



To: General Purposes Committee **Date:** September 01, 2022
From: Peter Russell **File:** 10-6125-07-01/2022-
 Director, Sustainability and District Energy Vol 01
Re: Richmond Circular City Strategy

Staff Recommendation

1. That, as described in the report titled “Richmond Circular City Strategy” from the Director, Sustainability and District Energy, dated September 1, 2022:
 - a. the Richmond Circular City Strategy in Attachment 1 of the report be endorsed for the purpose of public consultation as a framework to establish a strategic approach to the transition to a circular economy in Richmond;
 - b. a funding application to the Federation of Canadian Municipalities be submitted for undertaking a Material Flow Analysis Study; and,
 - c. the Chief Administrative Officer and General Manager, Engineering and Public Works be authorized to enter into a funding agreement with the Federation of Canadian Municipalities and that it be included in the Consolidated 5 Year Financial Plan (2023-2027) accordingly.

Peter Russell
 Director, Sustainability and District Energy
 (604-276-4130)
 Att. 4

REPORT CONCURRENCE		
ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER
Economic Development	<input checked="" type="checkbox"/>	
Parks Services	<input checked="" type="checkbox"/>	
Public Works	<input checked="" type="checkbox"/>	
Policy Planning	<input checked="" type="checkbox"/>	
Transportation	<input checked="" type="checkbox"/>	
Corporate Communication	<input checked="" type="checkbox"/>	
Building Approvals	<input checked="" type="checkbox"/>	
Intergovernmental Relations	<input checked="" type="checkbox"/>	
Finance	<input checked="" type="checkbox"/>	
SENIOR STAFF REPORT REVIEW	INITIALS: 	

Staff Report

Origin

This report presents the Richmond Circular City Strategy (Strategy) for Council consideration (Attachment 1). The Strategy is guided by six directions and 84 actions that will set Richmond on a path to achieve 100% circularity by 2050. The action-focused Strategy is aligned with City goals as articulated in approved plans and strategies, but is not redundant. This report responds to Council direction on April 12, 2021, where City Council resolved:

“That as described in the report titled “City Participation in the Circular Cities and Regions Initiative” dated March 2, 2021 from the Director, Sustainability and District Energy, the City of Richmond’s application to participate in the Circular Cities and Regions Initiative (CCRI), be endorsed.”

Participation in the CCRI included a commitment to bring forward a community strategy to achieve a circular city, which it is representing in this Strategy. This report supports Council’s Strategic Plan 2018-2022 Strategy #2 A Sustainable and Environmentally Conscious City:

Environmentally conscious decision-making that demonstrates leadership in implementing innovative, sustainable practices and supports the City’s unique biodiversity and island ecology.

2.1 Continued leadership in addressing climate change and promoting circular economic principles.

This report supports Council’s Strategic Plan 2018-2022 Strategy #5 Sound Financial Management:

5.3 Decision-making focuses on sustainability and considers circular economic principles.

This report supports Council’s Strategic Plan 2018-2022 Strategy #6 Strategic and Well-Planned Growth:

6.2 “Green” and circular economic growth and practices are emphasized.

Analysis

The circular economy involves the flow of resources, including materials, nutrients, products and energy. A circular economy strives to reduce resource consumption and maximize material and energy efficiency. Cities, regions and countries have recognized the importance of advancing a circular economy to mitigate climate change and tackle a host of challenges, from resource scarcity to biodiversity, environmental degradation, and social inequities. Cities play a critical part in moving to more sustainable consumption through the range of roles they play, facilitating a paradigm shift toward circular approaches. The directions and actions in the Strategy augment City undertakings through an expanded focus on these flows.

The Richmond Circular City Strategy

The City of Richmond has demonstrated leadership over the past decades by developing innovative policies, programs and services in environmental sustainability, shaped by inclusivity and

community engagement. The City is looking to further build on this by identifying a path to achieve a circular economy.

The Richmond Circular City Strategy includes six guiding directions with associated actions (Table 1). The Strategy also makes room for other organizations to co-create, test and implement circular practices as partners with the City or within their respective context, fostering the transition towards a regenerative and circular city. By adopting these directions, the City will reduce barriers that delay the transition to a circular economy. In this way, the City and Richmond's stakeholders will take tangible steps to accelerate Richmond's journey towards a fully circular city by 2050.

Table 1 – Strategy’s Directions & Objectives

	<p>1. Maximizing ecosystem services Enhancing natural ecosystem services through regenerative ecosystem goods and services management, increasing the capacity of the environment to provide public and private benefits and economic resilience.</p>	<p>1.1 Promote a multi-level regulatory and support system to accommodate a transition to sustainability and circularity 1.2 Advance the value of Richmond’s natural capital assets 1.3 Promote nature-based solutions 1.4 Build capacity and raise awareness of ecosystem services and value to the City</p>
	<p>2. Regenerative food system Foster an agri-food production system that rehabilitates and enhances soil productivity, water management and fertilizer use.</p>	<p>2.1 Create an inventory of nutrient and resource flows that sustain the food system in Richmond 2.2 Shorten the food chain from the farm to the fork 2.3 Increase local food production 2.4 Reduce food waste in all the food chain 2.5 Reduce the need of chemical fertilizers and pest control while increasing the land productivity 2.6 Build capacity and raise awareness with the food system industry and stakeholders</p>
	<p>3. Resilient and innovative economy Empowering cross-sector businesses in their adoption of circular strategies in their business practices.</p>	<p>3.1 Strengthen Richmond’s business sector by fostering sustainable growth through circular economy practices 3.2 Increase businesses resilience and innovation with circular strategies 3.3 Develop a framework for promoting circular economic transition in alignment with sustainable development goals 3.4 Encourage synergies and collaboration in the local market 3.5 Build capacity and awareness among businesses and stakeholders</p>
	<p>4. Shared mobility Explore and support a shared transportation and mobility system.</p>	<p>4.1 Calculate the mobility material intensity and resource efficiency 4.2 Reduce the use of virgin materials and material footprint in the mobility system 4.3 Facilitate the implementation of an integrated mobility sharing vehicles infrastructure and “mobility as a services” solutions 4.4 Reduce distances by increasing access to co-working spaces, digital solutions and virtual services 4.5 Support continuous improvement in the local logistic system</p>
	<p>5. Adaptive built environment Maximize the optimal use of construction materials and buildings, infrastructure, and land.</p>	<p>5.1 Assess the material usage in the built environment 5.2 Regenerate materials flow by promoting salvage and secondary use materials 5.3 Develop sectoral capacity and skills 5.4 Promote the use of new materials and develop research and pilot projects 5.5 Promote circular standards for constructions 5.6 Collaborate to create joint value</p>
	<p>6. Products and materials management Promote efficiency in consumer products materials and end-of-life management.</p>	<p>6.1 Understand the urban metabolism of Richmond 6.2 Promote new circular consumption behaviors and material use 6.3 Support the urban industry collaborative relationship 6.4 Enhance upcycle infrastructure for consumer goods’ materials</p>

The Strategy's six directions are defined to achieve the City's ambitions for the sectors in which the City has the most substantial impact. The directions do not concern a particular industry, but instead propose holistic actions to systemically create change, benefiting the entire community by providing an integral contribution toward a resilient, inclusive, sustainable, and prosperous future for residents and businesses.

Developing the Strategy

Staff reviewed current City plans, strategies, and programs to identify complementarities and opportunities for circular innovation, collaboration, and stakeholder engagement. In the past three years, staff members have carried out internal and external engagement activities, built capacity, developed plans and policies, interviewed industry representatives, developed pilot projects, conducted peer-to-peer initiatives, analyzed best practices, and gained extensive circular project knowledge, including tools, and learnings (see Attachment 2 - Richmond's circular achievement to date). Additionally, staff reviewed adopted plans, strategies, and policies to identify alignment with circular principles and opportunities for advancing the circular economy in Richmond. The Strategy's directions were also informed by regional, provincial, national and international trends and best practices (see Attachment 4). Each direction covers strategy-specific resource flows, and identifies a set of technical and non-technical priorities that will be implemented to accelerate the transition to a circular economy, enabling the implementation of a systemic approach rather than the implementation of incremental improvements to the existing linear model.

Strategy Implementation

The Strategy outlines an opportunistic and strategic implementation approach. It is anticipated that staff will take advantage of new opportunities that may arise in the coming years, including upcoming federal and provincial programs, expanded regulatory mandates, and new technologies and approaches. Actions in the Strategy will be carried out in tandem with efforts contained in other plans. A material flow analysis can be a powerful tool for identifying opportunities directly related to community impacts, providing prospects for policy interventions, information that supports decision-making and planning, laying the foundation for circular initiatives (see Attachment 3 for a description of the Material Flow Analysis methodology).

Next Steps

Transitioning from a linear to circular economy is a journey characterized by short-term and medium-term milestones, building toward a long-term objective of 100% circularity. The following activities will be undertaken to support progress toward the implementation of the Strategy activities in Richmond:

- **Community engagement:** In the fall of 2022, staff will facilitate a public consultation campaign on this Strategy to collect feedback from the public and stakeholders on proposed actions within the six Directions within the Strategy.
- **Material Flow Analysis Study:** As a key first step to establish a steady-state assessment of current circularity in Richmond, an analysis of material flow is proposed to focus primarily on the resources (nutrients, water, energy, biomass, metals, minerals, etc.) used within Richmond to produce goods and services, such as food, infrastructure, mobility, manufactured products. The study will identify Richmond's relationships between resource flows, social activities, economic development and environmental changes. The study outcomes will provide a baseline level for circularity and identify where intervention may be

possible to compare the effects of various alternative circular economy scenarios relative to one another. Staff are recommending the City use the funding available from the FCM to conduct a Material Flow Analysis Study.

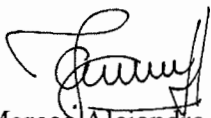
- **Continuous collaboration:** For the City to achieve its aspirational circular economy outcomes and climate action targets, public consultation, education and strategic collaborations will enable the City to expand circular innovations, as well as strengthen local community engagement.
- **Regular updates:** Staff intend to report out on Strategy achievement at least every two years.

Financial Impact

The Federation of Canadian Municipalities offers funding up to 50 percent of eligible costs for technical assessment. The value of the City in-kind contribution of staff salaries is also eligible but cannot exceed 10% of eligible costs. It is anticipated that the feasibility study work program will start in early 2023, take approximately 12 months to complete, and cost \$175,000. If Council endorses the recommendations, staff will apply for grant funding of up to \$87,500, based on the amount required to complete the Material Flow Analysis Study. The City will contribute matching funds of \$87,500 from the existing Sustainability Initiatives Funding approved by Council (2022 One-Time Expenditures). If approved by Council, the potential grant and corresponding feasibility costs will be included in the Consolidated 5 Year Financial Plan (2023-2027). Future expenditures required for implementation of the Strategy directions will be presented to Council for consideration during the budget process.

Conclusion

The City is becoming a national leader in planning for a circular economy in Richmond. The Strategy is a guiding strategy for the City and Richmond's stakeholders to update and strengthen policies, strategies and plans that support the regional innovation ecosystem. Funding available from Federation of Canadian Municipalities of up to \$87,500 for a Material Flow Analysis Study will map resources flow through the city to determine the current level of circularity, identify actions to boost circularity by sector and reveal economic opportunities directly related to environmental impacts. The Material Flow Analysis is an important technical foundation for policy interventions and can produce critical information for decision-making and planning.



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MB:mb

- Att. 1: Richmond Circular City Strategy
- Att. 2: Richmond's circular achievement to date
- Att. 3: Material Flow Analysis
- Att. 4: Toward a circular economy - Canada's opportunities

RICHMOND CIRCULAR CITY STRATEGY



ACKNOWLEDGMENTS

Cities and regions are where people, knowledge and ideas come together, where innovation is cultivated, and where most natural resources are consumed and waste generated. These dynamics position local governments at the heart of the circular economy transition.

