Appendix A: Summary of Preliminary Research to Inform the Climate Change Adaptation and Resilience Plan

New Westminster Climate Change Adaptation and Resilience Plan

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Introduction

This document summarizes the preliminary research and analysis conducted during phase one of the Climate Change Adaptation and Resilience Planning (CCARP) process, carried out from May to July 2025. The purpose of this phase was to establish foundational local climate change context and compile reference materials to inform the development of the CCARP.

As part of phase one, the Internal Working Group (IWG) and External Advisory Group (EAG) reviewed local climate projections, identified key climate-related hazards, and discussed how different parts of the community may be more vulnerable to these risks. The groups also explored current strengths and opportunities to build resilience and support the City's climate readiness efforts. A list of the departments for the IWG and organizations in the EAG can be found in Appendix A-1 of this report.

This summary highlights key climate-related hazards within the scope of the Plan, along with associated exposure, vulnerability, and resilience factors. This foundation will inform evidence-based decision-making as the CCARP development process advances.

Key Terminology

The following defines key terminology used throughout phase one of CCARP development:

- A **hazard** is an event that has the potential to cause harm such as wildfires and floods. A **climate-related hazard** is a natural hazard where the frequency, intensity, duration, or location is influenced by climate change.
- A **slow onset climate risk** is a gradual change as compared to a hazard event which is acute. Slow onset climate risks include sea level rise, invasive species spread, and ocean acidification. Climate change is also a risk multiplier, making existing patterns worse, such as accelerating biodiversity loss.
- **Exposure** refers to the presence of people, ecosystems, infrastructure, or other assets in locations that could be adversely affected by the hazard. Some hazards, like landslides, are very place specific, whereas extreme heat events cover large areas with variations in exposure related to physical environment and home and work conditions.
- **Vulnerability** acts to amplify the consequences or impacts of a hazard event. People, things, and systems that are more susceptible to negative impacts from the event are generally more vulnerable. Vulnerability is complex and includes links directly back to systemic inequities and broad determinants of health.
- **Equity** refers to just and fair inclusion where all individuals can thrive. Working towards equity acknowledges that people are not all the same, and some folks experience barriers caused by injustice.
- **Risk** refers to the combination of the likelihood of a hazard event occurring and the severity of the consequences resulting.

Climate Projections and Hazards

As part of phase one, climate projections were reviewed for New Westminster. These projections compare past climate conditions (based on data from 1981–2010) with two future time periods: the 2050s (2041–2070) and the 2080s (2071–2100). Two possible future scenarios are shown:

- A **moderate emissions scenario**, where emissions begin to stabilize mid-century, with approximately 2°C of warming globally by 2100; and
- A **high emissions scenario**, which reflects more extreme climate change, with approximately 4°C of warming globally by 2100.

It is important to note that generally the severity of climate hazards and impacts increases with increase in global temperatures. While planning for the worst-case scenario is considered best practice, using both scenarios helps provide a clearer picture of what the future may hold. Given the uncertainty of future global greenhouse gas emissions and evolving climate science, climate projections and adaptation plans should be reviewed every 5–10 years to ensure they remain effective and relevant.

Overall climate trends and a list of non-exhaustive impacts projected for British Columbia are displayed below in table 1.

Table 1. Overall climate trends and impacts projected for British Columbia

Climate Trend	Climate Impact
Hotter, drier summers	Increased risk of drought and wildfire
	Increased risk of heat-related illnesses and stress
	Increased aeroallergen level (substances in the air, like pollen, that can cause allergic reactions)
	Reduced ecosystem connectivity, decline in biodiversity
	Increased need to update homes without cooling infrastructure
	Increased need for cooling stations and shelters across the community
	Increased stress on water supply
	Decreased air quality, which can result in elevated risks of respiratory and cardiovascular illnesses
Warmer, wetter winters	Increased extreme rainfall events, such as atmospheric rivers, which can cause flooding
	Increased extent of pests due to warmer winter temperatures (e.g., mosquitoes, ticks), resulting in vector-borne diseases
	Increased invasive species and a decrease of native species
	Increased need to update storm water infrastructure and diking systems
Rising sea levels, ocean warming, and acidification	Changing regional biodiversity ranges for species
	Increased risk of saltwater intrusion
	Increased risk of coastal and Fraser River flooding

These trends include slow-onset climate risks and are expected to have wide-spread impacts on systems including, but not limited to, public health, infrastructure, ecosystems and local food.

