

CITY OF RICHMOND

Climate Action Programs

VERSION 2 | JULY 2023



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Overview and Context

This document stitches together the City’s varied plans, strategies and actions that directly and indirectly address climate change issues in Richmond. An overview of anticipated local impacts are summarized in Attachment 1. By 2050, the City’s integrated climate actions will be major contributors to realizing Richmond’s vision to be the most appealing, livable and well-managed community in Canada.

Climate change is not just a long-term threat, it is also a present-day reality. As a community made up of islands located in the Fraser River’s estuary, the City of Richmond was one of the first municipalities to establish itself as a national climate action leader. The City’s actions have had significant impact and have been widely recognized. The programs outlined in this document summarize, in one location, the numerous mitigation and adaptation plans, actions and strategies that have guided the City’s climate action work. Showcase projects are highlighted throughout the document.

The City of Richmond is taking a comprehensive and integrated approach to climate change Strategies summarized in this document outline Richmond’s climate adaptation and mitigation plans, actions and achievements. The City provides regular updates to Council and the community on many of these issues. The most recent information can be found at www.richmond.ca.

The City is undertaking both adaptation and mitigation efforts in addressing climate change.

<p>Climate mitigation actions limit the magnitude or rate of global warming and its related effects. In short, reduce greenhouse gas emissions.</p>	<p>Climate adaptation actions reduce the negative impact of a changing climate, while taking advantage of potential new opportunities.</p>
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The City’s targets are informed by the work of internationally recognized experts. In the fall of 2018, the United Nations’ Intergovernmental Panel Climate Change (IPCC) released updated information that caught the world’s attention in a different way than previous reports. The IPCC released their ‘Special Report on Global Warming of 1.5 °C’¹ in response to the climate action target set within the 2015 Paris Climate Agreement. This commitment has been ratified by Canada and by 190 other countries responsible for 97.7% of the world’s human-caused GHG emissions.²

The IPCC report detailed the necessary actions to prevent global average temperatures from rising more than 1.5 degrees Celsius above pre-industrial levels, concluding that that signatory countries would have to cut global greenhouse gas emissions (GHGs) by 45 percent below 2010 emission levels by 2030, and further reduce GHGs to net zero by 2050. These concerns were reiterated in IPCC’s Sixth Assessment Report³, published in 2021, which states that “it is unequivocal that human influence has warmed the atmosphere, ocean and land,” that “human-induced climate change is already affecting many weather and climate extremes in every region across the globe,” and that “global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in carbon dioxide (CO₂) and other greenhouse gas emissions occur in the coming decades.”⁴

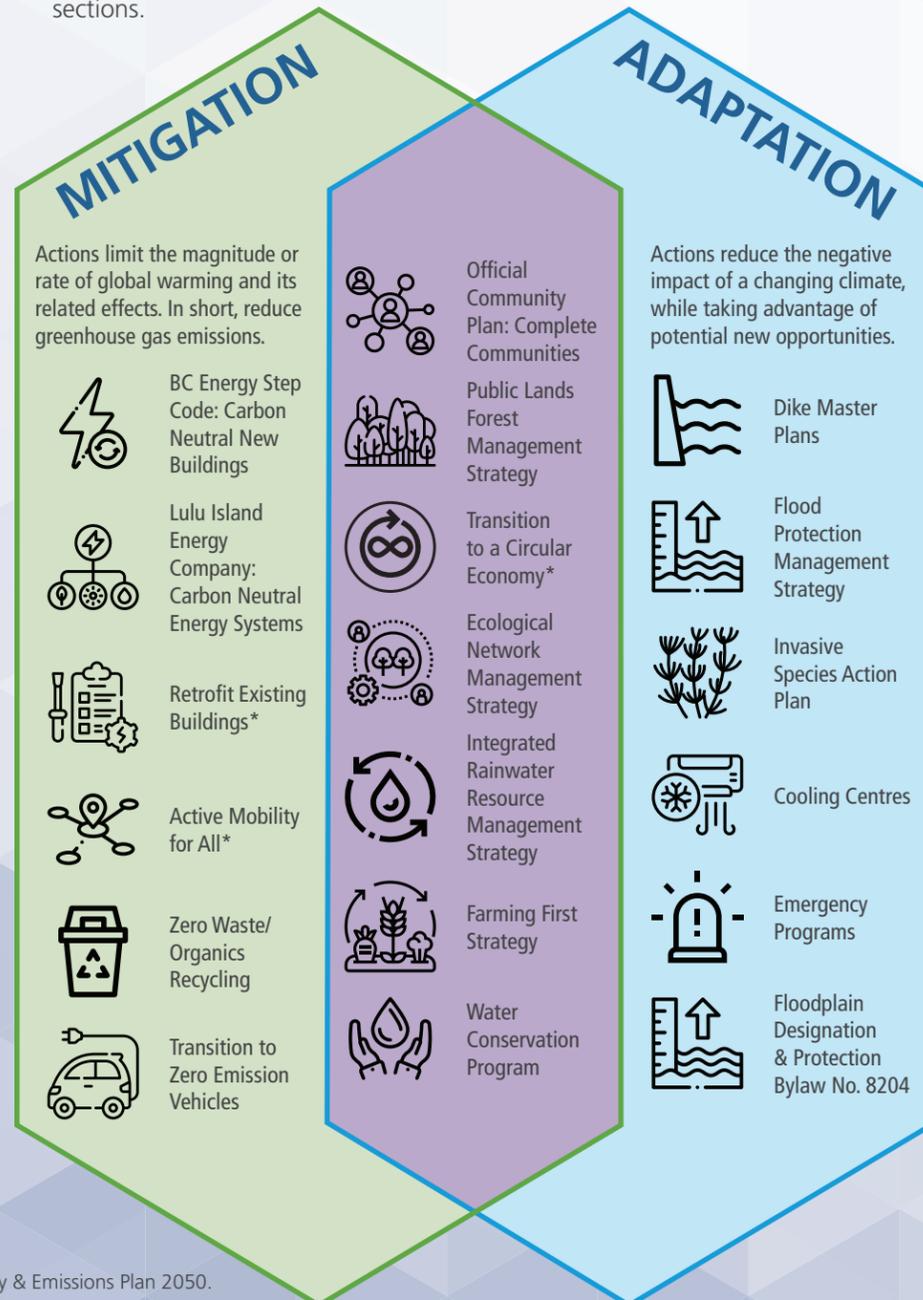
¹ <https://www.ipcc.ch/sr15/>
² As of October 26, 2021, only Eritrea, Iran, Iraq, Libya and Yemen are not party to the Paris Agreement. The US rejoined the Paris Agreement in 2021, after briefly withdrawing at the end of 2020.
³ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf
⁴ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Headline_Statements.pdf



