

Water and Wastewater Infrastructure

Discussion Paper to support *Climate 2050*

Reducing emissions and increasing climate resilience for water and wastewater infrastructure in the Metro Vancouver region over the next 10 to 30 years

January 2021



Your feedback is valued.

This paper was drafted in Fall 2020, and introduced for public, stakeholder and government comment during the COVID-19 pandemic response. Metro Vancouver assesses work plans on a case by case basis to determine if the COVID-19 pandemic response requires an adjustment to any work plans, including engagement components. For air quality and climate change programs and initiatives, this means continuing with work plans that protect human health and the environment, but adjusting how we approach engagement. Goals and targets in Metro Vancouver's climate-related plans are science-based and remain a priority. The interim target of a 45% reduction in greenhouse gas emissions below 2010 levels by 2030 has a time horizon of less than ten years. Pursuing a carbon neutral region by 2050 requires taking bold action now. Across the globe, the pandemic response has had an unexpected benefit of

significant environmental improvements. This provides a glimpse of what is possible and what we can achieve with coordinated efforts and common goals. Public feedback is valued and project teams continue to seek input, create online feedback opportunities and ensure feedback is reflected as policy development moves forward. Documents, feedback forms and direct email links to the project team are all posted to the Metro Vancouver website, metrovancover.org, search "*Climate 2050*."

Overview

Metro Vancouver maintains source reservoirs within three protected water supply areas, and treats and delivers clean, safe drinking water to member jurisdictions. Metro Vancouver also collects and treats the region's wastewater while recovering resources, to protect public health, the environment and to support economic prosperity. As our region responds to a changing climate, we need to maintain and strengthen this essential water and wastewater systems to ensure the region's 2.7 million residents have access to clean, safe drinking water and sanitation needs, now and in the future.

To increase the resilience of our water and wastewater infrastructure systems, we need to accelerate our climate actions. We are creating a roadmap to help us reach a low-carbon, resilient future. By 2050, we can ensure that our water and wastewater systems are carbon neutral and climate resilient.

Please provide us with your feedback on these ideas by April 30, 2021.



West Vancouver

Table of Contents

Overview	iii
Introduction	1
Planning for the Future	1
Meeting Long-Term Targets for the Region	3
Climate Change Targets	3
We Need Your Feedback	4
Expected Climate Hazards	6
Low-Carbon Water and Wastewater Infrastructure	8
Carbon Storage and Low-Carbon Opportunities	8
Current Actions to Create Low-Carbon Water and Wastewater Infrastructure	8
Climate Resilient Water and Wastewater Infrastructure	10
Current Actions to Improve the Resiliency of Water and Wastewater Infrastructure	10
Discussion: Ensuring Low-Carbon and Climate Resilient Water and Wastewater Infrastructure	13
Proposed Long-term Goals for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure	13
Example Metrics and Target for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure	13
Example Actions for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure	14
Potential Big Ideas for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure	14
Feedback and Engagement Process	17
How Feedback Will Be Used	17
Glossary	18

Introduction

Planning for the Future

Climate 2050 is an overarching long-term strategy that will guide our region's policies and collective actions to transition to a carbon neutral and resilient region over the next 30 years. Metro Vancouver is implementing *Climate 2050* through ten issue area *Roadmaps* (see Figure 1), which will describe how the region can reduce greenhouse gas (GHG) emissions and adapt to climate change impacts. Implementation of the *Roadmaps* will be driven by Metro Vancouver's management plans and other policies including the Drinking Water Management Plan and the Liquid Waste Management Plan, as well as the forthcoming Resilient Region Strategic Framework that will integrate the principles of resiliency and social equity across all Corporate functions.

Underlined words are key concepts and are defined in the Glossary on [page 18](#).

Key questions for feedback are shown in boxes marked 

Drinking water – Water Services

Metro Vancouver provides clean, safe drinking water through its member jurisdictions for 2.7 million residents in the region. This includes managing three protected water supply areas to collect and store water within source reservoirs, treating water to ensure that it is safe to drink and delivering drinking water to member jurisdictions through a network of pumping stations and large transmission mains. Member jurisdictions then distribute drinking water to residents and businesses.

Wastewater – Liquid Waste Services

Metro Vancouver collects wastewater from its members, conveys it via a network of pumps and sewer mains to five wastewater treatment plants where it is treated, heat and organic material are recovered and the treated wastewater is released into receiving waters. Wastewater also includes some of the rainwater runoff in areas of the region where stormwater is not completely handled by separate sewers. Member jurisdictions have responsibilities for conveying and discharging separated stormwater into local waterways; this responsibility is partially shared with Metro Vancouver in several drainage areas which cross municipal boundaries.

