metrovancouver | CLIMATE 2050

CLIMATE **2050**

Water & Wastewater Infrastructure Primer

Indigenous Territorial Acknowledgement

Metro Vancouver acknowledges that the region's residents live, work, and learn on the shared territories of many Indigenous peoples, including 10 local First Nations: q̓i̓c̓əy̓ (Katzie), q̓ʷɑ:n̓ƛ̓ən̓ (Kwantlen), kʷikʷəƛ̓əm (Kwikwetlem), máthxwi (Matsqui), xʷməθkʷəy̓əm (Musqueam), qiqéyt (Qayqayt), Semiahmoo, Sḵwx̱wú7mesh Úxwumixw (Squamish), sc̓əw̓aθən məsteyəxʷ (Tsawwassen), and səlilwətaɬ (Tsleil-Waututh).

Metro Vancouver respects the diverse and distinct histories, languages, and cultures of First Nations, Métis, and Inuit, which collectively enrich our lives and the region.

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Cover photo: Iona Island Wastewater Treatment Plant

Metro Vancouver

Metro Vancouver is a diverse organization that plans for and delivers regional services, including water, sewers and wastewater treatment, and solid waste management. It also regulates air quality, plans for urban growth, manages a regional parks system, provides affordable housing, and serves as a regional federation. The organization is a federation of 21 municipalities, one electoral area, and one treaty First Nation located in the region of the same name. The organization is governed by four Boards of Directors of elected officials, one for each legal entity making up Metro Vancouver with representation from member jurisdictions.

Contents

Low water levels at Capilano Reservoir

The Primer at a Glance

The *Climate 2050 Water and Wastewater Infrastructure Primer* is provides an overview of the strategies employed by Metro Vancouver to achieve carbon neutrality and climate resilience for the regional drinking water and wastewater systems, diversify our energy sources, pursue energy recovery opportunities, and improve infrastructure resilience to protect communities from climate impacts.

Impacts from a changing climate, such as more intense and frequent rainfall, sea level rise, and drought, directly affect water and wastewater utilities' operations and infrastructure. Mitigating the amount of greenhouse gas (GHG) emissions released into the atmosphere by the water and wastewater system often makes economic sense and is also an environmentally and socially responsible action.

Increasing the resilience of the drinking water and wastewater systems involves adapting key infrastructure to climate hazards, protecting the significant carbon storage areas of the regional drinking water supply watersheds, protecting the region's natural assets and ecosystems, and managing water and wastewater resources responsibly. Achieving carbon neutrality and climate resilience also presents opportunities for economic growth through innovative energy generation and recovery, and cost efficiencies through improved operational efficiency and resilience.

Overall, this primer offers a summary of strategies related to mitigating and adapting to climate change with several examples of actions taken to date. Future strategies and actions will be outlined in the Drinking Water Management Plan, Liquid Waste Management Plan, and other department level plans and programs.

Metro Vancouver's Responsibility for Water and Wastewater

Metro Vancouver's responsibility for water and wastewater infrastructure systems, including primary service roles:

- Planning, building, and maintaining infrastructure to treat and deliver high-quality drinking water to member jurisdictions
- Planning, building, and maintaining infrastructure to collect and treat wastewater from members
- Provide drainage services on certain waterways in collaboration with specific local governments to safely channel stream flows and reduce the risk of flooding

Metro Vancouver delivers these services primarily through two departments: Water Services, which handles drinking water, and Liquid Waste Services, which handles wastewater and drainage.