Scan to subscribe to Richmond’s Climate Action eNewsletter

Richmond's Climate Action Programs

Richmond has undertaken the necessary planning and implementation actions to reduce the negative impacts of climate change. This image summarizes Richmond's comprehensive approach to address climate change locally. More information about the strategies highlighted below can be found in the following sections.



* Key strategy in the Community Energy & Emissions Plan 2050.

1. Leadership in Climate Change Mitigation

The City's efforts started getting traction in the 1990's when Council adopted the City's first corporate energy efficiency policy. That early step led to a long list of initiatives over the decades that have made the City a national leader in climate change mitigation. The City's investments in infrastructure, policy and capacity building have mainly focused on reducing emissions from new and existing buildings. Transportation and solid waste sources.⁵ These City investments also advance a wide range of additional local and regional sustainability goals.

Richmond's accelerated GHG emissions reduction targets for 2030 and 2050 are defined in the updated Community Energy and Emissions Plan, with the intent to have our OCP 2041 amended in 2022 to include these new emission targets.⁶ The Community Energy and Emissions Plan 2050 (CEEP) identifies the following Strategic Directions and associated actions to meet these targets:

1. Retrofit Existing Buildings
2. Transition to Zero Emission Vehicles
3. Carbon Neutral New Buildings
4. Complete Communities
5. Active Mobility for All
6. Support Frequent Transit
7. Enhance Green Infrastructure
8. Transition to a Circular Economy

In 2019, City Council directed staff to renew Richmond's Community Energy and Emissions Plan (CEEP), with updated actions to achieve accelerated GHG emission reduction targets in line with IPCC (2015 Paris) Climate Accord. Extensive community and stakeholder consultation was conducted in 2019 and 2021, with over 1,150 Richmond residents engaged, along with modeling the collective emissions reduction impact of almost 200 proposed actions. Council adopted the new CEEP 2050 plan on February 14, 2022. More information in the footer below⁷.

CO-BENEFITS OF CLIMATE MITIGATION EFFORTS

The City's climate mitigation actions also improve the quality of life for residents and businesses in Richmond—moving away from fossil fuels to low carbon alternative sources of energy will make the air we breathe cleaner and our streets quieter and more liveable. Designing walkable, bike and transit friendly neighbourhoods and a vibrant City Centre will support healthier lifestyles, and great neighbourhoods with convenient access to amenities. Improving building energy use can provide healthier indoor spaces, while lowering costs.

⁵ GHG sources (2017): 40% buildings and 58% transportation for a total of 98%.

⁶ While the IPCC target is stated as "45% below 2010 levels by 2030" Richmond's base year for GHG emissions is 2007. Because Richmond's GHG emissions were estimated to have been higher in 2007 than in 2010, staff recommended an equivalent target using the 2007 base year.

⁷ https://www.richmond.ca/_shared/assets/ceepreport61163.pdf

Lulu Island Energy Company (LIEC): Low-Carbon District Energy Services

District energy systems centralize space heating, cooling, and/or domestic hot water heating production on the neighbourhood scale. Centralized infrastructure is a more energy-efficient way of providing these services to customers of all kinds, including residential, commercial, hotel and retail. Further, district energy systems can be powered by many types of energy sources, which means that they are able to take advantage of new energy technologies as they emerge. The City established LIEC in 2013 as a municipal corporation, wholly-owned by the City of Richmond, to implement and operate district energy systems in Richmond's City Centre area. LIEC currently operates the following three distinct service areas: the Alexandra District Energy Utility, the Oval Village District Energy Utility and the City Centre District Energy Utility. More information in the footer below⁸.



Established in 2012, the Alexandra District Energy Utility (ADEU) is the City's first district energy system and was established as a part of its commitment to reduce community GHG emissions. ADEU extracts thermal energy from the earth through the use of ground-source heat pumps and geo-exchange technology. Two park areas serve a second, hidden, function as ground heat resource fields, hosting 726 vertical loops of heat-exchange pipe—each 76m (250 ft.) deep. The heat energy extracted from the fields is transferred at the neighbourhood's Energy Centre to underground distribution piping that connect to buildings situated throughout the West Cambie neighbourhood. Depending on energy demands, ADEU's heat pumps can either extract energy from the ground for heating services during the cooler months of the year or extract unwanted summertime heat from these buildings (thereby cooling them down), and then pump this heat into the ground heat resource field for later re-use. More information in the footer below⁹.