This discussion paper addresses **water and wastewater infrastructure systems**, with a scope defined to include Metro Vancouver’s roles in:

- Planning, building and maintaining the infrastructure to deliver clean, safe drinking water to our member jurisdictions and the residents and businesses of Metro Vancouver.

Planning, building and maintaining the infrastructure to collect and treat wastewater from our members, and managing urban drainage/stormwater flows in areas managed by the Greater Vancouver Sewerage & Drainage District.

While Metro Vancouver has authority over the regional drinking water and wastewater infrastructure under its direct control, ongoing collaboration between Metro Vancouver and its members will be essential to ensure that both regional and local water and wastewater infrastructure minimizes greenhouse gas emissions and is prepared for climate change impacts. Climate change affects us all – both Metro Vancouver and its member jurisdictions have important roles in preparing for a changing climate and minimizing emissions.



Figure 1: Issue areas for *Climate 2050*

This discussion paper is intended to promote discussion and enable feedback that will be used in the development of a *Climate 2050 Water and Wastewater Infrastructure Roadmap*. Feedback will also inform the development of the next Drinking Water and Liquid Waste Management plans that will guide Metro Vancouver’s infrastructure policy and actions for many years to come.

Meeting Long-Term Targets for the Region

Metro Vancouver, together with its member jurisdictions, has been taking action on reducing greenhouse gas emissions and building climate resilience for decades. But actions must be accelerated to reduce our impacts on global climate change and to protect public health and the environment. The region also needs to adapt to the anticipated impacts from a changing climate.

There is significant overlap between the sources of [greenhouse gases](#) and [air contaminants](#), so actions that reduce emissions to protect public health can often (but not always) reduce greenhouse gases, and vice versa. Metro Vancouver aims to maximize co-benefits by focusing on policies and programs that reduce both greenhouse gases and [common air contaminants](#).

Climate Change Targets

Climate change is directly associated with greenhouse gases, primarily carbon dioxide. While emissions are global, we all have a shared responsibility to take local action. The major sources of greenhouse gases in this region are transportation, buildings and industry, with smaller contributions from waste management and agriculture. Regional water and wastewater utility operations are a relatively smaller source of regional greenhouse gas emissions; however, there are still opportunities to reduce high emissions activities and [embodied emissions](#) in materials associated with ongoing operations, maintenance and construction of water and wastewater infrastructure.

Metro Vancouver has adopted the following regional climate change targets:

1. reduce regional greenhouse gas emissions by 45% from 2010 levels by 2030;
2. become a [carbon neutral region](#) by 2050; and
3. ensure our infrastructure, ecosystems, and communities are resilient to the impacts of climate change.

Metro Vancouver and its member jurisdictions have also amended Metro 2040 to include these targets so they are the targets for all local governments in the region.

Although the region has made progress over the past 15 to 20 years, we need to accelerate our climate actions to meet these targets and do our part to avoid the most dangerous impacts of global climate change. More information on climate change in our region is available on the [Climate 2050 website](#).

We need to accelerate our climate actions now to meet these targets and do our part to avoid the most dangerous impacts of global climate change.

We Need Your Feedback

The purpose of this discussion paper is to enable feedback on key climate change issues related to managing water and wastewater infrastructure, including ways to reduce greenhouse gas emissions and adapt to a changing climate. This discussion paper is intended for the public, stakeholders and other governments including First Nations.

The goals, targets and actions identified are examples of potential opportunities for the region's water and wastewater systems to help meet the regional emissions targets and inform the development of the *Climate 2050* Infrastructure Roadmap. We must take action now to continue to reduce emissions and ensure that our water and wastewater infrastructure is resilient to a changing climate, and we need your help to figure out the best path forward while also recognizing that more opportunities will emerge in the future. This Roadmap development also aligns with upcoming updates to Metro Vancouver's Drinking Water Management Plan and Liquid Waste Management Plan, which provide further opportunities to focus on climate and resiliency related goals.

Climate change impacts some neighbourhoods, households and individuals more than others. Also, some households are better able to prepare for and protect themselves from climate change. A priority of *Climate 2050* is to incorporate the voices and needs of a full range of communities into program and policy design to ensure that fairness and equity are reflected in the actions that Metro Vancouver implements or advocates for. Policies and programs that reduce emissions should support an equitable distribution of benefits and costs, such as increased economic opportunities in a low emission and carbon neutral economy, affordable housing and more diverse transportation options. Issues of intergenerational equity will also be considered.

Specific opportunities to provide feedback are described under *Feedback and Engagement Process*, on [page 17](#).