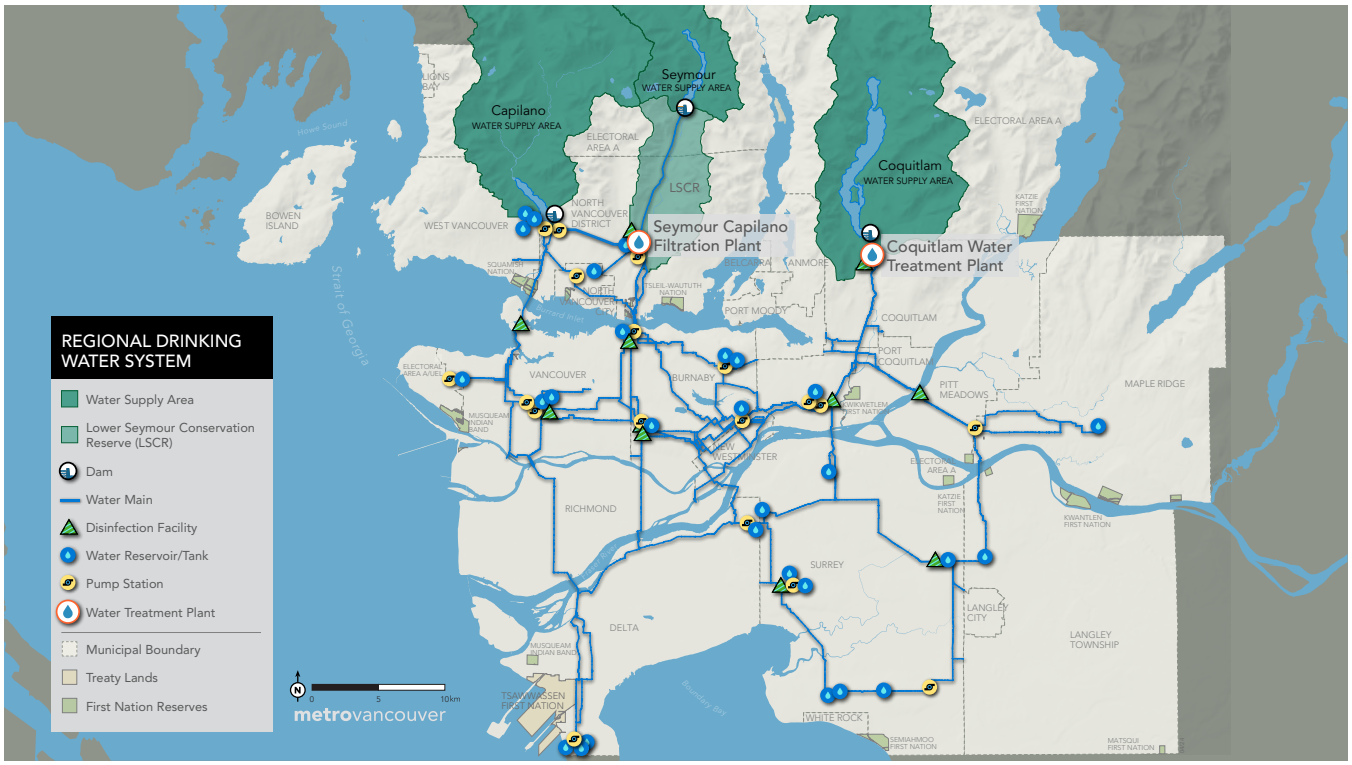
Drinking Water

Metro Vancouver's Water Services provides high-quality drinking water through its member jurisdictions to about three million residents in the region. Metro Vancouver's water comes from rainfall and snowmelt in three major water supply areas: Capilano, Seymour, and Coquitlam. These protected water supply areas comprise about 60,000 hectares, which store 20 million tonnes of carbon in their forests, and are closed to public access to safeguard the high-quality source water.

The water supply is stored in three main source storage reservoirs and three supplemental alpine reservoirs. Metro Vancouver benefits from existing supply sources that refill reliably, are close to the rapidly growing region that they serve and are situated at high elevations that allow water to be delivered largely by gravity, reducing the need for energy-intensive pumping creating a relatively low carbon footprint drinking water system.

The regional water system also includes five water supply dams, two water treatment plants, eight disinfection facilities, 19 pump stations, 28 in-system storage reservoirs and tanks, and over 520 kilometres of transmission water mains. This does not include members' infrastructure, which distributes water from the regional system to residents and businesses.

Figure 1: Metro Vancouver Drinking Water System



Wastewater

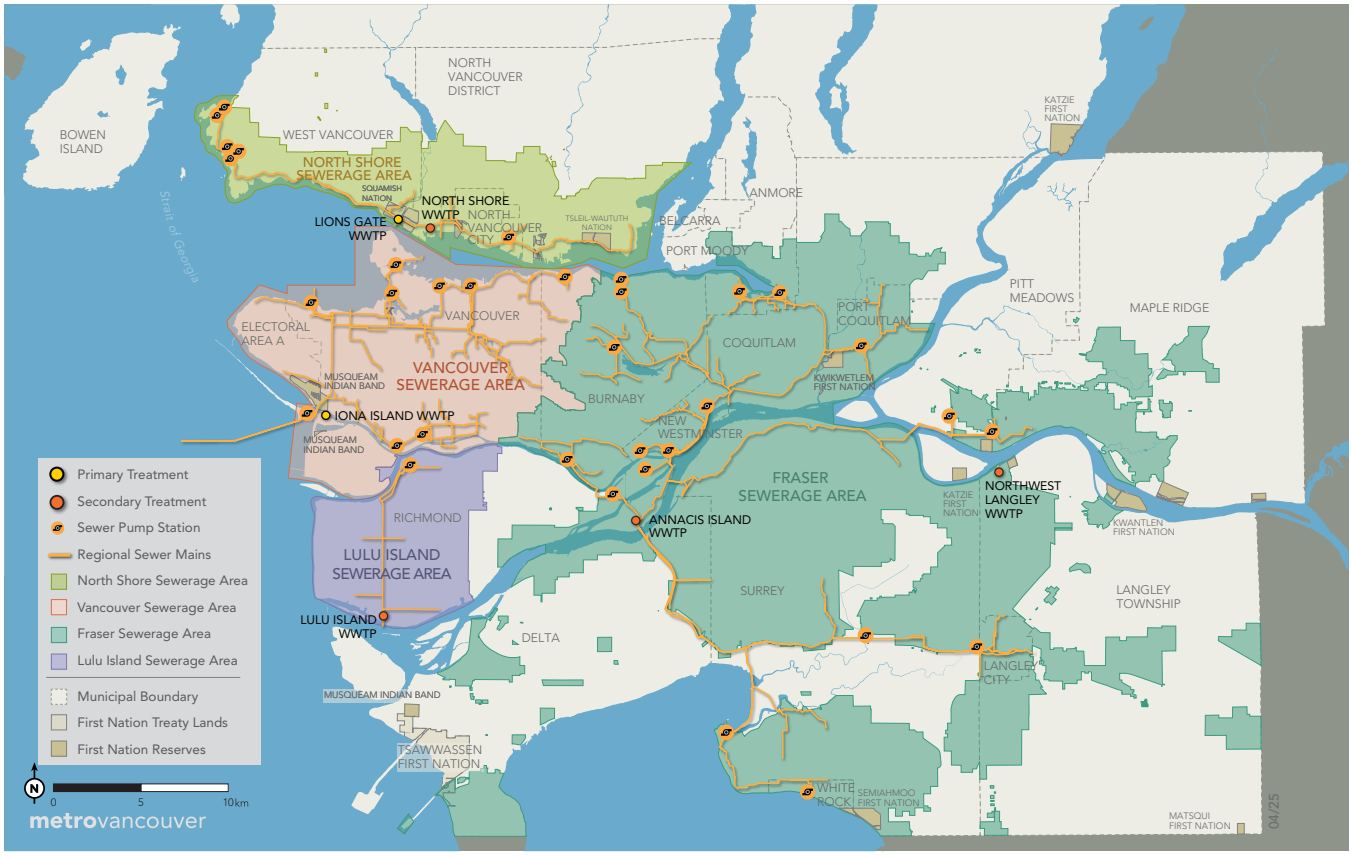
Metro Vancouver's Liquid Waste Services collects wastewater from members, conveys it through a network of pumps and sewer mains, treats wastewater at five wastewater treatment plants, and returns treated water to receiving waterbodies. Along the way, organic material, biogas, and waste heat are recovered and beneficially used. Wastewater also includes some of the rainwater runoff (known as stormwater) in areas of the region with combined sewer systems that convey sanitary sewage and stormwater together. Member jurisdictions are responsible for conveying and discharging stormwater from areas with separate sanitary and stormwater sewers into local waterways. In collaboration with specific members, Metro Vancouver provides drainage services on certain sections of waterways that cross municipal boundaries.