⁸ <http://www.luluslandenergy.ca/>
⁹ <http://www.luluslandenergy.ca/>

Complete Communities

The City's Official Community Plan (OCP), including the City Centre Area Plan, is a key tool for implementing sustainable land use and transportation objectives, making the city less car reliant through the creation of walkable, transit-supportive neighbourhoods. Complete communities support a broad range of uses in walking distance from housing, activate transportation routes and transit. More information in the footer below.¹⁰

Application of the BC Energy Step Code in Richmond

The Province of British Columbia's Energy Step Code (ESC) was the product of a multi-year collaboration between the Province, industry stakeholders, utilities and local governments. City of Richmond staff were and remain key contributors to the ESC. Adopted by the Province in April 2017, the Energy Step Code allows BC local governments to voluntarily reference a series of progressively more stringent energy performance "steps" in regulation. The Province has indicated that future iterations of the base BC Building Code will align with the Energy Step Code, and has committed that the BC Building Code will achieve "net zero energy ready" levels of performance by 2032, equivalent to the highest "step" of the Energy Step Code. Richmond was the first local government to announce its intent to implement the ESC and after extensive building and developer engagement, the City brought new construction under ESC regulation in 2018. The Energy Step Code encourages builders to improve the performance of the building envelope as well as mechanical systems for heating, cooling, hot water and ventilation. Incremental increases to Energy Step Code requirements were adopted by Council in 2020 and in 2022.

Active engagement with local homebuilders has been a key strategy for success in bringing in the stricter energy efficiency requirements of the BC Energy Step Code. The City has hosted well-attended Builders' Breakfast events since 2017 (and in webinar format during the pandemic), bringing in subject experts to present on energy-efficient and low carbon buildings. The City has funded training on proper air barrier installation techniques, as well as blower door tests for homes under construction in order to help local builders build successfully to the new requirements. The result has been a dramatic improvement in the airtightness and overall energy efficiency of new homes, and a near-perfect compliance rate with Richmond's tougher energy efficiency requirements for new construction.



¹⁰ https://www.richmond.ca/_shared/assets/ceepreport61163.pdf

CAPACITY BUILDING, EDUCATION AND PUBLIC ENGAGEMENT

Youth Engagement: Climate Change Showdown, annual REaDY Summit; Evie and Green Ambassador Program

**Building Sector—
BC Energy Step Code:** Programs and incentives for homebuilders including subsidized Airtightness, Blow Door Testing, and Passive House training. Minimum 3 meetings each year to showcase advanced techniques for high performance buildings.

Communication: Progress Updates. Climate Action Newsletter, Videos

Active Transportation: Cycling skills education courses for all Grade 6 and 7 students, learn to ride courses for new immigrants, annual regional Go by Bike and Shop by Bike events, Richmond Active Transportation Committee (informal advisory committee to Council)

Sustainable Transportation

Mobility and access are vital to the life of a city. Residents, employees and visitors need to get to places to work, live and play, and to access health care services and recreational, shopping and cultural activities. Businesses require efficient goods movement and emergency service providers need clear and convenient access. Transportation GHG emissions in 2017 were 57% of the City's total inventoried GHG emissions. For many Richmond residents, many trips are well within range of walking or cycling or transit; what is needed is the infrastructure to make these choices safer and more convenient. In this context, broadening low/zero carbon transportation options, such as walking, cycling and transit, will contribute to reduced GHG emissions. The City's related objectives are embedded in the Official Community Plan (Section 8)¹¹ and City Centre Area Plan (Section 2.3)¹². Supportive infrastructure investments made by the City to encourage low-carbon active transportation include new transit shelters, crosswalks, bike lanes and cycling facilities throughout Richmond.



The City continues to expand its active transportation network with a balance of facilities protected from traffic on major roads and neighbourhood bike routes on local roads that have lower traffic volumes and speeds. Over the past five years, City capital projects have expanded the network by over 14.5 km (e.g., River Parkway) with additional facilities secured via the development application process (e.g., Capstan Village area). To increase zero emission travel options for the community, the City is participating in the provincial electric kick scooter (e-scooter) pilot program. The public shared e-scooter system launched in May 2022 and continues to be operated by a third party (Lime Technology Inc.) at no cost to the City.

¹¹ https://www.richmond.ca/_shared/assets/OCP_9000_mobility34182.pdf
¹² https://www.richmond.ca/_shared/assets/23_mobility23839.pdf

Public and at-Home Electric Vehicle Charging

In December 2017, City Council adopted an amendment to the Richmond Zoning Bylaw requiring that all new residential parking spaces feature an energized outlet capable of providing "Level 2" electric vehicle (EV) charging.¹³ The City of Richmond was the first jurisdiction in North America, if not the world, to enact such a requirement.¹⁴ This move addresses one of the top barriers to faster EV adoption: the lack of access to EV charging at home, and demonstrates the important role local governments can play in promoting the use of electric vehicles. EVs result in zero tailpipe emissions, reducing air pollution and greenhouse gas emissions. They are also much lower cost to operate, are fun to drive and offer a range of performance benefits compared to fossil-fuel powered vehicles. The City of Richmond is building out a network of public electric vehicle (EV) charging stations throughout the community and has a goal that when residents or businesses visit a City facility, their EV can be charged. To promote efficient use by the greatest number of Richmond residents and visitors, and to support sustainable service as the City expands its network of public EV charging stations, the City implemented a user fee for charging EVs in 2019. More information in the footer below.¹⁵



In December 2017, the City became the first city on North America, if not the world, to require that 100% of residential parking spaces feature an energized outlet capable of providing "Level 2" EV charging for all new buildings.

Between 2013 and 2020, 20 charging points were installed at 8 locations. By the end of 2022, the City had expanded its public EV charging network to 53 Level 2 ports and 4 DC Fast Charging ports at 22 City facilities.

¹³ At the time of publication of this document in 2021, the City was developing a plan to require energized outlets capable of providing "Level 2" EV charging for commercial and industrial developments.
¹⁴ Many other municipalities within Metro Vancouver have since followed Richmond's lead, including Vancouver, Surrey, Burnaby, City of North Vancouver, West Vancouver and Port Moody. See: <https://pluginbc.ca/policy/>
¹⁵ <https://www.richmond.ca/services/climate/energysrvs/electricvehiclecharge.htm?PageMode=HTML>

Solid Waste Management

Waste that is not diverted through recycling, reuse and composting programs may end up at the landfill. Through decomposition, methane, a potent GHG, can be released into the atmosphere if not managed at the landfill. Community GHG emissions from this process is estimated at 3% of the total GHG emissions in Richmond. The City's exemplary waste management system has achieved outstanding results: the City has achieved a 79% landfill diversion rate from single detached homes and duplexes, and over 254,826 visits to the Recycling Depot in 2022. For more information, please see annual solid waste reporting. More information in the footer below¹⁶.