Barnston Pump Station

Linkages to Other Issue Areas

There are many linkages between water and wastewater infrastructure and other issue areas covered by *Climate 2050*. Metro Vancouver is considering these linkages when developing policies and actions. Some of the related issue areas for water and wastewater infrastructure include:

Waste: Residuals left over from water and wastewater treatment processes can be sources of greenhouse gas emissions but can also present opportunities for resource recovery and low-carbon energy.

Land-use and growth management: Policies that support more compact, complete communities also increase infrastructure resilience and can reduce costs and emissions associated with infrastructure growth. Planning decisions can also encourage directing growth away from vulnerable areas for added resiliency.

Energy use and generation: As climate change increases risks associated with power reliability, water and wastewater infrastructure operations will need to adapt, which can impact which energy sources are used. Potential exists for renewable energy generation from infrastructure.

Human health and well-being: Dependence on access to clean, safe drinking water and effective collection and treatment of wastewater is a vital public health need for the region.

Nature and Ecosystems: A rich and diverse natural environment, healthy waterways and added green infrastructure can improve the resilience of built infrastructure and ensure a sustainable supply of water resources.

Agriculture: High temperatures related to climate changes will likely increase agricultural demand for irrigation water. The region will need to plan for how to reduce the impact of increased water demand on the drinking water system. There may be a need for increased reliance on alternative freshwater sources and associated infrastructure for agricultural irrigation.

These issue areas will be explored in discussion papers of their own. As discussion papers are developed, they will be made available on the [Metro Vancouver website](#).

Expected Climate Hazards

Climate change projections for this region by the year 2050 include extended periods of hotter and drier summer weather, warmer and wetter fall and winter seasons with decreased snowpack as temperatures increase, and more extreme weather patterns. These projections are important considerations for the

resiliency of Metro Vancouver’s water and wastewater systems given that most regional infrastructure was not originally designed with climate change in mind.

Water and wastewater infrastructure in the region is expected to face a range of hazards from climate change, outlined in table below.

CLIMATIC CHANGES AND HAZARDS	ANTICIPATED IMPACTS TO WATER AND WASTEWATER INFRASTRUCTURE
Sea level rise and flooding (coastal and riverine)	
Rising water levels	<ul style="list-style-type: none"> • Risk of damage for critical infrastructure located at low elevations such as wastewater treatment plants, pump stations and marine crossings. • Extreme flooding causes structural changes to rivers and shorelines, which may have impacts to adjacent water and wastewater infrastructure. • Flood events can overwhelm collection and drainage systems, leading to sewage overflows and the release of contaminants into the environment.
Changing salinity	<ul style="list-style-type: none"> • Salt water will move further into rivers and coastal areas, which could impact current water supplies used for agricultural irrigation.
Changing precipitation patterns	
More intense extreme rainfall events	<ul style="list-style-type: none"> • Increased run-off, turbidity and erosion will add stresses to stormwater collection and drainage systems across the region. Stresses are exacerbated in areas around the Metro Vancouver region that still have combined sewer networks (unseparated sanitary and stormwater systems), which present additional risks of sewage overflow. • Increased risk of landslides within Metro Vancouver’s protected water supply lands with potential impacts to source water quality and treatment systems.
Longer dry spells in the summer	<ul style="list-style-type: none"> • Drought conditions, combined with higher temperatures, will increase the region’s demand for drinking water during summer months without significantly increased efforts towards conservation, adding strain on source water storage and transmission system capacity. • Warmer waters may contribute to increased primary production (algae) in source waters which will require additional treatment to ensure that treated drinking water is clean and safe for consumption. • Longer and more intense wildfire seasons, driven by both heat and drought, will place additional pressures on water supplies and may also present risks to Metro Vancouver’s protected water supply lands.
Increased precipitation in winter, spring and fall	<ul style="list-style-type: none"> • Heavy rain storms increase the likelihood of flood events, which can overwhelm collection and drainage systems, leading to sewage overflows and the release of contaminants into the environment.

Changing temperatures	
Extreme heat	<ul style="list-style-type: none"> • Severe heat waves can disproportionately impact the region's most vulnerable populations as water demand increases. • Additional stresses on nature and ecosystems may require more drinking water supplies to be used for irrigation purposes.
Warmer winters	<ul style="list-style-type: none"> • Reduced snowpack in Metro Vancouver's water supply lands will affect water storage capabilities to meet summer demands and potentially increase wildfire danger.
Seasonal shifts	<ul style="list-style-type: none"> • Shifts in seasonal temperatures (e.g., early spring/late fall) can cause additional demands on water supplies if more drinking water is required for irrigation, agricultural and/or recreational purposes.
Ocean warming and acidification	<ul style="list-style-type: none"> • Additional stresses to intertidal and estuarine ecosystems may require additional treatment provisions at wastewater treatment plants discharging into marine environments.
Wind storms	
High winds exacerbate other hazards	<ul style="list-style-type: none"> • Wind storms, in conjunction with sea level rise, can lead to greater storm surge events and more frequent infrastructure disruptions such as power outages and road closures.