Liquid Waste Services maintains, upgrades, and expands wastewater infrastructure to meet or surpass regulatory standards that protect human health and the environment, while reliably serving a growing population in the region. It also manages biosolids, the treated wastewater solids, aiming for 100 per cent beneficial use.

Metro Vancouver's Water and Wastewater Utility Planning Process

The Drinking Water Management Plan (DWMP) and the Liquid Waste Management Plan (LWMP) are the Board-approved decision-making pathways for Metro Vancouver to set direction and policies related to drinking water and liquid waste functions for Metro Vancouver and member jurisdictions. The management plans are updated every ten to 15 years based on robust engagement with First Nations, the public, and member jurisdictions.

Figure 2: The four sewerage areas of Metro Vancouver's regional liquid waste system



The Challenge

Climate change is causing shifts in the natural environment, resulting in more frequent and more severe extreme weather events. We are facing both higher intensity of rain in the wet season and longer droughts in the dry season. In a changing climate, engineered systems can no longer be designed for predictable snowpack that fills drinking water reservoirs, predictable rainfall intensities and return periods, or steady sea levels. Without reliable infrastructure, the region will not be able to:

- rapidly recover from the increasing number of significant rainstorms
- have adequate capacity in the water system to respond to fires; continue to provide uninterrupted drinking water supply when it is more crucial, such as during hotter weather
- treat wastewater to protect public health and the environment
- treat drinking water and wastewater for evolving receiving water quality concerns

Metro Vancouver must improve the resilience of its infrastructure and adapt to climate change impacts to continue to provide world-class drinking water and wastewater services. Addressing climate change will require significant financial investments. However, these infrastructure investments will avoid costly damages to communities from climate-related events. There are also opportunities to expand resource recovery options and generate revenue.

What Is a Carbon Neutral Region?

A carbon neutral region is achieved when the annual GHG emissions in the region are equal to the amount of carbon removed from the atmosphere and stored annually by the natural ecosystems in the region (e.g., forests and wetlands).

In the Metro Vancouver region, these ecosystems remove about 1 million tonnes of carbon from the atmosphere every year. Currently regional GHG emissions are around 17 million tonnes per year. These emissions must be reduced as much as possible, while ecosystems can help to offset a very small amount of remaining emissions, to achieve carbon neutrality.

Climate 2050 Regional Vision

Metro Vancouver's Climate 2050 strategy guides climate change policy and action for Metro Vancouver for the next 30 years. The strategy addresses adaptation (responding to climate impacts) and mitigation (reducing GHG emissions) to address climate change. The Climate 2050 framework is designed to ensure that Metro Vancouver remains a sustainable, prosperous, and livable region for future generations. Climate 2050 was adopted by the MVRD Board in 2018 and aims to:

- Achieve a carbon-neutral region by 2050;
- Reduce GHG emissions by 45% from 2010 levels by 2030; and
- Ensure the region's infrastructure, ecosystems, and communities are resilient to the impacts of climate change.

Greenhouse gas emissions are decreasing in some sectors across the region, but total emissions are still rising, and the region is not on track to meet the target of 45% reduction in regional emissions by 2030. Continued collective action remains paramount to reduce the future impacts of climate change. This means increased and more coordinated efforts are needed at all levels of government, in collaboration with partner organizations including public sector organizations, businesses, non-profits, and Metro Vancouver residents.

Climate Impacts on Water and Wastewater Infrastructure

Water and wastewater infrastructure in the region is expected to face a range of impacts and hazards from climate change. These climate impacts can be compounded — for example, flooding tends to be more severe following a wildfire, landslides tend to occur following heavy rainfall, and coastal storms may become more frequent and severe with additional impacts when compounded with sea level rise. Non-climatic hazards can also exacerbate climatic ones; for instance, land subsidence can increase overall sea level rise and earthquakes can disrupt flood protection infrastructure. Climate change impacts, such as those identified through the Climate Projections For Metro Vancouver Study, and listed below, will magnify existing stressors on water and wastewater infrastructure and increase demands on water resources.

