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Climate Change Adaptation Strategies in Vermont, New England, and International Cities Comparable to Burlington, VT

We present a collection of case studies on climate change adaptation strategies implemented at various levels, including state-level initiatives in states with climates similar to Vermont, international examples of large-scale adaptation, and local actions within Vermont municipalities. By analyzing specific climate resilience efforts in Vermont, neighboring states, and selected international locations, we highlight effective practices for adapting to climate impacts and build a comparative perspective on climate action frameworks.

State Level Adaptations

New York

Community Level Initiatives to Adapt to Climate Change: Climate Smart Communities (CSC) is a New York State program that aims to help local governments take action to reduce greenhouse gas emissions and adapt to a changing climate. The program offers grants, rebates for electric vehicles, and free technical assistance.[1]

The CSC certification program has a step-by-step process for gaining approval as a certified CSC.[2] A community must adopt the CSC pledge as a municipal resolution to join the program. Items from the CSC pledge are:

- Build a climate-smart community;
- Inventory emissions, set goals, and plan for climate action;
- Decrease energy use;
- Shift to clean, renewable energy;
- Use climate-smart materials management;
- Implement climate-smart land use;
- Enhance community resilience to climate change;
- Support a green innovation economy;
- Inform and inspire the public; or,

[1] New York State, "Getting Started" *Climate Smart Communities,* 2018. https://climatesmart.ny.gov/actions-certification/gettingstarted/
[2] New York State, "Getting Started."

- Engage in an evolving process of climate action.[3]

Communities review and select specific climate actions within these points listed, for example a community under the point of "inform and inspire the public" may create a specified social marketing campaign. When selecting actions, the program offers guidance on who should be involved, associated costs, resources, and required documents. Once the specific actions are selected and all requirements are met, the application to become a CSC is submitted. Local community governments are graded on how their proposed action plan addresses their expressed interest.[4]

The CSC uses a grading system for their certified communities: bronze, silver, and gold. As of 2021, 159 local communities in New York have been certified as CSCs, with 6,251 local actions completed in New York. Differences in levels are associated with how many points a community has earned for specific climate actions.[5]

Decreasing Energy use in Plattsburgh, NY: Plattsburgh, NY is a bronze certified community under the CSC plan. The city has used the CSC program to address specific issues within their local community.[6] To address decreasing energy use, Plattsburgh has passed policy that laid out a plan and guidelines for developing a city fleet that is energy efficient and increasingly reliant on alternative energy sources to fuel it.[7]

On April 21, 2022, The Common Council of the City of Plattsburgh created a policy aiming to reduce the city's spending on fuel-gas and diesel. Goals around improving efficiency and lowering carbon footprint have been achieved.[8] In 2011, the city purchased its first full hybrid truck for the municipal power department. They have since installed seven new electric charging stations around the city for public use. Detailed data on each fleet vehicle, including fuel efficiency and annual emissions measurements, are gathered to track progress toward emission reduction goals. The plan has annual goals of reduction compared to the total emissions of the fleet in 1990:

- By 2030, Plattsburgh plans to reduce emissions by 40% of the total emissions of 1990; and,
- By 2050, Plattsburgh plans to reduce emissions by 85% of the total emissions of 1990.[9]

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[3] New York State, "Model Resolution" *Climate Smart Communities,* October 2018. https://climatesmart.ny.gov/fileadmin/csc/documents/CSC_Model_Resolution/ModelResolutionCSC-Oct2018.docx
[4] New York State, "Getting Started," *Climate Smart Communities,* 2018. https://climatesmart.ny.gov/actions-certification/gettingstarted/
[5] New York State, "Climate Smart Communities Certification Report" *Climate Smart Communities,* October 2, 2023. https://climatesmart.ny.gov/actions-certification/participating-communities/certification-report/?tx_sjcert_certification%5Bcertification%5D%5B__identity%5D=182&tx_sjcert_certification%5Baction%5D=show&tx_sjcert_certification%5Bcontroller%5D=Certification&cHash=2e708aa115942f966c0eb433dbb61ab7
[6] New York State, "Climate Smart Communities Certification Report."
[7] New York State, "Climate Smart Communities Certification Report."
[8] Discover Plattsburgh, *City of Plattsburgh Green Fleet and Equipment Policy,* April 29, 2022.
[9] Discover Plattsburgh, *City of Plattsburgh Green Fleet and Equipment Policy*.

Adaptations for Flooding Related Climate Change, Albany NY: The Albany County Executive's Office has developed a Climate Resiliency Plan for Albany County to address risks and vulnerabilities associated with the increase in frequency and severity of storm events, sea level rise, flooding, and other climate-related hazards.[10]

The plan breaks down sections of the county into small parcels. It identifies specific areas of Albany County using a flood risk score on a 0-5 scale: 0 being minimal and 5 being extreme flood risk. After an area's flood risk is determined, the area's heat risk, and social vulnerability are also ranked on separate scales.