Note: These climate hazards can cause cascading or combined impacts – 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 when combined with sea level rise. Non-climatic hazards can also exacerbate climatic ones; for instance, subsidence can increase overall sea level rise and earthquakes can disrupt flood protection infrastructure. Climate change impacts will magnify existing stressors on water and wastewater infrastructure and increase demands on water resources.



Low-Carbon Water and Wastewater Infrastructure

Carbon Storage and Low-Carbon Opportunities

The ecosystems that Metro Vancouver protects in the region's water supply lands store approximately 20 million tonnes of carbon. Although carbon storage is not the primary function of these areas, ongoing protection of these significant carbon stores is critical to climate action in the region and the ongoing reliable supply of drinking water.

Metro Vancouver is pursuing a range of other low-carbon opportunities, such as continuing to invest in resource recovery to offset energy and water resource demands to taking a closer look at the materials, transportation and construction options available during infrastructure maintenance and upgrade activities. These low-carbon opportunities can also help improve climate resiliency – for example, diversifying our energy sources through energy recovery projects will also strengthen resiliency during power outages.

Current Actions to Create Low-Carbon Water and Wastewater Infrastructure

Metro Vancouver actively works with other local governments and agencies to take action to reduce GHG emissions. Some significant current actions on water and wastewater management in our region are outlined below.

(Additional information on the actions is listed in the web links shown.)

Water

1. **Watershed protection** (Metro Vancouver).
The three protected mountain water supply areas that supply the region's drinking water comprise 600 square kilometres of intact second-growth and resilient old-growth coastal temperate rain forest, representing 20% of Metro Vancouver's land base and approximately 20 million tonnes of carbon storage. Fire suppression and ecosystem conservation are actively addressed as critical aspects of drinking water quality protection for half the population of BC and are key facets of regional carbon storage and climate change resiliency.

2. **Energy recovery facility** at the Capilano Energy Recovery Facility. Treated water from the Seymour Capilano Filtration Plant travels via gravity through a seven kilometre tunnel which powers a turbine and generates 9.5 million kWh units of electricity which is approximately the power used by 1,000 households per year. The electricity generated is used to offset Metro Vancouver power needs at the Capilano Raw Water Pump Station and other nearby facilities.
3. **Water conservation campaigns** create awareness and provide water conservation tips to reduce water consumption for residents and businesses across the region. By ensuring the sustainable use of water resources, the region can protect our natural ecosystems, reduce emissions and defer costly upgrades required to expand our water system capacity (Metro Vancouver and member jurisdictions).
4. **Water treatment residuals** are beneficially used in local cement manufacturing, which reduces emissions from landfilling residuals and mining raw materials (Metro Vancouver).

Wastewater

5. A **biogas cleanup** facility under construction will generate **renewable natural gas (RNG)** that will be sold to FortisBC for regional use, displacing fossil fuel use.
6. **Cogenerating engines** at two wastewater treatment plants use biogas to meet nearly all plant heating needs and approximately half of the onsite electricity needs.
7. A **district energy** facility under construction will recover heat from wastewater effluent and supply it to a district energy provider (Metro Vancouver).
8. **Emission controls** reduce fugitive air contaminant from the Wastewater Treatment Plants (Metro Vancouver).
9. **Biosolids** recovered from wastewater treatment are beneficially used in landscaping soil to help improve the water-holding capacity, reducing the need for irrigation. Beneficial use also avoids emissions from landfilling.
10. Using **biosolids from wastewater treatment plants to cover decommissioned landfills** reduces climate change impacts by converting the methane in escaping landfill gas into carbon dioxide, a less potent greenhouse gas (Metro Vancouver).

Climate Resilient Water and Wastewater Infrastructure

The region's 2.7 million residents depend upon Metro Vancouver and its members to provide regional drinking water and wastewater services through the use of well-functioning water and wastewater infrastructure, integrated with healthy waterways.

Actions are needed to protect key infrastructure from climate hazards such as sea level rise and flooding, changing precipitation patterns and changing temperatures. Climate hazards must be considered during design and upgrades of our infrastructure to avoid creating vulnerabilities that make [climate change adaptation](#) more difficult and expensive for 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.