Warmer temperatures with increasing daytime and nighttime temperatures, and more hot summer days and fewer winter days with frost or ice.

Longer summer dry spells with summer rainfall declining by nearly 20 per cent and increased likelihood of extended drought periods.

Wetter fall and winters with a large increase in rainfall during these seasons, despite average total annual rainfall increasing by just 5 per cent.

More extreme precipitation events as more rain falls during the wettest days of the year and the frequency of extreme rainfall events increase.

Decreased snowpack by over 50 per cent during spring in the mountain water supply areas.

Impacts Felt

Drought conditions combined with higher temperatures increase the region's demand for drinking water during summer months, adding strain on source water storage and transmission system capacity.

Water scarcity stemming from a reduced snowpack compromises the drinking water system's ability to provide uninterrupted drinking water through the late summer months.

Heatwaves increase the demand for drinking water and can contribute to water scarcity.

Sea level rise of at least 1 meter by 2100 due to warming global temperatures impacts coastal areas with saltwater intrusion that can compromise local water supplies used for agricultural irrigation, resulting in increased demand on the drinking water system.

Warmer oceans stress intertidal and estuarine ecosystems and mitigating any further stress to these ecosystems may require additional treatment provisions at wastewater treatment plants discharging into marine environments.

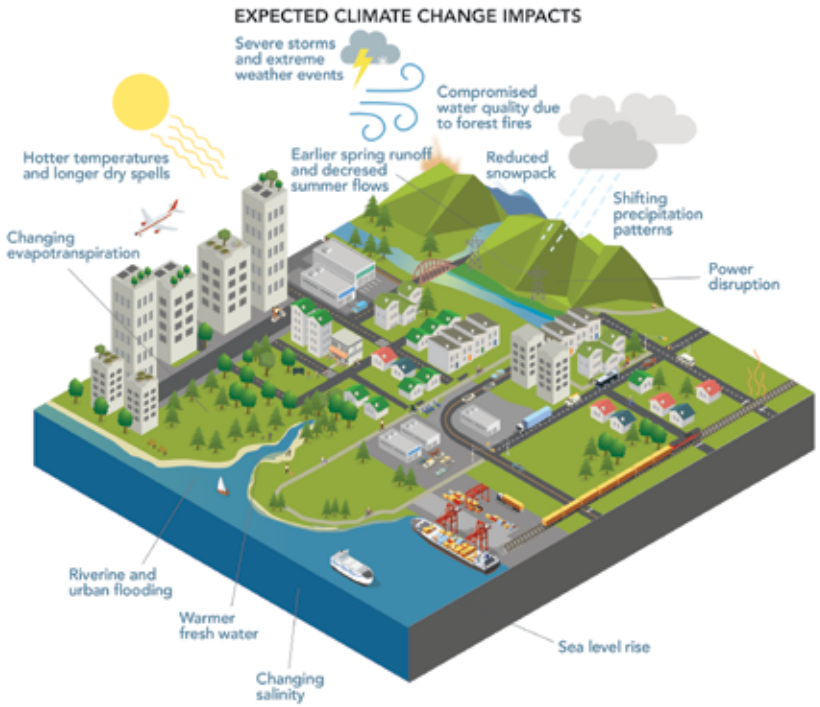
Extreme weather events can cause direct damage to infrastructure or cause power outages that interrupt the operations of critical infrastructure.

Flooding events can overwhelm collection and drainage systems, leading to sewage overflows and the release of contaminants into the environment, or damaging critical infrastructure by flooding facilities and overwhelming drainage systems. Such events, including storm surges, can also cause structural changes to rivers and shorelines, which affect adjacent water and wastewater infrastructure like plants, pump stations, and marine crossings.

Wildfire conditions, driven by heat and drought, are extended in duration, placing additional pressure on water supplies to suppress fires, threatening the region's protected water supply lands, and increasing landslide risk.

Landslides and debris flow from increased precipitation on unstable slopes compromise source water quality due to the increased turbidity, which stresses the treatment processes and requires an increase in chemical demands.

Figure 3: Expected climate change impacts on the region's water systems



Emissions from Water and Wastewater Infrastructure

Globally, the water and wastewater sector accounts for 4 per cent of total energy consumption.[1] Reducing GHG emissions from the energy used in water and wastewater operations will help meet Metro Vancouver's climate goals and can have a positive impact on our region.

Emissions from non-energy sources, such as process emissions and embodied emissions, are likely substantial but have not yet been measured or estimated. Emissions from construction activities may also be significant, but have not yet been measured or estimated.

Corporate Energy Management

The Corporate Climate and Energy Performance Report tracks Metro Vancouver's use of energy to deliver services to the region, GHG emissions related to this energy use, and initiatives to improve energy efficiency, reduce GHG emissions, and generate and use clean energy. Metro Vancouver's ***Corporate Energy Management Policy*** articulates a corporate commitment to continuously improve energy production, generation, recovery, and efficiency, as well as establish energy targets and regularly report on progress towards them.

