra que implementen las mejores prácticas de manejo de aguas pluviales.
    d. Crear un fondo dedicado a las aguas pluviales e incluirlo en las proyecciones presupuestarias municipales.
    e. Comenzar la evaluación y el cobro de tarifas.
    f. Mantener informada a la comunidad sobre el uso de los fondos.

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U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

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¿Qué tipo de proyectos se pueden financiar con tarifas de aguas pluviales?

Muchos municipios dan prioridad a la infraestructura de agua y alcantarillado sanitario por encima del drenaje de aguas pluviales, lo que resulta en una falta de fondos para el mantenimiento y la mejora de este sistema vital. Los sistemas de gestión de las aguas pluviales pueden llegar a ser inadecuados para hacer frente a las cargas contaminantes y de capacidad derivadas de mayores precipitaciones y tormentas más frecuentes resultantes del cambio climático. Sin embargo, el cumplimiento de la regulación MS4 ha hecho imperativo el manejo de las aguas pluviales. Las tarifas de las aguas pluviales pueden ser una forma para que los municipios planifiquen mejoras de capital que de otro modo podrían ser difíciles de financiar. Al igual que las tarifas de agua y alcantarillado sanitario apoyan las mejoras en su infraestructura, los fondos dedicados a las aguas pluviales se pueden utilizar para el diseño de infraestructura, construcción, mantenimiento y operación del sistema municipal de alcantarillado pluvial. Además, los fondos de aguas pluviales pueden ser utilizados para la divulgación pública relacionada con el manejo de aguas pluviales, la administración del programa, o para mejoras críticas a los sistemas municipales. Por ejemplo, New London, Connecticut utilizó fondos de aguas pluviales para reemplazar dos bombas anticuadas en un área propensa a inundaciones repetidas y cada vez más costosas, eliminando prácticamente el problema. Es importante destacar que este financiamiento amplía la capacidad de los municipios para abordar sus necesidades de financiamiento de resiliencia local y desarrollo de proyectos al proporcionar fondos de contrapartida para subvenciones estatales y federales.

Los cambios de diseño modestos pueden reducir en gran medida la escorrentía de las aguas pluviales y tener un gran impacto en la resiliencia y la calidad ambiental. La incorporación de soluciones sostenibles basadas en la naturaleza en sitios con grandes áreas de pavimento impermeable puede reducir en gran medida la cantidad de aguas pluviales que fluyen hacia las alcantarillas pluviales, así como los contaminantes que pueden transporter. Los cisnes de bioretención añadidos a los estacionamientos permiten la filtración in situ del agua. El pavimento permeable se puede utilizar en áreas apropiadas para reducir el escurrimiento. La combinación de estos esfuerzos con la señalización informativa puede educar al público sobre las aguas pluviales y la resiliencia y demostrar cómo y dónde se están utilizando las tarifas de aguas pluviales para beneficiar a la comunidad.

¿Cómo puede ayudar UConn?

- Subvenciones para estudios de factibilidad de la Autoridad de Aguas
- Pluviales, Talleres públicos, seminarios web y asistencia técnica, incluidos datos y mapas
- Ordenanza modelo para la implementación de la Autoridad de Aguas Pluviales

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Modelo de Ordenanza Habilitante de la Autoridad de Aguas Pluviales

Un municipio puede preferir crear una nueva junta o comisión como autoridad de aguas pluviales como lo permite C.G.S. 22a-498 (a). A continuación se muestra un modelo general para habilitar este órgano. El municipio tendrá que determinar si la junta/comisión será compensada, elegida o nombrada, y el número y la composición de la junta y la duración del mandato. Se necesita texto adicional si el organismo recomienda establecer una tarifa de aguas pluviales para crear un fondo de aguas pluviales y detallar la base de la tarifa y el proceso de apelación.

El [funcionario municipal principal: Alcalde, Primer Concejal, etc.] nombrará con la aprobación del [concejo, junta de selección, etc.] una autoridad de aguas pluviales compuesta por [XX] miembros que serán electores de [municipio].1 La autoridad tendrá todas las facultades y deberes que le confiere la ley y específicamente el C.G.S. 22a-497. Los miembros servirán sin remuneración.2 Cada nombramiento para la autoridad de aguas pluviales será por un período de [X] años.3 No habrá más de 2/3 miembros4 de cualquier partido político designados para cualquier período regular o no vencido en la autoridad. [Texto que aborda la necesidad de destituir a los miembros de sus cargos, si es necesario.] 5

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1 "Si se crea una nueva junta o comisión, dicha municipalidad determinará, por ordenanza, el número de miembros de la misma, su remuneración, si la hubiere, si dichos miembros serán elegidos o nombrados..." C.G.S. 22a-498(a).

2 Si los miembros serán compensados, inserte los detalles aquí.

3 Los términos pueden ser escalonados. Por ejemplo, si los mandatos son de 5 años, se podría añadir el siguiente texto: Excepto que inicialmente se nombrarán dos electores por un mandato de 5 años, dos electores serán nombrados por un mandato de 4 años, dos electores serán nombrados por un mandato de 3 años y un elector será nombrado por un período de 2 años, y a partir de entonces todos los nombramientos serán por períodos de 5 años, a menos que dicho nombramiento sea para llenar una vacante en un período no vencido.

4 Este término puede variar dependiendo de las disposiciones de los estatutos municipales o de las disposiciones estatales de representación de minorías.

5 Si se desea, se puede insertar el siguiente texto para abordar cuándo y cómo se puede destituir a los miembros de su cargo: El [funcionario municipal en jefe] puede destituir por desempeño indebido de deberes, malversación o prevaricación en el cargo, una violación de cualquier Código de Ética de la [municipalidad] o por cualquier otra causa adecuada, cualquier miembro de la autoridad de aguas pluviales designado por ella, siempre que el miembro haya recibido una notificación por escrito de la intención de destituir al miembro, que contenga una declaración clara de los motivos de dicha destitución y de la hora y el lugar, no menos de diez ni más de treinta días después de la entrega de dicha notificación, en la cual se dará al miembro la oportunidad de ser oído al respecto. Dicha audiencia será pública a elección del miembro que podrá ser representado por un abogado. La decisión del [jefe municipal] será definitiva.

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UCONN

Connecticut Institute for Resilience and Climate Adaptation

P.A. 21-115

Una Ley de Adaptación al Cambio Climático permite a los municipios tomar varias medidas para abordar la resiliencia climática, incluida la creación de una Autoridad Municipal de Aguas Tormentosas y la ampliación de la autoridad de las Juntas de Control de Inundaciones y Erosión para incluir la Resiliencia. Una tercera disposición de la ley amplía el papel del Connecticut Greenbank para permitir la financiación de proyectos de infraestructura verde.

- Una autoridad de aguas pluviales es responsable de desarrollar un programa de gestión de aguas pluviales que incluye la creación de un distrito de autoridad de aguas pluviales y recomendar al cuerpo legislativo municipal una tarifa modesta por el usuario de todos los bienes inmuebles. La tarifa se basa generalmente en la cantidad de cobertura impermeable en una propiedad. Los fondos generados deben ser utilizados para proyectos de aguas pluviales en el distrito.
- Los propietarios que instalen las mejores prácticas de gestión aprobadas para las medidas de mitigación de escorrentía de aguas pluviales como pavimento permeable o retención in situ pueden calificar para reducciones de tarifas. Las tarifas generadas por las propiedades hospitalarias están limitadas a no más del 15% del monto total recaudado.

Recursos adicionales

- PA 21-115
- CT MS4 program
- Resilient Cities Rainwater to Revenue webinar
- UConn CLEAR Stormwater Utilities in CT webinar 2019
- UConn CLEAR Stormwater Collaboratives and Utilities webinar 2020
- GZA stormwater finance blog
- Example ordinance New London, Connecticut
- Central Massachusetts Regional Stormwater Coalition
- DIMS example Portland, Maine
- Example model ordinance with explanation, State of Maine
- Western Kentucky University Stormwater Survey

Contacto

Para obtener más información sobre CIRCA, visite circa.uconn.edu y el proyecto Resilient Connecticut para obtener más herramientas de planificación de resiliencia climática: resilientconnecticut.uconn.edu
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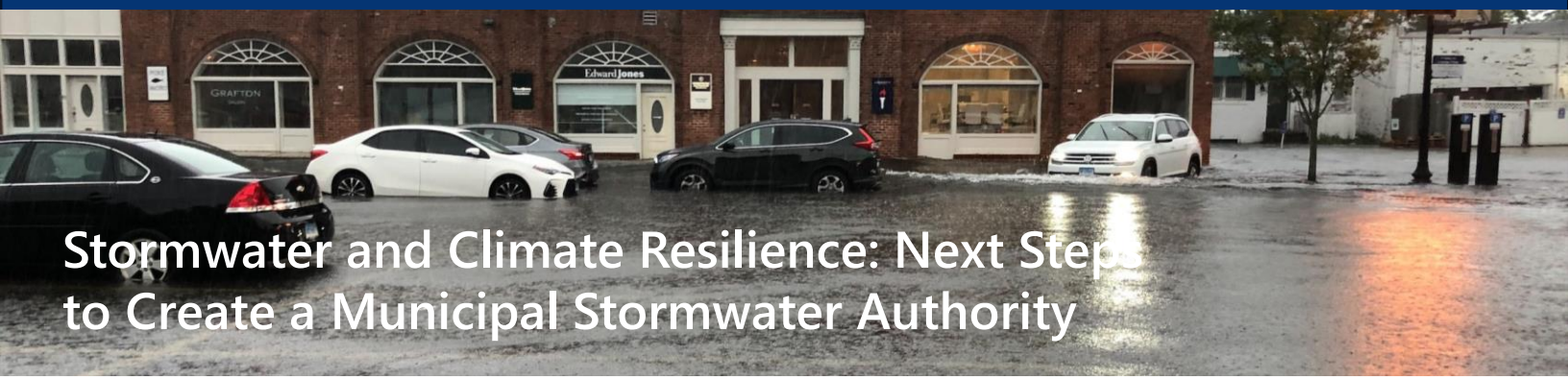

Stormwater and Climate Resilience: Next Steps to Create a Municipal Stormwater Authority

In 2021, the Connecticut legislature passed P.A. 21-115 allowing municipalities to create a stormwater authority by enabling an existing commission or board or by establishing a new stormwater authority. Stormwater authorities are recognized throughout the United States and abroad as a tool for communities to finance and manage stormwater infrastructure and increase resilience to climate change impacts. Once a community has conducted a feasibility study and determined how a stormwater authority would provide needed funding to address stormwater management, the next critical steps are to pass an ordinance to enable a stormwater authority, to determine how fees will be assessed, and to establish a separate stormwater enterprise fund. By carefully crafting the ordinances needed for these three steps, the municipality can stay within its statutory and constitutional authority and avoid legal challenges.

How to Determine the Best Fee Model for Your Community?

In establishing a stormwater authority, an essential decision for a municipality is determining what kind of fee model will best serve the needs of the community. The choice of fee model depends broadly on two ideas: how much will stormwater management cost; and how to fairly distribute the costs to users.

What are the costs of stormwater management?

Important considerations for determining the cost of stormwater management are assessing how stormwater program costs are currently distributed, what currently unfunded projects must be addressed, and what new costs will a stormwater fee system entail. Stormwater operations and management, capital improvements, and regulatory compliance may be spread among different departments within a government and may need to be consolidated. Backlogs from deferred maintenance and increased infrastructure needs should be evaluated and prioritized. Municipalities should consider funding needed to solve capacity issues related to data collection on impervious cover, establishing billing systems, and addressing appeals. Future maintenance and inspection needs should be included in the stormwater program costs as well as credits for disconnections. These costs all together form the stormwater program cost to be funded by the stormwater fee.

Additional factors in choosing a suitable fee model for a municipality are primary land use, population, development density, and community resources. Once a municipality makes a reasonable assessment of current costs, future needs, and other considerations, then they can make an appropriate choice of fee model to meet requirements and equitably distribute costs to system users. All these costs, however, must be weighed against the cost of failure to meet stormwater regulatory compliance, increasing precipitation loads on the system, and increased flood loss in the community. Even with additional program operation costs, stormwater fees give municipalities' resources to meet the challenges of increased stormwater burdens and increase climate resilience in the community.

Comparison of fee models

Stormwater fees are seen as more equitable than using tax revenue to pay for stormwater management because all properties, including non-profit, non-taxable properties are subject to the fee. In Connecticut, there are a few exceptions, including limits on the fees collected from certain hospital properties. Farm, forest, and state government lands can be charged fees only on land with impervious cover draining into municipal separate stormwater systems.

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Stormwater fees can be calculated in different ways. Broadly, there are three categories of fee models: A fee based on amount of impervious cover on the property; a flat fee charged to all property owners; and a fee based on assessed value of the property. The first model is the most widely in use (62% as of 2021) as it follows the idea that utility fees should be tied to service costs. In this case, reasonable fees are assessed based on how much stormwater runoff a property generates. However, in some circumstances, the latter two models may make the most sense for the conditions found in a community if property size and impervious cover are similar through the municipality (flat fee), or if property value is a close proxy for amount of impervious cover (value based fee).

Impervious area-based fees

The most common method for calculating stormwater fees is to develop a unit-based approach that allows for comparisons between residential, multifamily, commercial, and industrial properties. First, all impervious area must be mapped and quantified. The Connecticut Environmental Conditions database has mapping data available for impervious cover throughout the state (see Resources for link). Then, an Equivalent Residential Unit (ERU; but also known as a Residential Equivalent Unit REU) is calculated using the average impervious area in single-family residential properties. All single-family residences could be charged 1 ERU, or more equitably, each property could pay a scaled fee based on how many ERU's are on the parcel. The ERU system is easy to explain to the public: the more impervious surface generating stormwater, the higher the fee. However, runoff generated from pervious surfaces isn't captured in this calculation, nor does it account for intensity of development.

The ERU model can also be used as the basis for a tiered fee model. ERU's are calculated for each parcel, but then tiers are created which include a range of impervious cover values in steps. The tiered ERU model is used in New London, CT and has the advantage of absorbing minor mapping errors so there are fewer area-based appeals, saving time and program resources. When tiers are thoughtfully constructed, this method is seen as fair, easy to explain to the public, and will not be vulnerable to legal challenges.

There are other fee models based on impervious cover that include other metrics to capture a more complete picture of actual runoff. The Intensity Development Factor method adds a land use component to the ERU calculation. In this method, even undeveloped parcels are subject to the stormwater fee. The Equivalent Hydraulic Area method includes both pervious and impervious runoff to generate an individualized site-specific measurement and fee. The Residential Equivalent Factor method is the most complex method incorporating land use, soil type, and average rain fall metrics into the calculation. Although these methods may be more equitable than other simpler measures, they require a greater investment in continually updated parcel mapping, access to more data streams, and are more complex to explain to the public.

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Flat monthly fee and fee based on property assessed value

In this model the same fee is charged to all properties in the municipality, regardless of size, property value, or the amount of stormwater generated. The flat fee model is not equitable because the amount of stormwater generated on larger property with more impervious cover is greater, sometimes far greater, than smaller, less developed parcels making this method difficult to market to the public. However, this model may be a reasonable choice in some communities with a large proportion of similar lot sizes and land use and limited capacity to determine the amount of impervious cover per property.

Assessed property value has been used as a proxy for the amount of stormwater generated on a parcel. Like the flat fee, however, this proxy measure can be inequitable but may be useful in communities with limited capacity to use other methods.

Legal Challenges

Legal challenges to Stormwater authorities tend to revolve around two issues: challenges to legal authority and challenges to the nature of the fee. In Connecticut, the legislature has granted statutory authority to municipalities to enact stormwater authorities. Closely following the statutory provisions will allow municipalities to stay within their legal authority and avoid legal challenges. Under Connecticut law, stormwater authorities have a range of purposes including developing stormwater control programs; creating stormwater districts; construction and maintenance of stormwater control infrastructure; public education; and charging a fee on property that can only be used to carry out the powers of the stormwater district. The fee is statutorily limited on some hospital properties and open spaces, farms, forests, and government property. No more than fifteen percent of stormwater revenue can be generated from hospitals that are parties to a settlement agreement with the state. The fee can only be assessed on farm, forest, open space or state government property containing impervious surfaced that discharge stormwater into a municipal separate storm sewer system. Stormwater authorities in distressed municipalities have some additional authority, to sue, hold and convey property, contract, borrow money, and issue bonds.

Some legal challenges have been brought against stormwater authorities testing the nature of the fee mechanism. These suits are often challenging whether the charge is a user fee or a tax. In the majority of cases, courts have held the assessments to be user fees when there is a nexus between fee charged and service rendered, when there are benefits to those charges (even implied), and when the rate is a tied to the costs of the program. Stormwater fees cannot be structured like taxes, there must be a mechanism for reduction in fees if stormwater mitigation measures are applied, and there must be an appeals process to evaluate fees.

How Can UConn Help?

- Grants for stormwater authority feasibility studies
- Public workshops, webinars, and technical assistance, including data and maps
- Model ordinance for stormwater authority implementation

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Example ordinance from NEW LONDON
(with comments on how municipalities can tailor the ordinance to their needs)

Administration.

This article shall be administered by the ***Water and Water Pollution Control Authority of the city (hereinafter WWPCA)*** in accordance with the charter of the city and all ordinances of the city effecting the ***WWPCA*** and all policies statements of the city council relative to the ***WWPCA.***
(Ord. No. 06-18-18-2, § 1)

In New London, an existing Water and Water Pollution Control Authority acts as the Stormwater Authority. This section of the ordinance can be tailored to appoint any existing municipal authority, board, or commission to act as the Stormwater Authority. Substitute *italicized* and **bolded** text for the name of the existing board the town designates. If a new Stormwater Authority will be enabled, see Model Stormwater Authority Enabling Ordinance in CIRCA's *Stormwater and Climate Resilience*.

Sec. 21-178. - Service fees.

(a)
There is hereby established a municipal storm water fund.

The stormwater fund is a municipal enterprise fund which can only be used for purposes under the stormwater authority purview.

(b)
WWPCA, acting for the city, shall collect a storm water service fee from owners of each property and each condominium and each homeowners' association and each service connections for water and sewer not included above, located within the city.

Substitute WWPCA for the municipal designated Stormwater Authority.

(c)
Initially a flat fee shall be imposed in the amounts set forth on Schedule A attached to Ord. No. 06-18-18-2 and made a part hereof. The initial fund shall be used to: map the entire subsurface drain pipes and all outfalls; implement a public outreach program to educate the citizens of New London on impacts of storm water runoff and steps that can be taken to reduce it; implement and enforce an ordinance to prohibit unauthorized non-storm water discharges; assess and rank catch basins based on criteria to be developed into categories for the city to determine problem areas; outfall screening requirements and regular testing; develop short and long term maintenance plans with schedules to ensure performance; to retain and hire experts to advise the city in the administration of the storm water management plan; and to prepare reports for the state and federal governments.

In this section, New London imposes an initial flat fee with the intention of using revenue to conduct the baseline work needed to assess the needs for stormwater management, before a more fairly structured fee can be imposed.

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Example ordinance from NEW LONDON (continued)
(with comments on how municipalities can tailor the ordinance to their needs)

(d)
Thereafter, subject to the approval of the city council, fees may be based upon any of the following criteria: (1) impervious area existing on the property as of March 1 of the year in which the fee is imposed, (2) zoning classification of the property, or (3) continuing with a flat rate and/or including undeveloped property.

This section describes methods that may be used to assess the stormwater fee. Note that three different mechanisms are described allowing for flexibility to accurately capture the fee for service.

(e)
The fees stated above shall be collected in the same manner as other fees collected by the ***WWPCA*** and shall have the same priority, rights and bear the same interest and penalties, and be enforced in the same manner as, such other fees. Any unpaid fee or portion thereof shall be a lien upon the real property for which it is imposed and shall have the same priority as a lien imposed for non-payment of real estate taxes.

Because New London has a utility fee billing and collection system in place, they have adopted this simple provision allowing stormwater fee collection to piggyback on the existing billing, collection, and enforcement systems. Municipalities who do not have such systems in place should designate in the ordinance collection and enforcement protocols.

To comply with the existing statute, other provisions will need to be included clarifying any properties with limits or exemptions to the fees, appeal procedures, and mechanisms for lowering fees based on mitigation measures or disconnection from the stormwater system.