Current Actions to Improve the Resiliency of Water and Wastewater Infrastructure

Metro Vancouver and its member jurisdictions have been taking action to prepare for climate change impacts for well over a decade. Some key current actions to increase our water and wastewater infrastructure resiliency are outlined below.

1. **Improving system resiliency to intense storm events with backup power** for essential processes of water and wastewater systems, such as treatment facilities and pump stations. Metro Vancouver and its members continue to implement and prioritize backup power at key water and wastewater facilities (Metro Vancouver and member jurisdictions).



Iona Island Wastewater Treatment Plant

2. **Adapting to future sea level rise and storm surges** when upgrading end-of-life critical infrastructure located at low ground elevations, such as Sapperton Pump Station, North Shore Wastewater Treatment Plant and Second Narrows Water Supply Tunnel (Metro Vancouver and member jurisdictions).
3. **Adapting treatment processes to the impacts of changing climates**, such as rising temperatures and more extreme weather. The commissioning of the Seymour Capilano Filtration Plant in 2009 improves the resiliency of the water treatment and supply processes to changing source water quality, and new wastewater treatment plants such as Northwest Langley Wastewater Treatment Plant are being designed with provisions that accommodate higher temperatures (Metro Vancouver).
4. **Water conservation initiatives** that lower summer water demands help increase the resiliency of our source water supply to meet the demand for drinking water during hotter, drier summers (Metro Vancouver and member jurisdictions).
5. **The Watershed Protection Plan** details the extensive planning, training and resource sharing agreements with the BC Wildfire Service and local fire departments that ensure we are in a position to rapidly respond and contain wildfires to the greatest extent possible (Metro Vancouver).
6. **Planning for resiliency of the water and wastewater systems in the face of uncertainty** using techniques such as scenario planning and adaptive management. These approaches were used in the recently-published Water Supply Outlook 2120, allowing for a phased storage upgrading plan that is adaptable to actual trends not only in climate change, but also to other impacting factors such as population and economic growth, conservation, and efficiency.
7. **Maintaining current climate projections and analyzing up-to-date data** will support long-range planning efforts and enable sustainable decision making for future regional water and wastewater needs (Metro Vancouver).
8. **Working with members to assist in sharing and implementing best practices in stormwater management** that support improved resilience to changing climates (Metro Vancouver and member jurisdictions).

Roles and Responsibilities Water and Wastewater Infrastructure

Under authority delegated by the BC Government in the *Environmental Management Act*, **Metro Vancouver** is responsible for managing and regulating air quality and greenhouse gases in the region. As the regional federation, Metro Vancouver is a forum for facilitating collaboration with member jurisdictions and other organizations to create efficiencies, align climate change strategies and actions, and ensure that our region is adapting to climate change. Ensuring low carbon, resilient water and wastewater infrastructure requires close coordination among all governments, as well as businesses, utilities, institutions and residents. The roles of key partners are outlined below.

- **Government of Canada** is working with the provinces and territories to implement the Pan-Canadian Framework on Clean Growth and Climate Change, which includes plans to build climate resilience. The Government of Canada also provides funding for infrastructure that prioritizes emissions reductions and resiliency.
- **Government of BC** sets environmental performance requirements including emissions. The Government of BC is also developing a climate preparedness and adaptation strategy through its role in supporting residents and communities to adapt to climate change.
- **First Nations** are stewards of nature and keepers of generational knowledge on how a changing climate has impacted local water resources and ecosystems.
- **Member jurisdictions** are responsible for drinking water distribution and wastewater collection infrastructure within their own communities. Member jurisdictions and Metro Vancouver work hand in hand to ensure that local and regional water and wastewater infrastructure meets the needs of residents and is resilient to changing climates. Optimal climate adaptation strategies for the region will require well-aligned and consistent planning between member jurisdictions and Metro Vancouver.
- **Health authorities** ensure that water quality objectives are appropriate to protect public health, both now and in the future when changing climates place additional strain on the quantity and potentially affect the quality of our freshwater sources.
- **Academic institutions** in the region contribute important research and innovative ideas on low-carbon infrastructure and climate resiliency needs.
- **Local industry and businesses** develop and implement innovative solutions to environmental challenges, including pursuing water conservation, adopting green infrastructure and sustainable building practices and augmenting resource recovery and the circular economy.
- **Local residents** can help conserve our water resources by taking actions such as minimizing lawn watering and other discretionary outdoor activities that use treated drinking water. Residents can also volunteer to preserve built infrastructure through member jurisdiction-sponsored programs such as adopting a catch basin to prevent localized flooding.