Economic Opportunities in Energy Generation and Recovery

There are significant economic and climate opportunities for water and wastewater utilities through alternative energy sources and resource recovery. Existing examples include:

- At the Lulu Island Wastewater Treatment plant, the biogas generated from anaerobic digestion is used for plant heating needs. In 2021 a facility was installed to clean up excess biogas and sell the resulting renewable natural gas to FortisBC, generating revenue and displacing the use of fossil gas in the region.
- Metro Vancouver's planned regional biosolids drying facility will create pellets that can be used as low-carbon energy in cement kilns or as a fertilizer ingredient. This will reduce regional GHG emissions by displacing fossil fuels or chemical fertilizers.
- At the Capilano Energy Recovery Facility (CERF), a hydroelectric turbine recovers energy while reducing the pressure of treated drinking water before the water is delivered to residents. CERF has one of the largest hydroelectric turbines in a treated drinking water system in North America.

As new technologies and innovations emerge, Metro Vancouver will continue looking for economic opportunities for resource recovery and revenue generation while pursuing our climate goals.

Regional Growth

The region is expected to grow by about 42,500 residents per year. Expansion and upgrades to the water supply and transmission system, the wastewater collection system, and wastewater treatment plants will be required to meet the needs of a growing population.

Metro Vancouver's water and wastewater infrastructure operations can most often withstand power disruptions that may occur due to weather events. The majority of the supply and conveyance systems operate by gravity flow due to the region's geography. However, as the population grows, increased demand will require more pumping of drinking water and wastewater. Severe weather events and flooding, intensified by climate change, have the potential to disrupt the power supply.

Water Supply Outlook 2120

The Metro Vancouver ***Water Supply Outlook 2120*** study, completed in 2019, identifies risks and challenges to the resilience of the regional drinking water system, such as a rapidly growing population, changing climate, seismic events, and power outages. The study will guide the regional water system for the next 100 years to ensure continued, reliable, and sustainable delivery of high-quality drinking water.

1 International Energy Agency, ***World Energy Outlook***, 2016

Electric vehicle charging at Lake City Operations

Strategies Toward Carbon Neutral and Resilient Water and Wastewater Infrastructure

Mitigate Climate Change by Reducing Carbon Emissions

Metro Vancouver is pursuing opportunities to reduce energy use and emissions by recovering resources that offset energy and water demands and taking a closer look at materials, transportation, and construction options for infrastructure maintenance and upgrades.

This section outlines seven strategies to ensure the region's water and wastewater systems can mitigate and adapt to climate change.

Strategy 1: Minimize the Use of Fossil Fuels

Achieving a carbon-neutral region by 2050 will require water and wastewater infrastructure systems to minimize the use of carbon-based energy. Electrifying fleet assets is one important decarbonization strategy to meet emission reduction targets. Reducing energy use and transitioning to low-carbon fuel sources for the operations of water and wastewater facilities are also key. Metro Vancouver's Carbon Price Policy informs business case analyses to support decision-making on low-carbon opportunities.

Energy and Cost Reductions – Electricity

Since 2015, Water Services has undertaken various projects resulting in annual electrical energy savings of 2.1 GWh, equivalent to approximately $208,000 in cost reductions. These projects encompass upgrades and process automation improvements. Notable examples include the heating, ventilation and cooling Control Improvements project at the Seymour Capilano Filtration Plant, resulting in annual electricity savings of 316,377 kilowatt hour (kWh), and the LED interior lighting upgrade at the same facility, resulting in an annual savings of 662,605 kWh.

Additionally, by capitalizing on the natural topography of the region and using gravity to move drinking water in transmission mains from north to south within the region, the water utility minimizes the use of pump stations that require power to move the water.

Lulu Island Renewable Natural Gas Facility

Strategy 2:
Generate Low-Carbon Energy and Sequester Carbon

Metro Vancouver and its partners are generating low-carbon energy from water and liquid waste, and sequestering carbon, which bolsters infrastructure resilience and reduces GHG emissions.

The water and wastewater systems contain energy that can be recovered or converted to low-carbon fuels for use by Metro Vancouver to help decarbonize corporate operations, or for sale to third parties. While Metro Vancouver is working hard to reduce emissions (Strategy 1), emissions cannot be entirely eliminated from water and wastewater treatment. Pursuing opportunities to sequester carbon using our infrastructure can offset these remaining emissions.

Energy Recovery Initiatives

Using Sewage for Heating and Cooling

There is enough excess heat in Metro Vancouver's wastewater to heat about 700 high-rise buildings. Recovering heat from sewage provides renewable, fossil fuel–free heat to residents and businesses in the region, thereby reducing GHG emissions. Several projects to recover heat from wastewater are currently under design or in construction including an expansion of district energy in Surrey City Centre, development of district energy in Richmond servicing the Richmond Oval area, and development of a district energy system that will service the Sen̓áḵw residential development.

Electrical Energy Generation Offsets Facility Needs

The Capilano Energy Recovery Facility (CERF) harnesses hydroelectricity from treated drinking water flowing from the Seymour Capilano Filtration Plant. The water turns a turbine that generates electricity, which offsets a portion of the purchased electricity needed to operate the large pumps at the Capilano Raw Water Pump Station. Since 2016, CERF has generated 43.7 gigawatt hours (GWh) of electricity, which is equivalent to approximately $3.8 million in avoided electricity purchases.

Hydrothermal Liquefaction

Metro Vancouver is constructing a demonstration facility at Annacis Island Wastewater Treatment Plant that will transform wastewater sludge into biocrude oil through a process called hydrothermal liquefaction (HTL). The biocrude oil will be sent to project partner Parkland's nearby refinery, to be refined into low-carbon transportation fuels for aviation, shipping, trucking, and rail. The resulting fuels have a carbon intensity that is 80 per cent lower than fossil fuels. Detailed design is complete, and fabrication began in 2024. Increasing biofuel production from sustainable sources such as wastewater supports the transition to clean, renewable energy for these difficult-to-decarbonize sectors.

