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# RETROFITTING COMMUNITY BUILDINGS TO SUPPORT CLIMATE RESILIENCE

As the effects of climate change intensify, municipalities across Canada are encountering increasing risks from extreme weather and other events including heat waves, wildfires, hurricanes, floods and ice storms. Arenas, pools, community centres, libraries and other public facilities are crucial municipal assets that can provide shelter and services during such emergencies, both strengthening communities and enhancing their ability to survive and thrive in the face of climate challenges.

When municipalities retrofit public facilities so they can serve as community resilience hubs, these buildings become emergency response centres that are better able to support residents in times of crisis.

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## THE ROLE OF PUBLIC FACILITIES IN BUILDING CLIMATE CHANGE RESILIENCE

Public facilities are uniquely positioned to operate as community resilience hubs because they can be made accessible, are distributed across urban and rural areas and are already woven into the community's social fabric. During extreme weather and other events, these buildings can provide:

- **Shelter:** Retrofitted community buildings can provide safe, climate-controlled spaces during emergencies such as heat waves, cold snaps or wildfire smoke events. They can act as a refuge for vulnerable community members and accommodate emergency response crews as well as those without access to personal heating and cooling spaces.
- **Resources:** Due to their often central location in communities, these public facilities can act as a centre for distributing food, water, medical supplies, sleeping bags and other emergency resources.

- **Communication:** Retrofitted community buildings with a reliable power supply via renewable energy and battery storage face fewer power disruptions. They can act as information centres for emergency updates and provide services such as emergency vehicle dispatch, public Wi-Fi and device charging stations.

For help in assessing the vulnerability of public infrastructure to climate change impacts, refer to the [\*\*PIEVC protocol\*\*](#), the Institute for Catastrophic Loss Reduction's [\*\*Canadian Climate Change Risk Assessment Guide\*\*](#) and the [\*\*Climate Vulnerability and Risk Assessment Workbook\*\*](#) by ClimateWest.

View of Calgary's East Village during flood in June 2013.



Antigonish County Volunteer Fire Department serving as a comfort centre following Hurricane Fiona in 2022. The Comfort Centre offered food, water and charging stations.



ICLEI Canada's guidebook **Equitable Climate Adaptation: Considerations for Local Governments** explains how municipalities can advance climate change adaptation efforts in a way that centres equity and community engagement.

**Equitable Climate Adaptation:**

Considerations for Local Governments



## ASSESSING THE RESILIENCE POTENTIAL OF COMMUNITY BUILDINGS

To effectively understand which climate hazards might impact your local community buildings and how well these buildings can endure them, the initial planning phases of community building retrofit projects must incorporate climate change resilience assessments that include climate vulnerability and risk assessments.

Climate vulnerability and risk assessments should take into account potential interactions between multiple climate hazards across different scales. For instance, they might evaluate the effects of flooding occurring at the same time as a hurricane, while also considering impacts at the building level as well as on neighbourhood and municipal infrastructure. These assessments are critical to identify the key climate risks associated with a particular building.

By modelling building performance in relation to projected weather patterns and climate scenarios, building experts and municipal staff can evaluate the resilience potential of various retrofit options and consider the long-term implications of their choices.

Municipalities can simultaneously conduct community consultations, map neighbourhood needs, set annual building retrofit targets and prioritize retrofit projects that advance equity and accessibility. By incorporating these strategies into retrofit planning and decision-making processes, local governments can ensure that resources are allocated efficiently and directed toward climate resilience measures that adequately include the areas, communities, systems and equity-deserving populations that are the most vulnerable and the most likely to suffer from the effects of climate change.

# RETROFIT MEASURES TO CONSIDER

The following are some community building retrofit measures that can increase a community's resilience to climate hazards.

## Climate change effect

## Building resiliency measures

### Wildfires



- direct fire contact
- air pollution
- fireproofing buildings and surrounding landscaping
- air filtration for mechanical ventilation systems
- portable filtration systems

### Heat waves



- heat-related illness, including heat exhaustion and heat stroke
- mechanical cooling systems
- shelter-in-place refuge rooms that have cooling
- portable cooling systems
- semi-permanent shading devices
- light-coloured roofs
- increased green infrastructure to provide shade and/or evapotranspiration

### Drought



- water shortages
- wastewater reuse and reclamation
- potable water storage systems
- low-flow fixtures
- rainwater harvesting and storage for non-potable applications