Discussion: Ensuring Low-Carbon and Climate Resilient Water and Wastewater Infrastructure

The following sections outline proposed goals, example targets, example actions and potential Big Ideas to adapt to climate change impacts.

Proposed Long-term Goals for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure

Long-term goals describe a desired future state for low emission and carbon neutrality, with expected achievement in 2050 and beyond. Long-term goals will help identify and prioritize new actions to achieve the adaptations required from the water and wastewater systems. In order for water and wastewater systems to reach carbon neutrality or better, emissions will need to be balanced with carbon negative approaches such as ecological sequestration and energy recovery opportunities which may vary between water and wastewater systems.



Please consider the following long-term adaptation goals proposed for our region's water and wastewater infrastructure. Will these goals help us reach our desired future state?

- 1. Water infrastructure and operations aims to be carbon neutral.**
- 2. Wastewater infrastructure and operations aims to be better than carbon neutral.**
- 3. Water and wastewater infrastructure is resilient to the impacts of climate change, including high temperatures, severe weather, floods, wildfire impacts and supply chain disruptions.**

Example Metrics and Target for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure

To support achievement of the long-term adaptation goal, it is important to measure progress towards climate resilient water and wastewater infrastructure. How climate resiliency is measured is an emerging field of research and our region will be learning alongside other jurisdictions. Adaptation metrics will be included in the *Climate 2050 Water and Wastewater Infrastructure Roadmap*.



Please consider the following proposed, planned or in-use metrics, many of which have been considered in other jurisdictions. Could any of these help us measure progress toward our long-term goals? What should performance metrics look like for our region?

(Additional information on the targets is listed in the web links shown.)

1. The [City of Vancouver](#) commits to using 100% renewable energy by 2050.
2. Palo Alto's [Sea Level Rise Adaptation Policy](#) commits to conducting sea level rise vulnerability assessments on critical infrastructure and developing multi-year sea level rise implementation plans.
3. [United Utilities](#) in Liverpool, UK commits to 15% reduction in leakage from their water distribution system by 2025 to improve affordability and sustainability.

4. The [City of Los Angeles](#) aims to invest in green infrastructure and stormwater retention to increase the number of projects that capture water for reuse, improve stormwater quality, and reduce flooding risk by 2028.

Example Actions for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure

Actions are the policies and programs, including requirements, incentives and educational outreach campaigns that will lead to more climate resilient water and wastewater infrastructure. Actions will be included in the *Climate 2050 Water and Wastewater Infrastructure Roadmap*. In addition to existing actions we need new actions to address the many opportunities we have to increase resilience and meet our long-term goal.



Please consider the following proposed, planned or underway actions from other jurisdictions. Could any of these help us increase resilience to reach our goal? What should additional actions look like?

(Additional information on the actions is listed in the web links shown.)

1. Develop **climate resiliency guidelines** and incorporate climate change information into capital and operational decision making to keep infrastructure facilities safe and operational ([New York City](#), [Miami](#))
2. Prioritize **vulnerability and risk assessments** of critical infrastructure based on climate change impacts and **set priorities for adaptation strategies** ([Baltimore](#), [Portland](#), [San Francisco](#), [Palo Alto](#))

3. Prepare **stormwater management strategies** that account for intense precipitation events, known as cloudbursts, which are projected to increase in frequency and intensity with climate change ([Copenhagen](#), [Amsterdam](#))
4. Pursue options for **water conservation and water reuse** to improve water supply resiliency ([Minneapolis-Saint Paul](#), [Los Angeles](#), [Grand Rapids](#))

Potential Big Ideas for Low-Carbon and Climate Resilient Water and Wastewater Infrastructure

While Metro Vancouver is planning for and taking early actions towards its goal of a resilient region, more needs to be done to think big and act quickly. This section lays out Big Ideas that could more quickly drive the transition towards more resilient infrastructure in the region. Some of these ideas might be developed further through upcoming planning processes such as the new Liquid Waste Management Plan and Drinking Water Management Plan.



Please consider the following Big Ideas. Could any of these help us to significantly advance climate resilience for water and wastewater infrastructure? What other Big Ideas should Metro Vancouver consider?

Big Idea 1: Convene a Regional Resilience Taskforce to advance infrastructure resiliency

Climate change presents challenges that are indiscriminate of jurisdictional boundaries. Similarly, although the region's water and wastewater infrastructure ownership and responsibilities are delineated between Metro Vancouver and its member jurisdictions, the health and function of this infrastructure relies on coordinated management.

To address climate change challenges and improve resiliency, we need to reach beyond traditional jurisdictional and discipline-based silos to coordinate as a region and work toward common goals.