Adaptation strategies are then focused on identified high risk areas. An overall climate risk score as a summation of flood risk, heat risk, and social vulnerability scores of each parcel are scored on the 0-5 scale.[11]

The plan outlines recommended adaptation projects to build climate resilience. Adaptation actions can include moving people and economic activities out of flood-prone areas, building defenses to protect against water level rises, and/or growing alternative crops that are more suitable for warmer temperatures.[12]

One recommended strategy of the plan is to purchase First Street Foundation's "Flood Factor" data. The First Street Foundation is a Title 8 corporation, in general corporations law for the state of Delaware; that is, it is for profit corporation intended to produce a public benefit and operate in a responsible and sustainable manner. The "Flood Factor," managed by First Street Foundations, is a dataset providing information considering flooding around rain events, overflow of water bodies, high tides, coastal storm surges and changes in sea level and precipitation. This would allow the county to provide property-level data quantifying flood risks and projected flood hazards for strategizing adaptation plans. By utilizing this data, Albany County can provide high-quality flood risk and hazard data to the public to help proactively identify critical infrastructure at risk.

The Climate Resiliency Plan for Albany County also analyzes adaptations to the north and south wastewater treatment plants. These are pieces of critical infrastructure that process wastewater for over 200,000 people. These treatment plants are located along the Hudson River which has seen increased river level rise. Projections from the plan expect increased precipitation events that can create flooding and impact operations at the wastewater facilities. Both the north and south wastewater treatment plants. use gravity-fed collection systems to feed wastewater to the plants. Once wastewater enters the facility, it moves downward, where it's screened, and debris is removed that can harm downstream processes. The process functions fully through gravity. During wet weather conditions, the facilities operate under Wet Weather Operating Plans, where both sanitized wastewater and stormwater exit to maximize flow. If river levels rise at the discharge points, it will reduce the gravity discharge rate to the river. To maximize treatment and

[10] Albany County, *Climate Resiliency Plan,* 2022. https://www.albanycountyny.gov/government/county-executive/albany-county-climate-resiliency-plan
[11] Albany County, *Climate Resiliency Plan*.
[12] Albany County, *Climate Resiliency Plan*.

uphold water quality standards adaptations are being explored to ensure its effectiveness amid changing climates.[13]

Maine

Infrastructure and Affordable Efficient Heating/Cooling: In 2020, Maine launched a statewide climate plan, *Maine Won't Wait.* The plan is a four-year climate timeline including actionable strategies and achievable goals to emit less carbon, produce energy from renewable sources, and protect natural resources, communities and people from climate change.[14]

A specific adaptation within the plan is the "avoiding inaction" goal. Maine has pledged to invest into adoptions to at risk infrastructure to curb the effect of climate change.[15] Transitioning to cleaner more efficient heating and cooling systems has been another adaptation goal set out within the *Maine Won't Wait* plan. Since implementation, Maine has installed 115,442 new heat pumps and weatherized 12,705 homes.[16] Of those heat pumps, 7,882 were low-income pumps recommended by the Equity Subcommittee of the Maine Climate Council. This plan addresses already at-risk areas and addresses them through climate adaptations while also being forward looking with preventative measures in not yet affected areas.

International Adaptations

Nacka, Sweden

Issue of Stormwater Pollution/ Mismanagement: Nacka, Sweden is a group of islands connected by bridges that is surrounded by lakes and waterways. Like Burlington, it has a mix of urbanization and natural surroundings that attract citizens to the city. Its location in Sweden also parallels Burlington's cold, long winters. The current developments in the municipality do not properly treat stormwater, resulting in poor water quality in Lake Järlasjön.[17]

In Nacka, a 3,000 square meter basin was proposed to help clean up dirty stormwater in Järlasjön. The basin works by slowing down the water so that dirt and pollution can settle to the bottom. This natural process helps improve the water quality without using complicated technology. Improving water quality improves climate change because it enhances ecosystem resilience and supports renewable energy through decreasing reliance on fossil fuels.[18]

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[13] Albany County, *Climate Resiliency Plan,* 2022. https://www.albanycountyny.gov/home/showpublisheddocument/45601/638343464259030000
[14] State of Maine, *Inspiring Climate Action in Maine,* 2020. https://www.maine.gov/climateplan/
[15] State of Maine, *Inspiring Climate Action in Maine.*
[16] Maine Climate Council, *Maine Won't Wait,* December 3, 2023. https://www.maine.gov/future/sites/maine.gov.future/files/2023-12/_2023_MWW%20Progress%20Report.pdf
[17] Stern Dahl, P. L., Delrive, T., Jessen, O., & Magnusson, G, "Urban climate adaptation in the Nordics: Case studies and experiences from climate adaptation, fossil-free mobility and citizen engagement in Nordic and Baltic cities," *Nordic Council of Ministers,* February 6, 2023, https://pub.norden.org/nord2023-015/case-studies.html#id00231.
[18] Stern Dahl, et al., "Urban climate adaptation in the Nordics."