Appendix A-2 contains tables that present climate variables for each emissions scenario.

Equity Considerations Overview

Vulnerability to climate change recognizes that some individuals or groups may face greater risks due to social, economic, health, and environmental factors, or a combination of multiple factors, many of which are beyond their control. To ensure the CCARP responds to the needs of the whole community, it is important to engage with those who may be more affected by climate-related impacts. Listening to their lived experiences will help shape more inclusive, equitable, and effective solutions. Below is a table of groups (not exhaustive) within the City of New Westminster that may face disproportionate impacts from climate change (presented in no particular order), with examples of exposures and vulnerabilities they may have.

Table 2. Identified groups that may face disproportionate impacts from climate change.

Identified Groups	Potential Vulnerabilities
Older Adults (65+)	More likely to have underlying health conditions that are aggravated by extreme events, like storms, extreme heat, and wildfire smoke (especially for socially isolated individuals).
	Individuals without vehicles or convenient public transportation options may have more difficulty reaching public refuge spaces (e.g., cooling centre).
Infants, Children, and Youth	Have immature thermoregulatory systems and may depend on others for hydration and cooling during extreme heat events.
Women	Important to ensure that they feel safe and welcome in cooling centres and other community shelters.
	For pregnant individuals, have risk for pregnancy-related complications from extreme heat and air quality.
People Living Alone	Have heightened vulnerability to extreme heat events because of limited access to help and resources during emergencies.
	May have issues with receiving emergency communications or information about preparing for an event.
People with Pre-Existing/Chronic Health Conditions	Certain conditions and medications can impact thermoregulation abilities.
People with Diverse Mental, Physical and Sensory Abilities	Power outages during extreme events can affect mobility for individuals that rely on electrical lifts and devices.
	Possibility of evacuation because of an extreme weather event can create anxiety.
	Individuals with mobility issues may experience extreme heat events more significantly as it may be harder to access cooling or hydration.
	May face mobility and other challenges accessing supports (e.g., cooling spaces).
Urban Indigenous Peoples	Extreme heat can impact cultural practices, food sovereignty, and community events.
People Who Work Outdoors or in Hot Environments	Individuals can experience unsafe work conditions (especially without air filtration) during extreme heat and wildfire smoke events.
New Immigrants / People with Linguistic Barriers	May have issues with understanding emergency communications or information about preparing for an event.
People of Colour	Important to ensure that they feel safe and welcome in cooling centres and other community shelters.

People Earning Low Incomes	May have barriers with energy affordability and/or lack of awareness of active and passive cooling measures to help prepare for events, such as extreme heat or wildfire smoke events.
People Who Rent and/or Live in Stratas	May live in older buildings, which are more likely to overheat due lack of cooling, their design, and need for maintenance or retrofits for new climate conditions.
	Tenants may lack control addressing issues like inadequate heating and cooling systems, flood protection, energy costs, and the impact of climate change on housing affordability.
People Experiencing Precarious Housing or Homelessness	Can have greater exposure to extreme climate events, such as extreme heat, wildfire smoke, and storms.
People with Substance Use Challenges	Some substances can impact thermoregulation and awareness, which can impair recognition of overheating during extreme heat events.
People Experiencing Mental Health Challenges	Extreme weather events can trigger or worsen conditions like anxiety, depression, and post-traumatic stress disorder.
	Some medications can affect heat perception; certain conditions may impair recognition of overheating during extreme heat events.
People Who are Gender and/or Sexually Diverse	Important to ensure that they feel safe and welcome in cooling centres and other community shelters.