As nearly 99% of plastics are derived from fossil fuels, greenhouse gas emissions from plastics could reach 15% of the global carbon budget by 2050. Richmond's Single-Use Plastic and Other Items Bylaw No. 10000, works to reduce the community's GHG contribution by reducing the use of unnecessary single-use plastics. Effective March 27, 2022, Richmond will ban plastic checkout bags, plastic straws and foam food service ware. This important step will require businesses and consumers to shift away from wasteful single-use items and instead select materials that can be composted, reused and recycled multiple times adding to the circular economy in Richmond.

¹⁶ https://www.richmond.ca/_shared/assets/2022_Recycling_and_Solid_Waste_Management_Annual_Report66555.pdf

Carbon Neutral Civic Operations

The City, through its commitment under the Province's Climate Action Accord, has achieved carbon neutral operations every year since 2013, as guided by the City's "Towards Carbon Neutrality: Implementation Strategy". The strategy defined the following four key steps for meeting carbon neutrality commitments: measure, reduce, compensate (or offset) and report. The City is reducing its GHG emissions through the implementation of the Green Fleet Action Plan, Energy Management Program (for civic buildings and infrastructure), the Richmond Carbon Market program and other initiatives (more below). The City's public reporting can be found in the footer below¹⁷.

Sustainable High Performance Building Policy

The 'Sustainable "High Performance" Building Policy for City Owned Facilities' was initially adopted in 2005. The policy set specific management objectives and evaluation criteria for the development of City buildings culminating in the adoption the Leadership in Energy and Environmental Design (LEED) rating system as the measurement tool for new buildings and major renovations. The policy sets clear direction for the sustainable construction of new City buildings, targeting better than code construction and sets a path for zero carbon existing buildings by 2030. More information in the footer below¹⁸. With a growing focus on the energy and GHG emissions performance of buildings in the BC Building Code, the City intends to bring forward a revised policy in 2022.



Brighthouse Fire Hall No. 1. (6960 Gilbert Rd) is designed to withstand disasters and maintain operations post-event, and has a hybrid steel and mass timber roof. The facility optimized energy efficiency and achieved a LEED Gold certification. The facility was fitted with 136 solar panels that generate 60,000 kWh of electricity per year (equivalent of what 5 homes consume per year) and provide continuous power to the fire hall.

¹⁷ <https://www.richmond.ca/services/climate/energysrvs/report-carip.htm?PageMode=HTML>
¹⁸ <http://csweb01/docs/2307.pdf>

Energy Management Program (EMP) for Civic Buildings

The City's EMP is integral to the long term goal of maintaining carbon neutral operations through projects that reduce natural gas use. The City also remains committed to electricity use optimization and reduction through BC Hydro's Corporate Energy Manager program. Annually, staff submit capital funding requests for new projects as part of the EMP. The EMP focuses on three main action areas:

1. Energy conservation: reduce the overall demand for energy
2. Energy efficiency: reduce the energy required for operations
3. Renewable and clean energy: increase the use of renewable energy or decarbonize existing buildings

The City reduced GHGs from City buildings by 38% between 2007 and 2020 by implementing energy efficiency and fuel-switching initiatives¹⁹.



Heating and cooling upgrades at the Richmond Library & Cultural Centre (7700 Minoru Gate) were completed in 2022. Aging boiler equipment was replaced with highly efficient heat pumps to reduce greenhouse gas emissions by over 70%. The project benefited from funding from the Federation of Canadian Municipalities and CleanBC.

¹⁹ <https://www.richmond.ca/services/climate/energysrvs/energy-emissions/energymanagement.htm?PageMode=HTML>

Green Fleet Action Strategy

Richmond relies on its fleet of vehicles to maintain roads, provide bylaw enforcement, manage water and sewer services, keep parks beautiful and clean and provide many other services in the community. Aware that fleet operations also generate greenhouse gas (GHG) emissions, the City of Richmond's Green Fleet Action Plan, is shifting the City's vehicle fleet towards "green" operations. The Green Fleet Action Plan aims to reduce GHG emissions through strategies to purchase vehicles that have lower emissions, and setting out options to cut fuel consumption. In 2016, the City became the first municipality to receive a Platinum Rating from E3 Fleet, a national program that recognizes excellence in fleet management and environmental performance. An E3 Fleet Platinum Rating is the highest mark of achievement for fleet management in Canada. More information in the footer below²⁰.



E3 Fleet awarded the City with the first platinum rating in Canada for the City's excellence in fleet management and environmental performance. The City's actions are far-reaching: using alternative fuels, driver training and fleet electrification are just a few initiatives. To date, the City has 26 EV units (including road vehicles, an ice resurfacer, fork lifts, and generators), 32 Plug-in Hybrid EV's, 29 Hybrid units and one hydrogen vehicle.

²⁰ <https://www.richmond.ca/services/climate/energysrvs/energy-emissions/Fleet/fleet.htm?PageMode=HTML>

Environmentally Sensitive Areas

Today's marshes, wetlands, beaches and open spaces need to be preserved for the future. The common environment depends on the sustainability of Richmond's natural areas. By being involved in the preservation and maintenance of these environmentally-sensitive areas, the community can help in the saving of unique, local waterfront and bring positive results to an already fragile ecosystem. The City has designated Environmentally Sensitive Areas (ESA) in the City's Official Community Plan (OCP) for the protection of the natural environment, its ecosystems and biodiversity. The City's objective is to achieve long-term protection of all ESAs, encourage the restoration of natural habitats within these areas and connect ESAs with other ecological areas. Where development impacts to the ESA are unavoidable, the City will work with applicants to minimize disturbance, ensure a net gain in habitat area and ecosystem function.