In 2021, the City of Richmond joined the Circular Cities and Regions Initiative (CCRI), to be part of a one-year pilot to advance circular economy knowledge sharing and capacity in the Canadian local government sector. The Initiative was developed and delivered jointly by the National Zero Waste Council, the Federation of Canadian Municipalities, the Recycling Council of Alberta, and RECYC-QUÉBEC. Over the course of one year, the CCRI provided direct support, guidance and a peer-to-peer exchange for a group of 15 cities and regions as they take steps to become more circular.

By working with cities and regions of different sizes, different local contexts and at different stages of readiness, the CCRI tested and prototyped training, tools, and guidance that will be most helpful in scaling innovative place-based circular economy policies, programs and services.

Published by

The City of Richmond
September 2022

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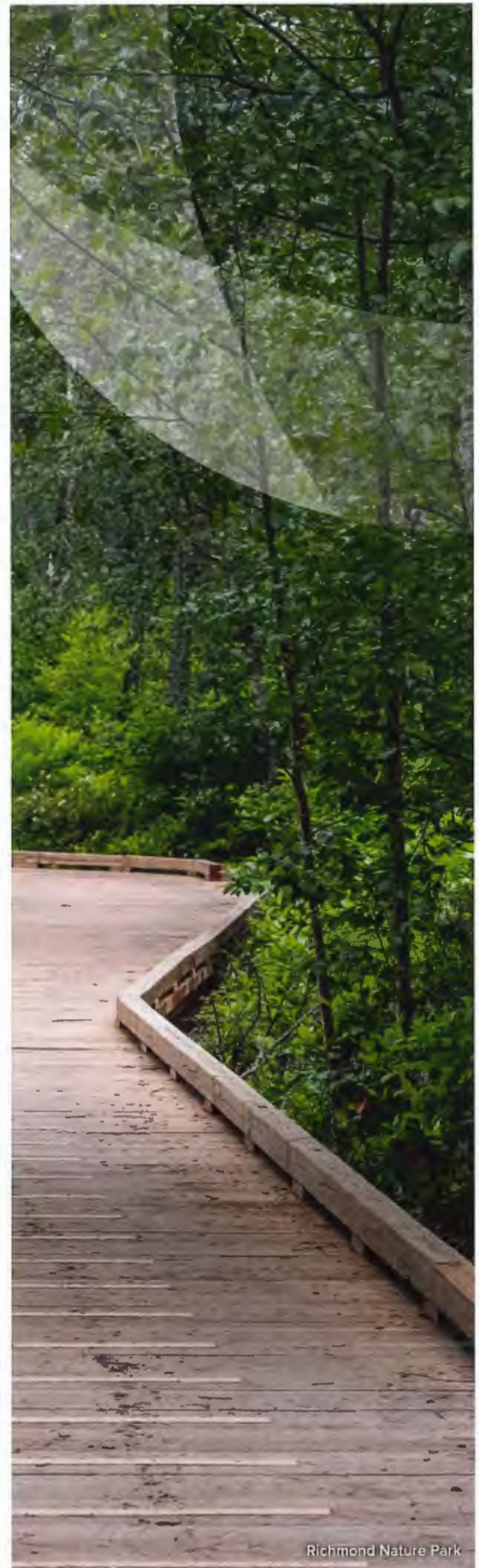
The circular economy is a systems-focused approach encompassing materials and energy flows, products and services value chains and actors across different sectors; offering a new model for innovation and integration between natural ecosystems, businesses, our daily lives, and waste management. This circular way of doing business decouples materials use from social and economic growth to generate prosperity, jobs, and resilience while reducing biodiversity loss, greenhouse gas emissions, waste, and pollution.

No one actor is responsible for the circular economy, and therefore is everyone's responsibility. This Strategy identifies directions and actions that the City will work in partnership with institutions, governments, businesses, non-profit organizations to move toward the local circular economy.

This Strategy places the City at the forefront of enabling a transition to a circular economy by integrating new and existing policies, building capacities, collaborating and engaging stakeholders, and stimulating innovation and participation across the agri-food, business, mobility, built environment and materials management sectors.

CONTENTS

STRATEGY-AT-A-GLANCE.....	4
MOVING FROM A LINEAR TO A CIRCULAR ECONOMY.....	7
DIRECTIONS FOCUS AREAS	13
1. MAXIMIZING ECOSYSTEM SERVICES	15
2. REGENERATIVE FOOD SYSTEM.....	19
3. RESILIENT AND INNOVATIVE ECONOMY	24
4. SHARED MOBILITY	28
5. ADAPTIVE BUILT ENVIRONMENT	32
6. PRODUCTS AND MATERIALS MANAGEMENT	37
IMPLEMENTATION APPROACH	41
IMPLEMENTATION TOOLKIT	43



STRATEGY-AT-A-GLANCE



This Strategy outlines a framework that will guide Richmond's transition to a circular economy.



VISION

The City of Richmond's vision for a 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.

PRINCIPLES

Design clean, Keep using, Collaborate to co-create, Regenerate, Maximize value.

DIRECTIONS

Maximizing ecosystem services; Regenerative food systems; Resilient and innovative economy; Shared mobility; Adaptive built environment; Products and materials management.

GOALS

30 directional goals, outcome focused.

ACTIONS

84 actions that will set Richmond on a path to achieve 100% circularity.

RESULTS

The Strategy makes room for other organizations to co-create, test and implement circular practices as partners with the City or within their respective context, fostering the transition towards a regenerative and circular city.

THE RICHMOND CIRCULAR CITY STRATEGY IS ALIGNED WITH CITY PLANS

The action-based approach of this Strategy is aligned with the goals as specified in the plans, strategies, programs and policies below, but is not redundant. Circular economy is about the flow of resources, materials, nutrients, products and energy. The actions in the Strategy augment the City work through an expanded focus on these flows.



- 5-Year Tourism Plan
- Agricultural Viability Strategy
- Barn Owls Nest Box Program
- Bat Friendly Community Recognition
- Biweekly Garbage Cart Program
- Blue Box/Blue Cart Programs
- Business Resilience Program
- City Centre Transportation Vision 2007
- Community Energy & Emissions Plan 2050
- Cultural Harmony Plan
- Farming First Strategy
- Ecological Network Management Strategy
- Enhanced Pesticide Management Program
- Green Cart Program
- House Moving and Salvage Program
- Industrial Land Intensification Initiative
- Integrated Rainwater Resources Strategy
- Invasive Species Action Plan
- Litter Collection Program
- Large Item Pick Up Program
- Resilient Economy Strategy
- Official Community Plan
- Park and Open Spaces Strategy
- Partners for Beautification
- Poverty Reduction Plan
- Public Spaces Recycling Program, Event Recycling, Facilities Recycling
- Procurement Policy
- Reclaimed Asphalt Pavement Pilot Project
- Richmond Business Development Program
- Richmond Food System Action Team
- Richmond Food System Assessment 2006
- Richmond Foodland Report 2013
- Richmond Garden Club
- Richmond Local Food Map
- Richmond Nectar Trail
- Richmond Pesticide Management
- Riparian Areas Regulation Response Strategy
- Single-Use Plastic and Other Items Bylaw No. 10000
- Tree Management Strategy
- Wellness Strategy



MOVING FROM A LINEAR TO A CIRCULAR ECONOMY

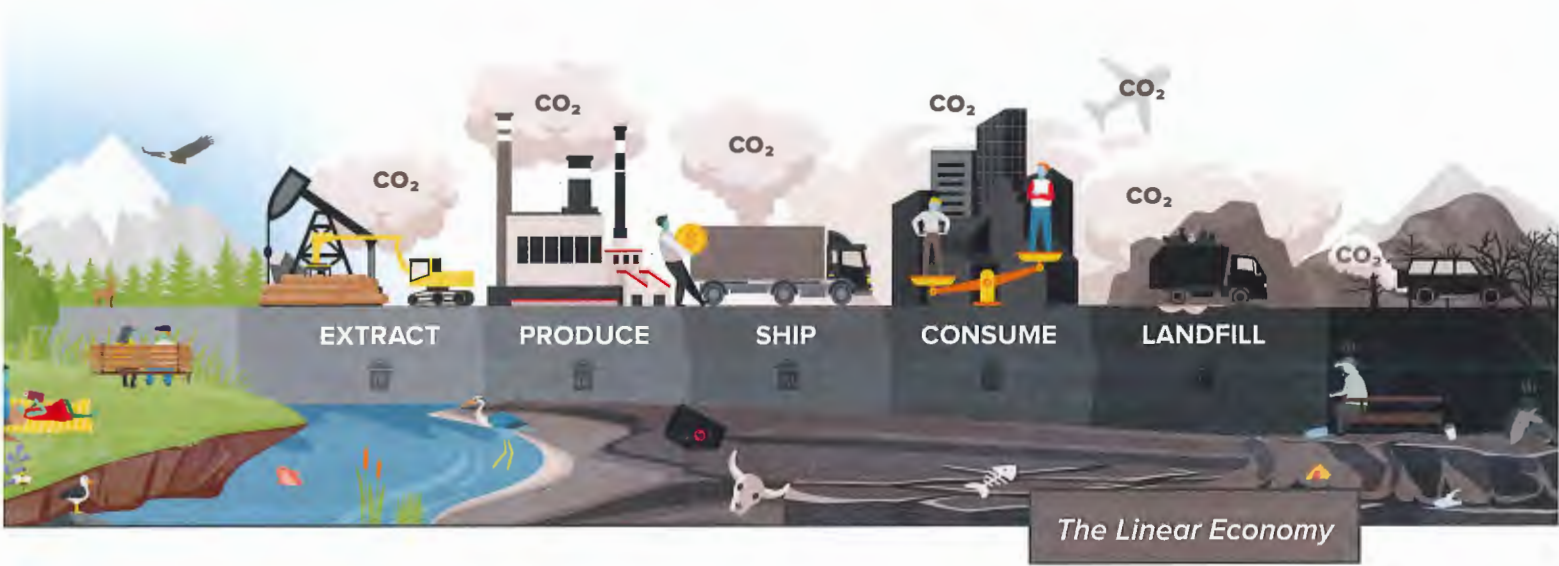
BEYOND PLANETARY BOUNDARIES

We need natural resources to sustain our economy, prosperity and well-being.

The current economy of “take-make-use-dispose” is called the linear economy, meaning things are made from virgin raw materials, used for a short period of time, and then disposed.

The footprint of biological capacity available on Earth is 1.6 global hectare (gha per person). An ecological deficit occurs when the demand for natural resources exceeds the biocapacity of the planet. Our current footprint -demand for natural resources- is 8.1 gha, indicates that we need 5.1 planets to satisfy our needs. Coupled with existing waste disposal models, the over-exploitation of natural resources has led to environmental problems such as soil contamination, lost natural capital, human health problems and climate change.

To narrow virgin raw material needs by 2050 and achieve 2030 climate commitments requires at least doubling the current portion of resources that re-enter the circular economy.



LIVING WITHIN PLANETARY BOUNDARIES

The implementation of the circular economy approach emerges as a counterpoint to the linear economy by closing resource loops. This model combines economic growth with a development cycle that preserves and enhances natural capital, optimizes resource production and minimizes risk through the management of limited resources and renewable loops. A circular economy, in essence, uses as few new resources as possible.

The City of Richmond's vision a for 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.

Additionally, it has the potential to enable companies to reduce production costs and losses, generate new sources of revenue and reduce their dependence on natural raw materials. A circular economy strategy maintains the highest value of products and materials as long as possible to conserve critical resources, prevent waste generation, and reduce the emissions from the production of goods and services.



Wild native Yarrow

The Richmond Circular City Strategy provides a crosscutting framework for decoupling Richmond's prosperity from natural resources extraction to turn the circular economy into a driver of growth, ensuring that products, components and materials remain at their highest use and value.