Additional work will be completed in the following phases to better understand lived experiences of populations and how intersectionality will increase exposure to climate risks in the City of New Westminster.

Strengths Overview

New Westminster was identified as a leading municipality in the Lower Mainland in terms of initiatives and actions to mitigate, prepare for and respond to extreme heat events. The recent 2022 Flood Resilience Plan is also leading edge, incorporating climate change considerations and recommending appropriate next steps. New Westminster has climate resilience-related actions in hazard-specific studies and policies and embedded throughout community plans and programs. An important principle of this project is to build on existing work, address gaps, and take advantage of new action opportunities. Current identified strengths of the City include:

- **Evidence-based planning:** hazard-exposure studies that integrate current and future climate conditions.
- **Targeted preparedness:** Up-to-date, single-hazard plans, particularly for extreme heat and wildfire smoke and translates them into concrete risk-reduction actions.
- **Nature-based solutions oriented:** incorporates green infrastructure and ecosystem approaches wherever feasible.
- **Resilient-building framework:** policies and requirements that drive the construction and retrofitting of climate-resilient homes.
- **Clear public outreach:** consistent, accessible communication that keeps residents informed about emerging hazards and protective measures.
- **Proven emergency response:** effective response plans for key climate-related events, demonstrating capacity to act quickly when threats materialize.

Opportunities Overview

The CCARP will build on existing work, address climate resiliency gaps in the City, and take advantage of new opportunities. Through the IWG and EAG, multiple lenses and expertise will help determine where there are areas for collaboration and recognize where further work is needed to strengthen or implement climate adaptation efforts. Preliminary identified opportunities include:

- **Equity-centered approach:** Maintain a focus on supporting vulnerable populations across a range of climate-related hazards, including heat, air quality, and energy access.
- **Integrated hazard analysis:** Align hazard studies with evolving climate risks and consider compound climate events (e.g., smoke during heatwaves or power outages).
- **Infrastructure adaptation:** Improve road redundancy, resize culverts for climate resilience, and upgrade aging infrastructure such as pump stations through proactive asset management.
- **Energy resilience and indoor health:** Address energy poverty and retrofit older buildings to ensure sufficient electrical capacity for cooling and improved indoor air quality.
- **Nature-based and green infrastructure planning:** Apply a climate lens to trade-offs and promote guidelines for integrating green infrastructure and nature-based streetscapes.
- **Local food systems planning:** Advance a community food strategy and expand opportunities for local food growing.
- **Collaborative communications:** Enhance public communication efforts through coordination with the health authority and community partners.
- **Incorporate Indigenous Knowledge:** Advance reconciliation and build relationships with local first Nations through the development of the CCARP.

CCARP engagement will aim to collect broader perspectives, especially from community members most disproportionately impacted by climate change, on existing strengths and gaps relevant to the project.

Appendix A-1
Internal and External Project Group Members

Internal Working Group (IWG) Departments:

- Community Services
- Emergency Management Office
- Energy and Climate Action
- Engineering and Public Works
- Finance and IT Services
- Library Services
- Parks and Recreation
- Planning and Development

External Advisory Group (EAG) Organizations:

- Fraser Basin Council
- Condominium Home Owners Association (CHOA)
- Translink
- BC Non-Profit Housing Association
- Fortis BC
- Ministry of Energy and Climate Solutions
- LandlordBC
- Downtown New West BIA
- City of Surrey
- Fraser Health
- BC Hydro
- Metro Vancouver
- City of Coquitlam
- School District 40

Appendix A-2
Climate Data Tables

The following tables present climate change variables and projections related to slow-onset climate risks. All tables reference the historical baseline period 1981-2010 (1990s or past) and two future time periods that represent the average across a 30-year period (i.e., 2050s is the average of the time period 2041-2070 and 2080s is the average of the time period from 2071 to 2100).