Circular Economy Leadership

To achieve the climate goals, while creating a prosperous and resilient Richmond economy, it is imperative to transform how products and food are designed, manufactured, and consumed. The City of Richmond's vision for the circular economy is to maximize the value of resources, by design, through responsible consumption, minimizing waste and reimagining how resources flow in a sustainable, equitable, low-carbon economy. Economic growth is combined with a development cycle that preserves natural capital, optimizes resource production, and minimizes risk by managing limited resources and renewable loops. The City has demonstrated leadership in circular innovation by developing innovative policies, programs, and services shaped by community and stakeholder participation.

- In February 2020, the City hosted Canada's first vendor-focused Circular Economy Engagement Workshop organized and facilitated by the City, with over 70 participants in attendance. The City launched a pilot project in October 2020 to use 40% Reclaimed Asphalt Pavement on a major municipal road. A total of twenty pathways have been paved throughout Richmond using high RAP since 2020.
- In May 2021, the City of Richmond successfully applied to join the Circular Cities and Regions Initiative (CCRI) P2P Network, which will in turn lead to the development of Richmond's circular roadmap in 2022.
- Due to demolition, land clearing and construction (DLC) waste accounts for 30% of total waste disposed in the region, in 2018 the City's has updated the Demolition Waste and Recyclable Materials Bylaw No. 9516 to require that 70% of the demolition waste be salvage, recycled or reused. With over 1,000 permits issued since the introduction of the bylaw, it is estimated that over 75,000 tonnes of DLC waste has been diverted from disposal. The House Move and Salvage Program successfully provides a streamlined regulatory process and supporting infrastructure for the public to consider house moving and/or salvaging of building materials as alternatives to demolition.

More information in the footer below²¹.

²¹ <https://www.richmond.ca/services/climate/circulareconomy.htm>



RICHMOND FOOD RECOVERY NETWORK PROGRAM

The City partnered with FoodMesh to mobilize local food manufacturing, processing and retail businesses to adopt circular economy practices. An online exchange platform enabled the diversion of surplus or off-spec food products away from waste streams to secondary markets or local charities. The initial partnership with FoodMesh and investment of \$25,000 was successful in establishing a critical mass of users on the Richmond Food Recovery Network. In its first year, this program helped reduce CO2 emissions by 788,423 in CO2. Now that a robust user base has been secured, the network is self-sustaining; existing and new companies and social groups can continue to use the platform in perpetuity. In 2021 the City was awarded the Community Project Award by the BC Economic Development Association for this initiative. The following outcomes were achieved in the pilot year:

	Projected	Results	% of Target
Participating organizations	30	59	197%
CO2 emissions saved	427,917 KG	788,423 KG	184%
Total weight of food diverted	225,000 KG	414,555 KG	184%
Number of meals created	300,000	644,800	215%
Savings to food brands and charities	\$1,250,000	\$2,207,971	177%
Weight of food turned into animal feed	50,000 KG	17,532 KG	35%

2. Leadership in Climate Change Adaptation

Over the last decade, Richmond has implemented a series of strategies and plans that, in combination, respond to anticipated climate change impacts projected for Richmond over the coming century. Staff continue to actively monitor climate change projections and associated impacts as new information becomes available to ensure that potential vulnerabilities are appropriately addressed in a timely manner.

A key area of focus relates to increasing global and local temperatures expected to cause oceans to thermally expand, and contribute to the melting of glaciers. In addition, the City has to contend with regional "subsidence", the slow settlement of soft deltaic soils, that is expected to raise local relative sea levels in Richmond by about 20cm over the next century. These changes are driving investments in perimeter diking. Investments in drainage infrastructure is being driven by growing seasonal variances in precipitation (Attachment 1). Other concerns related to climate adaptation relate to invasive species, changes in the natural environment, and human health. The City's adaptation strategies and programs are described below.

FLOOD PROTECTION SYSTEM IS COMPRISED OF

	
49 km of dikes	61 km of box culverts
	
39 drainage pump stations	155 km of water-courses
	
595 km of drainage pipes	\$42 million in senior government grants

Drainage, Flood Protection and Sea Level Rise

FLOOD PROTECTION UTILITY (2002)

The City's Flood Protection Utility was created to develop a reserve fund to operate, maintain, and upgrade Richmond's flood protection infrastructure. Since 2003, Council has approved increasing annual funding levels for the Drainage and Diking Utility from \$0.6M to its current level of \$18M.

Since 2005, the total capacity of the City's drainage pump stations has increased by 30%. Over the last 20 years, since the City introduced the Drainage and Diking Utility, the City has rebuilt or upgraded 19 of its 39 drainage pump stations.

FLOOD PROTECTION MANAGEMENT STRATEGY

The City's Flood Protection Management Strategy is the City's guiding framework for continual upgrades and improvements to the City's flood protection system. Richmond is a recognized as a leading dike authority in British Columbia and a key component of the City's success is the Flood Protection Management Strategy, which provides high-level guidance for flood risk management in the City. As sea level rise science evolves and the population and economic investment in Richmond continues to increase, the City's priorities and management of flood risk need to be reviewed to incorporate best practices and current science. The Flood Protection Management Strategy outlines short- and long-term strategies for policy planning, infrastructure upgrades and other areas related to flood risk mitigation.