Figure 1: Circularity Ladder. We propose a circularity ladder, so called R-ladder. A variety of R-models are used to extend circular strategies, ranked in priority order. The R-ladder can be seen as a hierarchy where the highest possible step would be more ideal for a circular strategy.



Richmond North-Arm Dike

This is an opportunity to create a new urban future - one connected with our planet, communities, and our wealth in service of prosperity and equity in a world of finite resources. Current economic models that date back to the industrial age are largely unresponsive to a changing world. Cities and governments are moving away from a linear economy, recognizing the loss of biodiversity, over consumption of natural resources, social impacts and supply chains that lack resilience.

The circular economy is the advancement of the relationship between our cultural and economic systems with the planet and its natural cycles to create both human and natural ecosystem prosperity and growth.

Moving to a circular economy will bring with it exciting opportunities to address systematic changes. The City has demonstrated leadership in sustainable development through innovative policies, programs, and services shaped by community and stakeholder participation. Adding a circular economy focus to the City's work will contribute to achieving sustainable development, mitigating climate change, conserving natural resources, and improving the state of the environment, all while generating economic growth and jobs.

It is time to pivot to a new model of economic prosperity and adopt a holistic approach to the systemic transformation of communities.



Richmond South Dike

The City of Richmond's vision for a 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. This Strategy outlines a framework that will guide Richmond's transition to a circular economy.

OUR APPROACH TO DRIVE SYSTEMATIC CHANGE

The Strategy is built on the circular economy principles supported by the City to strengthen the systemic transformation from a linear to a circular economy.

The City has started using circular economy criteria in various ways, guided by the following principles:

- Design clean
- Keep using
- Collaborate to co-create
- Regenerate
- Maximize value



GROWTH WITHIN PLANETARY BOUNDARIES FOR SOCIAL EQUITY

Canada is extracting natural resources 5.1 times faster than our planet's regenerative biocapacity, placing citizens and communities at risk.

While a transition towards a circular economy does not guarantee a more equitable society, it provides an opportunity to achieve societal benefits such as poverty reduction, meaningful employment, and human well-being. An equitable transition can help ensure that the benefits (and risks) of the circular economy are equally distributed through society. The Richmond Circular City Strategy incorporates equity considerations to identify possible pathways for sustainability and outlines directions that are resource-efficient and people-centred.

BENEFITS OF A CIRCULAR ECONOMY

Richmond's circular transition will be achieved through active collaboration among different sectors and stakeholders, as well as national and international cooperation with local governments.

The benefits of moving to a circular economy include:

CAPACITY-BUILDING

The strengthening knowledge about the value of moving to the circular economy is crucial for the growth of businesses and entrepreneurs throughout the value chain, especially for specific key sectors such as tourism, food production and construction. Businesses and jobs related to the circular economy can gain new skills through development opportunities.

PROSPEROUS AND RESILIENT ECONOMY

Sustainable consumption models, closing (waste) material cycles, establishing collaborative partnerships among business sectors and regional stakeholders, and piloting innovative ideas are all critical to invigorate new and existing local business products and services.

COLLABORATION BETWEEN MULTIPLE STAKEHOLDERS

Multi-stakeholder cooperation is essential to encourage and support residents, businesses, non-profit organizations and institutions to participate actively in the circular economy as part of the transformation. The creation of a circular framework of collaboration tools and networking platforms will provide a common ground so that Richmond's small and large businesses can work together to implement circular economy practices.

FOSTERING INNOVATION

Circular business models can be used to accelerate innovation and benefit small and medium-sized businesses to engage in value-retention activities like repair, refurbishment, and re-manufacturing.

NEW GREEN JOBS

Studies have indicated that circularity has the potential to create jobs when businesses focus on low-carbon targets and circular sectors.

PROTECT AND RESTORE LOCAL ECOSYSTEMS

Solutions that utilize functioning ecosystems as natural infrastructure to provide ecological services for residents and the environment are expected to emerge.

REDUCE CARBON EMISSIONS

The circular economy can contribute to a 50% reduction in greenhouse gas emissions.



Recycling generates an estimated **36 JOBS** every 10,000 tonnes of "waste"



Reuse and refurbishment can create more than **250 JOBS** for every 10,000 tonnes of "waste"

A study assessing Canada's circular economy potential found the total gross domestic product (GDP) of industries assumed to have the capability to integrate secondary materials into circular practices such as refurbished or re-manufactured products in Canada was



CAD 277 BILLION which represented 14.7% of national GDP in 2016.

CHALLENGES OF A CIRCULAR ECONOMY

The global economy extracts rough 84 billion tonnes of materials worldwide every year. This overwhelming demand for raw materials continues to increase due to growing prosperity and an equally growing world population. Richmond's critical challenges to move towards the circular economy include:

A KNOWLEDGE GAP

There is a general lack of local knowledge and data which is required for strategic planning and decision-making. Additionally, Richmond's case studies about circular business models and the results of their implementation are lacking.

SILOED SECTORS

Specialized suppliers often operate in silos that prevent industry cooperation. Cross-sectoral collaboration and taking a systems approach are required to achieve circularity.

LACK OF ECONOMIC INCENTIVES

Due to linear supply chains, low incentives, and a lack of practical information, businesses find it complex to adopt circular approaches and strategies.

SHORT-TERM FOCUS

Sectors are focused on short-term, fast, bottom-line results without considering long-term costs and benefits.

GROWING POPULATION

The demand for better infrastructure and energy is increasing as more people move to Richmond in search of better jobs, services, and culture.

CULTURE AND LIFESTYLE

In Canada, consumerism is the dominant culture, promoting overconsumption, discouraging the use of refurbished products and recycled materials, and preventing individuals from adopting circular practices.

LOW COST OF VIRGIN MATERIALS AND DISPOSAL

The Lower Mainland has low landfill and virgin material costs, limiting waste reduction and by-product materials.

SMALL BUSINESSES FACE HIGH INVESTMENT COSTS

Because the investment cost is high in some circular business models, small businesses with limited access to capital have difficulty funding long-term investments and uncertainty on adequate returns.

Engagement and Collaboration

During the past three years, the City has carried out internal and external engagement activities, built capacity, developed plans and policies, interviewed industry representatives, developed pilot projects, conducted peer-to-peer initiatives, analyzed best practices, and gained extensive circular project knowledge, including tools, and learnings.

Additionally, City staff reviewed adopted plans, strategies, and policies to identify alignment with circular principles and opportunities for advancing the circular economy in Richmond. The Strategy's directions were also informed by regional, provincial, national and international trends and best practices.



STRATEGIC DIRECTIONS

SIX STRATEGIC DIRECTIONS TO ACCELERATE THE CIRCULAR ECONOMY IN RICHMOND



The six directions to achieving city circularity focus on different resource flows by engaging a productive 'making' approach that empowers citizens, industry leaders and City's staff.

Each direction and its guiding actions focus on its own local topic, dynamic, cultural, social, economic, and technical challenges. The directions are a result of three-year comprehensive staff work on engagement activities, capacity-building actions, plan and policy development, industry interviews, pilot projects development, peer-to-peer initiatives, best practices analysis and extensive project knowledge, tools, and learnings. They will guide many Richmond actors to co-create, test and implement circular practices within their local and regional context, fostering the transition towards a regenerative and circular city, providing valuable examples for other cities to engage in this necessary transition.

Six priority directions are defined to achieve the ambitions in the sectors in which the City has the most substantial impact. Progress in these areas will remove barriers that stand in the way of the transition to a circular economy.

The Strategy does not concern a particular industry, but instead proposes holistic actions to systemically change and benefit the entire community.

The progress in these six priority areas will be assessed qualitatively and quantitatively. Learning and findings will be used to improve this Strategy and design new initiatives. In this way, we will take concrete steps to accelerate Richmond's journey towards a fully circular city by 2050.

Businesses, academic institutions and research organizations, consumers, residents, and vibrant communities are all needed to achieve change. At the same time, there is still much to learn. The City's approach is a "learn-by-doing" that builds on the values of collaboration, innovation, resiliency, and adaptability. By following this approach, we can strike the right balance between being concise and remaining flexible to embrace circularity in the coming years.

The adoption of these directions can reduce the overall level of materials flowing into Richmond's economy by increasing material efficiency—in other words, getting more (or the same) from fewer resources. This means, by moving toward the circular economy, Richmond has the opportunity to narrow flows of resources consumption, decrease embodied emissions in materials, and minimize the pressure on the natural ecosystem. This involves, for example, encouraging the use of sharing and rental models over private ownership, along with multifunctional products and buildings. Embracing digitization in business and across sectors could help to reduce the material inputs needed for products and even buildings, particularly if the trend toward working from home and telecommuting continues post-COVID-19. Additionally, we can save energy by extending the life of materials, thereby reducing the need to extract virgin materials.

SIX DIRECTIONS TO ACCELERATE THE CIRCULAR ECONOMY IN RICHMOND





1

MAXIMIZING ECOSYSTEM SERVICES

Enhancing natural ecosystem services through regenerative ecosystem goods and services management, increasing the capacity of the environment to provide public and private benefits and economic resilience.



1. MAXIMIZING ECOSYSTEM SERVICES

Enhancing natural ecosystem services through regenerative ecosystem goods and services management, increasing the capacity of the environment to provide public and private benefits and economic resilience.

Natural ecosystems are essential to support human health, wealth, culture, identity, happiness and well-being. Richmond's residents enjoy a high quality of life thanks partly to access natural areas and services in the city. Residents also benefit from ecosystem services, including pollination for our food production, water and air purification, climate regulation, nutrient cycling, habitat, recreation, health, protection from natural disasters, recreation, and cultural and spiritual well-being. Richmond's economic activities have an impact on its natural ecosystem services. Natural ecosystem services benefit from active management to ensure their functions are maintained for us now and into the future.

Wetlands, forests, shorelines, and old fields act as the foundation of Richmond's Ecological Network (EN) - a long-term ecological blueprint for the collaborative management and enhancement of the natural and built environments throughout the city. Consistent with the draft Metro Vancouver Regional Green Infrastructure Network, the EN was first introduced with the adoption of the Richmond 2041 Official Community Plan to achieve ecologically connected, livable and healthy places in which residents thrive. The EN vision and goals provide a framework for managing and guiding decisions regarding the city-wide system of natural areas and the ecosystem services they provide.

The City's **Environmentally Sensitive Area (ESA)** extends over approximately **8,015m²** compensated for by adding over

7,000

NATIVE TREES AND SHRUBS.

The City has also improved civil improvements (culverts) and ecological enhancements (native plantings) to about

1,800m

OF CHANNELIZED WATERCOURSE along Sidaway Road and Steveston Highway.

Over

200

VOLUNTEERS

planted more than

3,000

NATIVE TREES AND SHRUBS

along Richmond's greenways and parks.

The **Partners for Beautification Program** allowed community members to **ADOPT STREETS, GARDENS, PARKS, TRAILS PROACTIVELY, AND OPEN SPACES** to remove litter and invasive plants from these areas.

WHY CIRCULARITY IS IMPORTANT?

Human prosperity arises from using a combination of social capital, human capital and built capital, but these are all based on natural ecosystems. Conservation and restoration efforts alone are crucial, but they will not be enough, making opportunities for regenerative ecosystem goods and services that only nature can provide. By including the value of natural ecosystem resources and services into innovative business models and financial decision-making, circular economy approaches offer the opportunity reconciling Richmond's economic and environmental interests leveraging and accelerating the City's efforts to manage and enhance our ecological assets, strengthen city infrastructure, create, connect and protect diverse and healthy spaces and engage through stewardship and collaboration. A circular approach

can be used, to integrate Richmond's natural capital assets into the corporate financial accounts, providing economic value for ecosystems services as a means of supporting future growth and identifying innovative solutions, exploring their synergies, and highlighting how they fit into the current financial accounting. Consequently, Richmond's natural ecosystems and green infrastructure can be increased by implementing innovative nature-based solutions to enhance economic activities and ecosystem services to the community. Additionally, Richmond's green infrastructure and community and household yards can increase regenerated natural areas that can be integrated into Richmond's Ecology Network.