Biogas Production at Wastewater Treatment Plants

Metro Vancouver is developing a bioreactor that provides optimum growing conditions for methane-producing microbes, which will increase biogas production in digesters. The biogas can be sold as renewable natural gas, displacing the use of fossil gas and reducing greenhouse gas emissions in the region.

Biosolids Hauling

Strategy 3: Reduce Third-Party Emissions, Embodied Emissions, and Process Emissions

Third-party emissions are primarily associated with vehicles and non-road equipment operated by contractors. Currently, biosolids hauling is the largest source of energy-based emissions for the wastewater system, since the sites where where biosolids are used as a fertilizer in land application projects can be located up to 400 km away. Similarly, the hauling of water treatment residuals represents a large portion of the drinking water system's energy-based emissions.

Embodied emissions are associated with resource extraction, manufacturing, and distribution of materials used in construction and operation of infrastructure – for example, concrete for construction or chemicals for operation. Designers, contractors, and operators can choose construction materials and consumables with lower embodied emissions to reduce the carbon footprint of the water and wastewater infrastructure, if appropriate incentives and guidelines are established to support such decisions.

In addition to carbon dioxide, wastewater produces potent GHGs like methane and nitrous oxide as it travels through collection and treatment infrastructure. Process emissions include leakage (fugitive emissions) from sewers and pipes that are not air-tight, or from treatment process units that are open to the air. Efforts are underway to measure these emissions and pursue opportunities to minimize them.

Embodied Emissions in Concrete

The extensive use of concrete and cement in constructing and maintaining water and wastewater systems plays a crucial role in ensuring the ongoing functionality and durability of our water and wastewater infrastructure. Canada's **Primer to Net-Zero Carbon Concrete by 2050** outlines a comprehensive strategy for reducing GHG emissions from the cement and concrete industry. Cement production contributes approximately 1.5 per cent of national GHG emissions. The plan aims to cut emissions by 15 million tonnes by 2030 and achieve net-zero emissions by 2050. Key actions include optimizing the use of supplementary cementitious materials, transitioning to low-carbon fuels, and employing carbon capture technologies.

Metro Vancouver is developing a low-carbon concrete procurement policy that aligns with Canada's federal efforts, in coordination with the concrete industry and other stakeholders.

Reducing Emissions from Biosolids Hauling

In 2025, Liquid Waste Services worked with their biosolids hauling contractor to transition from fossil fuel-based diesel to renewable diesel. Renewable diesel reduces lifecycle greenhouse gas emissions resulting in a substantial decrease in third-party GHG emissions. Over the next five years, biosolids hauling operations are projected to achieve a 65% decrease in GHG emissions, eliminating approximately 11,000 tonnes of CO_2e - marking substantial progress in emission reductions for Liquid Waste Services.

Fire response in Lower Seymour Conservation Reserve

Adapt to Climate Impacts

Impacts from a changing climate are already hitting our region. Rising sea levels, increased frequency and severity of riverine flooding, and more frequent and intense heatwaves, wildfires, and droughts are already impacting regional infrastructure.

More than three million residents depend on Metro Vancouver and its members to provide regional drinking water and wastewater services. While continuing to provide these essential services, Metro Vancouver will prioritize projects to address human health, environmental protection, critical equipment reliability (e.g., power and communication systems), flood resilience, hydraulic capacity, pumping capacity, storage capacity, reducing drinking water demand and liquid waste production (e.g. through conservation and metering), and protection of shorelines.

Climate hazards must be considered during design and upgrades of our infrastructure to increase resilience and reduce impact on future generations. Ensuring that our water and wastewater infrastructure is climate resilient will also mean added flexibility to respond to other natural hazards that our region faces, such as earthquakes.

To adapt to climate impacts for long-term resilience, Metro Vancouver will use the following approaches to protect water and wastewater infrastructure projects:

- Incorporate climate hazard risk identification and adaptation planning in asset management.
- Ensure that infrastructure projects with high vulnerability/risk are adequately prioritized for completion.
- Ensure infrastructure plans incorporate updated projections of climate hazards and address a range of potential climate scenarios.
- Consider how changing land use and densification affect the risk of impacts from climate hazards.

Strategy 4: Increase Resilience to Hotter, Drier Summers

Hotter, drier summers could strain the existing water supply when drinking water demand is highest. Hotter weather also means an extended wildfire season, which poses a risk to the protected water supply areas. Warmer source waters will require more treatment, which increases energy use. Metro Vancouver is preparing for these changes by performing impact assessments that include variations in water quality.

Non-potable reuse systems treat rainwater and other non-potable water for non-essential purposes, reducing the use of high-quality drinking water. Adoption of non-potable water systems in the region is low; however, the business case for these systems is growing in response to climate change and population growth.

Building-Scale Non-Potable Water Project

Increasing non-potable water use by breaking down barriers to system implementation can support regional drinking water conservation and climate resilience. The **Non-Potable Water Project** produced a guidebook and companion document to support the design and implementation of non-potable water systems, providing guidance for region-specific regulations and sources of non-potable water. These documents also highlight lessons learned in design, implementation, operations, and maintenance. A working group of industry professionals contributed to a complementary key findings document that identifies barriers to the uptake of non-potable water systems and recommends approaches to addressing those barriers.