### Flooding



- pluvial (overland)
- fluvial (overflowing body of water)
- coastal flooding
- backwater prevention valves and sump pumps
- water-resistant building materials for ground and below-ground levels
- flood shields and barriers for doors and windows
- grading that leads away from buildings
- permeable surfacing in place of hard surfaces, to allow water to infiltrate
- downspouts disconnected from stormwater systems

### Hurricanes and extreme storms



- extreme winds
- power and/or communication outages
- reinforced structural design for higher wind loads (e.g., hurricane clips, roof sheathing fasteners, wind-resistant roof coating)
- structural consideration for short-term higher snow loads
- backup power systems (renewable energy)
- impact-resistant windows and doors

**Ice storms**

- prolonged power and/or communication outages
- systems to capture residual heat with thermoelectric generators and heat exchangers
- passive systems including roof lights and reflective surfaces to increase solar gain
- increased air tightness or wall cladding and glazing insulation and quality to reduce heat loss

## KEY CONSIDERATIONS FOR RETROFITTING PUBLIC FACILITIES

When planning retrofits, municipalities should focus on three primary areas: energy efficiency, emergency preparedness and accessibility and equity.

### 1. ENERGY EFFICIENCY

Energy-efficient retrofits can reduce operational costs and carbon emissions while ensuring that public facilities can operate during power outages or extreme temperatures. Potential upgrades include:

- **HVAC systems and insulation:** Energy-efficient heating, ventilation and air conditioning systems improve climate control. Better insulation can lower a building's energy consumption, reducing strain on infrastructure during extreme weather events.
- **Renewable energy:** Installing solar panels or geothermal systems reduces reliance on the grid and can ensure that facilities have backup power to remain operational during power outages.
- **Battery storage:** Energy storage systems can maintain power availability in the event of grid failure, ensuring continuous and uninterrupted service for emergency operations.

### 2. EMERGENCY PREPAREDNESS

Emergency preparedness retrofits ensure public facilities can operate effectively during emergencies. These retrofits should focus on:

- **Backup power systems:** Adding generators or renewable energy systems helps ensure a building can remain operational during outages.
- **Flood-proofing:** Flood barriers, raised electrical systems and improved drainage systems can prevent damage and ensure continuity of services.
- **Air filtration systems:** Extreme weather events and wildfires can worsen air quality. High-efficiency air filtration systems help ensure safe air quality in public facilities during emergencies.

### 3. ACCESSIBILITY AND EQUITY

Community building retrofits are an opportunity to add accessibility features so that all members of the community, including vulnerable populations and equity-deserving groups, are able to access these facilities, especially during climate events. Key considerations include:

- **Accessibility features:** Features such as ramps, elevators and accessible washrooms help ensure that buildings can provide safe shelter for all.
- **Equitable distribution:** By mapping the neighbourhoods most vulnerable to climate impacts, municipalities can prioritize equitable distribution of retrofitted buildings so that all vulnerable communities, particularly those in marginalized and low-income areas, have access to safe spaces during emergencies.
- **Multilingual signage and services:** Providing information and services in multiple languages used in the community promotes inclusivity and ensures access for those with limited or no official-language proficiency.

### CONCLUSION AND NEXT STEPS

Community building retrofits are a significant opportunity to make communities more equitable and resilient. By incorporating resilience considerations into the retrofit planning process, municipalities can help their communities better withstand climate challenges through improved access to safe spaces and services during extreme weather events.

For additional resources, events and training opportunities, explore the [Community Buildings Retrofit initiative](#). [The Resource Library](#) features practical tools for upgrading local facilities. You can also connect with energy management experts through the Advisory Service to discuss your community building retrofit plans and projects and learn about funding opportunities to help implement these initiatives.

### DEFINITIONS

**Climate change resilience:** [The Center for Climate and Energy Solutions](#) defines climate resilience as the ability to anticipate, prepare for and respond to hazardous events, trends or disturbances related to climate. Improving climate resilience involves assessing how climate change will create new, or alter current, climate-related risks and taking steps to better cope with these risks.

**Climate vulnerability and risk assessments:** Climate change vulnerability and risk assessments provide decision-makers with critical information about the potential impacts of climate change and the most effective ways to adapt to these impacts ([Climate Risk Institute](#)).



The Pictou County Wellness Centre was the base of operations for many during the aftermath of Hurricane Fiona. The PCWC accommodated and provided meals for electrical workers and provided charging stations for community members.