EQUITY FOCUS

Ensure that natural ecosystems and ecological services benefit all Richmond residents by promoting resource use without compromising their availability for future generations.

1. MAXIMIZING ECOSYSTEM SERVICES

ACTIONS		TOOLKIT	RESOURCES
1.1. Promote a multi-level regulatory and support system to accommodate a transition to sustainability and circularity			
1.1.1.	Integrate assessment opportunities to identify the cultural, market and technological barriers that limit the development of a circular economy.		•
1.1.2.	Advocate for system-level policy measures based on outcomes of the assessments.		••
1.2. Advance the value of Richmond's natural capital assets			
1.2.1.	Conduct a natural capital assessment to identify Richmond's natural ecosystem inventory and services.		•••
1.2.2.	Integrate natural capital assets and the ecosystem services they provide into the City's decision making and the corporate financial accounts, providing economic value for ecosystems services as a means of supporting future growth and identifying innovative solutions, exploring their synergies, and highlighting how they fit into the current financial accounting in a standardized way.		••



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS






















ADVOCACY



OUTREACH + CAPACITY BUILDING

• LOW •• MEDIUM ••• HIGH

1. MAXIMIZING ECOSYSTEM SERVICES

ACTIONS		TOOLKIT	RESOURCES
1.2.3.	Establish a soil management procedure(s) that identify opportunities for sustainable urban development, while enhancing soil health and fertility.	 	•
1.3. Promote nature-based solutions			
1.3.1.	Support design solutions for contemporary landscapes and architecture, which include natural and living materials through policies, measures and actions that promote their use.	   	••
1.3.1.	Protect the climate-regulating properties associated with the settlement of local micro-climates and water retention by use of vegetation, and prevent flooding by preserving natural wetlands.	  	•••
1.4. Build capacity and raise awareness of ecosystem services and value to the City			
1.4.1.	Develop pilot projects in partnership with educational institutions to identify community opportunities and solutions to re-wild Richmond's green space and landscape.	  	••
1.4.2.	Develop tools to promote behavioural change in households and businesses in relation to natural ecosystems.	  	••
1.4.3.	Promote revitalization of Richmond's green spaces by establishing pilot projects in collaboration with other senior governments and nonprofit organizations.	   	••



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

• LOW

•• MEDIUM

••• HIGH



2

REGENERATIVE FOOD SYSTEM

Foster an agri-food production system that rehabilitates and enhances soil productivity, water management and fertilizer use.



**Foster an agri-food
production system that rehabilitates
and enhances soil productivity, water management
and fertilizer use.**

Richmond holds a central position in regional food production, from agriculture to extensive community gardens to post-secondary education to the food processing industry. Although Richmond has become a diverse city, agriculture remains a crucial part of the economy and a significant land use. The Richmond Local Food Map 2022 shows the wide variety of local produce and seafood directly available from producers and merchants, as well as Farmers' Markets to showcase food and local artisans. Approximately 4,993 ha of Richmond's land base, or 39% of the City, is within the Agricultural Land Reserve (ALR). The amount of land in the ALR has remained relatively stable in the last 30 years. The 184 farms reported in the 2021 Census of Agriculture recorded gross farm receipts of \$66.1 million, with an average of \$305,820 per farm. This is an increase from \$57.8 millions by 189 farms in 2016, \$48.6 million of gross farm receipts reported by 211 farms in 2011, \$40.5 million of gross farm receipts reported by 172 farms in 2006, and \$37.6 million of gross farm receipts reported by 182 farms in 2001.

In April 2021, Council adopted the Farming First Strategy, a long-range strategy that includes policies to guide decisions on land use management of agricultural land, enhance public awareness of agriculture and food security issues, and strengthen agricultural viability in Richmond. The themes, objectives and policies contained in the Farming First Strategy are a result of a multi-phase process, which included a review of existing policies and practices in Richmond, best practice research from other jurisdictions, and input from the

City's Food Security and Agricultural Advisory Committee (FSAAC) and Richmond residents. Richmond's food system is essential to the well-being of communities, and a robust and resilient food system supports community health, environmental sustainability, and economic development. It is imperative to keep the food system's transition to resource-efficient strategies.

Garden City Lands is a remarkable open space in Richmond's Agricultural Land Reserve. It is situated in a transition zone between a rapidly growing urban area on three sides and a large natural and agricultural area to the east. The Park Development Plan includes 16 hectares of agricultural land. In most of the farming zone, the public will have access to trails that can also be used for farm service. Garden City Lands can play a significant role in supporting key outcomes, such as showcasing the City's unique landscape, food, arts, and culture.

The City provides Kwantlen Polytechnic University (KPU) with access to two parks. There is an 8ha farm on the Garden City Lands operated by KPU's Department of Sustainable Agriculture. Around 2.6ha of this farm is actively farmed by students enrolled in the four-year degree program. On the South Dike Agricultural Lands, KPU's Richmond Farm School operates intensive agriculture activities on incubator farms for new farmers. On both sites, cover crops are planted in large portions of the fields to nourish the soil and to promote the population of beneficial insects.

WHY CIRCULARITY IS IMPORTANT?

Even though the current food system has supported a rapidly growing population and fueled economic growth, productivity gains have been environmentally costly. The Future of Our Food System by the Province of British Columbia predicts that the current agri-food system will reduce food self-reliance in the region from 48% to 36%. Given the production technology available today, over half a hectare of farmland (0.524 ha) is needed to produce the food for one person for one year. Considering existing production technology based on the linear economy, to maintain the current level of food self-reliance through to the year 2025, the farmland with access to irrigation will be required to increase by 92,000 hectares or 49% over 2005 levels, and farmers will need to increase production by 30% over 2001 levels. Richmond's food system also faces many challenges, including pressure to urbanize the ALR, rural/urban conflicts, high land values, the economics of farming servicing and infrastructure limitations. Often the potential impacts of urban-based decisions on the industry are not studied.

Circular solutions positively enable the entire food system to benefit both local communities and the economy by increasing productivity, creating added value and improving profitability while responding to the many unique regional

contexts. The adoption of sustainable and circular practices that mimic natural functions can increase the crop production per unit area of soil while regenerating soil health, and increasing biodiversity, including the use of agroforestry and multi-cropping within the city limits. The circular economy approach also provides a broad range of actions for supporting a Richmond closed nutrient cycles to reduce the dependency and consumption of chemical fertilizers and reduced food waste. Combining the principles of circular economy with inclusion, collaboration, innovation and sustainability, is possible to improve the farm-to-fork resource-efficient food chain with shorter value chains and a lower ecological footprint. We can rethink how and where we grow food and support the local food production in household and community gardens throughout Richmond, increasing the local self-reliance of the organic food consumed in Richmond. Enhancing collaboration based on circular principles between all actors in the food systems, the City can support existing and new community partners and non-profit organizations to provide programming and educate Richmond residents on the importance of local food systems and local food hubs.





































EQUITY FOCUS

Promote access to food for all residents and make Richmond's food systems more resilient. A circular food system can be made sustainable by rethinking investments and innovations to avoid increasing food production costs. As an essential contributor to the local economy, the circular approach increases collective capacity and effectiveness, fosters community involvement in food-sharing platforms and initiatives, and monitors access to organic, healthy food options.



2. REGENERATIVE FOOD SYSTEM

ACTIONS		TOOLKIT	RESOURCES
2.1	Create an inventory of nutrient and resource flows that sustain the food system in Richmond		
2.1.1	Assess the food system to identify nutrient and resource flows, opportunities and priorities to enhance food production and soil productivity in Richmond, interconnecting the various growing practices to provide a flowing stream of healthy nutrients to all residents.	 	••
2.1.2	Compile data and information to identify opportunities and barriers to increase sustainable food production in the urban space to support the local demand for nutritious and healthy food with different types of plant cultivation into compact spaces.	  	••
2.2	Shorten the food chain from the farm to the fork		
2.2.1	Promote the direct relationship between farmers, food producers, residents and stakeholders.	  	•
2.2.2	Require a preference for local food into food service licenses.	 	•
2.2.3	Facilitate the implementation of vertical farming in industrial lands and other urban areas.	     	••
2.2.4	Provide residents with information about local food suppliers with circular menus and organic farming practices.	 	•
2.2.5	Monitor the affordability of circular food options for consumers and track access to healthy food products for low-income households.	  	•
2.3	Increase local food production		
2.3.1	Build a comprehensive urban agriculture program that includes community gardens, green areas, backyards and cultivation on City land.	   	••
2.3.2	Work with residents and key stakeholders to increase the food production in community and household gardens.	  	••
2.3.3	Develop innovative practices that contribute to a food-sharing platform and initiative that engages communities.	  	••
2.3.4	Support ongoing educational initiatives to raise knowledge and awareness among residents on how to prepare nutritious meals using local and seasonal produce.	  	•



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES



COLLABORATION + PARTNERSHIPS



ADVOCACY



























OUTREACH + CAPACITY BUILDING

RESOURCES

• LOW •• MEDIUM ••• HIGH

2. REGENERATIVE FOOD SYSTEM

ACTIONS		TOOLKIT	RESOURCES
2.3.5	Collaborate with local businesses to provide residents with information on local food production and Richmond community benefits.	 	.
2.4	Reduce food waste in all the food chain		
2.4.1	Support circular food marketplaces using physical spaces and digital platforms.	   	.
2.5	Reduce the need of chemical fertilizers and pest control while increasing land productivity		
2.5.1	Encourage farmers to practice regenerative agriculture and apply nature-based solutions that increase agricultural productivity per unit area of soil and improve biodiversity.	  	..
2.5.2	Advocate for the adoption of regenerative agriculture regulations and practices using nature-based solutions in agricultural activities in the Province, including the use of agroforestry and multi-cropping within the city limits.	 	..
2.5.3	Advocate local farmers' access to funding for regenerative farming programs to protect and enhance the environments in which they operate in conjunction with providing food security and economic development.	 	..
2.5.4	Promote the implementation of nature-based solutions to increase circularity in the food system, and closing nutrient cycles which have reduced the consumption of chemical fertilizers and reduced food waste in all supply chains.	 	..
2.6	Build capacity and raise awareness with the food system industry and stakeholders		
2.6.1	Support existing and new community partners and non-profit organizations to provide programming to further educate Richmond residents on the importance of local food systems and local food hubs.	 	..
2.6.2	Develop a toolkit for an educational program in the K-12 curriculum on Richmond's agricultural and food system to raise community knowledge to identify community-based solutions to increase food security, prepare nutritional meals using local food production, reduce waste along the foodchain and increase household nutrient recovery.	  	..
2.6.3	Support training opportunities for local food producers on circular economy practices for farming and businesses.	  	.
2.6.4	Support local academic institutions to increase professional training on sustainable farming and circular solutions for the agricultural and food system.		.



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

RESOURCES

● LOW ●● MEDIUM ●●● HIGH



3

RESILIENT AND INNOVATIVE ECONOMY

Empowering cross-sector businesses in their adoption of circular strategies in their business practices.



Empowering cross-sector businesses in their adoption of circular strategies in their business practices.

Richmond has a strong and diversified local economy with a stable base of employment and economic opportunities. In 2022, more than 14,000 businesses employ 130,000 people in various sectors, including aviation, manufacturing, agrifood production, clean technology, tourism and logistics. There are 1.35 jobs for every resident worker in Richmond, making it a major employment center for the region. Employment lands in Richmond include 4.9 million square feet of office space and over 45 million square feet of industrial space.