Early Detection of Wildfires in the Water Supply Areas

Two drones equipped with infrared cameras to support crews in remote visual inspections after lightning storms or reports of smoke are being used in the Water Supply Areas. The drones will support quick confirmation of smoke locations, assist crews in assessing the size of a wildfire, and support the development of operational strategies (e.g., potential water sources, values at risk).

Fire in Lower Seymour Conservation Reserve

Next Generation of Snowpack Monitoring

This project assessed new technologies for measuring and monitoring the snowpack within Metro Vancouver's water supply areas. Snowpack data is used to estimate how much water is available in the snowpack to replenish drinking water reservoirs and provide downstream environmental flows during the annual dry period in summer and early fall. The accuracy and efficiency of snowpack monitoring and water supply reporting have improved dramatically since this project in 2021.

Strategy 5: Protect Against Rising Sea Levels and Wetter Weather

As the climate changes, severe storms with heavy precipitation through fall, winter, and spring will occur more frequently and with greater magnitude. Wastewater collection infrastructure is vulnerable to heavier rainfall that can overwhelm the system and lead to flooding. Wastewater treatment infrastructure located near shorelines is at risk to sea level rise and storm surge. Storm surge, a sudden increase of water level due to low pressure during storm events, coupled with debris flows carried by storms, can severely damage coastal facilities. Wetter weather, causing more frequent and severe turbidity events, can overwhelm our existing treatment processes at the Seymour Capilano Filtration Plant and Coquitlam Water Treatmant Plant. Higher storm inflows into the protected water supply areas can also result in higher discharge flows from water supply dams which can lead to an increased downstream risk of overland flooding, landslides, and, of course, public safety concerns from very high river flows through areas where people often go for recreation purposes. Metro Vancouver will address threats from wetter weather, sea level rise, and storm surge through infrastructure protection actions and adaptation measures.

Storm sewer overflow

Wet Weather Pricing

In 2023, Metro Vancouver introduced incentives through the *Greater Vancouver Sewerage and Drainage District Cost Apportionment Bylaw* for member jurisdictions to address excess rainfall that enters sewers due to inflow and infiltration. The previous approach to regional cost allocation for wastewater services was based on dry weather flows. This did not reflect the full financial, environmental, and social costs of regional infrastructure to accommodate excessive wet weather flows and was inequitable – member jurisdictions with excessive wet weather flow were effectively subsidized by other members. Wet weather pricing, more accurately termed "wet weather cost apportionment" in the regional legislative context, is a key tool to incent rapid action on inflow and infiltration management.

Strategy 6: Prepare for Extreme Weather Events

Extreme weather events such as storm surge, flash floods, and droughts pose a threat to water and wastewater infrastructure and service delivery. Regularly reviewing and updating emergency response plans and contingency plans to better prepare for extreme weather events will help to ensure uninterrupted essential services vital for the health and safety of residents.

Talon Creek, Seymour Watershed landslide

Low water levels at Coquitlam Reservoir

Collaborate with Regional Partners

While Metro Vancouver is responsible for the regional drinking water and wastewater infrastructure, ongoing collaboration between Metro Vancouver, member jurisdictions, First Nations, and regional stakeholders is essential to ensure that both regional and local water and wastewater infrastructure minimizes GHG emissions and is prepared for climate change impacts. Regional stakeholders include energy utilities, TransLink, emergency response coordinating groups, and provincial ministries responsible for transportation, emergency management, and climate readiness.

Working with First Nations

As a part of our continued reconciliation efforts, Metro Vancouver is committed to meaningful engagement, dialogue, and collaboration with First Nations on our plans, programs and projects, as outlined in Metro Vancouver's ***Board Strategic Plan 2022-2026***. We also continue to build and strengthen respectful and reciprocal relationships with First Nations.

Strategy 7: Advance Regional Collaboration to Reduce Emissions and Increase Resilience

Metro Vancouver can work with member jurisdictions and other key partners to plan for emergencies, increase the resilience of water and wastewater infrastructure, and explore opportunities to reduce emissions. Opportunities for partnership and collaboration include developing region-wide policies (e.g. Regional Public Works Mutual Aid Agreement), bylaws and standards, working together on mitigation and adaptation projects that impact multiple partners, and supporting regional knowledge-sharing through existing committees and new working groups.

Alignment with Metro 2050

Metro Vancouver's Regional Growth Plan, *Metro 2050*, supports active work to compile and share information and data related to hazards, risks, and vulnerabilities in the region. This may include developing and maintaining a GIS-based hazard and vulnerability mapping interface to inform risk profiles and decision making.

Emergency Planning is Collaborative

Planning for regional emergency readiness and response requires the participation and collaboration of many partners and rights holders. Metro Vancouver will work with member jurisdictions and First Nations, TransLink, Emergency Management Climate Readiness, BC Hydro, Ministry of Transportation, and neighbouring regions (and other agencies as determined appropriate), by convening groups such as the Integrated Partnership for Regional Emergency Management (IPREM) to collaborate on data sharing, policy development and plans to address disruptions to critical regional infrastructure during extreme events.

Linkages to Other Climate 2050 Issue Areas

There are many links between drinking water and wastewater infrastructure and other issue areas covered by Climate 2050. Some related areas for water and wastewater infrastructure include:

Energy: Low-carbon energy can be produced in the wastewater system through heat recovery, generating biogas through anaerobic digestion, and creating biocrude from wastewater sludge via hydrothermal liquefaction. Increasing the use of clean, renewable energy in the water and wastewater systems will reduce GHG emissions from infrastructure operations. Ensuring water and wastewater infrastructure has access to backup power will minimize interruptions to these essential services during climate-related weather events.