Distressed municipalities may add provisions adopting powers specific to their communities described in statute.

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Resources

Connecticut Environmental Conditions Online, Database for Natural Resource Information and Imagery for Planning, Management, Education and Research. Includes impervious cover mapping data for CT towns. https://cteco.uconn.edu/index.htm

Stormwater Fees: Overview of Municipal Stormwater Fee Programs Pennsylvania Environmental Council https://pecpa.org/wp-content/uploads/StormwaterUtilityFee_Update_20190730.pdf

Funding Stormwater Programs EPA https://www.epa.gov/sites/default/files/2015-10/documents/fundingstormwater.pdf

Legal Considerations for Enacting Implementing & Funding Stormwater Programs NACWA https://www.nacwa.org/docs/default-source/default-document-library/2016-12-08stormwaterwhitepaper.pdf?sfvrsn=e2f6e961_0

A Model Stormwater Utility for the State of Maine https://www.portlandmaine.gov/DocumentCenter/View/5381/Report--Model-Stormwater-Utility-for-the-State-of-Maine

2021 Western Kentucky Stormwater Utility Survey with analysis of fair fee structures. https://digitalcommons.wku.edu/cgi/viewcontent.cgi?article=1003&context=seas_faculty_pubs

Black and Veatch 2021 Stormwater Utility Survey Report https://www.bv.com/sites/default/files/2021-03/2021%20Stormwater%20Utility%20Report%20WEB%20FINAL.pdf

Additional Resources

PA 21-115, An Act Concerning Climate Change Adaptation
CT MS4 program
Resilient Cities Rainwater to Revenue webinar
UConn CLEAR Stormwater Utilities in CT webinar 2019
UConn CLEAR Stormwater Collaboratives and Utilities webinar 2020
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Example model ordinance with explanation, State of Maine
Western Kentucky University Stormwater Survey

Contact

To learn more about CIRCA visit circa.uconn.edu and the Resilient Connecticut project for more climate resilience planning tools: resilientconnecticut.uconn.edu

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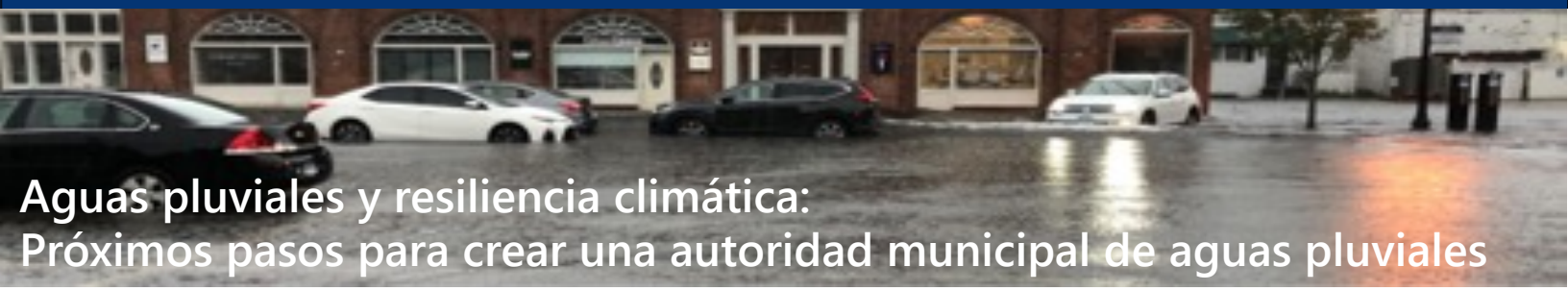

Aguas pluviales y resiliencia climática: Próximos pasos para crear una autoridad municipal de aguas pluviales

En 2021, la legislatura de Connecticut aprobó la P.A. 21-115 permitiendo a los municipios crear una autoridad de aguas pluviales al habilitar una comisión o junta existente o al establecer una nueva autoridad de aguas pluviales. Las autoridades de aguas pluviales son reconocidas en todo Estados Unidos y en el extranjero como una herramienta para que las comunidades financien y gestionen la infraestructura de aguas pluviales y aumenten la resiliencia a los impactos del cambio climático. Una vez que una comunidad ha realizado un estudio de factibilidad y ha determinado que una autoridad de aguas pluviales proporcionaría los fondos necesarios para abordar el manejo de aguas pluviales, los siguientes pasos críticos son aprobar una ordenanza para habilitar una autoridad de aguas pluviales, determinar cómo se evaluarán las tarifas y establecer un fondo empresarial de aguas pluviales por separado. Al elaborar cuidadosamente las ordenanzas necesarias para estos tres pasos, el municipio puede mantenerse dentro de sus límites estatutarios y autoridad constitucional y evitar impugnaciones legales.

Cómo determinar el mejor modelo de tarifas para tu comunidad?

Al establecer una autoridad de aguas pluviales, una decisión esencial para un municipio es determinar qué tipo de modelo de tarifas servirá mejor a las necesidades de la comunidad. La elección del modelo de tarifa depende en términos generales de dos ideas: Cuánto costará la gestión de las aguas pluviales y cómo distribuir de manera justa los costos a los usuarios.

¿Cuáles son los costos de la gestión de aguas pluviales?

Las consideraciones importantes para determinar el costo de la gestión de aguas pluviales son evaluar cómo se distribuyen actualmente los costos del programa de aguas pluviales, qué proyectos actualmente no financiados deben abordarse y qué nuevos costos implicará un sistema de tarifas de aguas pluviales. Las operaciones y la gestión de las aguas pluviales, las mejoras de capital y el cumplimiento normativo pueden estar repartidos entre los diferentes departamentos de un gobierno y es posible que deban consolidarse. Los atrasos derivados del mantenimiento diferido y el aumento de las necesidades de infraestructura deben evaluarse y priorizarse. Los municipios deben considerar la financiación necesaria para resolver los problemas de capacidad relacionados con la recopilación de datos sobre cobertura impermeable, el establecimiento de sistemas de facturación y la tramitación de las apelaciones. Las necesidades futuras de mantenimiento e inspección deben incluirse en los costos del programa de aguas pluviales, así como en los créditos por desconexiones. Todos estos costos forman el costo del programa de aguas pluviales que se financiará con la tarifa de aguas pluviales.

Otros factores para elegir un modelo de tarifa adecuado para un municipio son el uso primario de la tierra, la población, la densidad de desarrollo y los recursos comunitarios. Una vez que un municipio hace una evaluación razonable de los costos actuales, las necesidades futuras y otras consideraciones, entonces pueden hacer una elección apropiada del modelo de tarifas para cumplir con los requisitos y distribuir equitativamente los costos a los usuarios del sistema. Sin embargo, todos estos costos deben sopesarse con el costo de no cumplir con las regulaciones de aguas pluviales, aumentar las cargas de precipitación en el sistema y aumentar las pérdidas por inundaciones en la comunidad. Incluso con los costos adicionales de operación del programa, las tarifas de aguas pluviales brindan recursos a los municipios para enfrentar los desafíos del aumento de la carga de aguas pluviales y aumentar la resiliencia climática en la comunidad.

Comparación de modelos de tarifas

Las tarifas de las aguas pluviales se consideran más equitativas que usar los ingresos fiscales para pagar la gestión de las aguas pluviales porque todas las propiedades, incluidas las propiedades sin fines de lucro y no sujetas a impuestos, están sujetas a la tarifa. En Connecticut, hay algunas excepciones, incluyendo límites en las tarifas cobradas de ciertas propiedades hospitalarias. Las tierras agrícolas, forestales y del gobierno estatal solo pueden cobrarse tarifas en tierras con cobertura impermeable que drenan en sistemas municipales de aguas pluviales separadas.

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Las tarifas de aguas pluviales se pueden calcular de diferentes maneras. En términos generales, hay tres categorías de modelos de tarifas: una tarifa basada en la cantidad de cobertura impermeable en la propiedad; una tarifa plana que se cobra a todos los propietarios; y una tarifa basada en el valor de tasación de la propiedad. El primer modelo es el más utilizado (62% a partir de 2021), ya que sigue la idea de que las tarifas de los servicios públicos deben estar vinculadas a los costos del servicio. En este caso, se evalúan tarifas razonables en función de la cantidad de escorrentía de aguas pluviales que genera una propiedad. Sin embargo, en algunas circunstancias, los dos últimos modelos pueden tener más sentido para las condiciones que se encuentran en una comunidad si el tamaño de la propiedad y la cobertura impermeable son similares en todo el municipio (tarifa plana), o si el valor de la propiedad es un indicador cercano de la cantidad de cobertura impermeable (tarifa basada en el valor de la propiedad).

Tarifas impermeables basadas en la zona

El método más común para calcular las tarifas de las aguas pluviales es desarrollar un enfoque basado en unidades que permita comparaciones entre propiedades residenciales, multifamiliares, comerciales e industriales. En primer lugar, todas las áreas impermeables deben ser mapeadas y cuantificadas. La base de datos de Condiciones Ambientales de Connecticut tiene datos de mapeo disponibles para cobertura impermeable en todo el estado (ver Recursos para el enlace). Luego, se calcula una Unidad Residencial Equivalente (ERU; pero también conocida como Unidad Residencial Equivalente REU) utilizando el área impermeable promedio en propiedades residenciales unifamiliares. A todas las residencias unifamiliares se les podría cobrar 1 ERU, o más equitativamente, cada propiedad podría pagar una tarifa escalada en función de cuántos ERU hay en el paquete. El sistema ERU es fácil de explicar al público: Cuanto más impermeable sea la superficie que genere aguas pluviales, mayor será la tarifa. Sin embargo, la escorrentía generada a partir de superficies perversas no se captura en este cálculo, ni da cuenta de la intensidad del desarrollo.

El modelo ERU también se puede utilizar como base para un modelo de tarifas escalonadas. Las ERU se calculan para cada parcela, pero luego se crean niveles que incluyen un rango de valores de cobertura impermeable en pasos. El modelo ERU escalonado se utiliza en New London, Connecticut, y tiene la ventaja de absorber errores de mapeo menores, por lo que hay menos apelaciones basadas en el área, lo que ahorra tiempo y recursos del programa. Cuando los niveles se construyen cuidadosamente, este método se considera justo, fácil de explicar al público y no será vulnerable a desafíos legales.

Existen otros modelos de tarifas basados en la cobertura impermeable que incluyen otras métricas para capturar una imagen más completa de la escorrentía real. El método del Factor de Desarrollo de Intensidad agrega un componente de uso de la tierra al cálculo de la URE. En este método, incluso las parcelas no desarrolladas están sujetas a la tarifa de aguas pluviales. El método del Área Hidráulica Equivalente incluye tanto la escorrentía permeable como la impermeable para generar una medición y una tarifa individualizadas específicas del sitio. El método del Factor Equivalente Residencial es el método más complejo que incorpora en el cálculo las métricas de uso del suelo, tipo de suelo y precipitación media. Aunque estos métodos pueden ser más equitativos que otras medidas más simples, requieren una mayor inversión en la cartografía de parcelas continuamente actualizada, acceso a más flujos de datos y son más complejos de explicar al público.

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Tarifa plana mensual y tarifa basada en el valor evaluado de la propiedad

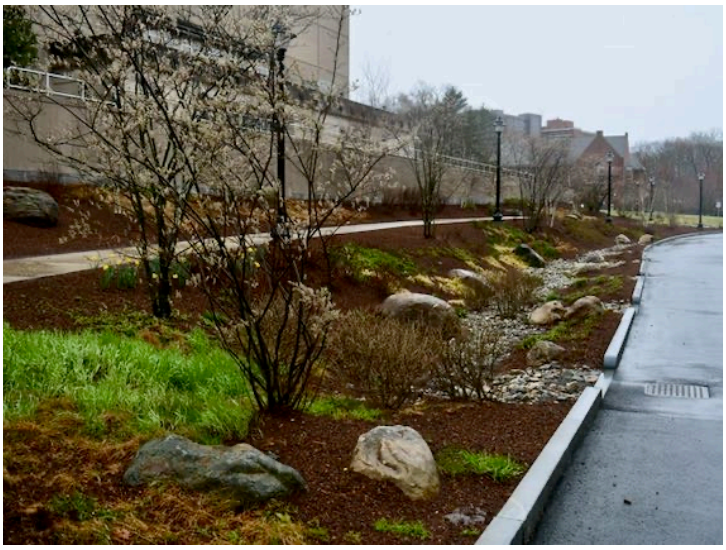
En este modelo, se cobra la misma tarifa a todas las propiedades del municipio, independientemente del tamaño, el valor de la propiedad o la cantidad de aguas pluviales generadas. El modelo de tarifa plana no es equitativo porque la cantidad de aguas pluviales generadas en propiedades más grandes con una cobertura más impermeable es mayor, a veces mucho mayor, que las parcelas más pequeñas y menos desarrolladas, lo que dificulta la comercialización de este método al público. Sin embargo, este modelo puede ser una opción razonable en algunas comunidades con una gran proporción de tamaños de lote y uso de suelo similares y una capacidad limitada para determinar la cantidad de cobertura impermeable por propiedad.

El valor tasado de la propiedad se ha utilizado como un indicador de la cantidad de aguas pluviales generadas en una parcela. Sin embargo, al igual que la tarifa fija, esta medida indirecta puede ser inequitativa, pero puede ser útil en comunidades con capacidad limitada para utilizar otros métodos.

Desafíos legales

Los desafíos legales a las autoridades de Stormwater tienden a girar en torno a dos cuestiones: Los desafíos a la autoridad legal y los desafíos a la naturaleza de la tarifa. En Connecticut, la legislatura ha otorgado autoridad legal a los municipios para promulgar autoridades de aguas pluviales. Seguir de cerca las disposiciones legales permitirá a los municipios permanecer dentro de su autoridad legal y evitar impugnaciones legales. Según la ley de Connecticut, las autoridades de aguas pluviales tienen una variedad de propósitos, incluido el desarrollo de programas de control de aguas pluviales; la creación de distritos de aguas pluviales; construcción y mantenimiento de infraestructura de control de aguas pluviales; enseñanza pública; y el cobro de una tarifa en la propiedad que solo se puede usar para llevar a cabo los poderes del distrito de aguas pluviales. La tarifa está limitada por ley en algunas propiedades hospitalarias y espacios abiertos, granjas, bosques y propiedades gubernamentales. No más del quince por ciento de los ingresos por aguas pluviales pueden ser generados por hospitales que son partes en un acuerdo de acuerdo con el estado. La tarifa solo puede ser evaluada en fincas, bosques, espacios abiertos o propiedades del gobierno estatal que contengan superficies impermeables que descarguen aguas pluviales en un sistema de alcantarillado municipal separado. Las autoridades de aguas pluviales en los municipios en dificultades tienen alguna autoridad adicional para demandar, mantener y transmitir propiedades, contratar, pedir dinero prestado y emitir bonos.

Se han presentado algunos desafíos legales contra las autoridades de aguas pluviales que prueban la naturaleza del mecanismo de tarifas. Estas demandas a menudo son desafiantes si el cargo es una tarifa de usuario o un impuesto. En la mayoría de los casos, los tribunales han sostenido que las evaluaciones son tarifas de usuario cuando existe un nexo entre la tarifa cobrada y el servicio prestado, cuando hay beneficios en esos cargos (incluso implícitos) y cuando la tarifa está vinculada a los costos del programa. Las tarifas de aguas pluviales no se pueden estructurar como impuestos, debe haber un mecanismo para reducir las tarifas si se aplican medidas de mitigación de aguas pluviales y debe haber un proceso de apelación para evaluar las tarifas.



¿Cómo puede ayudar UConn?

- Subvenciones para estudios de viabilidad de la autoridad de aguas pluviales
- Talleres públicos, seminarios web y asistencia técnica, incluidos datos y mapas
- Ordenanza modelo para la implementación de la autoridad de aguas pluviales

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Ejemplo de ordenanza de NEW LONDON (con comentarios sobre cómo los municipios podrían adaptar la ordenanza a sus necesidades).

La Administración.

Este artículo será administrado por la Autoridad de Control del Agua y la Contaminación del Agua de la ciudad (en adelante, WWPCA) de acuerdo con la carta de la ciudad y todas las ordenanzas de la ciudad que afecten a la WWPCA y todas las declaraciones de políticas del consejo de la ciudad relacionadas con la WWPCA.
 (Ord. Nº 06-18-18-2, § 1)

En Nueva Londres, una Autoridad de Control de la Contaminación del Agua y del Agua actúa como Autoridad de Aguas Tormentosas. Esta sección de la ordenanza se puede adaptar para designar cualquier autoridad municipal existente, junta o comisión para actuar como la Autoridad de Aguas Tormentas. Sustituya el texto en *cursiva* y en **negrita** por el nombre de la junta existente que designa la ciudad. Si se habilitará una nueva Autoridad de Aguas Tormentas, vea la Ordenanza Modelo de Autorización de Aguas Tormentas en la Resiliencia Climática y Aguas Tormentosas de CIRCA.

Sección 21-178. - Tarifas de servicio.

(a)
Se establece un fondo municipal para aguas pluviales.

El fondo de aguas pluviales es un fondo de empresa municipal que solo puede ser utilizado para fines bajo el ámbito de competencia de la autoridad de aguas pluviales.

(b)
WWPCA, actuando para la ciudad, cobrará una cuota de servicio de agua pluvial de los propietarios de cada propiedad y cada condominio y cada asociación de propietarios y cada conexión de servicio de agua y alcantarillado no incluidos arriba, ubicados dentro de la ciudad.

Sustituya WWPCA por la Autoridad de Aguas Pluviales designada municipalmente.

(c)
Inicialmente, se impondrá una tarifa plana en los montos establecidos en el Anexo A adjunto a la Ord. No. 06-18-18-2 y que forma parte del mismo. El fondo inicial se utilizará para: mapear todas las tuberías de drenaje del subsuelo y todos los emisarios; implementar un programa de divulgación pública para educar a los ciudadanos de New London sobre los impactos de la escorrentía de aguas pluviales y los pasos que se pueden tomar para reducirla; implementar y hacer cumplir una ordenanza para prohibir las descargas no autorizadas de aguas no pluviales; evaluar y clasificar las cuencas de captación en función de criterios que se desarrollarán en categorías para que la ciudad determine las áreas problemáticas; requisitos de detección de emisarios y pruebas periódicas; desarrollar planes de mantenimiento a corto y largo plazo con cronogramas para garantizar el rendimiento; retener y contratar expertos para asesorar a la ciudad en la administración del plan de manejo de aguas pluviales; y preparar informes para los gobiernos estatal y federal.

En esta sección, New London impone una tarifa plana inicial con la intención de utilizar los ingresos para realizar el trabajo de referencia necesario para evaluar las necesidades de gestión de aguas pluviales, antes de que se pueda imponer una tarifa estructurada de manera más justa.

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Ejemplo de ordenanza de NEW LONDON (continuación) (con comentarios sobre cómo los municipios podrían adaptar la ordenanza a sus necesidades).

(d)
A partir de entonces, sujeto a la aprobación del consejo de la ciudad, las tarifas pueden basarse en cualquiera de los siguientes criterios: (1) área impermeable existente en la propiedad a partir del 1 de marzo del año en que se impone la tarifa, (2) clasificación de zonificación de la propiedad, o (3) continuar con una tarifa plana y / o incluir propiedades no desarrolladas.

Esta sección describe los métodos que se pueden utilizar para evaluar la tarifa de aguas pluviales. Tenga en cuenta que se describen tres mecanismos diferentes que permiten flexibilidad para capturar con precisión la tarifa por el servicio.

(e)
Las tarifas indicadas anteriormente se cobrarán de la misma manera que otras tarifas recaudadas por la **WWPCA** y tendrán la misma prioridad, derechos y soportarán los mismos intereses y multas, y se aplicarán de la misma manera que esas otras tarifas. Cualquier cuota impagada o parte de la misma será un gravamen sobre el bien inmueble por el que se impone y tendrá la misma prioridad que un gravamen impuesto por falta de pago de impuestos inmobiliarios.

Debido a que New London cuenta con un sistema de facturación y cobro de tarifas de servicios públicos, han adoptado esta sencilla disposición que permite que el cobro de tarifas de aguas pluviales se complemente con los sistemas existentes de facturación, cobro y cumplimiento. Los municipios que no cuenten con dichos sistemas deben designar en la ordenanza los protocolos de recolección y cumplimiento.