DIKE MASTER PLANS

A key action identified in the City's Flood Protection Management Strategy involves continuing to upgrade the City's perimeter dike in anticipation of climate change induced sea level rise. The City's Dike Master Plan addresses this need by recommending dike upgrade options for each dike section throughout the City. Richmond is protected from flooding by infrastructure that includes 49 kilometres of dike. The Dike Master Plan and the Flood Protection Management Strategy identify strengthening and raising the City's perimeter dike to 4.7 metres geodetic elevation as the priority response to sea level rise. All new dikes are designed to accommodate a further height increase to 5.5 metres to address sea level rise beyond 2100. In addition, the City is actively pursuing opportunities to construct superdikes, where land behind the dike is built up to the same elevation as the dike. This eliminates visual impacts of a raised dike structure on waterfront views while providing an enhanced flood protection structure for the City. Superdikes constructed through development to date include sections near the Richmond Olympic Oval, Parc Riviera and at the Imperial Landing and Kawaki developments in Steveston.

FLOOD PLAIN DESIGNATION AND PROTECTION BYLAW

The City's Flood Plain Designation and Protection Bylaw No. 8204 was adopted by Council in 2008 to guide development setback, flood construction levels and exemption areas.



The City successfully upgraded 650 m of dike along the Fraser River's south arm between Gilbert Road and No. 3 Road. This upgrade raised the dike by approximately 1.5 m and included a multi-use trail separated from traffic lanes and incorporated seating, picnic areas and arrival points with wayfinding and parking.

Integrated Rainwater Resource Management Strategy

The majority of the Richmond's land mass is located on Lulu Island which forms a single watershed with carefully engineered drainage catchments that include channelized watercourses, sloughs and ditches that serve drainage, irrigation and habitat functions. As a floodplain municipality with soft soils, low gradients and a high water table, the City has unique stormwater management issues and needs compared to regional neighbours.

The Integrated Rainwater Resource Management Strategy (IRRMS) outlines initiatives to manage stormwater that aim to minimize the effects on drainage infrastructure and identify opportunity to use rainwater as a resource. The IRRMS also identifies strategies for reducing the impacts that new development may have on stormwater flows and water quality. The contributions of the IRRMS are significant as it relates to managing the expected increase in rainfall intensities due to climate change. The Strategy is guided by four main goals to address these specific needs: (1) minimize the impacts of future development and redevelopment on drainage infrastructure and ecological health; (2) reduce potable water use; (3) address existing and future sedimentation issues; and, (4) support the City's Ecological Network.

Natural Environment

ECOLOGICAL NETWORK MANAGEMENT STRATEGY

In order to protect, enhance and expand a diverse, connected and functioning Ecological Network, Richmond City Council adopted the Ecological Network Management Strategy in September 2015. The strategy provides a framework for managing and guiding decisions regarding the city-wide system of natural areas in Richmond and the ecosystem services they provide on City, public and private lands. The strategy, intended to be opportunistic and collaborative, sets out priority areas and actions for the on-going and long-term implementation of the Ecological Network (EN). The strategy notes that impacts of climate change and sea level rise will impact the City.

INVASIVE SPECIES ACTION PLAN

In January 2016, Council adopted the Invasive Species Action Plan in order to "reduce the economic and environmental risks of invasive species in Richmond, which are caused, in part, by climate change and associated ecological shifts that influence the proliferation of invasive species. More information in the footer below²².



The City managed a three year, pesticide free management program for Brazilian elodea, an invasive plant commonly used in aquariums, concluded in the summer of 2021. Effective 2022, the site will be monitored for resurgences

²² https://www.richmond.ca/_shared/assets/2017_ISAP_Update_Report48953.pdf

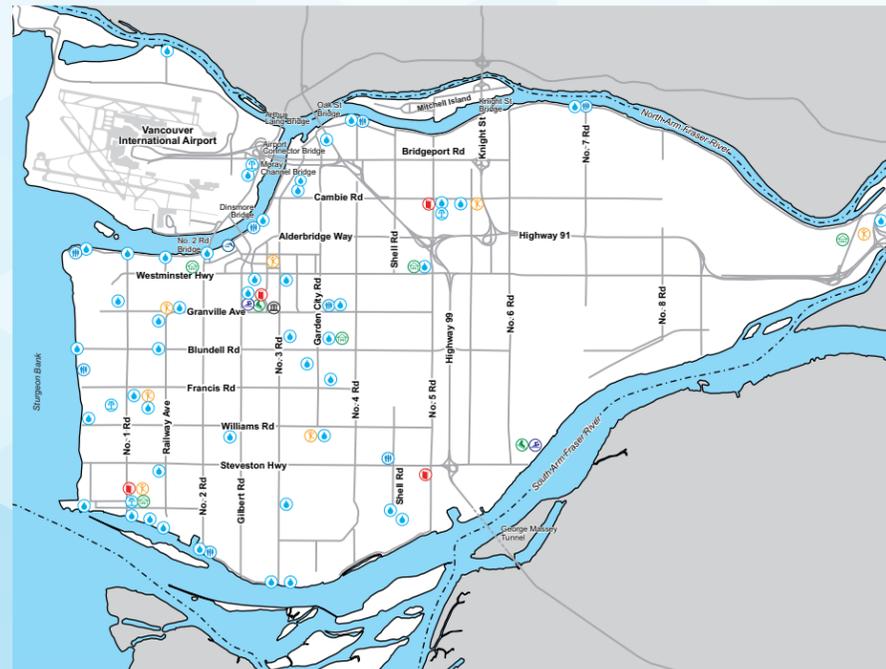
PUBLIC LANDS FOREST MANAGEMENT STRATEGY

In 2019, Council adopted the Public Lands Forest Management Strategy to maximize the multiple benefits that trees provide for Richmond, including local shading and cooling effects that counter urban heat island effects. Trees and vegetation generally will be stressed as local climate conditions change such as heat stress during the summer, waterlogging in the winter and/or pest outbreaks. The strategy lays out a path to create an evolving urban forest that will be less vulnerable to climate change. A healthy urban forest will complement the City's adaptation efforts by providing cooling refuges, absorbing rainwater and preventing erosion, reducing air pollution, buffering severe wind and sequestering carbon. More information in the footer below²³.