Climate Variables	Past (1990s)	By 2050s		By 2080s	
		Moderate Emissions Scenario	High Emissions Scenario	Moderate Emissions Scenario	High Emissions Scenario
Frost Days (days when the minimum temperature is below 0°C sometime during the day)	42 days	16 days	13 days	10 days	5 days
Frost Free Period (days)	234 days	296 days	303 days	312 days	334 days
Minimum winter temperature (°C)	1.1°C	3.2°C	3.8°C	3.9°C	5.4°C
Freeze thaw cycles *	24 days	9 days	7 days	5 days	2 days
Coldest day annually (°C)	-10.1°C	-5.2°C	-5.4°C	-5.1°C	-1.9°C
Growing degree days ^	2172 dd	2774 dd	2961 dd	3000 dd	3718 dd
Average total winter precipitation (mm)	551mm	587mm	578mm	593mm	609mm (+10.5%)
Average total spring	304mm	315mm	320mm	322mm	337mm (+11%)

precipitation (mm)					
Average total fall precipitation (mm)	431mm	468mm	470mm	482mm	515mm (+16%)

*Count of days when the air temperature fluctuates between freezing and non-freezing on the same day
^ Growing degree days provide an index of the amount of heat available for the growth and maturation of plants and insects.

Table 4. Climate Projections for variables related to floods

Climate Variables	Past (1990s)	By 2050s		By 2080s	
		Moderate Emissions Scenario	High Emissions Scenario	Moderate Emissions Scenario	High Emissions Scenario
Maximum 1-day total precipitation (mm)	50mm	55mm	56 mm (+11%)	56mm	61mm (+22%)
Maximum 5-day rainfall (mm)	117mm	126mm	127mm (+8%)	131mm	135mm (+22%)
Total rainfall on 1:20 wettest days (mm)	82.5mm	87mm	110mm (+33%)	103mm	118mm (+26%)
Intensity and frequency of heavy rainfall (95th)*	276mm (median)	326mm	346mm (+25%)	337mm	477mm (+72%)
Intensity and frequency of heavy rainfall (99th)*	93mm	120mm	130mm (+40%)	126mm	199mm (+87%)

*Measure of how much total annual precipitation falls during the wettest days of the year, specifically on days when the precipitation exceeds a threshold set by the annual 95th and 99th percentile of wet days from the baseline period (1971-2000).

Table 5. Climate projections for variables related to extreme heat.

Climate Variables	Past (1990s)	By 2050s		By 2080s	
		Moderate Emissions Scenario	High Emissions Scenario	Moderate Emissions Scenario	High Emissions Scenario
Hottest Day Annually (30°C)	29.9°C	32.5°C	33.3°C	33.5°C	36.2°C
# of days with Max temp > 30°C annually	1 day	8 days	12 days	10 days	35 days
# of days with humidex above 30°C annually	19 days	41days	51days	52 days	86 days
# of days with nighttime max temp above 18°C annually	0 days	2 days	5 days	4 days	22 days
Cooling degree days (degree days) *	60 dd	203 dd	283 dd	272 dd	590 dd

* Cooling degree days (CDD) are equal to the number of degrees Celsius a given day's mean temperature is above 18 °C. For example, if the daily mean temperature is 21 °C, the CDD value for that day is equal to 3 °C.

Table 6. Climate projections for variables related to drought.

Climate Variables	Past (1990s)	By 2050s		By 2080s	
		Moderate Emissions Scenario	High Emissions Scenario	Moderate Emissions Scenario	High Emissions Scenario
Average snowpack in north shore watershed areas* (cm)	208cm		93cm (-55%)		49cm (-75%)
Consecutive dry days	23 days	24 days	25 days	26 days	28 days
Total summer rainfall (mm)	150mm	140mm	130mm (-13%)	130mm	127mm (-15%)

*source: Climate Projections for Metro Vancouver, developed with the high emissions scenario only.