Para cumplir con el estatuto existente, será necesario incluir otras disposiciones que aclaren las propiedades con límites o exenciones a las tarifas, los procedimientos de apelación y los mecanismos para reducir las tarifas en función de las medidas de mitigación o la desconexión del sistema de aguas pluviales.

Los municipios en dificultades pueden añadir disposiciones que adopten facultades específicas para sus comunidades descritas en la ley.

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Los Recursos

Connecticut Environmental Conditions Online, Database for Natural Resource Information and Imagery for Planning, Management, Education and Research. Includes impervious cover mapping data for CT towns. https://cteco.uconn.edu/index.htm

Stormwater Fees: Overview of Municipal Stormwater Fee Programs Pennsylvania Environmental Council https://pecpa.org/wp-content/uploads/StormwaterUtilityFee_Update_20190730.pdf

Funding Stormwater Programs EPA https://www.epa.gov/sites/default/files/2015-10/documents/fundingstormwater.pdf

Legal Considerations for Enacting Implementing & Funding Stormwater Programs NACWA https://www.nacwa.org/docs/default-source/default-document-library/2016-12-08stormwaterwhitepaper.pdf?sfvrsn=e2f6e961_0

A Model Stormwater Utility for the State of Maine https://www.portlandmaine.gov/DocumentCenter/View/5381/Report--Model-Stormwater-Utility-for-the-State-of-Maine

2021 Western Kentucky Stormwater Utility Survey with analysis of fair fee structures. https://digitalcommons.wku.edu/cgi/viewcontent.cgi?article=1003&context=seas_faculty_pubs

Black and Veatch 2021 Stormwater Utility Survey Report https://www.bv.com/sites/default/files/2021-03/2021%20Stormwater%20Utility%20Report%20WEB%20FINAL.pdf

Recursos Adicionales

PA 21-115, An Act Concerning Climate Change Adaptation

CT MS4 program

Resilient Cities Rainwater to Revenue webinar

UConn CLEAR Stormwater Utilities in CT webinar 2019

UConn CLEAR Stormwater Collaboratives and Utilities webinar 2020

GZA stormwater finance blog

Example ordinance New London, Connecticut

Central Massachusetts Regional Stormwater Coalition

DIMS example Portland, Maine

Example model ordinance with explanation, State of Maine

Western Kentucky University Stormwater Survey

La Información de Contacto

Para obtener más información sobre CIRCA, visite circa.uconn.edu y el proyecto Resilient Connecticut para obtener más herramientas de planificación de resiliencia climática:
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Photos sourced from CIRCA and courtesy of Don Bell

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Ten Steps to Municipal Resilience

Information for a More Resilient Connecticut

It is getting warmer and the sea level is rising. It is now clear that these changes in our environment are consequences of greenhouse gas released into the atmosphere by humans. Internationally coordinated action is urgently required to cap and reduce the rate of these emissions. A recent report by the Governor's Council on Climate Change concluded that even if the most effective policies get adopted soon, air temperatures are getting warmer and mean sea level in Connecticut will rise up to 20 inches by 2050 and will continue to increase until at least 2100. We must all take steps to reduce greenhouse gas emissions since these changes will have costly and dangerous impacts in our state. In the meantime, municipalities can increase their resilience to the foreseeable impacts of climate change by considering the following ten steps:

1 Build adaptation into infrastructure investments to avoid future costs.

To minimize future costs and social disruption, municipalities should integrate climate change adaptation into all planning decisions and investments. Every town's Plan of Conservation and Development and Hazard Mitigation Plan, for example, should enhance long-term resilience. Routine repairs and improvements that recognize future risk will yield a high return on investment.

2 Resist development in the 2020 floodplain.

Higher mean sea levels will increase the frequency of flooding in areas that are currently flood-prone. Enforcement of existing policies will reduce risk to people, property, and the town's tax base and make new commercial and residential development less vulnerable.

3 Develop a resilience project pipeline.

In many towns, there are several areas at-risk that need attention. Having resilience projects identified or underway will increase the likelihood of winning state and federal adaptation grants and increase support for the local share of the costs.

4 Take advantage of existing programs.

Towns should use locally accurate, science-based risk assessments to identify and prioritize projects and evaluate the costs and benefits of adaptation alternatives. CIRCA and many other organizations offer support for planning and engagement. Towns should also expand participation in the FEMA Community Rating System since it builds resilience and saves citizens money.

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Visit CIRCA's Resilient Connecticut Planning Tools webpage for information to help take action on these 10 steps: resilientconnecticut.uconn.edu/planning-tools

5 Use inclusive planning approaches.

The entire community must be engaged in adaptation needs, priorities, and project design. After all, they will live with what is built and will pay much of the cost. Broad consultation is essential to ensure public support and to identify needs of the most vulnerable.

6 Organize to win federal resilience and adaptation funds.

Most resilience projects will take years to plan, fund, and implement. An office that coordinates sustained planning, proposal development, and advocacy will enhance success.

7 Plan for the local share of the costs.

A resilience project pipeline will require local cost-sharing so a strategy for raising funds is essential. For example, Public Act 19-77 allows a municipality to create a resiliency reserve fund and Public Act 21-115, "An Act Concerning Climate Change Adaptation," also provides municipalities with a suite of voluntary tools to fund climate resilience including establishment of storm-water authorities and a new Environmental Infrastructure Fund within the Connecticut Green Bank.

8 Take action on existing vulnerabilities.

Many towns have identified areas that are vulnerable to flooding and high winds and temperatures. It is useful to assess why resilience projects identified as a need have not been implemented and to assess the cost of further inaction.

9 Prioritize emergency preparedness and recovery planning.

Prioritize preparedness for storms by incorporating climate change into your local and regional emergency planning and identify "Community Lifelines" that must function in the aftermath of a disaster. Lifelines are essential to human health and safety, and sustain the operation of critical government and business functions.

10 Track changes in climate projections and policies.

Scientists around the world are working to check and refine climate predictions and new results should be expected. And governments, including our own state, are increasingly developing new resilience and adaptation approaches. Towns should track changing climate projections and assess the importance and value of implementing innovative policies in their community.

Visit CIRCA's Resilient Connecticut Planning Tools webpage for information to help take action on these 10 steps: resilientconnecticut.uconn.edu/planning-tools

CONNECTICUT Department of Housing

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

Funding for this project is provided by the U.S. Department of Housing and Urban Development through the Community Development Block Grant National Disaster Recovery Program, as administered by the Connecticut Department of Housing. This publication does not express the views of the Department of Housing or the State of Connecticut. The views and opinions expressed are those of the authors.


(photo courtesy of Ken Engelman)

Branford's Coastal Resiliency Reserve Fund - Planting Seeds for the Future

Information for a More Resilient Connecticut

"Start where you are. Use what you have. Do what you can."
- Arthur Ashe

With over 20 miles of coastline on Long Island Sound, Branford is a coastal community on the front lines facing the challenges of sea-level rise and climate change in Connecticut. As recent storms in the past decade have revealed the extent of vulnerabilities across Connecticut's coast, Branford has taken proactive steps to put plans in place with an eye to the future. In 2016 a Coastal Resilience Plan was developed to identify location specific and town-wide options for adaptation. An update to Branford's Plan of Conservation and Development in 2019 considered the impact of sea-level rise to the town's vision for the future and had this to say: "The scope of the issues associated with sea level rise is so extensive and expensive that it will be difficult, if not impossible, for the Town of Branford or any other governmental organization to address them all." Branford's Director of Finance James Finch likes to use the above quote by Arthur Ashe to frame the town's approach to figuring out what to do next without giving in to doom and despair. What if the town created a fund dedicated to addressing resilience challenges and managed the assets similar to a pension plan? The idea is to invest what they have now, take a long term strategy, and grow the reserve fund with the goal of matching a future funding source to "the long-term liabilities" associated with

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Stormwater flooding and damage on Branford roadways. (photos courtesy of James Finch and Jan Spiegel)

sea-level rise. In addition to the traditional ways the town funds projects, such as capital improvement planning, federal and state grants, municipal bond issuance, and "pay-as-you go"; a coastal resiliency reserve fund would be another tool in the tool-kit to help Branford manage the costs of adapting to climate change over the long term. It's a simple idea that draws on the town's experience of managing other future financial expenses such as employee pensions, OPEB trusts, and self-insurance.

Up until 2019, no town in Connecticut had yet taken this approach, and a change in state law was needed to enable municipalities to create reserve funds for resiliency with the investment flexibility needed to create higher returns. Finch along with First Selectman Jamie Cosgrove, worked with State Senator Christine Cohen, to craft legislation and Public Act No. 19-77 "AN ACT AUTHORIZING MUNICIPAL CLIMATE CHANGE AND COASTAL RESILIENCY RESERVE FUNDS," (see sidebar) was approved unanimously in the Senate and signed by Governor Lamont on July 1, 2019.

Branford prides itself on having a history of balancing its budgets and developing strategies to identify and fund long-term obligations and capital needs. In his comments to the Board of Finance during the creation of the resiliency fund Finch noted,

"Often this results in a disciplined and consistent effort that over long periods of time reduces the burden on future tax payers while remaining sensitive to current tax payers."

The town allocated a $1 million surplus in 2019 from its general fund to seed the new Coastal Resiliency Reserve Fund. Going forward a small fraction of every budget will be set aside to continue building the reserve, with an additional $300k set aside in FY20 and FY21.

Public Act No. 19-77

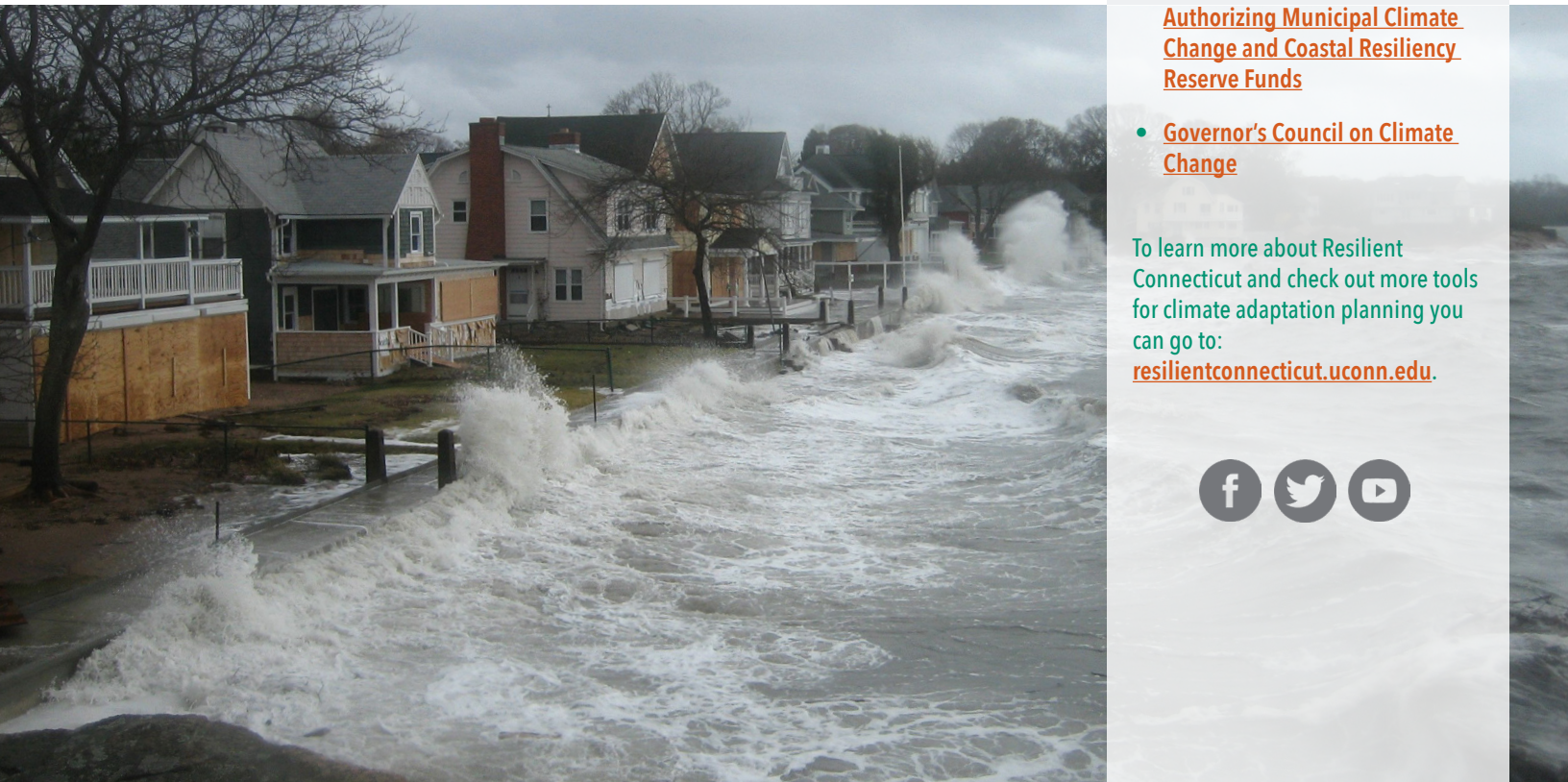
- AN ACT AUTHORIZING MUNICIPAL CLIMATE CHANGE AND COASTAL RESILIENCY RESERVE FUNDS enables municipalities to create a Climate Change and Coastal Resiliency Reserve Fund (CCCRRF).
- A CCCRRF allows the budget-making authority of a municipality the option to invest a portion of the fund (up to 50%) in equity securities, US Government Bonds, certificates of deposit, commercial paper, savings accounts and bank acceptances, other state and municipal bonds, as well as other investment vehicles meant to allow flexibility and higher rates of return on investment.
- Upon the recommendation of the chief elected official and budget-making authority, and approval of the legislative body of a municipality, the reserve fund may be used and appropriated to pay for municipal property losses, capital projects and studies related to mitigating hazards and vulnerabilities of climate change including, but not limited to, land acquisition.

The costs and impacts to municipal budgets from sea-level rise are continuing to get more attention from the investment and financial services community (read Moody's Environmental Risks article, link on sidebar). In fact, Branford's approach with its resiliency reserve fund was highlighted among the factors that supported a AAA rating of the town's long-term General Obligation Bond by S&P Global Ratings in a 2019 report for investors. It's clear that the approach towns and states use to manage the long term financial risks of climate change will continue to factor into borrowing costs and investors' willingness to purchase their debt.

Moving forward there's still a lot of unknowns and the fund is still in it's infancy. Exactly how much will Branford need and when will they need it? Finch compares the problem to a recent college graduate wondering how much they'll need to save for retirement. "Given all the unknowns it would be easy to ignore the problem or push things off for another day. What we do know is if we start today and position the fund to grow over the long term, it's vastly superior to doing nothing," Finch says.

Learn more about additional financing options, including how Governor Lamont's climate adaptation bill (HB6441) will allow municipalities to pass a "buyers conveyance fee" and use it to create climate change and coastal resiliency reserve funds. Visit the Governor's Council on Climate Change website for more information. □

Waves crash over the seawalls along Branford's shoreline during Hurricane Sandy in 2012. (photo courtesy of CT Mirror and Jan Spiegel)



For More Information

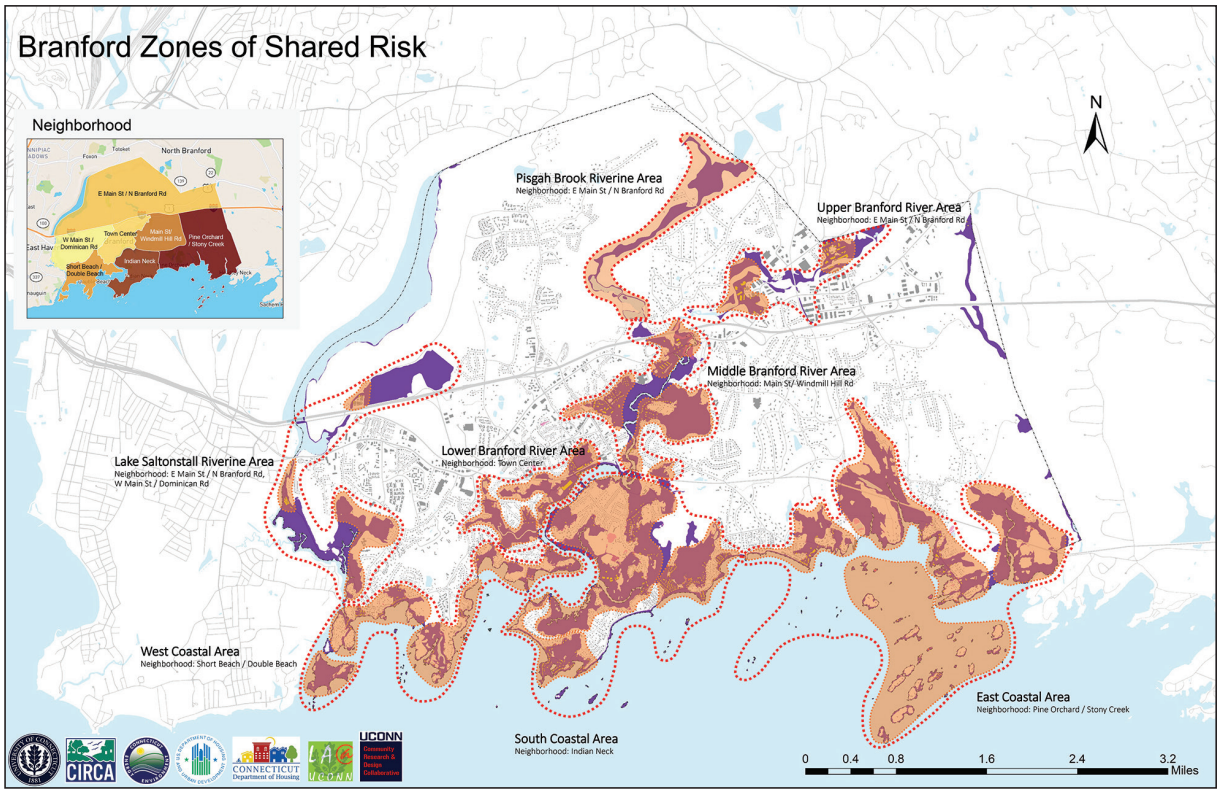
Planning Inventory

If you'd like to learn more about how towns are planning for sea-level rise and climate change, CIRCA has assembled a "Planning Inventory" as part of the Resilient Connecticut project.

Additional Resources

- Branford Coastal Resilience Plan
- Branford's Plan of Conservation and Development
- Branford's S&P Global Ratings 2019 Report for Investors
- Moody's Environmental Risks Article
- HB 6441, An Act Concerning Climate Change Adaptation
- Public Act 19-77, An Act Authorizing Municipal Climate Change and Coastal Resiliency Reserve Funds
- Governor's Council on Climate Change

To learn more about Resilient Connecticut and check out more tools for climate adaptation planning you can go to: resilientconnecticut.uconn.edu.