Guided by the Resilient Economy Strategy, the City and stakeholders support local businesses and foster the conditions that enable key sectors to grow and become more resilient to economic and environmental change.

Approximately 37% of all jobs in Richmond are located on industrial land, but vacancy in the region is at an all-time low with limited options for new development. This lack of industrial space poses a challenge for the retention and expansion of key industries; however, this is also driving efforts to optimize the use of existing land by the private and public sector. This includes the City of Richmond's Industrial Land Intensification Initiative. A series of bylaw and policy changes were adopted by Council in 2021 to encourage more intensive utilization of existing industrial land and reduce barriers to multi-level and other innovative forms of industrial developments.

The Supply Chain Resiliency Program was undertaken in partnership with the City of Surrey, Township of Langley and the BC Tech Association to gain a more in-depth understanding of regional manufacturing activities which can lead to further industrial efficiencies across jurisdictions and sectors. This program also encourages technology adoption by manufacturing businesses to help them become more resilient to challenges such as the shortage of space and workers, and supply chain disruptions.

The City continues to seek ways to help businesses maximize the use of resources and adopt circular economy practices into their operations. For example the City partnered with FoodMesh, a Vancouver-based company that facilitates food redistribution, to develop the Richmond Food Recovery Network. This platform enables local food businesses to divert their unsold surplus food from waste streams to higher value uses. Fifty-nine organizations participated in the first year of the program, which resulted in the diversion of 414,555 kg of food from waste stream and the creation of 644,800 meals for those in need. For this initiative, the City won the 2021 Community Project Award from the British Columbia Economic Development Association.

WHY CIRCULARITY IS IMPORTANT?

It is possible to implement circular strategies from multiple perspectives and increase business collaboration to achieve common goals through joint solutions. By optimizing resource consumption, businesses can access cheaper resources, reduce waste handling costs, and increase competitiveness. The circular economy brings opportunities to localize supply chains and build local economic growth, employment and labour forces. An Ontario study estimates that increasing the province's waste diversion rate to 60% would create nearly 13,000 new direct and indirect full-time jobs. Since this

estimate is based on a waste-diversion strategy only, the full employment potential of a comprehensive circular economy strategy could be much more significant.

Richmond's businesses can benefit from circular economy strategies by creating a collaborative Circular Innovation Hub, which will foster innovation to develop sustainable products as a service and enable better business solutions to close the material loop.



EQUITY FOCUS

The circular economy for sharing, repairing and offering second-hand products needs to diversify consumers' opportunities and make consumer goods more accessible to residents, especially those who have less to spend.

3. RESILIENT AND INNOVATIVE ECONOMY

ACTIONS		TOOLKIT	RESOURCES
3.1.	Strengthen Richmond's business sector by fostering sustainable growth through circular economy practices		
3.1.1.	Conduct a technical review of the regional legislation to identify opportunities, barriers and gaps to successfully implement circular practices in Richmond's commercial and industrial sectors.		•
3.1.2.	Analyze the Richmond business material metabolism to identify opportunities to maximize efficiency and symbiotic resource use.		••



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS



ADVOCACY





















OUTREACH + CAPACITY BUILDING

• LOW

•• MEDIUM

••• HIGH

3. RESILIENT AND INNOVATIVE ECONOMY

ACTIONS	TOOLKIT	RESOURCES
3.2. Increase businesses resilience and innovation with circular strategies		
<p>3.2.1. Create the Richmond Circular Hub for innovation to support entrepreneurs, ventures and businesses as they develop circular strategies and business applications, including initiatives such as:</p> <ul style="list-style-type: none"> • Support local businesses to integrate new circular strategies in all their supply chain by developing innovative solutions and local pilot projects; • Promote the development of circular business models in business sectors by advocating for changes to regional regulations and policies; • Develop guidelines for help SMEs scale up and implement circular business models in strategic areas; • Facilitate the sharing of workspaces, accommodations, equipment, tools, transportation, and materials between businesses; • Build industry synergy and develop more resource-efficient loops. 		
3.3. Develop a circular framework which aligns with the sustainable development goals		
<p>3.3.1. Work with local and senior governments on enhancing legislation to accelerate the transition of regional markets to a circular economy and anticipate opportunities for businesses.</p>		
<p>3.3.2. Work with interested municipalities to promote circular sharing over ownership and minimize the risks related to the business.</p>		
3.4. Encourage synergies and collaboration in the local market		
<p>3.4.1. Collaborate in the development of a virtual B2B marketplace that links waste streams with product inputs as by-products, facilitating material flow throughout the city and region.</p>		
<p>3.4.2. Encourage businesses to assess opportunities for regenerative, nature-based products and to promote sharing, reusing models to utilize materials at their optimum levels for as long as possible.</p>		
<p>3.4.3. Engage and collaborate in regional projects, case studies, and initiatives to support co-creation of innovative solutions in a pre-competitive environment.</p>		
3.5. Build capacity and awareness among businesses and stakeholders		
<p>3.5.1. Work in partnership with academic institutions and interested municipalities to foster capacity in building businesses and stakeholders adoption of circular strategies.</p>		
<p>3.5.2. Develop a communication strategy to raise awareness and educate residents about using materials and products in a circular way and improving relationships with local businesses that do the same.</p>		
<p>3.5.3. Participate in regional and international events to identify new opportunities for circular products, technologies and approaches.</p>		



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

● LOW

●● MEDIUM

●●● HIGH



4

SHARED MOBILITY

Explore and support a shared transportation and mobility system.



4. SHARED MOBILITY

Explore and support a shared transportation and mobility system.

Life in the city depends on mobility and access. Everyone needs to get to work, live, play, and access health care, recreation, shopping, and cultural activities. Greenhouse gases (GHGs) emitted by cars, light and heavy-duty trucks accounted for 57% of Richmond’s total emissions in 2017. Cars account for about 54% of all trips in Richmond. Approximately 69% of all trips take place within Richmond. The average trip length in Richmond is 14.2 km by transit, 8.8 km by car, 4.5 km by bicycle, and 0.9 km by foot. Council endorsed the Community Energy and Emissions Plan 2050 in 2022, aiming to ensure 90% of Richmond residents live within 400 metres (5-minute walk/roll) of transit and no more than 1,600 metres from a neighbourhood mobility hub. Additionally, the Plan aims to facilitate electrical mobility for all residents and businesses in Richmond, with expanded options for

charging at home, work, and on the go for personal electric vehicles, electric car-share, e-bicycles and e-scooters. To contribute to a future where transportation is shared, affordable, and carbon-free, the City introduced its app-based pilot program in Richmond in May 2022. The Richmond Green Ambassadors worked with the City to develop a new outreach program to promote electric vehicle awareness among youth. The outreach program, known as the Richmond EVie Lesson Toolkit includes lesson plans for both kindergarten to grade seven students and one for grades eight to 12. In 2020, the Richmond Active Transportation Network provides nearly 80 km of bicycle and walking routes, including on-street routes, off-street greenways, and multi-use paths (excluding unpaved dyke trails). Up from 65 km at end of 2014.



Bike Lane on No3 Road and Saba Road

WHY CIRCULARITY IS IMPORTANT?

There are many improvement opportunities for a circular mobility system. The dream of owning a personal vehicle is no longer an attractive one. People can access the things they need - space, products or transport - in new ways. Our experience during the COVID-19 pandemic taught us that a practical way to reduce travel is to provide hubs at regional and local levels, shared and virtual offices, workplace flexibility, e-learning options, and telecommuting. This can be through sharing rather than owning, connecting people to their neighbours and communities, or through product-as-a-service contracts.

Mobility planning can employ circular economy strategies in several ways of sharing models that optimize material use to minimize waste, reduce miles traveled, and cut costs. Shared mobility services, carpooling, ride-sharing, and public transportation can be used to reduce energy consumption and the number of vehicles on the city's roads. The adoption of a circular strategy can also contribute to a new form of urban social infrastructure enabling collaborations between people, ideas and connecting places.



EQUITY FOCUS

Circular interventions in the mobility strategy can reduce Richmond's carbon emissions while expanding access to jobs and enabling participation in the community. The adoption of enablers and addressing risks will ensure social equity and prevent people from being left behind. Moreover, vulnerable communities may be targeted for provision of an accessible, affordable, and effective multi-modal mobility structure.

4. SHARED MOBILITY

ACTIONS		TOOLKIT	RESOURCES
4.1	Calculate the mobility material intensity and resource efficiency		
4.1.1	Conduct an extended input-output analysis to assess the environmental footprint of Richmond's mobility sector, understanding the sector demands of natural resource flows and the generated environmental impacts.		••
4.2	Reduce the use of virgin materials and material footprint in the mobility system		
4.2.1	Reduce the e-waste generation from low carbon vehicles and infrastructure by supporting the implementation of electric vehicle and battery recycling in the region.		•••
4.2.2	Work with industry stakeholders and other municipalities to increase the proportion of recycled material components used in road, paths and sidewalks pavement, and other mobility infrastructure in Richmond.		•
4.2.3	Assess the opportunities to implement harvesting energy technology in high transit areas in Richmond.		•



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

• LOW

•• MEDIUM

••• HIGH

4. SHARED MOBILITY

ACTIONS		TOOLKIT	RESOURCES
4.3	Facilitate the implementation of an integrated mobility sharing vehicles infrastructure and “mobility as a services” solutions		
4.3.1	Develop a communication strategy to raise awareness and educate residents about using vehicles, transit and sharing infrastructure.		•
4.3.2	Work with TransLink and other mobility providers to connect Mitchell Island and other island areas to be fully integrated by transit, sharing vehicles and mobility-as-a-service options to reduce the need of use personal cars.		•
4.3.3	Plan and implement mobility-as-a-service pilots as part of Mobility Hubs throughout the city.		••
4.3.4	Support educational opportunities to assist residents in choosing circular options of vehicles.		•
4.3.5	Advocate for the province to introduce new options of low carbon mobility beyond pilot projects.		•
4.4	Reduce distances by increasing access to co-working spaces, digital solutions and virtual services		
4.4.1	Facilitate the creation of co-working spaces in neighborhoods of Richmond where residents can access remote work and e-learning programs.		••
4.4.2	Assess the opportunity to increase shared spaces in the City’s community centres and library branches, as well as other strategic facilities in Richmond, where residents can access online for digital meetings, remote work, and e-learning opportunities.		••
4.4.3	Advocate for low cost, high-speed internet access for all neighborhoods and communities in Richmond.		•
4.4.4	Advocate for co-working spaces for residents, entrepreneurs, students and start-ups to enable them to access affordable sharing services.		•
4.5	Support continuous improvement in the local logistic system		
4.5.1	Incorporate innovations and digital business solutions to address urban logistics challenges as part of transportation planning.		••
4.5.2	Advocate for the creation of a regional logistic reverse strategy that enhances the movement of goods and reduces costs and environmental footprint.		•



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



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ADVOCACY



OUTREACH + CAPACITY BUILDING

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••• HIGH



5

ADAPTIVE BUILT ENVIRONMENT

Maximize the optimal use of construction materials
and buildings, infrastructure, and land.



5. ADAPTIVE BUILT ENVIRONMENT

**Maximize the optimal use of
construction materials and buildings,
infrastructure, and land.**

Richmond is the fourth most populated municipality in the Greater Vancouver area. Between 2016 and 2021, the City's population grew by approximately 11,628 people (5.9%), the fifth-highest overall growth after Surrey, Vancouver, Burnaby, and Langley Township. There is a significant need for infrastructure development and transformation. In Canada, the built environment is one of the most extensive user of raw materials and energy consumers and the most critical contributor to waste streams by weight. A total of 3.4 million tonnes of construction material is disposed of in landfills annually in Canada, resulting in an estimated 1.8 million tonnes of embodied carbon. The construction sector is an essential part of Canada's economy. It generates nearly 7% of the country's GDP and employs approximately 7.5% of the workforce. It is estimated that Canada will need to invest over C\$1.6 trillion in infrastructure between 2016 and 2040. An anticipated 230 billion square meters of new construction will be built within the next 40 years—doubling the current global floor area.