Health

COOLING CENTRES

The City offers clean air cooling stations as a response to heat waves and poor air quality events. The City encourages the use of Richmond community centres, community centres, pools, water parks, libraries and arenas, as clean air cooling stations for residents vulnerable to heat stress and/or respiratory conditions. The City also provides tips for staying cool from provincial and federal health ministries.



23 https://www.richmond.ca/city-hall/strategies/mandateparksrec/planning/Public_Tree_Management_Strategy.htm

Emergency Programs

The scope of the City's Emergency Programs includes services to ensure the protection of life, public infrastructure, private property and the environment in the event of an emergency or disaster situation. While not explicitly focused on climate change adaptation, Emergency Programs serve as an important backstop should climate related impacts such as flooding be experienced locally. More information in the footer below²⁴.

Food Security

Agriculture is an important part of the local and regional economy, and it is a major land use in Richmond. Over 40 percent of Richmond's land base is agricultural; of that, 39 percent is in the Agricultural Land Reserve. The Farming First Strategy includes objectives and policies to guide decisions on the land use management of agricultural land, enhance public awareness of agriculture and food security issues, and strengthen agricultural viability in Richmond. Theme 4 in the strategy includes an objective and associated actions to mitigate the impacts of climate change on agricultural production. More information in the footer below²⁵.

In 2016, Council adopted the Richmond Food Charter that includes a commitment to 'preserve and strengthen land and water resources that support food production' and to 'promote food industry practices that reduce environmental impacts and greenhouse gas emissions'. More information in the footer below²⁶.



24 <https://www.richmond.ca/city-hall/city-departments/contact/departments/safety/emergency.htm>

25 https://www.richmond.ca/_shared/assets/Farming_First_Strategy_One-Year_Review62859.pdf

26 <https://www.richmond.ca/city-hall/city-departments/contact/departments/safety/emergency.htm>

Attachment

Anticipated Climate Impacts

Local impacts of climate change impacts in a given location will be influenced by human and economic dynamics, local geography, climatic conditions and certainly, the extent in which mitigation and adaptation actions are effectively implemented. Sources for the information below is noted in each section. The information is not exhaustively reported but aims to paint a picture of anticipated climate impacts if global, regional and local mitigation and adaptation measures are not implemented.

STRATEGIES OUTLINED IN SECTION 2:

- Flood Protection Management Strategy
- Integrated Rainwater Resource Management Strategy

Local Weather Conditions

The Pacific Climate Impacts Consortium at the University of Victoria completed the Climate Projections for Metro Vancouver²⁷ report for the Metro Vancouver Regional District in 2016. The report “downscaled” global climate models, translating the outputs from the IPCC’s low-resolution global-scale climate models into high-resolution projections at the local scale. The report provided regional projections of climate change impacts derived from the IPCC’s 1.5 °C, 2 °C and 4 °C scenarios of global average warming, for both the 2050s and the 2080s. Results were compared against 1970-2000 historical averages for the region. Projected regional impacts within Metro Vancouver for the 1.5 and 2.0 °C scenarios follow.

- **Precipitation:** Within Metro Vancouver, projections show that there is likely to be a shift towards an increase in intensity, duration and frequency of precipitation events. Within the drinking water supply areas of Metro Vancouver, increased rainfall intensity can exacerbate landslides and turbidity events in the reservoirs. Richmond’s drainage system is designed to accommodate a 10-year return period rainfall event. Although there have been some instances of minor localized surface ponding in Richmond due to heavy rainfall that exceeded a 10-year return period rainfall event, Richmond’s robust flood protection and drainage systems and proactive maintenance programs have mitigated significant flood risks. With continued Council support for capital upgrades through the City’s Drainage and Diking Utility, the City’s flood protection and drainage systems will continue to protect residents from climate change induced flood risks.
- **Summertime Drought:** Regional climate projections indicate a modest increase in total annual precipitation under both 1.5°C and 2.0°C scenarios – showing a shift towards wetter fall-spring periods, which is partially offset by dryer summers. The biggest declines in summertime precipitation are forecast for the 2 °C scenario.
- **Heat wave:** The IPCC report projects worse heat waves at 2°C compared to 1.5°C globally.

²⁷ <http://www.metrovancouver.org/services/air-quality/AirQualityPublications/ClimateProjectionsForMetroVancouver.pdf#search=%22climate%20projections%20metro%20vancouver%22>



Sea Level Rise and Freshet Flooding

The IPCC report projects a global average rise in sea level of 0.26 to 0.77 m by 2100 (relative to average sea levels in 1986-2005) with 1.5°C of global warming. This is 10cm less that would be experienced with 2 °C of global average warming. The report also states that “sea level rise will continue beyond 2100 even if global warming is limited to 1.5°C in the 21st century.” The IPCC report goes further by suggesting that if destabilization of polar ice sheets is avoided, global average sea levels could regain equilibrium after a rise of “0.5–1.2 m and 0.6–1.7 m in 1.5°C and 2°C warmer worlds, respectively.”

The Climate Projections for Metro Vancouver report does not include a downscaled projection of sea level rise for Metro Vancouver, but in 2018 the Washington Coastal Hazards Resilience Network produced sea level rise projections to 2150 for more than 100 locations on the coast of Washington State, for both the 2°C global average warming and 4°C global average warming scenarios.²⁸ The projections for Point Roberts (the closest modelled location to Richmond) show mid-range sea level rise estimates of 1.3 ft. (40 cm) and 1.8 ft. (55 cm) by 2100 under the 2°C and 4°C scenarios respectively, with 3% and 9% respective probabilities of sea level rise exceeding 0.91 m (3ft).