About CIRCA and Resilient Connecticut

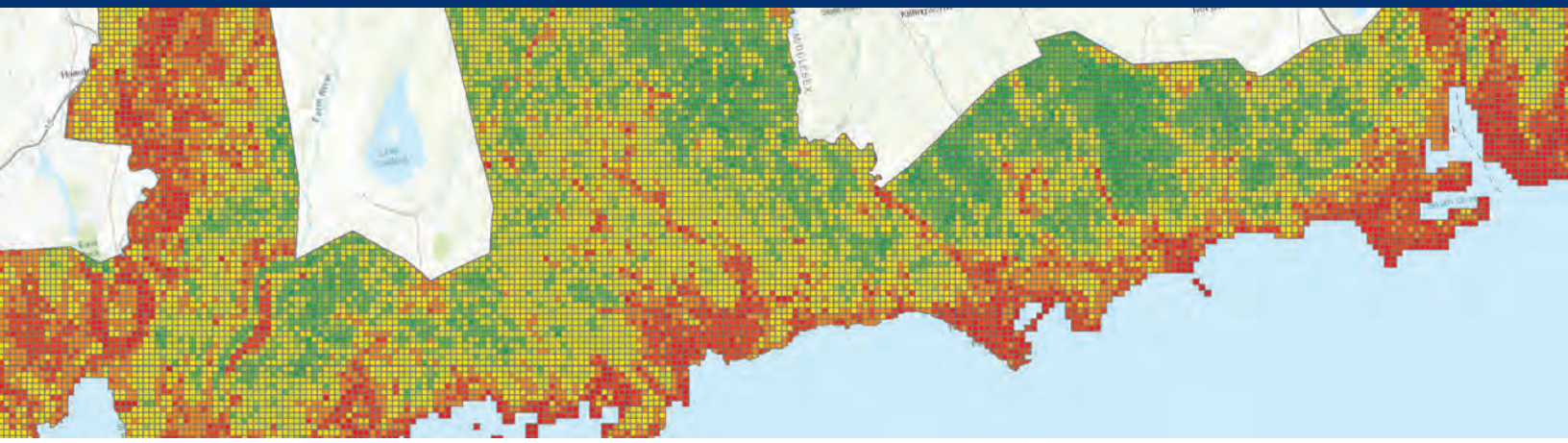
The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is a University of Connecticut research institute that brings together experts in the natural and social sciences, engineering, economics, finance, policy, and law to address climate impacts at a local and state level. The mission of CIRCA is to increase the resilience of communities vulnerable to the growing impacts of climate change.

CIRCA, along with state agencies, regional Councils of Governments (COGs), and municipalities, initiated the Resilient Connecticut project in 2018, which focuses on communities impacted by Superstorm Sandy in New Haven and Fairfield Counties. Activities include science-based risk assessments, community outreach, and pilot project designs. The goal of this work is to help decision makers prepare for changes in heat, flooding, and precipitation and advance planning for more resilient housing, transportation, and healthy communities. Importantly, Resilient Connecticut builds off existing planning efforts at the local and regional levels and uses CIRCA's climate research and tools for decision making.

As part of the Resilient Connecticut project, CIRCA is developing a Municipal Toolkit to help local and state agency staff better understand climate vulnerabilities and how to plan for them. The toolkit will contain both technical tools (data viewers, story maps, vulnerability assessments) and planning tools (stakeholder and planning inventories, model regulations, resilience planning checklist). "Zones of Shared Risk" (ZSR) maps like this one for Branford are part of the Toolkit. ZSR are regions that face common flood, wind, or heat related climate challenges and include the land, buildings, and infrastructure as well as the hydrological, ecological, and social elements that contribute to a place.

Branford's case study on financing resilience is another toolkit example and one product in a packet of "Information for a more Resilient Connecticut" that CIRCA created to help inform municipalities. A Coastal Resiliency Reserve Fund helps a community be proactive and address climate change by putting money in a fund today to help address the needs of tomorrow. □

Funding for this project is provided by the U.S. Department of Housing and Urban Development through the Community Block Grant National Disaster Recovery Program, as administered by the Connecticut Department of Housing.



CIRCA's Resilient Connecticut Project

About CIRCA

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) is a University of Connecticut research institute that brings together experts in the natural and social sciences, engineering, economics, finance, policy, and law to address climate impacts at a local and state level. The mission of CIRCA is to increase the resilience of communities vulnerable to the growing impacts of climate change.

CIRCA and our partners work together to help communities with topics of sea level rise, coastal and inland flooding, heat and wind vulnerability, critical infrastructure, living shorelines, and climate policy and planning.

More information on CIRCA projects can be found at circa.uconn.edu.

More information on Resilient Connecticut can be found at resilientconnecticut.uconn.edu.

What is Resilient Connecticut?

CIRCA, along with state agencies, regional Councils of Governments (COGs), and municipalities, initiated the Resilient Connecticut project in 2018. This project initially focused on areas impacted by Superstorm Sandy in New Haven and Fairfield Counties, but has since expanded to the rest of Connecticut. Activities include science-based risk assessments, community outreach, and pilot project designs. Products include maps, policy recommendations, and research. The goal of this work is to help decision makers prepare for changes in heat, flooding, and precipitation and advance planning for more resilient housing, transportation, and healthy communities. Resilient Connecticut has three phases:

1. Develop a Resilience Planning Framework.
2. Engage and collaborate with partners to develop resilience strategies, tools, and training.
3. Develop implementation plans for select pilot projects.

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Products for Resilience Planning

Importantly, Resilient Connecticut builds off existing planning efforts at the local and regional levels and uses CIRCA's climate research and tools for decision making. Many of these products will be used to create a Municipal Toolkit to help local and state agency staff. The Toolkit will help decision makers better understand climate vulnerabilities and how to plan for them.

(map image) Resilient Connecticut supports inland and coastal communities with planning that considers economic and transit-oriented development, conservation strategies, and critical infrastructure improvements.

Technical Tool Examples

data viewers • storm surge and wave height viewer for CT's coastal towns • story maps • social vulnerability index • vulnerability assessments for flood, sea level rise, and heat

Planning Tool Examples

stakeholder inventory • resilience planning checklist • model regulations for municipal resilience • case studies • mapped areas of climate risk • and zones of shared risk

Ways to Engage

CIRCA is using a variety of activities to help get the word out about this project. Attend one of our events, sign-up to receive our monthly Resilience Roundup newsletter, and follow us on social media.

Share information about vulnerable areas in the region where you live and work. Is there flooding that happens frequently around a train station, over roadways, or along evacuation routes? Are there critical facilities that are important to protect like a wastewater treatment plant or power station? To help CIRCA identify projects that benefit both regional and local needs, tell us your thoughts.

- What are the ways climate change is impacting your community?
- What actions do you think would help to make your community and the region stronger and more resilient to these impacts?

Visit our website to provide general comments or provide feedback (form on home page), sign up for the Resilience Roundup newsletter, follow us on social media, and more.

resilientconnecticut.uconn.edu

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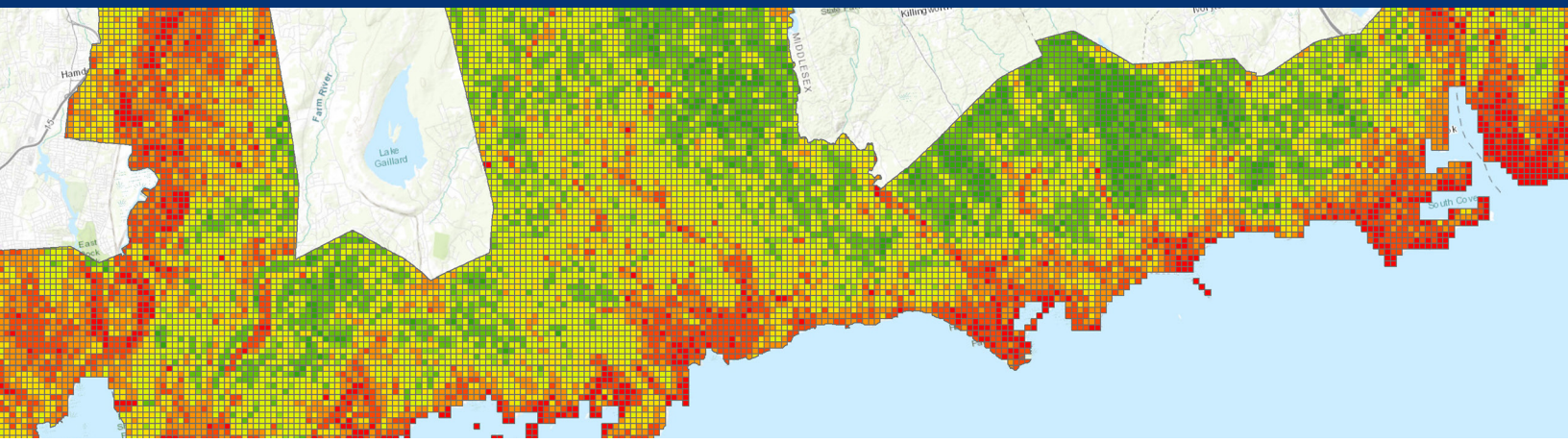

Proyecto Connecticut Resiliente de CIRCA

Sobre CIRCA

El Instituto de Connecticut para la Resiliencia y la Adaptación al Clima (CIRCA) es un instituto de investigación de la Universidad de Connecticut que reúne expertos en ciencias naturales y sociales, ingeniería, economía, finanzas, políticas y leyes para abordar los impactos climáticos a nivel local y estatal. La misión de CIRCA es incrementar la resiliencia de las comunidades vulnerables a los crecientes impactos del cambio climático.

CIRCA y nuestros socios trabajan juntos para ayudar a las comunidades con temas de aumento del nivel del mar, inundaciones costeras e interiores, vulnerabilidad al calor y al viento, infraestructura crítica, costas vivas y, políticas climáticas y de planeamiento.

Puede encontrar más información sobre los proyectos CIRCA en circa.uconn.edu.

Puede encontrar más información sobre Resiliente Connecticut en resilientconnecticut.uconn.edu.

¿Qué es Resiliente Connecticut?

CIRCA, junto con agencias estatales, Consejos de Gobierno regionales (COG) y municipios, inició el proyecto Resilient Connecticut en 2018. Este proyecto se centra en las comunidades afectadas por la supertormenta Sandy en los condados de New Haven y Fairfield. Las actividades incluyen evaluaciones de riesgos basadas en la ciencia, alcance comunitario y diseños de proyectos piloto. Los productos incluyen mapas, recomendaciones de politicas e investigación académica. El objetivo de este trabajo es ayudar a quienes toman decisiones a prepararse para cambios en calor, inundaciones y precipitaciones, y planificación anticipada para viviendas más resilientes, transporte y comunidades saludables. Resilient Connecticut tiene tres fases:

1. Desarrollar un marco de planificación de resiliencia
2. Involucrarse y colaborar con socios para desarrollar estrategias, herramientas y capacitación de resiliencia
3. Desarrollar planes de implementación para proyectos piloto

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Productos para la Planificación de la Resiliencia

Es importante destacar que Resilient Connecticut se basa en los esfuerzos de planificación existentes a nivel local y regional, y utiliza la investigación y las herramientas climáticas de CIRCA para la toma de decisiones. Muchos de estos productos se utilizarán para crear un toolkit (caja de herramientas) municipal, para ayudar al personal de las agencias locales y estatales. El toolkit ayudará a quienes tomen decisiones a comprender mejor las vulnerabilidades climáticas y cómo planificarlas.

Ejemplos de herramientas técnicas

visores de datos • story maps • índice de vulnerabilidad social • evaluaciones de vulnerabilidad de inundaciones, aumento del nivel del mar, calor y viento.

Ejemplos de herramientas de planificación

inventario de partes interesadas • lista de verificación para el planeamiento de la resiliencia • regulaciones modelo para la resiliencia municipal • casos de estudio • áreas cartografiadas de riesgo climático.

(map image) Resilient Connecticut apoya a las comunidades costeras y del interior con una planificación que considera el desarrollo económico y orientado al tránsito, las estrategias de conservación y las mejoras críticas en la infraestructura.

Formas de Participar

CIRCA está utilizando una variedad de actividades para ayudar a correr la voz sobre este proyecto. Asiste a uno de nuestros eventos, regístrese para recibir nuestro boletín mensual Resilience Roundup y síganos en las redes sociales a través de la página web de Resilient Connecticut: resilientconnecticut.uconn.edu.

Comparta información sobre áreas vulnerables en la región donde vive y trabaja. ¿Hay inundaciones que ocurren con frecuencia alrededor de una estación de tren, carreteras o rutas de evacuación? ¿Existen instalaciones críticas que es importante proteger, como una planta de tratamiento de aguas residuales o una central eléctrica? Para ayudar a CIRCA a identificar proyectos que beneficien tanto las necesidades regionales como locales, cuéntenos sus pensamientos en este sitio web.

Proporcione comentarios generales o su opinion en la página de inicio de Resilient Connecticut. Por ejemplo:

- ¿Cuáles son las formas en que el cambio climático está afectando a su comunidad?
- ¿Qué acciones cree que ayudarían a que su comunidad y la región sean más fuertes y resilientes a estos impactos?

El financiamiento para este proyecto es proporcionado por el Departamento de Vivienda y Desarrollo Urbanístico de los Estados Unidos. A través de el Community Block Grant National Disaster Recovery Program, a través del Programa Nacional de Subsidios Comunitarios para la Recuperación de Desastres, administrado por el departamento de Vivienda de Connecticut.

Conservation Commissions and Natural Resource Resilience

"Climate-resilient lands not only protect wildlife but also provide natural defenses against flood, drought and other risks to people." Open Space Institute[1]

The state of Connecticut is rich in natural resources and diverse wildlife, plants, and landscapes make the state an attractive place to live, work, and play. Climate change poses a threat to Connecticut, but through protection of natural areas, municipalities can enhance climate resilience. Conservation Commissions share the responsibility of guiding their municipalities in meeting open space goals as a resilient strategy. Conservation Commissions should consider the effect of climate change on natural resources and the solutions these resources provide when undertaking their duties of protecting and preserving biological diversity and natural resources.

Natural Resource Conservation and Climate Resilience

Natural resource conservation can be used as an adaptation strategy to slow the rate of climate change and its damaging effects by working to protect vulnerable areas that serve as natural buffers to climate impacts.[2] Conservation is the protection of natural resources for future generations. Conservation can include wildlife habitat restoration, deterring species extinction, enhancing resilient ecosystem services, and protecting biological diversity. Conservation Commissions can influence nature-based solutions and conservation methods to reinforce climate resilience. Blending natural features with built infrastructure through environmental management, planning, and design can foster climate change adaptation and resilience.[3]

What is a Conservation Commission?

Conservation Commissions are volunteer municipal government bodies that are authorized by Connecticut Statute to "conserve, develop, supervise and regulate natural resources (C.G.S. Ch. 97. Sec. 7-131a)." However, the charge of a Commission may vary by municipal ordinance. Commissions may manage open space, land and water resources within their jurisdictional limits. Commissions have the authority to advise other boards and agencies about conservation concerns within municipal projects and development. Conservation Commissions have a role in increasing resiliency by suggesting how climate change may further impact natural resources due to specific land management in vulnerable locations. Commissions can represent the significance of how natural features could be part of nature-based solutions to climate impacts such as flooding, excessive heat, erosion, shoreline stabilization, or poor water quality.

Coordination between municipal boards and commissions, non-governmental organizations, and even adjacent towns is imperative when addressing climate resiliency. Municipalities should utilize a Conservation Commission in finding solutions to site-specific concerns. For example, when considering flood solutions, combining best practice stormwater management with a conservation easement that protects open space and allows for natural stormwater infiltration, would be an effective use of a Conservation Commission authority and allow another level of monitoring and enforcement.

CIRCA
CONNECTICUT Department of Housing
U.S. Department of Housing and Urban Development

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Authority and Duties of a Conservation Commission

Establishment & Legal Authority

The statutory authority of a Conservation Commission derives from Chapter 97, Section 7-131a of the *Connecticut General Statutes*. Commissions are established by vote of the municipal legislature.

Membership

It is important to consider members with diverse interests and knowledge in resource conservation. Commission members serve in part to educate local citizens and officials on conservation issues and present practical and effective recommendations to land use boards and other commissions.

- *Minimum of 3 members; 11 members maximum.*
- *Maximum 3 alternate members; when seated, have all the powers and duties of a member of the commission.*
- *Members appointed, removed for cause, and vacancies filled by the Chief Executive of a given municipality.*
- *Terms served by members are designated by the legislative body establishing commission.*

Powers and Duties

Must do "Shall's":

- ✓ *Conduct research into the possible utilization of land areas within its municipality.*
- ✓ *Keep index of all open areas, publicly and privately owned, including open marshlands, swamps and other wetlands to obtain information on proper use of such land.*
  - *It may, from time to time, recommend to the planning commission or, if none, to the chief executive officer or the legislative body, plans and programs for the development and use of such areas.*
- ✓ *Keep records of its meetings and activities and shall make an annual report to the municipality.*
- ✓ *Administer gifts the same for such purposes subject to the terms of the gift.*

Permissible "May's":

- ✓ *Coordinate activities of unofficial bodies organized for similar purposes.*
- ✓ *Advertise, prepare and distribute books, maps, charts, plans, and pamphlets necessary for its purposes.*
- ✓ *Propose a Greenway plan for inclusion in conservation plan and development per Section 8-23.*
- ✓ *Inventory natural resources and formulate watershed/drought management plans.*
  - *Plans shall be consistent with water supply management plans per Section 25-32d.*
- ✓ *Make recommendations to planning, zoning, inland wetlands or other municipal commissions and agencies on proposed land use changes.*
- ✓ *With approval of municipal legislative body acquire land and easements in name of municipality and promulgate rules and regulations including but not limited to the establishment of reasonable charges for the use of land and easements for any of its purposes.*
- ✓ *Supervise/manage municipal owned open space or parks if authority delegated by entity responsible for such management*
- ✓ *Receive gifts in the name of the municipality for its purposes.*
- ✓ *Exchange information with the Department of Energy and Environmental Protection (DEEP).*
  - *Commissioner of DEEP may assign technical personnel to a commission, per request, for assistance in planning its overall program and for coordinating state and local conservation activities.*

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Natural Resources and Climate Change Impacts

Natural resources refer to living and non-living elements of the Earth system that humans rely on to survive and evolve.[4] Climate change threatens our natural resources, affects global food security and water supplies, and jeopardizes the livelihood of our public, local and national economies.[5] Local action by Conservation Commissions and their communities can enhance municipal resilience by preserving present and future natural resources and the ecosystem services they provide.

Climate Change Impacts on Natural Resources[6]

Increased Precipitation & Flooding

- Destroyed crops by silt and sediment threatening food supply
- Uprooted trees/Vegetation due to high-velocity water flow; negatively impacting the benefits of trees
- Contaminated runoff (pesticides, chemicals, sewer and debris) lead to poor water quality and endangered ecosystems
- Increased erosion and flood risks
- Altered landscape and collapsed riverbanks
- Damaged wildlife habitat

Increased Heat

- Migration of invasive pests and diseases harmful to the health of humans and the built environment
- Declined cold-water fish diversity I.e., bass and trout
- Transition of tree species from Maple/Birch to Oak/Hickory; affecting maple sap economies
- Increased toxic blue-green algae blooms in water bodies that affect public health, the environment and economies
- Shifted correlation between pollinator activity and honey production

Picture used with permission ©Guarantee Pest Elimination

Increased Drought Periods

- Failed food & crop yields; threatening food supplies and economies
- Declined drinking water resources
- Dropped wetlands; resulting in loss of habitat and carbon sequestration capabilities
- Increased freshwater salinity resulting in toxic marine algae environments for fish and ecosystems
- Adverse forest and agriculture conditions

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Resilient Environmental Conservation

Connecticut is abundant in forest, water and wildlife resources that are in need of preservation. Conservation Commissions can provide leadership on climate resiliency projects by utilizing science-based research in outreach to educate the public and planning officials. Conservation Commissions can advocate resilient measures in areas more susceptible to climate change impacts by identifying risks and recommending land use changes and nature-based solutions as mitigation strategies. When reviewing land use applications, Conservation Commissions can advocate for mitigation by use of strategies pertaining to the climate impact and site. For example, additional bioswales or limiting impervious pavement design may be an appropriate recommendation for site-specific flooding that brings risk to nearby crops.

Resilient actions such as land conservation allow ecosystems to naturally sequester carbon, reduce greenhouse gas emissions, increase plant and animal diversity and protect against climate change impacts that negatively affect our public health and infrastructure.[7] Conservation Commissions can advocate for the benefits of clustered development to protect open space and preserve crucial ecosystems and wildlife habitat. Commissions must first understand how climate change will affect the natural resources of their present and future communities and act accordingly within their authority. Below are conservation strategies that Commissions can use to improve the climate resilience of their community.