Nature and Ecosystems: Detecting and suppressing wildfires in the water supply areas protects the region's drinking water from increasing risk due to climate change. Green infrastructure increases biodiversity and improves the resilience of urban areas during wet weather events by reducing stormwater overflows and flooding. Protecting infrastructure against sea level rise and storm surges will also protect vulnerable shorelines from erosion and support aquatic ecosystems.

Buildings: Improving water efficiency standards by advocating for updates to the *BC Building Code* and implementing non-potable water systems in buildings will help preserve high-quality drinking water for essential uses during longer dry seasons, which are increasingly frequent due to climate change.

Industry and Business: Establishing water conservation targets for industrial activities will support a reduction in water consumption. Improving industrial discharge quality may reduce the energy required by wastewater infrastructure.

Agriculture: Implementation of on-site water storage and reuse systems may reduce the demand for drinking water and wastewater systems, especially as agricultural source waters such as the Fraser River become compromised due to changes in water quality due to sea level rise.

These other issue areas are captured in Climate 2050 Primers and Roadmaps that will be made available on the **Metro Vancouver** website as they are developed.

Low water levels at Seymour Reservoir

Setting the Path Ahead

The path towards a carbon neutral, resilient region provides an opportunity to achieve prosperity and sustainability. Metro Vancouver must achieve significant GHG emission reductions among industry and business activities in the region over the next three decades to meet our goals, and with this need is the opportunity to provide strong leadership.

Learn more about Metro Vancouver's planned climate action initiatives in the Liquid Waste Management Plan and Drinking Water Management Plan.

Glossary

Biogas is a mixture of methane and carbon dioxide produced by the anaerobic digestion of sewage sludge at a wastewater treatment plant. Biogas can be cleaned up for use as renewable natural gas.

Biosolids are the treated solids recovered from wastewater. The solids are treated by microorganisms and heated to eliminate pathogens and reduce odours. The final product is an earth-like material that is rich in nutrients and organic matter.

A **carbon neutral region** is achieved when the annual GHG emissions are equal to the amount of carbon removed from the atmosphere and stored annually by the natural ecosystems (e.g. forests and wetlands).

Climate change adaptation means anticipating, planning for and responding to the adverse effects of climate change and taking appropriate action to prevent or minimize the damage it can cause, or taking advantage of opportunities that may arise. Research shows that well planned, early adaptation action saves lives and money later.

Embodied emissions are the GHG emissions associated with the construction of goods and products, including the raw materials and the transport of goods or products to where they are sold or used.

Green infrastructure includes natural, enhanced and engineered systems that manage rainwater and mitigate negative impacts of urban development. These natural assets (e.g., forests, wetlands, and soil), enhanced assets (e.g., urban trees and bioswales), and engineered systems (e.g., green roofs, rain gardens, and permeable pavement) help absorb and filter stormwater to reduce flooding, improve water quality, and enhance urban biodiversity.

Greenhouse gases (GHGs) are air contaminants that trap heat and cause climate change. GHGs include carbon dioxide and nitrous oxide, as well as short-lived climate forcers such as methane, halocarbons, black carbon and ozone. Limiting or preventing GHG emissions and removing these gases from the atmosphere is critical to avoiding catastrophic climate change (sometimes referred to as climate change mitigation).

Hazard refers to a dangerous phenomenon, substance, human activity, or condition. In this context, hazards are caused or made worse by climate change. Examples include rainstorms, extreme weather, wildfires, storm surges and landslides.

Inflow and Infiltration is water that gets into sanitary sewer pipes that should not be there. Infiltration is rainwater or groundwater that enters a sanitary sewer due to leaky or damaged pipes. Inflow is rainwater that enters a sanitary sewer due to improperly connected roof or foundation drains.

Renewable natural gas is created from biogas that has been cleaned up so that it is mostly methane and can be injected into the natural gas distribution network for use in homes and businesses.

Stormwater is water from rain or melting snow that is not absorbed into the ground. In urban areas, stormwater runs off impervious surfaces such as rooftops, roads, and parking lots, and is typically directed into storm sewers, which empty directly into creeks, rivers, or the ocean.

Vulnerability is the degree to which ecosystems, economies, infrastructure and communities are susceptible to, or unable to cope with, the adverse effects of climate change. Vulnerability varies based on exposure, sensitivity and adaptive capacity. Geographic location, socio-economic conditions and other factors can impact susceptibility to harm and adaptive capacity.

Water treatment Water from the source reservoirs is treated with ozonation or filtration, followed by UV and residual disinfection (chlorination) at one of the two water treatment facilities, then undergoes secondary disinfection as it moves throughout the region. This ensures that drinking water remains clean and safe for residents across the region.

Water treatment residuals are the material left over after drinking water is filtered. It consists of filtered sediment and organics from the source water and coagulants from the drinking water treatment process.

Wastewater treatment occurs at five Metro Vancouver wastewater treatment plants that currently process over one billion litres of wastewater every day. Wastewater contains different compounds and waste products including soap, food scraps, human waste, oils, and other chemicals. Treating wastewater removes substances that can harm human health and the environment. Treated wastewater, or effluent, is released into the Fraser River, Burrard Inlet, or Strait of Georgia.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