Metro Vancouver can lead a Regional Resilience Taskforce to improve the resiliency of infrastructure. This taskforce can provide a coordinated approach on how to incorporate climate change and resiliency implications in the planning and capital spending for infrastructure projects, set guidelines and design standards, incorporate climate considerations in asset management and leverage partnerships with other agencies.

Meeting long-term targets requires integrated approaches for tracking progress – as the regional federation, through this Regional Resilience Taskforce, Metro Vancouver can develop common progress indicators and work with member jurisdictions and other organizations to monitor and encourage progress on shared actions.

The City of Toronto's [Resiliency Strategy](#) outlines similar efforts to coordinate and break down silos through partnership.

Big Idea 2: Further integrate One Water approaches to water and wastewater management

In recent years, water and wastewater utilities have begun to shift away from the traditionally separate silos of drinking water, wastewater and stormwater towards an integrated systems approach, often referred to as "One Water." This is based on the fundamental concept that all water systems are interconnected and opportunities exist to leverage the interconnections of our water resources.

An integrated approach to water management allows for a more sustainable and inclusive way to turn challenges into opportunities with initiatives such as reusing water and using less water, energy and nutrient recovery, green infrastructure, as well as innovative ways to optimize planning for operations and finances. The City of Los Angeles recently

completed a One Water LA 2040 Plan that will provide greater resiliency to drought conditions and climate change.

The upcoming updates to the Drinking Water Management Plan and the Liquid Waste Management Plan will incorporate a One Water approach, allowing Metro Vancouver's Water Services and Liquid Waste Services departments to align and coordinate on common goals. This will expand upon on-going work to explore non-potable water reuse and reclaimed water from wastewater treatment plants. Metro Vancouver will work with the Government of BC and others as necessary to seek modernization of governing legislation, and to update codes and standards to facilitate One Water approaches that improve resiliency to climate change.

Big Idea 3: Require full carbon cost accounting and ecosystem service valuation during construction and operation of Metro Vancouver's infrastructure

Many services and products are sourced from outside of the region, and the practices of suppliers vary. Likewise, design and operational decisions can have varying associated emissions impacts. By integrating full carbon cost accounting and ecosystem services valuation into decision making on water and wastewater infrastructure construction and maintenance work, Metro Vancouver can do its part to minimize emissions.

Carbon cost accounting is a developing field that is not yet established or standardized across BC or Canada. The Canada Green Building Council (CaGBC) recently developed carbon emissions accounting methodology within the [CaGBC ZCB Standard](#) that accounts for direct emissions, indirect emissions, biomass emissions and green power in its carbon balance model. This, or other carbon cost accounting methodologies, can be integrated into decision making processes to better understand the full implications when evaluating options for infrastructure projects.

Valuing natural assets and integrating the information into decision-making is also an emerging practice. Some early adopters of this approach are listed below:

- The [Municipal Natural Assets Initiative](#) team provides scientific, economic and municipal expertise to support and guide local governments in **identifying, valuing and accounting for natural assets in their financial planning and asset management programs**.
- [Gibsons, BC](#) was North America's first community to experiment with strategies to **integrate natural assets into asset management and financial planning**. For example, Gibsons' Integrated Stormwater Management Plan leverages natural assets to provide stormwater services, as an alternative to building new infrastructure, and has resulted in millions of dollars saved in construction and maintenance costs.
- The [Region of Peel and Credit Valley Conservation](#) have inventoried and assessed stormwater services provided by wetlands, forests and open green spaces for the entire region under current and future climates – valuing these services at over \$20 billion. This information will be used to develop a business case for natural asset management, maintenance and restoration.

Big Idea 4: Create low-carbon energy

Metro Vancouver and its partners are exploring several key opportunities to create low-carbon energy from water and liquid waste, as outlined below. These low-carbon energy and resource recovery opportunities will bolster infrastructure resilience and mitigate greenhouse gas emissions.

- Develop additional **district energy** using waste heat from liquid waste infrastructure, including wastewater treatment plants and large sewers (see side box).

- **Residuals** recovered from the wastewater system contain organic matter that **can be used as a low-carbon energy source**. Metro Vancouver is exploring technologies to convert residuals into solid fuels to displace higher carbon fuels such as coal in cement kilns, as well as into liquid fuels, using a process called hydrothermal liquefaction.
- Build additional biogas cleanup facilities at wastewater treatment plants to **generate renewable natural gas (RNG)** that will be sold to FortisBC for regional use, displacing fossil fuel use.