Land Conservation: Open Space Management

Conservation Easements

With approval of a legislative body, Conservation Commissions may acquire land and easements in the name of the municipality. A conservation easement is a voluntary legal agreement between a landowner and a land trust or government agency restricting the use of land to retain the "natural, scenic or open condition or in agricultural, farming, forest or open space" (C.G.S 47-42a). The landowner cedes the right to develop on a parcel yet retains ownership and the right to sell or pass property on to heirs. While some conservation easements may prohibit any land use to protect the benefits of the natural space, some may include the right to limited agricultural development depending on the agreement.[8]

Conservation easements can be a tool to expand municipal resilience through natural resource protection, but because conservation easements are permanent, special care should be taken to understand the effects of climate change on the protected parcel. The legal language creating the easement should include monitoring provisions and not preclude actions needed to adapt to an unpredictable climate. If appliable, easement amendments should incorporate changing land restrictions as climate change alters risks to land and its natural resources. For example, easements could include provisions for addressing future increased flood risk from sea level rise. Additionally, other strategies such as rolling, term-terminal and tradable easements may allow for flexibility within boundaries as climate change shifts the vulnerability and levels of resilience needed.[9]

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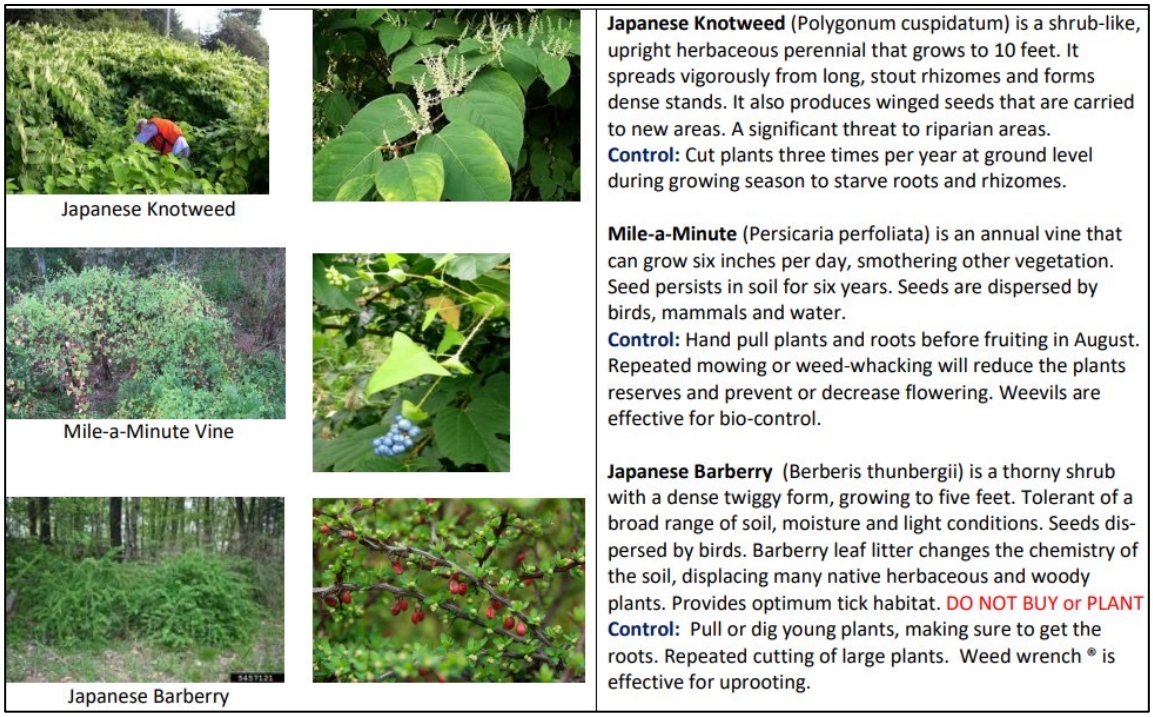
Invasive plant species removal

Native plant conservation is imperative to the sustainability of our ecosystems and climate resilience. Invasive plant species are nonnative species that may cause harm to the environment, human health and economies by displacing native species. As climate change influences higher average temperatures for Connecticut[10], it enables invasive plant and insect pest species to move in. Conservation Commissions can implement the protection and restoration of native plant populations with outreach materials on invasive species specific to their territory, best practices for removal and resources to assist with management within their communities. Commissions can host volunteer invasive species removal events to incorporate and educate their communities about ecology and the importance of invasives management.

Commissions may inventory natural resources and screen landscapes for invasive species and guide municipal management plans. Management of invasive species is community-based and relies on town wide acknowledgment and removal participation. Developing charts of native vegetation to restore will allow landowners to immediately support ecosystems and build climate resilient properties. Commissions in need of plant information of invasives found in Connecticut can visit the Connecticut Agricultural Experiment Station Field Guide. For more information on invasive species and statutes, visit The Department of Energy and Environmental Protection.

Commission Outreach

- Develop flyers, pamphlets, charts and books for public awareness of locally endangered natural resources with resilient conservation strategies that can provide hazard mitigation
- Organize seminars to educate municipal residents and other planning officials on up-to-date climate science and vulnerability assessments
- Educate on invasive plant species and the importance of town wide participation to remove them and restore native plants and trees



Text and photos used by permission from Pollinator-Pathway.org and *CT Invasive Plant Working Group (CIPWG). Connecticut Invasive Plants Council's List of 12 Invasive Plants that threaten our Environment, Economy, and Human Health. 2023.* https://www.pollinator-pathway.org/invasives

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Water Conservation

Section 8-23 of the CT General Statutes, amended by PA 15-95, requires each municipality to prepare or amend and adopt a Plan of Conservation and Development (POCD). Local Land Use Boards should be sure to include water resource planning in their municipal POCD. Conservation Commissions can suggest the:[11]

- Influence of amendments to include source water protection as climate change impacts water resources
- Inclusion of drought management in Hazard Mitigation Planning in regions that may experience more frequent periods of drought due to climate change
- Incorporation of source water protection into watershed management and open space plans
- Adoption of water ordinances for water conservation and drought planning
- Recommendation of the creation of a "Water Supply Chief/Team" to manage water resources
- Municipalities are following Emergency Supply Plans

Conservation commissions may inventory water resources and advise zoning boards to maintain critical water supply source areas as open space.[12] Commissions can advocate to homeowners the importance of water conservation in their bathrooms, kitchens and landscaping. For water efficiency ideas, visit Tips for Conserving Water.

Rainwater Harvesting

The state of Connecticut does not regulate the collection of rainwater and encourages homeowners to use rainwater for non-potable water needs. Rainwater harvesting is a great way to conserve natural resources, save money on utility bills, reduce energy used to pump water, and reduce stormwater runoff. Rainwater can be used to irrigate plants and landscapes, wash cars or home windows, but should never be used for human consumption. Conserving water resources by rainwater collection can be useful during drought periods to reduce pressure on potable water resources.[13] To learn more about the benefits and installation of rain barrels, visit A Resident's Guide to Rain Barrels in Connecticut.

Healthy Soil Practices/Soil Conservation

Water conservation can begin with healthy soil practices. Healthy soils can act as a sponge with the ability to absorb and hold its volume in water when it rains. Nature-based solutions can influence water conservation by healthy soils and its ability to capture and store much more water. Regions that experience periods of drought should seek healthy soil as it can deliver water to plants and crops in the most needed times. Organic matter and living organisms improve soil health and hydrologic function.[14] With a focus on healthy soils, less water can be irrigated for agricultural purposes which enhances the conservation and resiliency of water resources.

Conservation Commissions can provide resources about the negatives of tillage and plowing within applicable municipal agricultural lands and influence best practices such as growing cover crops and diversifying crop and animal rotations. Organic matter is then naturally created and will better harness and distribute water for increased crop yields. Healthy soil practices have the resilient benefits of carbon sequestration and decreasing drought risks to crops.[15]

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Forest and Tree Conservation

Trees are renewable resources that add to the quality of life by filtering pollutants from the air, boosting mental health, moderating temperatures and reducing urban heat, providing habitats for wildlife, providing shade, conserving heating and cooling energy, preventing soil erosion, slowing stormwater runoff, filtering drinking water and serving as carbon sinks by sequestering atmospheric carbon dioxide. The many benefits of trees allow ecosystems to be more resilient to climate change effects. The conservation and restoration of trees allows present and future generations to enjoy the benefits that trees bring to communities. Conservation Commissions can encourage landowners to plant native trees and perform tree maintenance on existing trees. Commissions may suggest to municipal Planning and Zoning boards to implement Tree Protection ordinances or other Street Tree Requirements to influence tree planting. Conservation Commissions may act as a Tree Commission if granted authority by the local legislative body and can develop action plans to protect the tree canopy. An example of a large city Tree Action Plan is the City of Hartford's plan to protect and expand their tree canopy with coinciding resilient benefits.

Tree Warden

When considering tree maintenance, Conservation Commissions may assist the municipal tree warden by bringing attention to damaged trees or trees that are hosts to invasive species, and regulate and enact tree maintenance. In collaboration with the tree warden, Commissions can further assist by removal or planting of trees and making recommendations for the preservation of trees within their jurisdictional limits. Per *Connecticut Statute Chapter 451 Section 23-59*, *"...care and control shall extend to such limbs, roots or parts of trees and shrubs as extend or overhang the limits of any such public road or grounds."* Although a base of a tree may lie on privately owned land, the "*care and control*" of a tree that "*extends into public road or grounds*" belongs to a municipal tree warden. Conservation Commissions can work with the tree warden to educate the public about the benefits of trees, and how to choose climate resilient and ecologically appropriate species for specific sites.

Forest Protection

Forests are natural landscapes that reduce and store carbon that lessen the effects of climate change. Conservation Commissions are integral in protecting local forests by advising on municipal policy for open space and park acquisition and management. Town Plans of Conservation and Development serve as a guide to town goals for forest and tree protections. In particular, core forests, those more than 300 feet from the forest boundary, are in acute need of protection statewide.[16] Additionally, if delegated by the body having such authority, Conservation Commissions can supervise or manage municipally owned parks or open space and promulgate rules and regulations for those properties, including setting specific time frames and reasonable fees for public use.

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Wildlife Conservation

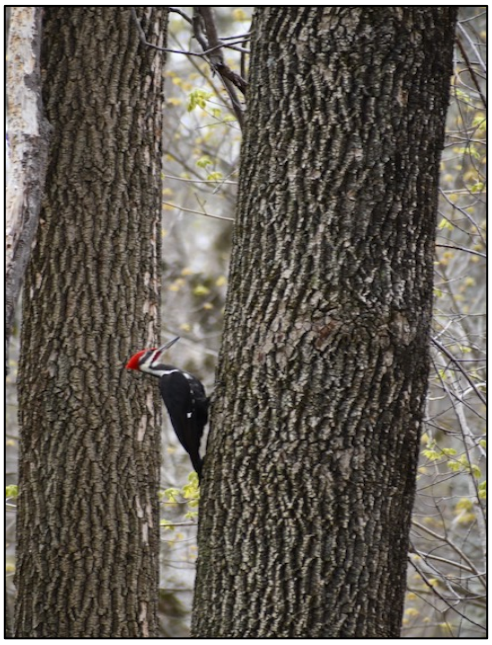
Wildlife conservation stimulates ecological stability, secures the food chain, and strengthens our food security. Working alongside local environmental non-governmental organizations like the Connecticut Audubon Society, Commissions can gain conservation knowledge on project initiatives concerning birds, wildlife and their habitats. With diverse expertise, Audubon staff can examine and assess wildlife habitats in specific locations and create plans to enhance conservation and resilience while considering ecology, wetlands management, soil science and more.[17] Commissions can create outreach materials for the public to recognize the importance of wildlife and provide ways to protect their diversity.

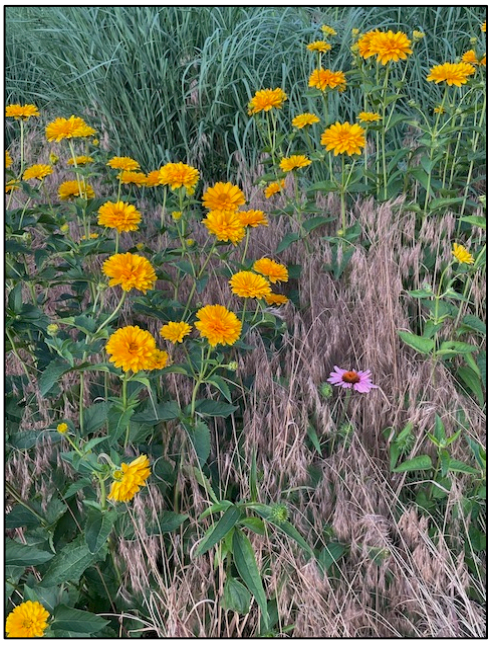
Pollinator Gardens

Human food supplies rely on the resilience of pollinator species, making their conservation, biodiversity and protection crucial. "Pollinators are responsible for 1 out of 3 bites of food we take each day,"[18] yet pollinator populations have declined drastically. Commissions can influence the creation of pollinator gardens within their communities. These gardens can generate or enlarge habitats benefiting bees, butterflies, birds and bats. Native trees and shrubs such as Flowering Dogwood, may be used to define the boundaries of a larger garden to provide nectar, pollen, fruit and host habitat.[19] Allocating ample nectar and pollen sources through pollinator gardens can enhance pollinator populations and provide resilience to human food supplies and other ecosystem services as climate change and development impacts our resources.

Nest boxes and Bat houses

Birds and Bats are crucial to climate resilience because they eat insects, pollinate flowers and are naturally responsible for growing plants and trees by spreading seeds. Bats consume a large volume of insects nightly, many that can cause harm to people, crops and forests. Encouraging bird and bat conservation and increasing their habitats can lower pest control costs.[20] As climate change brings warmer climates for Connecticut, more pests can affect crop yields. Birds and bats can help mitigate those effects by pest consumption and seed spreading. Conservation Commissions can educate about the use of nest boxes and bat houses to help protect bird and bat species and preserve their ecological role.





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Environmental Management: Influence Nature-based solutions

"Lands managed with the climate in mind also filter and protect water supplies, increase soil fertility and forest productivity, foster biodiversity and strengthen ecosystems' capacity to withstand drought and extreme weather – reducing flooding, runoff, and erosion."[21] The Federal Emergency Management Agency defines nature-based solutions as, "sustainable planning, design, environmental management and engineering practices that weave natural features or processes into the built environment to promote adaptation and resilience."[22] Nature-based solutions can be used to combat climate change, restore wetlands, reduce flood risks, reduce urban heat, add recreational opportunities and more.[23] Conservation Commissions can incorporate nature-based solutions into conservation strategies to further increase natural resource resilience and store carbon within landscapes such as forests and wetlands without intervention.

Wetland Conservation and Restoration

Conservation Commissions must "*keep index of all open areas, publicly and privately owned, including open marshlands, swamps and other wetlands to obtain information on proper use of such land.*" (C.G.S Chapter 97, Section 7-131a). They may recommend plans and programs for the development and use of such areas to municipal Planning and Zoning commissions and consult on development applications near or within wetlands that can alter the state of the natural resource. Wetlands are crucial natural resources because they provide habitat for diverse animal and plant species, buffer against natural flooding and storm surge, provide recreation, naturally filter water, and act as a carbon sink. Conservation and restoration of wetlands are imperative to coastal and inland wetlands in providing climate resilience to flood, drought, storm and erosion risks.

Green Infrastructure

Green roofs, rain gardens or engineered bioswales can influence climate resilience by absorbing stormwater, reducing the risks of infrastructure flooding and protecting rivers and streams from harmful pollutants and sediment. These nature-based solutions offer additional ecological benefits such as wildlife habitat that support biodiversity for birds and pollinators, promote stronger mental health[24], reduce urban heat, and reduce energy use and associated costs.[25] Conservation Commissions can investigate green infrastructure alternatives and make suggestions to zoning boards and landowners on resilient implementation.

Reforestation

Reforestation can mitigate the negative impacts of climate change. Commissions can seek to conserve and develop resources for their municipality. They can assist municipalities in applying for forestry grants such as CT DEEP's America the Beautiful and use funds to plant trees to advance urban forestry in collaboration with boards and selectmen. Suggesting and implementing reforestation within conservation easements on public and private land is a great way to secure tree resources that will enhance the resiliency of natural carbon sequestration, wildlife habitats and cleaner air supplies for future generations.

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Greenways

Per *CT General Statute § 8-23*, Conservation Commissions may "propose a Greenway plan for inclusion in conservation plan and development of the municipality." Connecticut Public Act 95-335 defines a greenway as a "corridor of open space that:

1. may protect natural resources, preserve scenic landscapes and historical resources or offer opportunities for recreation or non-motorized transportation;
2. may connect existing protected areas and provide access to the outdoors;
3. may be located along a defining natural feature, such as a waterway, along a man-made corridor, including an unused right of way, traditional trail routes or historic barge canals; or
4. may be a green space along a highway or around a village"[26]

Greenways can protect land and natural resources with the opportunity to restore wetlands, prairies, flood plains and habitats with the benefits of linking our communities together and influencing healthy lifestyles. Greenway projects can be submitted to the Greenways Council for resource protection and enhanced resilience consideration.[27]

How can CT DEEP help?

Commissions can request technical assistance from certified personnel to assist with in-depth planning that coordinates with state and local conservation efforts that may be outside of their capability. Check out the vast library of conservation related information and grant programs they offer by searching CT DEEP.

Conservation Commissions should support and enable climate awareness within their communities to enhance conservation and protection of natural resources, improve ecosystem services and sustain resilience to the impacts of a changing climate. Serving as a research body, keeping proper index of open space and wetlands, and recommending sustainable development in vulnerable areas, Conservation Commissions can use their authority to promote resilient conservation within their municipality.

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Contact

For more information on Conservation Commissions, please contact Kayla Vargas, Research Technician, CIRCA, kayla.vargas@uconn.edu

Photos courtesy of Kayla Vargas, Louanne Cooley, or as cited.

To learn more about CIRCA visit circa.uconn.edu and the Resilient Connecticut project for more climate resilience planning tools: resilientconnecticut.uconn.edu

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Funding & Other Resources

Per *Connecticut Statue, section 7-131a*, municipalities may appropriate funds to a Conservation Commission. Commissions can also pursue municipal, state and federal funding for conservation research, natural resource restoration and land protection projects. Check out these resources below to help fund conservation projects:

Federal

- FEMA Pre-Disaster Mitigation (PDM) Grant
- US Department of Interior Land and Water Conservation Fund
- FEMA Hazard Mitigation Assistance Grants
- US Fish & Wildlife Traditional Conservation Funds
- USDA: Environmental Quality Incentives Program
- CT DEEP Grants for Control of Aquatic Invasive Species

State

- State Wildlife Grants
- Open Space and Watershed Land Acquisition Grant Program
- Urban Green and Community Gardens Grant Program
- State Conservation Tax incentives

Other

- Wildlife Conservation Society: Climate Adaptation Fund
- Conservation Innovation Grants
- Connecticut Conservation Programs
- Connecticut Association of Conservation and Inland Wetlands Commissions (CACIWC)
- CT DEEP Natural Resources

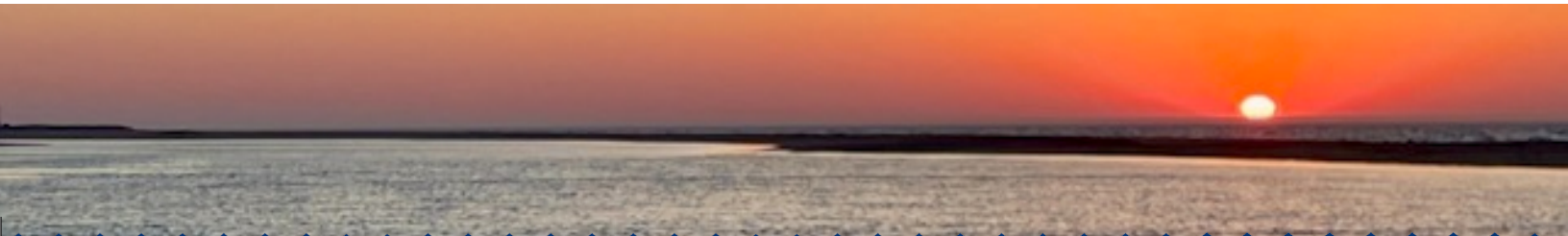
References

1. *Resilient landscapes funds*. Open Space Institute. Retrieved September 27, 2022, from https://www.openspaceinstitute.org/funds/resilient-landscapes-funds.
2. *Ecosystem-based adaptation briefing note series: Protecting nature to protect people*. UN Environment Programme. (6 October, 2022). Retrieved May 4, 2023, from https://www.unep.org/gan/news/editorial/ecosystem-based-adaptation-briefing-note-series-protecting-nature-protect-people.
3. *Nature-based solutions*. FEMA.gov. (21 December, 2022). Retrieved March 15, 2023, from https://www.fema.gov/emergency-managers /risk-management/nature-based-solutions.
4. Bansard, J. and M. Schröder, *The Sustainable Use of Natural Resources: The Governance Challenge*, Earth Negotiations Bulletin Brief 16, International Institute for Sustainable Development, (2021), https://www.iisd.org/articles/deep-dive/sustainable-use-natural-resources-governance-challenge.
5. Cho, R. (20 June, 2019). *How climate change impacts the economy*. State of the Planet. Retrieved May 4, 2023, from https://news.climate.columbia.edu/2019/06/20/climate-change-economy-impacts/.
6. USGCRP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018; *See:* Anji Seth et al., *Connecticut Physical Climate Science Assessment Report (PCSAR): Observed trends and projections of temperature and precipitation*, (2019), https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/11/CTPCSAR-Aug2019.pdf and NH Sea Grant and UNH Cooperative Extension, *What Conservation Commissions Can Do to Protect Natural Resources in a Changing Climate*, Retrieved September 26, 2022, from https://extension.unh.edu/sites/default/files/migrated_unmanaged_files/Resource007030_Rep10170.pdf.