The City issued a Demolition Bylaw for single-family units to support diverting 70% of material from landfills. It is not a single tectonic solution to support the growing population's demand and decouple prosperity from virgin resources.

Richmond's growth will function within a larger regional ecosystem, transforming from a source of carbon emissions into a carbon sink through the development of new buildings, as planned in the Community Energy and Emission Plan 2050. Refurbishing buildings and reusing the materials they were built will be a new normal. We can use the circular economy to rethink how Richmond can sustain its growth by using materials more efficiently. That is a massive change for a big industry. The next and most challenging step is for economic structures and institutional behaviour to move away from the traditional construction industry and toward a circular low carbon industry. In June 2018, Council adopted into Richmond's Building Regulation Bylaw the BC Energy Step Code requirements to reduce greenhouse gas (GHG) emissions from the buildings sector. The BC Energy Step Code is a provincial standard that provides an incremental and consistent approach to achieving more energy-efficient buildings, intending to construct net-zero energy-ready buildings by 2032.

WHY CIRCULARITY IS IMPORTANT?

Buildings have improved in energy efficiency and liveability over the last few decades. Still, today's built environment continues to rely on linear 'take-make-dispose' models. Over the last several decades, efforts have focused mainly on waste diversion and, to some degree, resource recovery. Despite advances in downstream strategies, little has been achieved in upstream circular strategies, such as circular inputs and product as a service. A variety of opportunities are emerging throughout the life cycle of buildings and infrastructure that drive the adoption of circular business practices. Several industries and critical stakeholders in Richmond are becoming more aware and interested in circular economy solutions.

When applied to a sector of high growth, such as the built environment, circular economy approaches represent an enormous opportunity for boosting secondary materials markets by offering high-quality products for new construction and renovation projects in Richmond and its region. By using circular business models and collaborative

partnerships, buildings in Richmond can be more sustainable by implementing innovative products and technologies to enable maximum material re-use and longer building life and keep materials at their highest intrinsic value. Implementing suitable instruments to monitor the City's material flow, embodied carbon and the resource footprint of buildings and infrastructure can ensure resource efficiency throughout the construction lifecycle. The transition to a circular economy will involve innovative strategies that enable both current and new buildings to be used flexibly and perform more efficiently. Using circular principles in the design, operation, and maintenance of built assets can allow for higher adaptability, use of renewable, recycled materials, and thorough deconstruction at the end of its useful life. Such thinking can be seen as a natural extension of the holistic approaches already applied by architects, engineers and planners.



EQUITY FOCUS

Circularity in the built environment can support affordability of living and working spaces, as well as strengthen support for all residents and workers.

5. ADAPTIVE BUILT ENVIRONMENT

ACTIONS		TOOLKIT	RESOURCES
5.1	Assess the material usage in the built environment		
5.1.1	Conduct a material flows analysis and an urban metabolism assessment to identify opportunities and priorities for turning Richmond built environment into a circular economy.		••
5.1.2	Create an inventory of available material flow-related data in Richmond's region, including embodied carbon-related data, to support the development of a Richmond's Construction Material Strategy.		••
5.1.3	Collaborate with other local governments to develop a detailed map of Richmond's social and ecological boundaries, outlining its strengths and weaknesses.		••



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

• LOW

•• MEDIUM

••• HIGH

5. ADAPTIVE BUILT ENVIRONMENT

ACTIONS		TOOLKIT	RESOURCES
5.2	Regenerate materials flow by promoting salvage and secondary-use materials		
5.2.1	Promote and potentially regulate the use of secondary and recycled materials in the construction of new buildings and infrastructure.		••
5.2.2	Develop strategies to retain resource value in the region and develop Richmond's salvaged and reclaimed material market.		••
5.2.3	Promote refurbish options to extend lifetime of buildings and infrastructure.		••
5.2.4	Advocate for strengthening the construction industry's ability to use reclaimed components and materials.		•
5.2.5	Assess the development of a local and regional hub for reclaimed material from deconstruction.		••
5.3	Develop sectoral capacity and skills		
5.3.1	Assess the local circular skillsets and knowledge to support new green employment opportunities in the building retrofit sector.		••
5.3.2	Work with local partners and municipalities to identify circular best practices in the built environment.		•
5.3.3	Develop suitable instruments to monitor the City's material flow, embody carbon and resource footprint of buildings and infrastructure to ensure resource efficiency throughout constructions life-cycle.		••
5.4	Promote the use of new materials and develop research and pilot projects		
5.4.1	Advocate for a regional Circular Construction Hub to develop new techniques for circular constructions and pilot the use of recycled materials in the renovation and construction of new buildings and infrastructure.		••
5.4.2	Use low-emission concrete or alternatives to concrete.		•
5.4.3	Support the circular design for adaptability, and modular housing and buildings to implement circular strategies, such as replacing aging components more easily.		•
5.5	Promote circular standards for constructions		
5.5.1	Advocate for the adoption of the extension of buildings and infrastructure lifetime supported by Total Cost of Ownership or Life Cycle Assessment methodologies.		•



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

• LOW

•• MEDIUM

••• HIGH

5. ADAPTIVE BUILT ENVIRONMENT

ACTIONS		TOOLKIT	RESOURCES
5.5.2	Enact policy and regulations for the use of innovative, renewable and low-carbon materials where opportunities exist.		•••
5.5.3	Collaborate with regional and national organizations to improve construction material data accuracy and quantity to support material flow analysis and circular strategies.		•
5.5.4	Advocate for regional and provincial standards (i.e. building code) to include circular economy requirements.		•
5.5.5	Support the integration of buildings and infrastructure with green infrastructure and natural ecosystems to reduce maintenance and material use throughout the lifecycle.		••
5.6 Collaborate to create joint value			
5.6.1	Partner with other organizations to develop a database of sustainable, renewable and recyclable construction materials that can be used in successive life-cycles and have low embodied carbon content.		••
5.6.2	Create a collaboration network of building managers who implement circular economy principles in building operations to share their experiences.		•
5.6.3	Collaborate with regional municipalities to identify common circular approaches, common goals, and procurement templates that can be used in the built environment.		•



POLICY + REGULATION

INNOVATION, PILOTS + INITIATIVES

INCENTIVES

RESOURCES

COLLABORATION + PARTNERSHIPS

ADVOCACY

OUTREACH + CAPACITY BUILDING

• LOW •• MEDIUM ••• HIGH



6

PRODUCTS AND MATERIALS MANAGEMENT

Promote the efficiency of consumer product development,
manufacturing, and end-of-life.



6. PRODUCTS & MATERIALS MANAGEMENT

Promote the efficiency of consumer product development, manufacturing, and end-of-life.

Richmond is well-positioned to support the transition to a circular economy thanks to its comprehensive recycling programs and residents' commitment to diverting waste from landfills. As a result of the City's sustainable waste management programs, household items can be reused, repurposed, and recycled multiple times into new products. In 2021, residents diverted 79.3% of their waste from landfills through various programs, including curbside and centralized collection programs and convenient, one-stop recycling services at the Richmond Recycling Depot, which is open seven days a week and continues to accept a variety of items.

The Recycling Depot collected 7,581.56 tonnes of recyclable materials in 2021. In its Rethink Waste campaign, the City also encourages community members to reduce waste overall by reassessing buying decisions and extending product lifespans. Adopting the Single-Use Plastic and Other Items Bylaw No. 10000 was a key achievement. In order to introduce Bylaw 10000, a comprehensive community engagement campaign was conducted, which included working directly with businesses, and educating the public and promoting the use of reusable items. The City expanded its use of online outreach to host its first virtual Repair Fair focused on repairing and maintaining gas lawnmowers.



WHY CIRCULARITY IS IMPORTANT?

Between 1990 and 2017, the world population grew from 5 to 7.5 billion people, and global gross domestic product (GDP) per capita increased by 50%. Richmond's growth between 2016-2021 was 5.9%. The global annual material consumption per capita grew from 22 kg in 1990 to 33 kg in 2017 (OECD, 2019). A person's "ecological footprint" is a measure of how much biologically productive land they require to provide them with resources and absorb their waste. In the last 20 years, the ecological footprint of each Canadian has grown by 15% (from 7 to 8.1 hectares). To support Richmond's current population using this figure, an area 373 times larger than the city itself would be required. Based on what we know today, recycling is a necessary component of a circular economy, but it should only be used when there are no other options, such as reusing, refurbishing, remanufacturing, or repairing.

Transitioning to a circular economy involves both smarter economic solutions and practices, and greater behaviour change. Awareness campaigns and initiatives are continually developed as a part of the City's ongoing efforts to encourage residents to share, repair and reuse items such as textiles, electronics, furniture and other products and materials. In order to decouple economic growth from resource use, increase competitiveness, and boost innovation, the City can stimulate innovation and collaboration among knowledge institutions, businesses, and consumers. Our economy and society can be more sustainable and resilient for the future through the circular economy.



EQUITY FOCUS

In a circular economy, we prevent waste by preserving the value of products, components and raw materials in closed loops for as long as possible, resulting in a decrease in waste. This way we can reduce our impact on the environment without compromising quality. By sharing more, reusing more and repairing more, we will also contribute to a cleaner and more inclusive city.

6. PRODUCTS AND MATERIALS MANAGEMENT

ACTIONS		TOOLKIT	RESOURCES
6.1	Understand the urban metabolism of Richmond		
6.1.1	Assess the city's environmental footprint and the material flows of consumer goods to help prioritize Richmond's circular economy opportunities.		●●
6.2	Promote new circular consumption behaviors and material use		
6.2.1	Use community-based social marketing and educational community programs to inspire behavior change within the community to encourage the adoption of reusable materials, demonstrate how residents may benefit from the circular economy and how they can support local businesses.		●●



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES

RESOURCES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

● LOW ●● MEDIUM ●●● HIGH

6. PRODUCTS AND MATERIALS MANAGEMENT

ACTIONS		TOOLKIT	RESOURCES
6.2.2	Collaborate with schools to implement circular volunteer programs to encourage circular economy principles among youth in the community.		..
6.2.3	Develop circular certification to create community pride.		..
6.3 Support the urban industry by fostering collaborative relationships			
6.3.1	Promote and advocate the creation of a regional co-operation network that develops circular economy-based business models for the textile-recycling ecosystem.		..
6.3.2	Promote tracking material assets and flows by Richmond businesses and stakeholders to maximize the use of existing resources and reduce waste generation.		..
6.3.3	Identify opportunities for synergies with businesses to share data on material flow and waste streams to create closed loop waste and material flows in the city.		.
6.4 Enhance upcycling infrastructure for consumer goods' materials			
6.4.1	Advocate incorporating technical information about recycled materials into a digital library, which would increase knowledge about materials in product design, encourage industrial symbioses and enhance the materials flow in the Richmond area.		.
6.4.2	Pilot a "Reuse Centre(s)" and "Tool Library(ies)" that offers free space for community education, repair events, and circular information dissemination. (Circular Academy)		...
6.4.3	Work with residents, commercial business and industry to identify opportunities to generate revenue from waste "by-products".		...



POLICY + REGULATION



INNOVATION, PILOTS + INITIATIVES



INCENTIVES



COLLABORATION + PARTNERSHIPS



ADVOCACY



OUTREACH + CAPACITY BUILDING

RESOURCES

● LOW

●● MEDIUM

●●● HIGH



IMPLEMENTATION APPROACH

The following six key attributes guide our approach to roadmap implementation.

OPPORTUNISTIC AND STRATEGIC

Becoming fully circular by 2050 will require a scale-up of activity. City's staff will take advantage of new opportunities that may arise over the years, with respect to new Federal and Provincial programs, expanded regulatory mandates, and emergence of 'break-through' technologies and approaches.