Metro Vancouver will continue to explore these and other opportunities to create low-carbon energy for the region. These energy sources reduce greenhouse gas emissions elsewhere; Metro Vancouver has estimated that the above projects could reduce regional greenhouse gas emissions by up to 500,000 tonnes per year.

District Energy Opportunities in Metro Vancouver

District energy systems are centralized facilities that heat and cool residential and commercial buildings more efficiently and with less emissions than individual building heating and cooling systems. Metro Vancouver is building a facility to recover heat from wastewater effluent and supply it to a district energy provider (in progress). Metro Vancouver is exploring several other district energy opportunities, including using steam generated at the Waste-to-Energy Facility or heat recovered from large sewer pipes.

Feedback and Engagement Process

Metro Vancouver invites feedback from diverse viewpoints to help shape *Climate 2050*. Metro Vancouver will carefully consider all input. Feedback is welcome by email at Climate2050@metrovancouver.org, or by telephone at 604-432-6200.

To ensure efficiency and cross-project considerations, feedback on this discussion paper will also be shared with the Metro Vancouver project teams for additional projects including the upcoming updates to the regional drinking water and liquid waste management plans.

To ensure your comments are considered please provide feedback by April 30, 2021.

How Feedback Will Be Used

With revisions, content from this discussion paper will form the basis of the *Climate 2050 Water and Wastewater Infrastructure Roadmap*, which will be available for feedback before it is finalized.

Comments and suggestions will be compiled into a summary report for consideration by the Metro Vancouver Board and will be made publicly available.

Metro Vancouver staff will treat personal information with confidentiality; please note that comments you submit may be provided to a third party if a freedom of information request is made under the *Freedom of Information and Protection of Privacy Act*. If you have any questions or comments regarding the consultation process, please call 604-432-6200.

Thank you for taking the time to provide your valuable feedback.

For more information, visit metrovancouver.org and search "*Climate 2050*", or call 604-432-6200.

Glossary

Air contaminants are any substances emitted into the air that do or could a) harm public health (including material physical discomfort) and property, b) damage the environment, including the climate, c) impede normal business operations, or d) impair visual air quality

Biosolids is produced from anaerobic digestion processes at wastewater treatment plants and can be used to generate heat and electricity.

Carbon neutral region is a region that has achieved the deepest greenhouse gas emissions reductions possible across all economic sectors, and removes or captures sufficient carbon dioxide to balance any remaining regional greenhouse gas emissions.

Circular economy is an economy where the value of products is retained after their initial use through reuse, repair and remanufacturing. Keeping products functioning at their highest potential reduces embodied emissions, and also reduces emissions associated with waste management. Transitioning to a circular economy will gradually decouple economic activity from the consumption of finite resources, by designing waste out of the

system and helping to regenerate natural systems.

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. It has been shown that well planned, early adaptation action saves money and lives later.

Common air contaminants are air contaminants that can harm public health and reduce residents' quality of life and life expectancy by causing heart and lung diseases, cancer, asthma and other impacts. Some air contaminants have odorous characteristics. Common air contaminants include fine and coarse particulate matter, ground-level ozone, nitrogen dioxide and sulphur dioxide.

Embodied emissions are the greenhouse gas emissions associated with the construction of goods and products, including the raw materials and the transport of the good or product to where it is sold.

Green infrastructure is a tool for providing biodiversity and climate benefits through nature-

based solutions. It includes natural, enhanced, and engineered assets that collectively provide society with ecosystem services required for healthy living. Natural assets (e.g., forests, wetlands and soil) and enhanced or engineered systems (e.g., bioswales and green roofs) improve resilience and mitigate negative environmental impacts from urban development, benefiting both people and ecosystem function.

Greenhouse gases (GHGs) are air contaminants that trap heat and are the cause of climate change. Greenhouse gases include carbon dioxide and nitrous oxide, as well as short-lived climate forcers such as methane, halocarbons, black carbon and ozone. Limiting or preventing greenhouse gas 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.

Source Reservoirs are the six bodies of water where natural rainfall and snowmelt is stored in Metro Vancouver's Water Supply Area. The source reservoirs have dams and conveyance infrastructure to send the stored water to treatment on demand.

Stormwater is the water from rain or melting snow that is not absorbed into the ground. In urban areas, stormwater goes into storm sewers (the grated drains found on streets), which empty directly into rivers, creeks or the ocean. Managing stormwater and drainage is key to preserving the health of urban streams and rivers.

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 combination of ozonation or filtration, followed by UV and residual disinfection (chlorination) at one of 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.

Wastewater treatment occurs at five Metro Vancouver wastewater treatment plants across the region. Wastewater can contain a number of different pollutants and waste products, including soap, food scraps, human waste, oils and other chemicals.