Funding for this project is provided by the U.S. Department of Housing and Urban Development through the Community Development Block Grant National Disaster Recovery Program, as administered by the Connecticut Department of Housing.

References Continued

7. Rebecca L. Kihslinger & Jessica Wilkinson eds., Lasting Landscapes: Reflections on the Role of Conservation Science in Land Use Planning (Envtl. L. Inst. 2007).
8. *Conservation easements*. Town of Vernon. Retrieved October 12, 2022, from https://www.vernon-ct.gov/government/board-and-commissions/conservation-commission/conservation-easements.
9. *Can private land conservation efforts adapt to climate change?* Yale Environment Review. (2 May, 2017). Retrieved October 12, 2022, from https://environment-review.yale.edu/can-private-land-conservation-efforts-adapt-climate-change-0#:~:text=Climate%20change%20impacts%20will%20challenge,privately%20owned%20land%20in%20perpetuity.
10. Seth, *supra* note 6.
11. Denise Savageau, 29 Oct. 2022, Managing for water resources in a changing climate, presentation at 45th annual meeting of Connecticut Association of Conservation and Inland Wetlands Commissions.
12. CT Department of Energy and Environmental Protection. *Management*. CT.gov. Retrieved March 15, 2023, from https://portal.ct.gov/DEEP/Aquifer-Protection-and-Groundwater/Ground-Water/Understanding-Ground-Water/Management.
13. CT Department of Energy and Environmental Protection. Rainfall as a Resource: A Resident's Guide to Rain Barrels in Connecticut. Retrieved March 15, 2023 from https://portal.ct.gov/-/media/DEEP/water/watershed_management/wm_plans/LID/whatisarainbarrelpdf.pdf?la=en
14. *The importance of Good Soil Health*. TennGreen Land Conservancy. (2 December, 2021). Retrieved from https://tenngreen.org/celebrate-good-soil-health/#:~:text=Healthy%20soils%20with%20a%20variety,healthy%20soils%20also%20regulate%20temperature.
15. Nichols, R. (12 May, 2015). *A hedge against drought: Why healthy soil is 'water in the bank'*. USDA. Retrieved November 2, 2022, from https://www.usda.gov/media/blog/2015/05/12/hedge-against-drought-why-healthy-soil-water-bank#:~:text=While%20most%20look%20to%20the,in%20handy%20during%20dry%20spells.
16. CT Department of Energy and Environmental Protection Forestry Division, 2020, Connecticut's 2020 Forest Action Plan, https://portal.ct.gov/-/media/DEEP/forestry/2020-Approved-CT-Forest-Action-Plan.pdf .
17. Connecticut Audubon Society. (14 August, 2020). Retrieved November 10, 2022, from https://www.ctaudubon.org/.
18. *The importance of pollinators*. USDA. Retrieved November 9, 2022, from https://www.usda.gov/peoples-garden/pollinators#:~:text=Pollinators%20by%20Numbers,bees%20help%20increase%20crop%20yields.
19. *Deer Pond Farm - Bird & Pollinator Garden*. Connecticut Audubon Society. (16 September, 2022). Retrieved November 9, 2022, from https://www.ctaudubon.org/deer-pond-farm-bird-pollinator-garden/.
20. *Bats*. USDA. Retrieved November 10, 2022, from https://www.usda.gov/peoples-garden/pollinators/bats.
21. Land Trust Alliance, *Conservation in a Changing Climate: Natural Climate Solutions*, (18 December, 2019). Retrieved November 13, 2022, from https://climatechange.lta.org/natural-climate-solutions/.
22. FEMA, *Nature-Based Solutions*. (8 May, 2023). Retrieved May 16, 2023, from https://www.fema.gov/emergency-managers/risk-management/nature-based-solutions.
23. *Supra* Land Trust Alliance, note 21.
24. World Wildlife Fund. (10 November, 2020). *What are nature-based solutions and how can they help us address the Climate Crisis?* WWF. Retrieved October 13, 2022, from https://www.worldwildlife.org/stories/what-are-nature-based-solutions-and-how-can-they-help-us-address-the-climate-crisis.
25. Office of Sustainability. (26 September, 2018). *Hartford's Green Infrastructure Project*. Green Infrastructure Handbook Best Management Practices in Hartford, Connecticut . Retrieved November 14, 2022, from https://circa.uconn.edu/2018/09/26/hartfords-green-infrastructure-project/.
26. Public act summary for 95-335. Retrieved November 14, 2022, from https://www.cga.ct.gov/ps95/sum/sum0335.htm.
27. *Establishing Greenways Criteria*. CT.gov. (17 November, 2014). Retrieved October 24, 2022, from https://portal.ct.gov/DEEP/Outdoor-Recreation/Greenways/Establishing-Greenways-Criteria.



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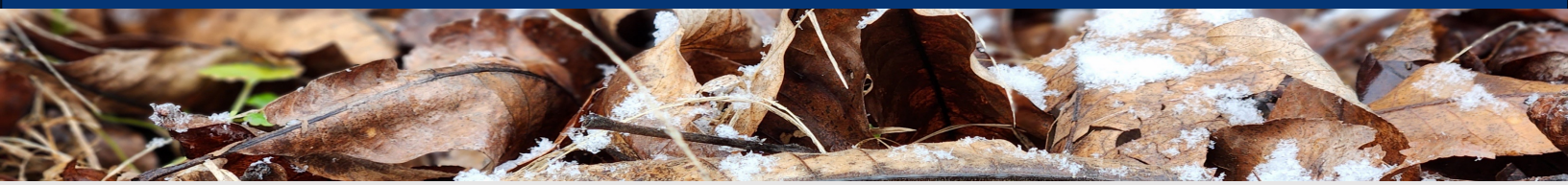

Comisiones de Conservación y Resiliencia de Recursos Naturales

"Las tierras resilientes al clima no solo protegen la vida silvestre, sino que también proporcionan defensas naturales contra inundaciones, sequías y otros riesgos para las personas." Instituto de Espacio Abierto[1]

El estado de Connecticut es rico en recursos naturales y la diversidad de vida silvestre, plantas y paisajes hacen del estado un lugar atractivo para vivir, trabajar y jugar. El cambio climático representa una amenaza para Connecticut, pero a través de la protección de las áreas naturales, los municipios pueden mejorar la resiliencia climática. Las Comisiones de Conservación comparten la responsabilidad de guiar a sus municipios en el cumplimiento de los objetivos de espacios abiertos como una estrategia resiliente. Las Comisiones de Conservación deben considerar el efecto del cambio climático en los recursos naturales y las soluciones que estos recursos proporcionan al asumir sus deberes de proteger y preservar la diversidad biológica y los recursos naturales.

Conservación de Recursos Naturales y Resiliencia Climática

La conservación de los recursos naturales puede utilizarse como una estrategia de adaptación para frenar el ritmo del cambio climático y sus efectos nocivos, trabajando para proteger las zonas vulnerables que sirven de amortiguadores naturales a los impactos climáticos.[2] La conservación es la protección de los recursos naturales para las generaciones futuras. La conservación puede incluir la restauración del hábitat de la vida silvestre, la disuasión de la extinción de especies, la mejora de los servicios ecosistémicos resilientes y la protección de la diversidad biológica. Las Comisiones de Conservación pueden influir en las soluciones basadas en la naturaleza y en los métodos de conservación para reforzar la resiliencia climática. La combinación de características naturales con la infraestructura construida a través de la gestión, la planificación y el diseño ambientales puede fomentar la adaptación y la resiliencia al cambio climático.[3]

¿Qué es una Comisión de Conservación?

Las Comisiones de Conservación son organismos voluntarios del gobierno municipal que están autorizados por el Estatuto de Connecticut para "conservar, desarrollar, supervisar y regular los recursos naturales" (C.G.S. Cap. 97. Sec. 7-131a)." Sin embargo, el cargo de una Comisión puede variar según la ordenanza municipal. Las comisiones pueden administrar los espacios abiertos, la tierra y los recursos hídricos dentro de sus límites jurisdiccionales. Las comisiones tienen la autoridad para asesorar a otras juntas y agencias sobre las preocupaciones de conservación dentro de los proyectos y el desarrollo municipal. Las comisiones de conservación tienen un papel en el aumento de la resiliencia al sugerir cómo el cambio climático puede afectar aún más a los recursos naturales debido a la gestión específica de la tierra en lugares vulnerables. Las comisiones pueden representar la importancia de cómo las características naturales podrían ser parte de las soluciones basadas en la naturaleza para los impactos climáticos, como las inundaciones, el calor excesivo, la erosión, la estabilización de la costa o la mala calidad del agua.

La coordinación entre las juntas y comisiones municipales, las organizaciones no gubernamentales e incluso las ciudades adyacentes es imprescindible cuando se aborda la resiliencia climática. Los municipios deben utilizar una Comisión de Conservación para encontrar soluciones a los problemas específicos del sitio. Por ejemplo, al considerar soluciones para inundaciones, combinar las mejores prácticas de manejo de aguas pluviales con una servidumbre de conservación que proteja los espacios abiertos y permita la infiltración natural de aguas pluviales, sería un uso efectivo de una autoridad de la Comisión de Conservación y permitiría otro nivel de monitoreo y cumplimiento.

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Los fondos para este proyecto son proporcionados por el Departamento de Vivienda y Desarrollo Urbano de los Estados Unidos a través del Programa Nacional de Recuperación de Desastres de Subvención en Bloque para el Desarrollo Comunitario, administrado por el Departamento de Vivienda de Connecticut.

Autoridad y deberes de una Comisión de Conservación

Establecimiento y Autoridad Legal

La autoridad estatutaria de una Comisión de Conservación se deriva del Capítulo 97, Sección 7-131a de los Estatutos Generales de Connecticut. Las comisiones se establecen por votación de la legislatura municipal.

La Afiliación

Es importante considerar a los miembros con diversos intereses y conocimientos en la conservación de los recursos. Los miembros de la comisión sirven en parte para educar a los ciudadanos y funcionarios locales sobre temas de conservación y presentar recomendaciones prácticas y efectivas a las juntas de uso de la tierra y otras comisiones.

- *Mínimo de 3 miembros; máximo 11 miembros.*
- *Máximo 3 miembros suplentes; Cuando esté sentado, tendrá todas las facultades y deberes de un miembro de la Comisión.*
- *Miembros nombrados, removidos por causa justificada y vacantes cubiertas por el Jefe Ejecutivo de un municipio determinado.*
- *Los mandatos de los miembros son designados por el órgano legislativo que establece la comisión.*

Poderes y Deberes

Debe hacer "Shall's":

- ✓ Realizar investigaciones sobre la posible utilización de las áreas de tierra dentro de su municipio.
- ✓ Mantener un índice de todas las áreas abiertas, de propiedad pública y privada, incluidas las marismas abiertas, los pantanos y otros humedales para obtener información sobre el uso adecuado de dichas tierras.
    - Puede, de vez en cuando, recomendar a la comisión de planificación o, si no hay ninguna, al director ejecutivo o al cuerpo legislativo, planes y programas para el desarrollo y uso de dichas áreas.
- ✓ Llevar un registro de sus reuniones y actividades y rendir un informe anual a la municipalidad.
- ✓ Administrar los regalos de los mismos para tales fines, sujeto a los términos del regalo.

Permisible "May's":

- ✓ Coordinar las actividades de los organismos no oficiales organizados con fines similares.
- ✓ Publicitar, preparar y distribuir libros, mapas, gráficos, planos y folletos necesarios para sus fines.
- ✓ Proponer un plan de Vía Verde para su inclusión en el plan de conservación y desarrollo según la Sección 8-23.
- ✓ Inventariar los recursos naturales y formular planes de manejo de cuencas hidrográficas/sequías.
    - Los planes deben ser consistentes con los planes de manejo del suministro de agua según la Sección 25-32d.
- ✓ Hacer recomendaciones a las comisiones de planificación, zonificación, humedales continentales u otras comisiones y agencias municipales sobre los cambios propuestos en el uso de la tierra.
- ✓ Con la aprobación del cuerpo legislativo municipal, adquirir tierras y servidumbres en nombre de la municipalidad y promulgar reglas y reglamentos, incluidos, entre otros, el establecimiento de cargos razonables por el uso de la tierra y las servidumbres para cualquiera de sus propósitos.
- ✓ Supervisar/administrar los espacios abiertos o parques de propiedad municipal si la autoridad es delegada por la entidad responsable de dicha gestión.
- ✓ Recibir regalos en nombre del municipio para sus fines.
- ✓ Intercambiar información con el Departamento de Energía y Protección Ambiental (DEEP, por sus siglas en inglés).
    - El comisionado de DEEP puede asignar personal técnico a una comisión, previa solicitud, para que le ayude en la planificación de su programa general y para coordinar las actividades de conservación estatales y locales.

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Recursos Naturales e Impactos del Cambio Climático

Los recursos naturales se refieren a elementos vivos y no vivos del sistema de la Tierra en los que los seres humanos dependen para sobrevivir y evolucionar.[4] El cambio climático amenaza nuestros recursos naturales, afecta la seguridad alimentaria mundial y el suministro de agua, y pone en peligro los medios de vida de nuestras economías públicas, locales y nacionales. [5] La acción local de las Comisiones de Conservación y sus comunidades puede mejorar la resiliencia municipal al preservar los recursos naturales presentes y futuros y los servicios ecosistémicos que proporcionan.

Impactos del Cambio Climático en los Recursos Naturales[6]

Aumento de las precipitaciones e inundaciones

- Cultivos destruidos por el limo y los sedimentos que amenazan el suministro de alimentos.
- Árboles arrancados de raíz / vegetación debido al flujo de agua de alta velocidad impactando negativamente en los beneficios de los árboles.
- La escorrentía contaminada (pesticidas, productos químicos, alcantarillado y escombros) conduce a una mala calidad del agua y ecosistemas en peligro de extinción.
- Aumento de los riesgos de erosión e inundaciones.
- Paisaje alterado y riberas colapsadas.
- Hábitat de vida silvestre dañado.

Aumento del calor

- Migración de plagas y enfermedades invasoras dañinas para la salud de los seres humanos y el entorno construido.
- Disminución de la diversidad de peces de agua fría, es decir, lubina y trucha.
- Transición de especies arbóreas de arce/abedul a roble/nogal americano; afectando a las economías de la savia de arce.
- Aumento de la proliferación de algas tóxicas verdeazuladas en los cuerpos de agua que afectan la salud pública, el medio ambiente y las economías.
- Cambió la correlación entre la actividad de los polinizadores y la producción de miel.

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Aumento de los períodos de sequía

- Fallas en el rendimiento de los alimentos y los cultivos; amenaza el suministro de alimentos y las economías.
- Disminución de los recursos de agua potable.
- Caída de los humedales, lo que provoca la pérdida de hábitat y de la capacidad de secuestro de carbono.
- Aumento de la salinidad del agua dulce, lo que da lugar a entornos tóxicos de algas marinas para los peces y los ecosistemas.
- Condiciones forestales y agrícolas adversas.

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U.S. Department of Housing and Urban Development

Los fondos para este proyecto son proporcionados por el Departamento de Vivienda y Desarrollo Urbano de los Estados Unidos a través del Programa Nacional de Recuperación de Desastres de Subvención en Bloque para el Desarrollo Comunitario, administrado por el Departamento de Vivienda de Connecticut.

Conservación Resiliente del Medio Ambiente

Connecticut es abundante en recursos forestales, hídricos y de vida silvestre que necesitan preservación. Las Comisiones de Conservación pueden proporcionar liderazgo en proyectos de resiliencia climática mediante la utilización de la investigación basada en la ciencia en la divulgación para educar al público y a los funcionarios de planificación. Las Comisiones de Conservación pueden abogar por medidas resilientes en las zonas más susceptibles a los impactos del cambio climático identificando los riesgos y recomendando cambios en el uso de la tierra y soluciones basadas en la naturaleza como estrategias de mitigación. Al revisar las aplicaciones de uso de la tierra, las Comisiones de Conservación pueden abogar por la mitigación mediante el uso de estrategias relacionadas con el impacto climático y el sitio. Por ejemplo, los productos biológicos adicionales o la limitación del diseño de pavimentos impermeables pueden ser una recomendación adecuada para inundaciones específicas del sitio que traen riesgo a los cultivos cercanos.

Las acciones resilientes, como la conservación de la tierra, permiten que los ecosistemas secuestren carbono de forma natural, reduzcan las emisiones de gases de efecto invernadero, aumenten la diversidad vegetal y animal y protejan contra los impactos del cambio climático que afectan negativamente a nuestra salud pública e infraestructura.[7] Las Comisiones de Conservación pueden abogar por los beneficios del desarrollo agrupado para proteger los espacios abiertos y preservar los ecosistemas cruciales y el hábitat de la vida silvestre. En primer lugar, las comisiones deben comprender cómo afectará el cambio climático a los recursos naturales de sus comunidades presentes y futuras, y actuar en consecuencia dentro de su autoridad. A continuación se presentan las estrategias de conservación que las comisiones pueden utilizar para mejorar la resiliencia climática de su comunidad.

Conservación de la Tierra: Gestión de Espacios Abiertos

Servidumbres de conservación

Con la aprobación de un cuerpo legislativo, las Comisiones de Conservación pueden adquirir tierras y servidumbres a nombre del municipio. Una servidumbre de conservación es un acuerdo legal voluntario entre un propietario y un fideicomiso de tierras o una agencia gubernamental que restringe el uso de la tierra para retener el"condiciones naturales, escénicas o abiertas o en espacios agrícolas, ganaderos, forestales o abiertos" (C.G.S 47-42a). El propietario cede el derecho a desarrollar en una parcela, pero conserva la propiedad y el derecho a vender o transmitir la propiedad a los herederos. Si bien algunas servidumbres de conservación pueden prohibir cualquier uso de la tierra para proteger los beneficios del espacio natural, algunas pueden incluir el derecho a un desarrollo agrícola limitado según el acuerdo.[8]

Las servidumbres de conservación pueden ser una herramienta para expandir la resiliencia municipal a través de la protección de los recursos naturales, pero debido a que las servidumbres de conservación son permanentes, se debe tener especial cuidadopara comprender los efectos del cambio climático en la parcela protegida. El lenguaje legal que crea la servidumbre debe incluir disposiciones de monitoreo y no excluir las acciones necesarias para adaptarse a un clima impredecible. Si es aplicable, las enmiendas a la servidumbre deben incorporar restricciones de tierras cambiantes a medida que el cambio climático altera los riesgos para la tierra y sus recursos naturales. Por ejemplo, las servidumbres podrían incluir disposiciones para hacer frente al aumento futuro del riesgo de inundación por el aumento del nivel del mar. Además, otras estrategias, como las servidumbres de paso, las servidumbres a plazo y las servidumbres negociables, pueden permitir la flexibilidad dentro de los límites a medida que el cambio climático cambia la vulnerabilidad y los niveles de resiliencia necesarios.[9]

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Eliminación de especies vegetales invasoras

La conservación de las plantas nativas es imprescindible para la sostenibilidad de nuestros ecosistemas y la resiliencia climática. Las especies de plantas invasoras son especies no nativas que pueden causar daños al medio ambiente, la salud humana y las economías al desplazar a las especies nativas. A medida que el cambio climático influye en las temperaturas promedio más altas de Connecticut[10], permite que las especies invasoras de plagas de plantas e insectos se muevan. Las Comisiones de Conservación pueden implementar la protección y restauración de las poblaciones de plantas nativas con materiales de divulgación sobre especies invasoras específicas de su territorio, mejores prácticas para la remoción y recursos para ayudar con el manejo dentro de sus comunidades. Las comisiones pueden organizar eventos voluntarios de eliminación de especies invasoras para incorporar y educar a sus comunidades sobre la ecología y la importancia del manejo de especies invasoras.