A GUIDELINE, NOT A WORK PLAN

This document is not a detailed, phased work plan. Rather it is a blueprint that empowers the City's staff and other actors to pursue opportunities when they are presented. This Strategy provides a sufficient level of guidance and definition so that action can begin immediately, while allowing flexibility to further refine or modify plan actions as needs arise, and developing detailed work plans as needed.

RESOURCES TO MATCH AMBITION

We will need to assemble resources sufficient to match the scale of effort required by the Strategy. This includes identifying sources of external or partner funding, creating dedicated operating budgets for initiatives that span several years, including additional level funding requirements. Increased competency and knowledge capacity for sectors related to building electrification and decarbonization should receive high priority.



DRIVING CHANGE THROUGH COLLABORATION

Advancing this Strategy towards a circular economy will require taking advantage of collaboration and engagement opportunities between various sectors, actors, and stakeholders, as well as national and international cooperation with local governments. Collaboration has emerged as both an enabler and a necessity.

EQUITABLE TRANSITION TOWARDS THE CIRCULAR ECONOMY

The Strategy acknowledges the opportunity to address not only environmental challenges but also social ones. With planet and people in mind, the Strategy can help us create an equitable space for all people in Richmond, including Indigenous people and First Nations, visible minorities, low-income households, women, seniors, new Canadians and persons with disabilities. To bring about true change, environmental goals need to be matched with social objectives.

MATERIAL FLOW FOR DECISION-MAKING OR CIRCULAR ECONOMY THINKING

Monitoring the flow of materials and how they are used in society is essential to measuring Richmond's circularity throughout its metabolism. Material flow analysis produces visual maps which provide a holistic view of the input, throughput and output of resources, nutrients and energy within, or by sectors, and how these materials subsequently flow out of the sectors in the form of wastes and emissions. Since material flows are accounted for in mass, it is possible to identify the origins, stocks and leakages, as well as calculate embodied carbon. Based on the current trends of the resources use, the analysis is able to anticipate what material consumption and waste generation patterns could look like in 10 years if left unchanged. This can provide a useful baseline to compare the impact of circular scenarios, reveal economic opportunities directly linked to environmental impacts and provide technical data for decision making and planning, which would be helpful for prospective policy intervention.





IMPLEMENTATION TOOLKIT

The City of Richmond has six tools to facilitate the transition to a circular economy. Each of these tools can be used separately or together when developing and implementing the Strategy's directions and actions. Different elements of the local government "toolkit" can be used, depending on specific toolkit leveraged to advance action, relative jurisdiction or level of control by the City, and resources or investment required.



POLICY + REGULATION

City Council can develop and implement bylaws that set out legal regulations to govern specific activities within the City of Richmond. Provincial legislation sets the areas in which Council has jurisdiction to implement bylaws. The City has the right to enforce adopted bylaws when a bylaw is violated. City Council may also adopt policies setting out standard procedures and priorities that staff and Council can use when evaluating and implementing plans and projects.



INNOVATION, PILOTS + INITIATIVES

Local governments can undertake the development and implementation of research and development projects, pilot projects, studies, measurement frameworks and solution testing that benefit the residents and economy of the City. These enable local governments assess the performance and progress of the circular initiatives and identify what can be improved in the future.



INCENTIVES

City Council can provide incentives to encourage circular action by adjusting the allocation of City resources. Council can adjust the criteria by which the City charges municipal taxes or fees and/or prioritizes service delivery. Incentives can only encourage; they cannot prevent (or require that) an action be taken. However, well-designed incentives can influence decision-makers to choose circular options more often than they would otherwise.



COLLABORATION + PARTNERSHIPS

Local governments may need to partner with provincial or federal governments or other agencies to have a sufficient mandate to implement prioritized circular economy actions. It may be more cost-effective for external agencies or non-governmental associations to implement specific climate actions on behalf of the City, or work with several governments to implement circular strategies together.



ADVOCACY

In some areas, local governments have little or no legal mandate to implement policies or programs to accelerate the transition towards a circular economy. In these cases, City Council can make formal requests to the provincial and/or federal governments and their agencies on behalf of Richmond residents for policy changes and/or new regulations to be implemented. The City regularly calls on senior levels of government to take more significant action on sustainability and circular economy issues.



OUTREACH + CAPACITY BUILDING

Local residents and businesses have a crucial role in many decisions that affect the use of resources within Richmond. Local governments can allocate resources to increase awareness and empower economic actors to grow the circular economy and facilitate collaboration.



Gary Point Park

The Strategy is a guiding approach for the City and Richmond's stakeholders to update and strengthen policies, strategies and plans that support the regional innovation ecosystem. This Strategy will contribute to implementing circular principles in alignment with City policies, strategies and plans. It will also encourage stakeholders to adopt or update their circular economy strategies, plans, and measures.

The transition to the circular economy in Richmond will be systemic, deep, and transformative. It will sometimes be disruptive, but it will always be fair. It will require alignment and collaboration of all stakeholders at all levels - local, regional, national, and international.

The Strategy is guided by six directions and 84 actions to set Richmond on a path to becoming 100% circular. The Strategy will facilitate Richmond to move toward a circular economy, improving economic and environmental outcomes by continuously pausing, rethinking and acting to reuse, remanufacture, and recycle resources, materials, and nutrients.

RICHMOND CIRCULAR CITY STRATEGY

SEPTEMBER 2022



Richmond's circular achievement to date

By applying a learning-by-doing approach, the City's level of readiness on circular economy has increased significantly in the last three years. Innovative approaches taken by the City demonstrates commitment and leadership in Canada for integrating circular economy principles which include:

- As part of its 2018-2022 strategic plan, the City's Council became one of the first in Canada to incorporate specific circular economy goals:
 - #2 A Sustainable and Environmentally Conscious City: 2.1 Continued leadership in addressing climate change and promoting circular economic principles;
 - #5 Sound Financial Management: 5.3 Decision-making focuses on sustainability and considers circular economic principles;
 - #6 Strategic and Well-Planned Growth: 6.2 "Green" and circular economic growth and practices are emphasized; and,
 - #7 A Supported Economic Sector: 7.1 Demonstrate leadership through strategic partnerships, collaborations and exploring innovative and emerging economic practices and technical advancements.

- The City developed a framework based on emerging global best practices and input from its staff and stakeholders to reflect the City's vision for a circular economy. The framework is aligned with Council policies on environmental sustainability and emerging Canadian policy context by the circular economy principles.

- Richmond identified innovative solutions with circular economy principles and anticipated cost-benefit considerations through robust external stakeholder engagement over the last three years:
 - Launch the City of Richmond circular economy landing page on www.richmond.ca;
 - Government Staff Interviews: over 20 interviews with leading, early adopter cities and organizations around the world, at different stages of maturity with respect to circular economy;
 - Stakeholder Workshop: Canada's first vendor-focused Circular Economy Engagement Workshop hosted and facilitated by the City of Richmond, with over 70 participants in attendance (pre-COVID);
 - The City's Economic and Environmental Advisory Committees; and,
 - Industry Interviews: Over 30 one-per-one interviews with vendors and other external stakeholders.

- Richmond became the first Canadian city to apply 40% recycled asphalt pavement (RAP) on a municipal road; initially an 800-meter segment of a high traffic volume road and by early 2022 Richmond had used 40% RAP on 4,740 meters of multi-use pathways as well as on the arterial road. In this circular pilot project, more than 2,000 metric tons of reclaimed asphalt pavement have been diverted from landfill and used as raw material in the new asphalt pavement. The project included a robust early engagement of industry stakeholders that was critical in making the pilot feasible and securing regional transition toward a circular economy. Given the success of the program, the City created an online toolkit to help other local governments introduce RAP to further their sustainability goals while maintaining quality.

- The City became the first municipality in Canada to integrate circular economy criteria into its Procurement Policy #3104. The circular approach included in the Policy entails a systemic multi-level

change toward the circular economy, including technological innovation, new business models, and stakeholder collaboration, by understanding more fully the potential life cycle impacts and potential benefits of available options.

- 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, with a 414,555 kg of diverted food waste and \$2,207,971 savings to food brands and charities.
- The City Joined the national Love Food Hate Waste Campaign to promote food waste reduction through a partnership with the province.
- The City 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 strategy in 2022.
- The City’s Single-Use Plastic and Other Items Bylaw No. 10000 was adopted to help reduce unnecessary waste and plastic pollution. The new ban affects all businesses operating in Richmond. The Bylaw is aligned with regional, national and worldwide circular approaches to reduce by design the waste generations and minimize its environmental and social impacts. Bylaw No. 10000 became effective March 27, 2022 and bans plastic checkout bags (including biodegradable and compostable plastics), plastic straws (including biodegradable and compostable plastics) and foam food service ware for prepared food (such as foam plates, clamshell containers, bowls and cups).
- The City actively participated as zero waste stakeholders and in a Deconstruction Specialist working group hosted by District and City of North Vancouver. For this design thinking event, participants reflected on the lack of market for the reuse of construction, demolition, and deconstruction materials and identify potential solutions on how bring more circularity to the sector.
- The City participated in the Green Economy Canada’s Sustainable IT Procurement pilot, aiming to uncover key insights on the barriers and opportunities to integrate circular principles in City’s procurement practices. Green Economy Canada released a whitepaper titled “Buying a Better Future” which captures pilot learnings that can help organizations across Canada get engaged in using the power of procurement to help Canada transition to a low-carbon, circular economy.
- The City’s Community Energy and Emission Plan 2050, adopted in 2022, properly integrates a circular economy strategy to mitigate carbon emissions. The Strategy Direction 8 - Transition to a Circular Economy introduces specific actions to reduce non-inventoried embedded carbon in materials from goods and services that Richmond residents and businesses consume. While the plan does not quantify consumption and material-based GHG emissions in Richmond, it does have specific policy and program actions identified to mitigate this type of emissions by transitioning from a linear to a circular economy.

Material Flow Analysis

It is possible to reduce environmental impact and meet climate change targets by implementing strategic dematerialization, in other words, getting more (or the same) from fewer materials. Circular strategies can reduce the quantity of materials flowing into an economy by increasing material efficiency. Consequently, the emissions embodied in materials and end-products will be lowered. Further, the overall level of material consumption should be lowered to narrow flows. It is impossible for us to keep up with the advancements in material efficiency and cycling advances if the common denominator, the consumption of virgin materials, keeps growing.

Keeping track of the flow of materials into and out of Richmond's economy, stock levels, and how they are utilized throughout society allows Richmond to measure its circularity resources in its metabolism. Material flows are accounted for in mass, allowing identification of origins, stocks, leaks, and embodied carbon. Using material flow analysis, Richmond's input, throughput, and output of resources are examined (including but not limited to energy, biomass, nutrients, minerals, water, and metals).

The material flow analysis provides a visual representation of resources consumed within sectors. It also shows how these materials flow out of the sectors through waste and emissions. An analysis of business-as-usual could be included in the study to predict what material consumption and waste generation patterns might look like in 10 years if no changes are made. The tool provides a helpful baseline for comparing alternatives to circular economy scenarios.

The following are some of the benefits of a material flow analysis:

- Providing prospects for policy interventions and needed technical data to support decision-making and planning;
- Identifying economic opportunities directly linked to environmental impacts;
- Establishing a foundation for the development of circular business;
- Offering a visual 'snapshot' of resource metabolism in Richmond by sector to more easily explain the baseline level of circularity; and,
- Identifying practical actions to make linear flows circular.

The material flow analysis can involve 3 phases, where the results are validated with local stakeholders after each step:

- **Phase 1 - Identifying the starting points:** Provides insight into the local economy's strengths and weaknesses showing what skills and sectors are at the economy's core and how these skills can be used in a circular economy.
- **Phase 2 - Material flow analysis:** Provides insight into the magnitude and nature of the material flows through the city in order to tackle those material flows that are highly impactful to the environment.
- **Phase 3 - Integrate the result with the Strategy's directions and actions:** Key indicators are provided to guide and prioritize the most successful pilots and interventions.