The City is implementing the Dike Master Plan, which provides full protection against 1 metre of sea level rise, with the ability to accommodate up to 1.8 metres of sea level rise if necessary. As such, work already underway is sufficient to protect Richmond against projected local sea level rise out to 2100.

²⁸ i.e. downscaled projections of the IPCC’s RCP4.5 and RCP8.5 scenarios respectively. This work did not include projections based on the RCP2.5 scenario that results in 1.5 oC of global average warming.

STRATEGIES OUTLINED IN SECTION 2 ADDRESS THESE IMPACTS:

- Flood Protection Strategy
- Dike Master Plans



**STRATEGIES
OUTLINED IN
SECTION 2
ADDRESS THESE
IMPACTS:**

- Flood Protection Management Strategy
- Dike Master Plans
- Ecological Network Management Strategy
- Public Lands Forest Management Strategy
- Invasives Species Action Plan
- Community Energy & Emissions 2050 (Strategic Direction #8)

Ecosystems and the Natural Environment

The Climate Projections for Metro Vancouver report notes that rising temperatures and changes in precipitation will affect ecosystems including urban forests, parks, and wetlands. These changes will see changes in the survivability of trees and plants if no adaptations are made over time. A combination of decreasing

snowpack, frost days, and summer precipitation, and increasing temperatures ‘will cause stress to some forests that may cause tree growth to decline and mortality rates in vulnerable species to rise’ and through these processes bring an increase in wildfire risk. Prolonged dry spells, stressed reservoirs, and warmer summer temperatures would be expected to reduce soil moisture in the summer could affect urban tree growth and increased tree mortality.

The report notes that pests and invasive species ‘may be better able to thrive in changing conditions and may out-compete native species’. All of the above processes may also impact soil chemistry and soil capacity to retain water, increasing potential frequency and severity of flooding. Finally, the report noted that the above changes will impact ‘terrestrial species, decreased plant growth, heat stress, and scarcity of water reduce the quality of forage crops, causing increased competition for resources.’

More broadly, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services 2019 Global Assessment on Biodiversity and Ecosystem Services report²⁹ highlighted that if ‘action is not taken to sustainably manage changes in land and sea use; reduce direct exploitation of organisms; address climate change, pollution and invasive alien species, a 1,000,000 species will be threatened with extinction’. The Report conclusions were supported by five decades of historical assessments that linked economic development and associated impacts on nature.

²⁹ <https://ipbes.net/global-assessment>

Finally, the UN’s 2020 Convention on Biological Diversity’s “The Global Biodiversity Outlook 5 (GBO-5)³⁰ offered an ‘authoritative’ overview of the state of nature. The report called for ‘a shift away from “business as usual” across a range of human activities’. The report outlined eight transitions that recognize the value of biodiversity, the need to restore the ecosystems on which all human activity depends, and the urgency of reducing the negative impacts of such activity. Specifically for cities, the transition strategy advises ‘deploying ‘green infrastructure’ and making space for nature within built landscapes to improve the health and quality of life for citizens and to reduce the environmental footprint of cities and infrastructure’. Climate actions need to employ nature-based solutions, alongside a rapid phase-out of fossil fuel use, to reduce the scale and impacts of climate change, while providing positive benefits for biodiversity and other sustainable development goals.

³⁰ <https://www.cbd.int/gbo/gbo5/publication/gbo-5-spm-en.pdf>



STRATEGIES OUTLINED IN SECTION 2 ADDRESS THESE IMPACTS:

- Cooling Centres
- Emergency Programs

Health

Vancouver Coastal Health (VCH) has resources and information related to heat stress and related health impacts that “will become more of an issue as the climate warms”. They note that heat-related illnesses such as heat exhaustion, heat stroke “in extreme situations, can lead to permanent disability or death” noting that older adults, people with chronic conditions, people on certain medications, infants and young children are especially sensitive to the health effects of heat. They also advise that severe cases have the potential to lead to heat stroke, a condition requiring immediate medical care. VCH offers resources to manage heat stress³¹ that include stay cooling, drink plenty of water.

Finally, VCH also notes that during the summer months, both heat and wildfire smoke can be a health concern. Wildfire smoke is a mixture of air pollutants and can lead to important health concerns.. VCH notes that as the climate warms ‘the number, size and duration of wildfires are expected to increase and seriously impact air quality in British Columbia. Wildfire smoke causes episodes of the worst air quality that most people will ever experience in BC.’

³¹ <http://www.vch.ca/public-health/environmental-health-inspections/healthy-built-environment/air-quality/outdoor-air-quality/extreme-heat>

Equity

The Canadian Urban Sustainability Practitioners³² (CUSP) network have developed Canadian-specific resources for how to address equity issues when undertaking climate action work. They note that the ‘growing wealth disparity between low- and moderate-income households and other underserved groups and those with greater affluence is reflected through the disproportionate uptake of clean technologies by higher-income households in U.S. and Canadian municipalities’. Barriers exist, such as affordability, up front costs, access to credit, and others, that prevent or frustrate the adoption of clean energy technologies for these households. CUSP’s work highlights that ‘inequity within communities is exacerbated by additional factors beyond income, including race, ethnicity, citizenship, ability, age, and fluency with the dominant language’. CUSP created a guidebook that provides guidance on how equity issues can be recognized in policy and/program design. This work in cities across North America is an evolving area of practice leading to emerging approaches and best practices.

³² <https://cuspnetwork.ca/wp-content/uploads/2020/03/USDNEquitableCleanEnergyGuidebookCompressed-2.pdf>

STRATEGIES OUTLINED IN SECTION 1:

- Community Energy and Emissions Plan 2050 identifies specific actions that present opportunities to advance equity, fairness and inclusion during plan implementation
- Energy Poverty Toolkit for Low Income Households and their Service Providers



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City of Richmond

6911 No. 3 Road, Richmond, BC V6Y 2C1

Telephone: 604-276-4000

www.richmond.ca