Las comisiones pueden inventariar los recursos naturales y examinar los paisajes en busca de especies invasoras y orientar los planes de gestión municipales. El manejo de las especies invasoras se basa en la comunidad y se basa en el reconocimiento de toda la ciudad y la participación en la eliminación. El desarrollo de gráficos de vegetación nativa para restaurar permitirá a los propietarios de tierras apoyar inmediatamente los ecosistemas y construir propiedades resistentes al clima. Las comisiones que necesiten información sobre las plantas invasoras que se encuentran en Connecticut pueden visitar la Guía de campo de la Estación Experimental Agrícola de Connecticut. Para obtener más información sobre las especies invasoras y los estatutos, visite el Departamento de Energía y Protección Ambiental.

Divulgación de la Comisión

- Desarrollar volantes, panfletos, gráficos y libros para la concientización pública sobre los recursos naturales en peligro de extinción local con estrategias de conservación resilientes que puedan proporcionar mitigación de riesgos.
- Organizar seminarios para educar a los residentes municipales y otros funcionarios de planificación sobre la ciencia climática actualizada y las evaluaciones de vulnerabilidad.
- Educar sobre las especies de plantas invasoras y la importancia de la participación de toda la ciudad para eliminarlas y restaurar las plantas y árboles nativos.

Japanese Knotweed (Polygonum cuspidatum) es una planta herbácea perenne erguida similar a un arbusto que crece hasta 10 pies. Se propaga vigorosamente a partir de rizomas largos y robustos y forma rodales densos. También produce semillas aladas que se llevan a nuevas áreas. Una amenaza significativa para las zonas ribereñas. Control: Cura las plantas tres veces al año a nivel del suelo durante la temporada de crecimiento para matar de hambre a las raíces y los rizomas.

Mile-a-Minute (Persicaria perfoliate) es una enredadera anual que puede crecer seis pulgadas por día, sofocando otra vegetación. Las semillas persisten en el suelo durante seis años. Las semillas son dispersadas por aves, mamíferos y agua. Control: Arrancar a mano las plantas y las raíces antes de fructificar en agosto. La siega repetida o el corte de malezas reducirá las reservas de las plantas y evitará o disminuirá la floración. Los gorgojos son eficaces para el control biológico.

El agracejo japonés (Berberis thunbergii) es un arbusto espinoso con una forma densa de ramitas, que crece hasta cinco pies. Tolera una amplia gama de condiciones de suelo, humedad y luz. Parece disperso por los pájaros. La hojarasca de agracejo cambia la química del suelo, desplazando a muchas plantas herbáceas y leñosas nativas. Proporciona un hábitat óptimo para las garrapatas. **NO COMPRE NI PLANTE.** Control: arranca o cava las plantas jóvenes, asegurándote de obtener las raíces. Corte repetido de plantas grandes. La llave para malezas es eficaz para arrancar de raíz.

Text and photos used by permission from Pollinator-Pathway.org and *CT Invasive Plant Working Group (CIPWG). Connecticut Invasive Plants Council's List of 12 Invasive Plants that threaten our Environment, Economy, and Human Health. 2023.* https://www.pollinator-pathway.org/invasives

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Conservación del agua

La Sección 8-23 de los Estatutos Generales de CT, enmendada por PA 15-95, requiere que cada municipio prepare o enmiende y adopte un Plan de Conservación y Desarrollo (POCD). Las Juntas Locales de Uso de la Tierra deben asegurarse de incluir la planificación de los recursos hídricos en su POCD municipal. Las Comisiones de Conservación pueden sugerir:[11]

- Influencia de las enmiendas para incluir la protección de las fuentes de agua a medida que el cambio climático afecta a los recursos hídricos
- Inclusión de la gestión de la sequía en la planificación de la mitigación de riesgos en regiones que pueden experimentar períodos de sequía más frecuentes debido al cambio climático
- Incorporación de la protección de las fuentes de agua en los planes de gestión de cuencas hidrográficas y espacios abiertos
- Adopción de ordenanzas sobre el agua para la conservación del agua y la planificación de la sequía
- Recomendación de la creación de un "Jefe/Equipo de Abastecimiento de Agua" para gestionar los recursos hídricos
- Los municipios están siguiendo los Planes de Suministro de Emergencia

Las comisiones de conservación pueden inventariar los recursos hídricos y asesorar a las juntas de zonificación para que mantengan las áreas críticas de fuentes de suministro de agua como espacios abiertos.[12] Las comisiones pueden recomendar a los propietarios de viviendas la importancia de la conservación del agua en sus baños, cocinas y jardines. Para obtener ideas sobre la eficiencia del agua, visite Consejos para conservar el agua.

Recolección de agua de Lluvia

El estado de Connecticut no regula la recolección de agua de lluvia y alienta a los propietarios de viviendas a usar el agua de lluvia para necesidades de agua no potable. La recolección de agua de lluvia es una excelente manera de conservar los recursos naturales, ahorrar dinero en las facturas de servicios públicos, reducir la energía utilizada para bombear agua y reducir la escorrentía de aguas pluviales. El agua de lluvia se puede utilizar para regar plantas y jardines, lavar coches o ventanas de casas, pero nunca debe utilizarse para el consumo humano. La conservación de los recursos hídricos mediante la recolección de agua de lluvia puede ser útil durante los períodos de sequía para reducir la presión sobre los recursos de agua potable.[13] Para obtener más información sobre los beneficios y la instalación de barriles de lluvia, visite A Resident's Guide to Rain Barrels in Connecticut.

Prácticas Saludables del Suelo/Conservación del Suelo

La conservación del agua puede comenzar con prácticas saludables en el suelo. Los suelos sanos pueden actuar como una esponja con la capacidad de absorber y mantener su volumen en agua cuando llueve. Las soluciones basadas en la naturaleza pueden influir en la conservación del agua mediante suelos sanos y su capacidad para capturar y almacenar mucha más agua. Las regiones que experimentan períodos de sequía deben buscar un suelo saludable, ya que puede suministrar agua a las plantas y los cultivos en los momentos más necesarios. La materia orgánica y los organismos vivos mejoran la salud del suelo y la función hidrológica.[14] Con un enfoque en suelos sanos, se puede regar menos agua para fines agrícolas, lo que mejora la conservación y la resiliencia de los recursos hídricos.

Las Comisiones de Conservación pueden proporcionar recursos sobre los aspectos negativos de la labranza y el arado dentro de las tierras agrícolas municipales aplicables e influir en las mejores prácticas, como el cultivo de cultivos de cobertura y la diversificación de las rotaciones de cultivos y animals. La materia orgánica se crea de forma natural y aprovechará y distribuirá mejor el agua para aumentar el rendimiento de los cultivos. Las prácticas de suelo saludable tienen los beneficios resilientes del secuestro de carbono y la disminución de los riesgos de sequía para los cultivos.[15]

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Conservación de Bosques y Árboles

Los árboles son recursos renovables que se suman a la calidad de vida al filtrar los contaminantes del aire, mejorar la salud mental, moderar las temperaturas y reducir el calor urbano, proporcionar hábitats para la vida silvestre, proporcionar sombra, conservar la energía de calefacción y refrigeración, prevenir la erosión del suelo, ralentizar la escorrentía de aguas pluviales, filtrar el agua potable y servir como sumideros de carbono al secuestrar el dióxido de carbono atmosférico. Los numerosos beneficios de los árboles permiten que los ecosistemas sean más resilientes a los efectos del cambio climático. La conservación y restauración de los árboles permite a las generaciones presentes y futuras disfrutar de los beneficios que los árboles aportan a las comunidades. Las Comisiones de Conservación pueden alentar a los propietarios de tierras a plantar árboles nativos y realizar el mantenimiento de los árboles existentes. Las comisiones pueden sugerir a las juntas municipales de Planificación y Zonificación que implementen ordenanzas de protección de árboles u otros requisitos de árboles en las calles para influir en la plantación de árboles. Las Comisiones de Conservación pueden actuar como una Comisión de Árboles si el cuerpo legislativo local les otorga autoridad y pueden desarrollar planes de acción para proteger el dosel de los árboles. Un ejemplo de un Plan de Acción de Árboles de una gran ciudad es el plan de la Ciudad de Hartford para proteger y expandir su dosel arbóreo con beneficios resilientes coincidentes.

Guardián de Árboles

Al considerar el mantenimiento de los árboles, las Comisiones de Conservación pueden ayudar al guardián municipal de los árboles llamando la atención sobre los árboles dañados o que albergan especies invasoras, y regular y promulgar el mantenimiento de los árboles. Al considerar el mantenimiento de los árboles, las Comisiones de Conservación pueden ayudar al guardián municipal de los árboles llamando la atención sobre los árboles dañados o que albergan especies invasoras, y regular y promulgar el mantenimiento de los árboles. Aunque la base de un árbol puede estar en terrenos de propiedad privada, el "cuidado y control" de un árbol que "se extiende a la vía pública o a los terrenos" pertenece a un guardián municipal de árboles. Las Comisiones de Conservación pueden trabajar con el guardián de árboles para educar al público sobre los beneficios de los árboles y cómo elegir especies resistentes al clima y ecológicamente apropiadas para sitios específicos.

Protección de los Bosques

Los bosques son paisajes naturales que reducen y almacenan carbono que disminuyen los efectos del cambio climático. Las Comisiones de Conservación son parte integral de la protección de los bosques locales al asesorar sobre la política municipal para la adquisición y gestión de espacios abiertos y parques. Los Planes Urbanos de Conservación y Desarrollo sirven como guía para los objetivos de la ciudad para la protección de bosques y árboles. En particular, los bosques centrales, aquellos que se encuentran a más de 300 pies del límite del bosque, tienen una gran necesidad de protección en todo el estado.[16] Además, si son delegadas por el organismo que tiene dicha autoridad, las Comisiones de Conservación pueden supervisar o administrar parques o espacios abiertos de propiedad municipal y promulgar reglas y regulaciones para esas propiedades, incluido el establecimiento de plazos específicos y tarifas razonables para el uso público.

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Conservación de la vida silvestre

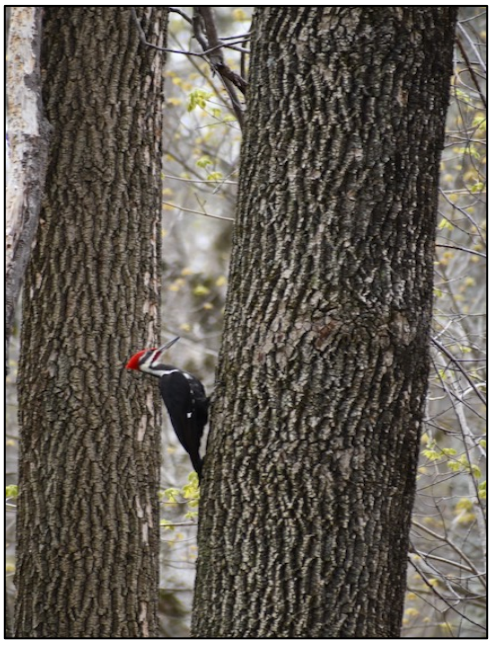
La conservación de la vida silvestre estimula la estabilidad ecológica, asegura la cadena alimentaria y fortalece nuestra seguridad alimentaria. Trabajando junto con organizaciones ambientales no gubernamentales locales como la Sociedad Audubon de Connecticut, las Comisiones pueden obtener conocimientos de conservación sobre iniciativas de proyectos relacionados con las aves, la vida silvestre y sus habitats. Con experiencia diversa, el personal de Audubon puede examinar y evaluar los hábitats de la vida silvestre en lugares específicos y crear planes para mejorar la conservación y la resiliencia al tiempo que considera la ecología, el manejo de los humedales, la ciencia del suelo y más.[17] Las comisiones pueden crear materiales de divulgación para que el público reconozca la importancia de la vida silvestre y proporcione formas de proteger su diversidad.

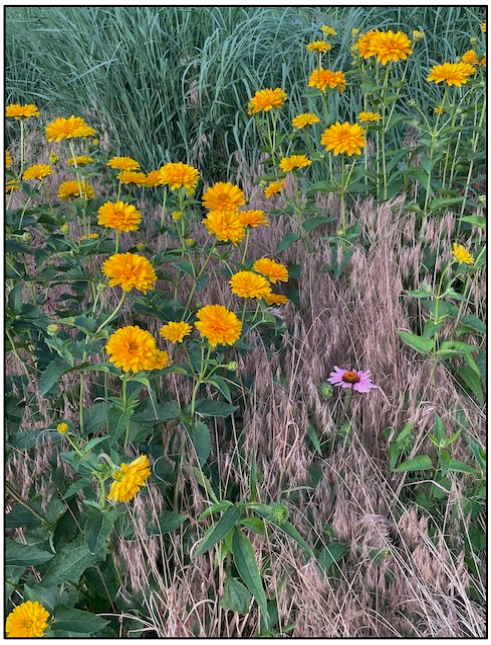
Jardines de polinizadores

El suministro de alimentos humanos depende de la resiliencia de las especies polinizadoras, lo que hace que su conservación, biodiversidad y protección sean cruciales. "Los polinizadores son responsables de 1 de cada 3 bocados de comida que tomamos cada día",[18] sin embargo, las poblaciones de polinizadores han disminuido drásticamente. Las comisiones pueden influir en la creación de jardines de polinizadores dentro de sus comunidades. Estos jardines pueden generar o ampliar hábitats beneficiando a abejas, mariposas, aves y murciélagos. Los árboles y arbustos nativos, como el cornejo en flor, se pueden usar para definir los límites de un jardín más grande para proporcionar néctar, polen, fruta y hábitat huésped.[19] La asignación de amplias fuentes de néctar y polen a través de los jardines de polinizadores puede mejorar las poblaciones de polinizadores y proporcionar resiliencia a los suministros de alimentos humanos y otros servicios ecosistémicos a medida que el cambio climático y el desarrollo afectan nuestros recursos.

Cajas nido y casas para murciélagos

Las aves y los murciélagos son cruciales para la resiliencia climática porque comen insectos, polinizan flores y son naturalmente responsables del crecimiento de plantas y árboles al esparcir semillas. Los murciélagos consumen un gran volumen de insectos todas las noches, muchos de los cuales pueden causar daños a las personas, los cultivos y los bosques. Fomentar la conservación de aves y murciélagos y aumentar sus hábitats puede reducir los costos de control de plagas.[20] A medida que el cambio climático trae climas más cálidos para Connecticut, más plagas pueden afectar el rendimiento de los cultivos. Las aves y los murciélagos pueden ayudar a mitigar esos efectos mediante el consumo de plagas y la propagación de semillas. Las Comisiones de Conservación pueden educar sobre el uso de cajas nido y casas para murciélagos para ayudar a proteger las especies de aves y murciélagos y preservar su papel ecológico.





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Gestión Ambiental: Influir en las soluciones basadas en la naturaleza

"Las tierras gestionadas teniendo en cuenta el clima también filtran y protegen los suministros de agua, aumentan la fertilidad del suelo y la productividad forestal, fomentan la biodiversidad y fortalecen la capacidad de los ecosistemas para resistir la sequía y el clima extremo, reduciendo las inundaciones, la escorrentía y la erosión". [21] La Agencia Federal para el Manejo de Emergencias (FEMA, por sus siglas en inglés) define las soluciones basadas en la naturaleza como "prácticas sostenibles de planificación, diseño, gestión ambiental e ingeniería que entretejen características o procesos naturales en el entorno construido para promover la adaptación y la resiliencia".[22] Las soluciones basadas en la naturaleza pueden utilizarse para combatir el cambio climático, restaurar los humedales, reducir los riesgos de inundación, reducir el calor urbano, añadir oportunidades recreativas y mucho más.[23] Las Comisiones de Conservación pueden incorporar soluciones basadas en la naturaleza en las estrategias de conservación para aumentar aún más la resiliencia de los recursos naturales y almacenar carbono en paisajes como bosques y humedales sin intervención.

Wetland Conservation and Restoration

Las Comisiones de Conservación deben "mantener un índice de todas las áreas abiertas, de propiedad pública y privada, incluidas las marismas abiertas, los pantanos y otros humedales para obtener información sobre el uso adecuado de dichas tierras". (C.G.S. Capítulo 97, Sección 7-131a). Pueden recomendar planes y programas para el desarrollo y uso de dichas áreas a las comisiones municipales de Planificación y Zonificación y consultar sobre solicitudes de desarrollo cerca o dentro de humedales que puedan alterar el estado del recurso natural. Los humedales son recursos naturales cruciales porque proporcionan hábitat para diversas especies de animales y plantas, amortiguan las inundaciones naturales y las marejadas ciclónicas, proporcionan recreación, filtran el agua de forma natural y actúan como sumideros de carbono. La conservación y restauración de los humedales es imprescindible para los humedales costeros y continentales a fin de proporcionar resiliencia climática a los riesgos de inundaciones, sequías, tormentas y erosión.

Infraestructura Verde para la Conservación y Restauración de Humedales

Los techos verdes, los jardines de lluvia o los biopantanos diseñados pueden influir en la resiliencia climática al absorber las aguas pluviales, reducir los riesgos de inundaciones de infraestructura y proteger los ríos y arroyos de contaminantes y sedimentos nocivos. Estas soluciones basadas en la naturaleza ofrecen beneficios ecológicos adicionales, como el hábitat de la vida silvestre que apoya la biodiversidad de aves y polinizadores, promueve una salud mental más sólida[24], reduce el calor urbano y reduce el uso de energía y los costos asociados.[25] Las Comisiones de Conservación pueden investigar alternativas de infraestructura verde y hacer sugerencias a las juntas de zonificación y a los propietarios de tierras sobre la implementación resiliente.

La Reforestación

La reforestación puede mitigar los impactos negativos del cambio climático. Las comisiones pueden procurar conservar y desarrollar recursos para su municipio. Pueden ayudar a los municipios a solicitar subvenciones forestales como America the Beautiful de CT DEEP y utilizar fondos para plantar árboles para promover la silvicultura urbana en colaboración con juntas y selectores. Sugerir e implementar la reforestación dentro de las servidumbres de conservación en tierras públicas y privadas es una excelente manera de asegurar los recursos arbóreos que mejorarán la resiliencia del secuestro natural de carbono, los hábitats de la vida silvestre y los suministros de aire más limpio para las generaciones futuras.

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Vías Verdes

Según el Estatuto General de CT § 8-23, las Comisiones de Conservación pueden "proponer un plan de Vía Verde para su inclusión en el plan de conservación y desarrollo del municipio". La Ley Pública de Connecticut 95-335 define una vía verde como un "corredor de espacio abierto que:

- puede proteger los recursos naturales, preservar los paisajes escénicos y los recursos históricos u ofrecer oportunidades para la recreación o el transporte no motorizado;
- puede proteger los recursos naturales, preservar los paisajes escénicos y los recursos históricos u ofrecer oportunidades para la recreación o el transporte no motorizado;
- puede estar ubicado a lo largo de una característica natural definitoria, como una vía fluvial, a lo largo de un corredor artificial, incluyendo un derecho de paso no utilizado, rutas de senderos tradicionales o canales de barcazas históricos;
- puede ser un espacio verde a lo largo de una carretera o alrededor de un pueblo"[26]

Las vías verdes pueden proteger la tierra y los recursos naturales con la oportunidad de restaurar humedales, praderas, llanuras aluviales y hábitats con los beneficios de vincular a nuestras comunidades e influir en estilos de vida saludables. Los proyectos de Vías Verdes pueden presentarse al Consejo de Vías Verdes para su consideración sobre la protección de los recursos y la mejora de la resiliencia.[27]

¿Cómo puede ayudar CT DEEP?
Las comisiones pueden solicitar asistencia técnica de personal certificado para ayudar con una planificación en profundidad que se coordine con los esfuerzos de conservación estatales y locales que pueden estar fuera de su capacidad. Echa un vistazo a la amplia biblioteca de información relacionada con la conservación y los programas de subvenciones que ofrecen buscando en CT DEEP.