Riga, Latvia

Issue of Addressing a Lack of Green Spaces: The city of Riga is on the Gulf of Riga, which leads to the Baltic Sea in Latvia. Until 2021, Riga's "Theatre Square" was a parking lot of dead space on the edge of Old Town, a popular entertainment district.[19]

In summer 2022, the city transformed Theatre Square into a fixed green space. The municipality used mobile benches and potted plants as a quicker and lower cost alternative to larger and more expensive renovations.[20]

According to *archdaily.com*, an online architecture magazine, the square also uses sustainable rainwater management solutions that mimic the flow of rainwater in natural ecosystems. It prevents flood risks and relieves the burden on rainwater drainage systems, improves the quality of public outdoor space, and promotes biological diversity in the city.[21]

State of Vermont Adaptations

Montpelier

Issue of Addressing Increased Deer Over-Browsing in Northern Hardwood Forests: In Montpelier, Vermont, deer were overgrazing the Northern Hardwood Forests, leading to severe impacts on forest regeneration, with young saplings such as white ash and sugar maples struggling to grow. This affected the forest's resilience and sustainability to climate change.[22]

To address the issue, Montpelier adopted a strategy where the city worked with local hunters and wildlife agencies to regulate and manage deer populations. To reduce the deer population, the city increased hunter access to key forested areas and installed fencing around critical regeneration sites to protect young trees from browsing. Healthy forests with a diverse mix of species are more resilient to climate change, including extreme weather events and pests.[23]

Barre City

Issue of Building Climate Projections and Anticipating Current/ Future Risks: The Summer Street Housing Limited Partnership consists of a partnership between the Central Vermont Community Land Trust, a community development organization that develops affordable

[19] Stern Dahl, et al., "Urban climate adaptation in the Nordics."
[20] Stern Dahl, et al., "Urban climate adaptation in the Nordics."
[21] ArchDaily, "Daile Theatre Square Refurbishment," 2023. https://www.archdaily.com/1008868/daile-theatre-square-refurbishment-made-arhitekti.
[22] James Horton, Matthew Langlais, Timothy Morton, David Paganelli, Nancy Patch, and Sandra Wilmot, "Creating and maintaining resilient forests in Vermont: Adapting forests to climate change," *Vermont Department of Parks and Recreation*, May 2015. https://fpr.vermont.gov/sites/fpr/files/Forest_and_Forestry/The_Forest_Ecosystem/Library/Climate%20change%20report_final_v6-18-15a.pdf
[23] Horton, et al., "Creating and maintaining resilient forests in Vermont."

housing in Vermont, and non-profit Housing Vermont.[24] The partnership sought to redevelop a brownfield site in Barre that was previously an automobile servicing station and a paint shop that contained several underground petroleum storage tanks. A brownfield is defined by the federal government as a "abandoned, idled or underused industrial and commercial properties where expansion or redevelopment is complicated by real or perceived environmental contamination."[25] In Barre City, the partnership conducted an Analysis of Brownfields Cleanup Alternatives to build in climate resiliency and adaptation.

This analysis examined potential climate vulnerabilities, specifically the risks of increased flooding and temperature extremes. By assessing these factors, the partnership was better prepared to select cleanup alternatives that could withstand projected climate impacts. For instance, the analysis concluded that simply capping contaminated soil could be inadequate against future flooding; therefore, they opted for an excavation approach coupled with a soil management plan and safeguards like sub-slab depressurization and vapor barriers, all aimed at preserving indoor air quality in future structures.[26]

Summary

This report identified a number of climate adaptation strategies in the U.S. and abroad, including New York's Climate Smart Communities program, Vermont's targeted forest and brownfield strategies, and Nacka's stormwater basin and Riga's green space conversion. These adaptation strategies typically involved collaborative efforts between state, municipal, and community stakeholders.

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[24] Idealist, "Central Vermont Community Land Trust," accessed November 8, 2024. https://www.idealist.org/en/nonprofit/0cf06c30fe814e0db4626b79e0c6ae61-central-vermont-community-land-trust-barre

[25] Environmental Law Institute, "Brownfields Basics," accessed November 8, 2024. https://www.eli.org/brownfields-program/brownfields-basics

[26] Environmental Protection Agency, *Barre City, Vermont Accounts for Climate Change within a Brownfield Redevelopment Plan,* September 25, 2024. https://www.epa.gov/arc-x/barre-city-vermont-accounts-climate-change-within-brownfield-redevelopment-plan