Las Comisiones de Conservación deben apoyar y permitir la concienciación climática dentro de sus comunidades para mejorar la conservación y protección de los recursos naturales, mejorar los servicios ecosistémicos y mantener la resiliencia a los impactos de un clima cambiante. Al servir como un organismo de investigación, mantener un índice adecuado de espacios abiertos y humedales, y recomendar el desarrollo sostenible en áreas vulnerables, las Comisiones de Conservación pueden usar su autoridad para promover la conservación resiliente dentro de su municipio.

CIRCA
CONNECTICUT Department of Housing
U.S. Department of Housing and Urban Development

Los fondos para este proyecto son proporcionados por el Departamento de Vivienda y Desarrollo Urbano de los Estados Unidos a través del Programa Nacional de Recuperación de Desastres de Subvención en Bloque para el Desarrollo Comunitario, administrado por el Departamento de Vivienda de Connecticut.

Contacto

Para obtener más información sobre las Comisiones de Conservación, comuníquese con Kayla Vargas, Técnica de Investigación, CIRCA, kayla.vargas@uconn.edu

Photos courtesy of Kayla Vargas, Louanne Cooley, or as cited. Spanish translation © 2024 Defne Alpdogan

Para obtener más información sobre CIRCA visite circa.uconn.edu y el proyecto Resilient Connecticut para obtener más herramientas de planificación de resiliencia climática: resilientconnecticut.uconn.edu

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circa@uconn.edu

Financiamiento y otros recursos

Según el Estatuto de Connecticut, sección 7-131a, los municipios pueden asignar fondos a una Comisión de Conservación. Las comisiones también pueden buscar fondos municipales, estatales y federales para la investigación de la conservación, la restauración de los recursos naturales y los proyectos de protección de la tierra. Echa un vistazo a estos recursos a continuación para ayudar a financiar proyectos de conservación:

Federal

- FEMA Pre-Disaster Mitigation (PDM) Grant
- US Department of Interior Land and Water Conservation Fund
- FEMA Hazard Mitigation Assistance Grants
- US Fish & Wildlife Traditional Conservation Funds
- USDA: Environmental Quality Incentives Program
- CT DEEP Grants for Control of Aquatic Invasive Species

El Estado

- State Wildlife Grants
- Open Space and Watershed Land Acquisition Grant Program
- Urban Green and Community Gardens Grant Program
- State Conservation Tax incentives

Otra

- Wildlife Conservation Society: Climate Adaptation Fund
- Conservation Innovation Grants
- Connecticut Conservation Programs
- Connecticut Association of Conservation and Inland Wetlands Commissions (CACIWC)
- CT DEEP Natural Resources

Referencias

1. *Resilient landscapes funds*. Open Space Institute. Retrieved September 27, 2022, from https://www.openspaceinstitute.org/funds/resilient-landscapes-funds.

2. *Ecosystem-based adaptation briefing note series: Protecting nature to protect people*. UN Environment Programme. (6 October, 2022). Retrieved May 4, 2023, from https://www.unep.org/gan/news/editorial/ecosystem-based-adaptation-briefing-note-series-protecting-nature-protect-people

3. *Nature-based solutions*. FEMA.gov. (21 December, 2022). Retrieved March 15, 2023, from https://www.fema.gov/emergency-managers /risk-management/nature-based-solutions.

4. Bansard, J. and M. Schröder, *The Sustainable Use of Natural Resources: The Governance Challenge*, Earth Negotiations Bulletin Brief 16, International Institute for Sustainable Development, (2021), https://www.iisd.org/articles/deep-dive/sustainable-use-natural-resources-governance-challenge.

5. Cho, R. (20 June, 2019). *How climate change impacts the economy*. State of the Planet. Retrieved May 4, 2023, from https://news.climate.columbia.edu/2019/06/20/climate-change-economy-impacts/

6. USGCRP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II* [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 1515 pp. doi: 10.7930/NCA4.2018; *See:* Anji Seth et al., *Connecticut Physical Climate Science Assessment Report (PCSAR): Observed trends and projections of temperature and precipitation*, (2019), https://circa.uconn.edu/wp-content/uploads/sites/1618/2019/11/CTPCSAR-Aug2019.pdf and NH Sea Grant and UNH Cooperative Extension, *What Conservation Commissions Can Do to Protect Natural Resources in a Changing Climate*, Retrieved September 26, 2022, from https://extension.unh.edu/sites/default/files/migrated_unmanaged_files/Resource007030_Rep10170.pdf.

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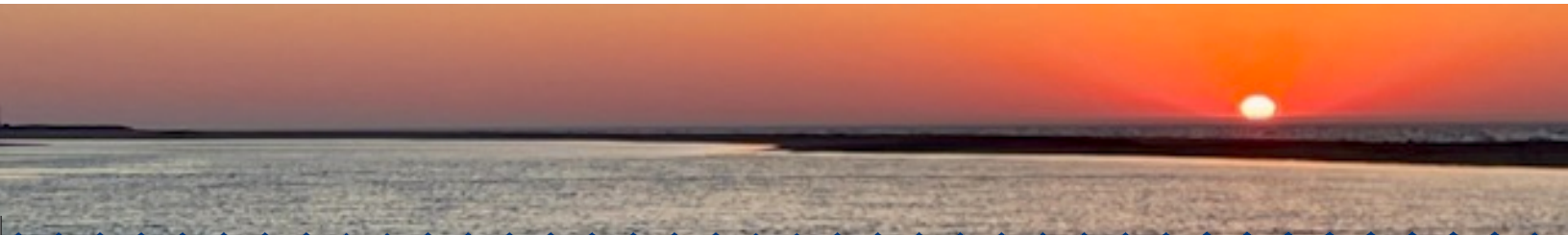
Referencias

7. Rebecca L. Kihslinger & Jessica Wilkinson eds., Lasting Landscapes: Reflections on the Role of Conservation Science in Land Use Planning (Envtl. L. Inst. 2007).

8. *Conservation easements*. Town of Vernon. Retrieved October 12, 2022, from https://www.vernon-ct.gov/government/board-and-commissions/conservation-commission/conservation-easements.
9. *Can private land conservation efforts adapt to climate change?* Yale Environment Review. (2 May, 2017). Retrieved October 12, 2022, from https://environment-review.yale.edu/can-private-land-conservation-efforts-adapt-climate-change-0#:~:text=Climate%20change%20impacts%20will%20challenge,privately%20owned%20land%20in%20perpetuity.
10. Seth, *supra* note 6.
11. Denise Savageau, 29 Oct. 2022, Managing for water resources in a changing climate, presentation at 45th annual meeting of Connecticut Association of Conservation and Inland Wetlands Commissions.
12. CT Department of Energy and Environmental Protection. *Management*. CT.gov. Retrieved March 15, 2023, from https://portal.ct.gov/DEEP/Aquifer-Protection-and-Groundwater/Ground-Water/Understanding-Ground-Water/Management.
13. CT Department of Energy and Environmental Protection. Rainfall as a Resource: A Resident's Guide to Rain Barrels in Connecticut. Retrieved March 15, 2023 from https://portal.ct.gov/-/media/DEEP/water/watershed_management/wm_plans/LID/whatisarainbarrelpdf.pdf?la=en
14. *The importance of Good Soil Health*. TennGreen Land Conservancy. (2 December, 2021). Retrieved from https://tenngreen.org/celebrate-good-soil-health/#:~:text=Healthy%20soils%20with%20a%20variety,healthy%20soils%20also%20regulate%20temperature.
15. Nichols, R. (12 May, 2015). *A hedge against drought: Why healthy soil is 'water in the bank'*. USDA. Retrieved November 2, 2022, from https://www.usda.gov/media/blog/2015/05/12/hedge-against-drought-why-healthy-soil-water-bank#:~:text=While%20most%20look%20to%20the,in%20handy%20during%20dry%20spells.
16. CT Department of Energy and Environmental Protection Forestry Division, 2020, Connecticut's 2020 Forest Action Plan, https://portal.ct.gov/-/media/DEEP/forestry/2020-Approved-CT-Forest-Action-Plan.pdf
17. Connecticut Audubon Society. (14 August, 2020). Retrieved November 10, 2022, from https://www.ctaudubon.org/.
18. *The importance of pollinators*. USDA. Retrieved November 9, 2022, from https://www.usda.gov/peoples-garden/pollinators#:~:text=Pollinators%20by%20Numbers,bees%20help%20increase%20crop%20yields.
19. *Deer Pond Farm - Bird & Pollinator Garden*. Connecticut Audubon Society. (16 September, 2022). Retrieved November 9, 2022, from https://www.ctaudubon.org/deer-pond-farm-bird-pollinator-garden/.
20. *Bats*. USDA. Retrieved November 10, 2022, from https://www.usda.gov/peoples-garden/pollinators/bats.
21. Land Trust Alliance, *Conservation in a Changing Climate: Natural Climate Solutions*, (18 December, 2019). Retrieved November 13, 2022, from https://climatechange.lta.org/natural-climate-solutions/.
22. FEMA, *Nature-Based Solutions*. (8 May, 2023). Retrieved May 16, 2023, from https://www.fema.gov/emergency-managers/risk-management/nature-based-solutions
23. *Supra* Land Trust Alliance, note 21
24. World Wildlife Fund. (10 November, 2020). *What are nature-based solutions and how can they help us address the Climate Crisis?* WWF. Retrieved October 13, 2022, from https://www.worldwildlife.org/stories/what-are-nature-based-solutions-and-how-can-they-help-us-address-the-climate-crisis.
25. Office of Sustainability. (26 September, 2018). *Hartford's Green Infrastructure Project*. Green Infrastructure Handbook Best Management Practices in Hartford, Connecticut . Retrieved November 14, 2022, from https://circa.uconn.edu/2018/09/26/hartfords-green-infrastructure-project/.
26. Public act summary for 95-335. Retrieved November 14, 2022, from https://www.cga.ct.gov/ps95/sum/sum0335.htm.
27. *Establishing Greenways Criteria*. CT.gov. (17 November, 2014). Retrieved October 24, 2022, from https://portal.ct.gov/DEEP/Outdoor-Recreation/Greenways/Establishing-Greenways-Criteria.



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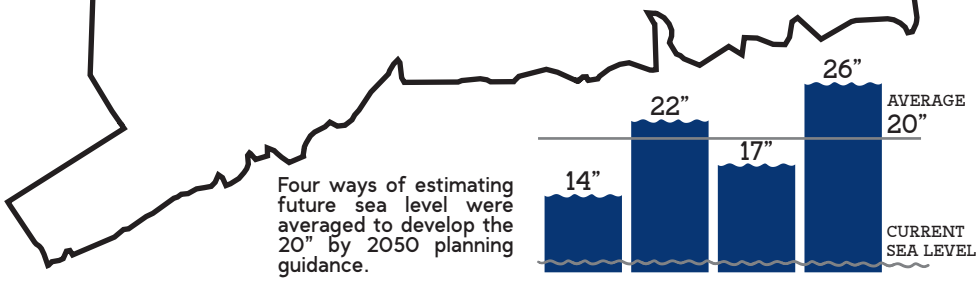
SEA LEVEL RISE & COASTAL FLOODING IN CONNECTICUT

Information from the Governor's Council on Climate Change

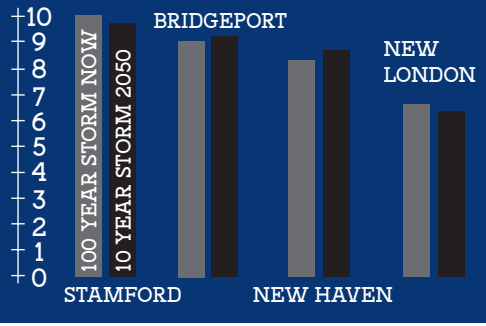
1. Sea level is expected to rise by up to 20 inches by 2050, and to continue increasing after that.
2. Small changes in mean sea level have a big impact on the frequency of flooding.
3. Areas that experience flooding every few years now should expect flooding multiple times a year by 2050.



Four ways of estimating future sea level were averaged to develop the 20" by 2050 planning guidance.

Return intervals describe the frequency and severity of a storm by giving the average time between flood events. For instance, in Stamford a storm with 10' storm surge has a return interval of 100 years.

With up to 20" of sea level rise, storms with a 100 year return interval now will have a 10 year return interval in 2050. Vertical axis scale is in feet.



Sea Level Rise Predictions:

Connecticut is expected to experience up to 20" of sea level rise by 2050, leading to greater frequency of flooding from tides and storms. Small changes in mean sea level have a big impact on the frequency and severity of flooding.

With 20" of sea level rise, what we experience today as a 4.5' storm surge will occur up to ten times more often in 2050. Some areas that flood once every 10 years will likely flood every 2 years. Chronic flooding will be a challenge for neighborhoods, roads, and areas affected in the past.

Planning for communities, infrastructure, and human health should consider the 2050 planning guidance, acceptable levels of risk, and strategies that do not increase exposure of public investment to flooding. Future development plans should consider "resilient corridors," as well as high ground that will be inherently resilient to future sea level rise

Consequences & Flood Risk:

Coastal residents could expect:

- Higher cost of living
- Greater property damage risk
- More highway and road closures
- Inaccessibility to and higher maintenance costs for critical infrastructure

Individual towns are beginning to plan for coastal and inland impacts of climate change, as well as coordinated regional efforts that are underway. Some current actions include the Governor's Council on Climate Change; Multi-jurisdictional Hazard Mitigation Planning by Regional Councils of Governments; and Resilient Connecticut.

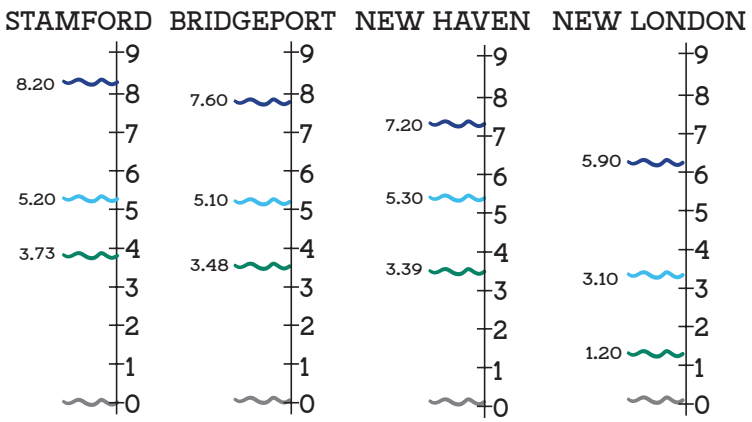
Resilient Connecticut is an initiative charged with creating a regional adaptation plan for Fairfield and New Haven counties by coordinating actions between local and regional stakeholders. The project includes coodination and planning with state agencies, policy recommendations, and strategies that use up-to-date monitoring and science based regional risk assessments to inform pilot projects.

Over the coming years, estimates will be revisited and updated with the most recent data and models.

FLOODING WATER LEVELS IN CT NOW

- MAJOR FLOODING
- MINOR FLOODING
- MEAN HIGHER-HIGH WATER
- CURRENT SEA LEVEL

Current water level benchmarks from Long Island Sound tide gages. Vertical axis scale is in feet and referenced to the North Atlantic Vertical Datum of 1988. More extreme water levels are located further west. **For values in 2050 add 20" (1.66').**



More detailed information is in the ***Sea Level Rise in Connecticut Report***, which is available here: https://circa.uconn.edu/sea-level-rise/references

resilientconnecticut.uconn.edu

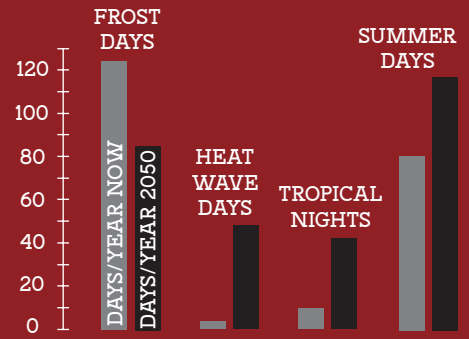
RISING TEMPERATURES & PRECIPITATION IN CONNECTICUT

Information from the Governor's Council on Climate Change

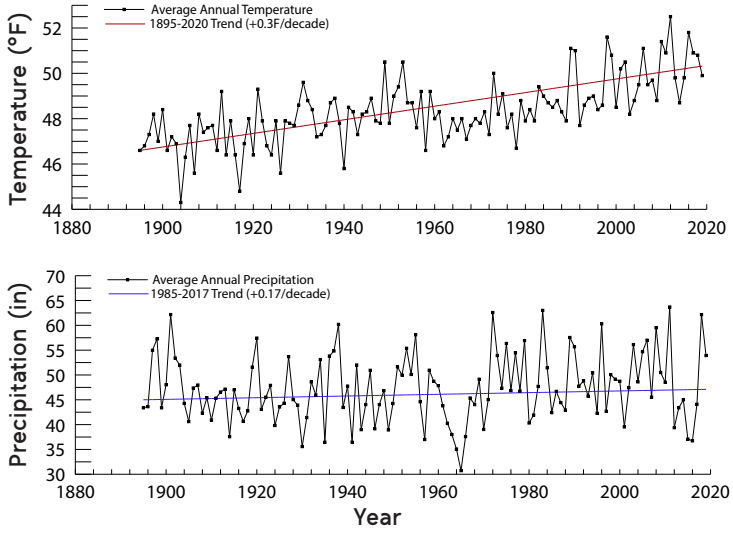
1. By 2050, average temperatures are expected to increase about 5°F, with increases thereafter dependent on emissions choices now.
2. Average precipitation is expected to increase about 8% (4 inches/year).
3. Indices of hot weather, summer drought, and extreme precipitation, are expected to increase.

Indices are tools used to track trends and projections in local climate. Extreme Indices help quantify impacts of a warming climate on weather measurements. Many of these common indices have been increasing due to climate change.

Annual counts of certain indices (defined below) in CT are to the right. Gray bars indicate today's and black 2050 values.



TEMPERATURE & PRECIPITATION RECORD FOR CT SINCE 1895



Current Trends:

Since 1895, Connecticut's annual average temperature has been increasing by 0.3°F per decade, or 3°F warmer in 2020. Seasonal averages have also been increasing, with winter experiencing the greatest increase. Observations show more warming along the southern coast and eastern half of the state.

Precipitation across Connecticut has been increasing by 0.17 inches per decade since 1985, with the largest increases in fall.

Predictions:

According to high CO_2 emission scenarios (RCP 8.5) for the future, average temperatures in Connecticut are predicted to rise 5°F (± 1°F) by 2050 and continue rising thereafter. The largest temperature increase is expected in summer and fall.

In the same scenario, average annual precipitation is expected to increase about 8% (4 inches per year), with much occurring in winter and spring. In a warmer Connecticut, precipitation will increase because of evaporation and the water cycle.

Present & Future Extreme Indices:

Heat/Cold Indices:

- Frost Days (annual number of days when the daily minimum is below 32°F) to drop from 124 to 85.
- Heat Wave Days (6 or more consecutive days with daily maximum temperature above the 90th percentile.) to rise from 4 to 48.
- Tropical Nights (annual number of days when the daily minimum is above 68°F) to rise from 10 to 40.
- Summer Days (annual number of days when the daily maximum temperature is above 77°F) to rise from 81 to 118.
- Number of Days above 90°F (annual number of days with maximum temperatures above the threshold value) to rise from 5 to 25.

Wet/Dry Indices:

- Number of days with more than 1 inch of precipitation to rise from 12 to 14.
- Number of heavy precipitation days to rise from 3 to 5.
- Fraction of heavy precipitation to rise from 15% to 20%.
- Maximum 1-day precipitation to rise (27%) from 2.8 to 3.5 inches.
- Maximum 5-day precipitation to rise (20%) from 4.5 to 5.4 inches.

More detailed information is in the ***Connecticut Physical Climate Science Assessment Report*** which is available here: https://circa.uconn.edu/ct-climate-science

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