In Canada, the City of Toronto, the City of Montreal and the Province of Quebec implemented a material flow analysis to understand circularity in crucial sectors and determine where interventions are required to guide future action and provide robust monitoring.

Toward a circular economy - Canada's opportunities

Environment and Climate Change Canada (the Sponsor) asked the Council of Canadian Academies (CCA) to conduct an evidence-based assessment to answer the following question: “What are the potential opportunities and challenges for a circular economy in Canada?” To address the charge, the CCA assembled a multidisciplinary Panel of 16 experts from across Canada and abroad. The Panel included academic experts and practitioners from industry, governments, and non-governmental organizations (NGOs). Below, there is a summary of the key findings included in the 2021 CCA’s report titled “Turning Point, the expert panel on the circular economy (CE) in Canada.” Transitioning to a CE represents a shift away from the traditional, predominantly linear model. To guide deliberations, the Panel defines the CE as a systemic approach to production and consumption for living within planetary boundaries that conserves material resources, reduces energy and water use, and generates less waste and pollution.



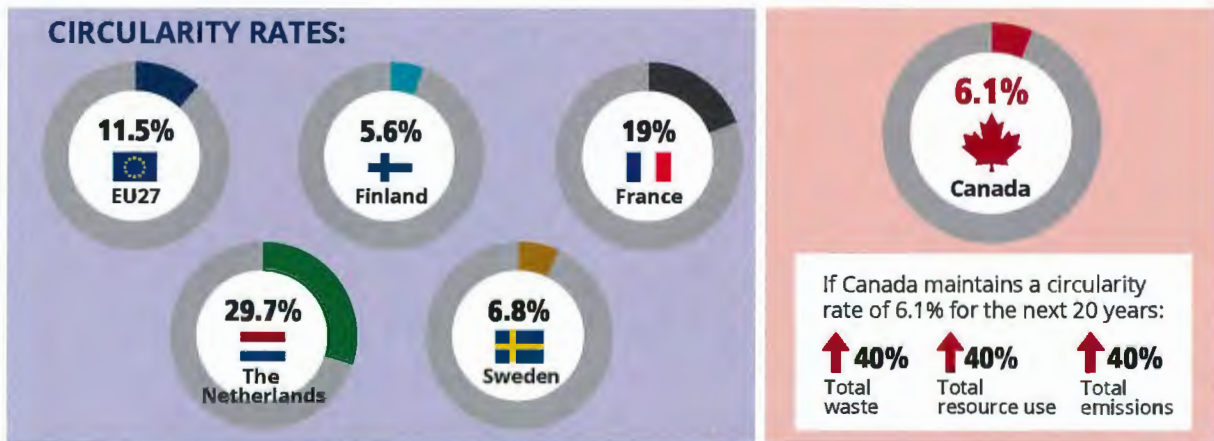
Global consumption patterns are drawing significantly more resources from the Earth than it is able to sustain. A more circular economy (CE) could reduce consumption, keep valuable material out of landfills, and slow global climate change. **Turning Point** explores what a transition towards a circular economy would mean for Canada.

WORLD: Material extraction and waste are exceeding the planet’s safe operating limits. Evidence suggests we are currently using **1.7 Earths** worth of resources.

CANADA: Canada’s consumption rates of materials, energy, and water are currently among the highest in the world, and **73%** of waste ends up in the landfill or is incinerated, much of which still holds value.

HOW CIRCULAR IS CANADA?

Indicators of the circular economy can include measures of material use, environmental impact, and socio-economic impact. The **circularity rate** is the percentage of the economy’s material needs which are filled with recycled or recovered materials. For the first time ever, a circularity rate was calculated for Canada. Using a similar material flows approach to that of the EU, the Expert Panel estimated that the circularity rate of Canada is **6.1%**.



The circular economy is an aspirational direction in which to move, and ultimately involves transformative, system-wide change.

OPPORTUNITIES TO ADVANCE THE CIRCULAR ECONOMY IN CANADA



9% of **plastics** are recycled.



Metal recovery from recycled **electronics** is **2-10x** more energy efficient than producing metals from virgin ore.



1/3 of all **food** produced and distributed is never eaten.



Canada is aiming to grow its **natural resource** exports to **\$350B** by 2025, in part by implementing innovative circular economy measures.



85% of **textiles** are landfilled.



3.4 million tonnes of **construction, renovation, and demolition** waste was landfilled in Canada in 2015.

ADVANCING THE CIRCULAR ECONOMY IN CANADA

GOVERNMENT:



- Incorporating circular principles into public **procurement** criteria
- Developing **roadmaps** to support a CE transition
- Tracking progress on the CE through **data collection**
- **Investing** in CE-supporting infrastructure and research

BUSINESS:



- Implementing **circular business models**
- Contributing to **standards** for circular products
- **Partnerships** to facilitate circular supply chains and design
- **Investing** in refurbishing capacity and R&D

CIVIL SOCIETY:



- Addressing cost and practical barriers to **increase accessibility** of circular practices
- Increased **cultural** and **social visibility** of circularity
- Engage in **training** and **advocacy**

The transition towards a **CIRCULAR ECONOMY** requires collaboration among all levels of government, businesses/industry, NGOs, and civil society.

Turning Point. The Expert Panel on the Circular Economy in Canada (2021).
www.cca-reports.ca



Factors Relevant to a circular economy in Canada

Canada's economic, environmental, social, geographical, and jurisdictional features require a distinct approach to the circular economy. There are several factors to consider when developing a circular economy strategy for Canada, including its large size and low population density, the concentration of the population along its Canada-US border, and the differences between urban and rural areas. A large proportion of Canada's economy is composed of small and medium-sized enterprises (SMEs), which offer opportunities for local circular economy strategies that may mitigate geographical problems. The circular economy also presents significant opportunities for Canadian firms that engage in value-retention activities like repair, refurbishment, and remanufacturing. An approach made in and for Canada will be necessary to advance the circular economy. Although there is strong support for environmental protection among the Canadian public, including support for some circular measures, cultural and geographical factors in Canada have contributed to creating an economy with very high consumption rates of materials, energy, and water. This high level of consumption degrades ecosystems and contributes to strain on planetary boundaries. Canada's federal jurisdictional structure means that each level of government has different roles and responsibilities concerning implementing a circular economy, requiring cooperation across levels of government for a transition. Collaboration with Indigenous governments and communities is also essential for a successful and inclusive circular economy transition.

The Current State of the circular economy in Canada

Canadian industry has sectoral strengths and existing initiatives that can be built on to advance the circular economy. Sectoral strengths and opportunities represent the seeds of circularity in Canada in various industries, including plastics, natural resources, construction, food and agriculture, electronics, and textiles. Many Canadian circular economy initiatives currently deal with plastics, broadly promoting plastics recycling. Nearly half of plastic waste in Canada comes from packaging, a key area for waste reduction. Mining, forestry, and fossil fuel industries are also exploring circular strategies in resource extraction and processing, such as reducing waste and recovering valuable by-products, the implementation of which would generate more value from Canada's natural resources sector. Construction represents a core sector for advancing the circular economy in Canada due to its economic importance, high material requirements, and large amounts of waste. Even small changes regarding the reuse of buildings or building materials could significantly impact. Preventable food waste in Canada has an economic value of at least \$49 billion, and several Canadian companies are taking advantage of opportunities to reduce and recycle food and agricultural waste. In the electronics sector, critical initiatives for increasing circularity include product-service systems, product life extension, and design for disassembly. Several initiatives within the textile sector in Canada are geared towards increasing textile recycling; additional initiatives could target the underutilization of clothing. Industrial symbiosis (collaboration) projects and the development of eco-industrial parks in Canada have advanced the circular economy in various sectors. Industry-specific training programs could also be introduced in multiple sectors to help prepare the Canadian workforce to transition to a circular economy.

Steps towards a circular economy have been initiated at multiple levels of government, and NGOs, universities, and colleges are supporting a transition.

Various Canadian jurisdictions have implemented initiatives or strategies that contribute to a circular economy. Though these are somewhat limited, only Quebec has advanced a comprehensive approach. Federal initiatives toward the circular economy include the Canada-wide Strategy on Zero Plastic Waste and exploring circular procurement opportunities. Current provincial and territorial initiatives primarily focus on waste management, plastics, and extended producer responsibility (EPR), though several provinces have instituted sustainability strategies that include additional circular economy concepts. Many municipalities in Canada have become involved in the circular economy through zero-waste strategies, new circular procurement standards, or other initiatives. Collaborations among local governments, NGOs, and provincial and territorial agencies, such as the Canadian Circular Cities and Regions Initiative (CCRI), support knowledge sharing and capacity building. More broadly, many NGOs in Canada are supporting cross-sectoral collaboration toward a circular economy. Several Canadian universities and colleges have developed significant expertise in circular economy research, are collaborating to facilitate the transition towards a circular economy, and offer some circular economy courses or programs. This patchwork of government and civil society initiatives has been useful in the early stages of the circular economy, but coordination of efforts would be needed to create systemic change.

Challenges to implementing a circular economy in Canada

Businesses find it challenging to adopt circular strategies due to linear supply chains, economic disincentives, and a lack of practical information. Economic disincentives, as well as shareholder pressure to minimize risks, have inhibited circular leadership in business. Landfilling and virgin materials are both low-cost in Canada, which creates economic disincentives for waste reduction and the use of secondary materials. The cost of investment is high for some circular business models, such as refurbishment, which is difficult for businesses to justify when the long-term return on circular investments is unclear. Investment costs are especially challenging for SMEs with limited access to capital. The circular economy requires coordination within a business and across the supply chain to be most effective. Businesses thus find implementing circular strategies within linear supply chains to be challenging. Trust can be difficult to establish between businesses, which impedes sharing information relevant to establishing circular practices. Innovation and commercialization of innovative solutions are also necessary to advance the circular economy but piloting circular business models is challenging. Without practical information regarding how to adopt these models, businesses often adopt linear models such as planned obsolescence, which are competitive under existing linear systems.

Aligning policies and regulations to support a circular economy is challenging, especially given Canada's jurisdictional complexity.

The development of policies such as sustainable procurement and effective EPR in Canada has been hampered by a fragmented policy approach, information gaps, and difficulty balancing the needs of different stakeholders. Lobbying is known to slow sustainability policy development and could be a significant factor for circular economy policy development given Canada's long natural resource-focused economic policy history. Data gaps and limited circularity metrics impede the development of effective circular policies and assessment of the impacts of interventions. Canadian data collection regarding waste diversion is inconsistent between jurisdictions. Moreover, the effects of a shift towards circular economy on global trade are unclear. Trade barriers, such as a lack of international standards for circular materials, will need to be overcome to advance the circular economy globally. One key challenge will be to ensure that regulations permit trade in valuable secondary materials without allowing waste to be exported to developing countries that cannot process it safely. To address many of these barriers, collaboration and policy harmonization are needed across governments in Canada, but this coordination is difficult given Canada's jurisdictional complexity.

A cultural shift is necessary to promote circular behaviour among consumers, but accessibility impedes the adoption of circular practices.

Demographics and socio-economic status affect the cultural acceptability of circular practices. Canada has a strong culture of consumerism, which promotes overconsumption, contributes to attitudes that reduce demand for refurbished products or recycled material, and impedes individual adoption of circular practices such as reuse and sharing. Moreover, material factors such as affordability, contractual obligations, or urban structure impact the accessibility of circular practices. Material conditions also affect the accessibility of the circular economy for some communities: distance and climate limit the types of material loops that can be effectively established, and these challenges are heightened for rural and remote communities due to infrastructure gaps and low population densities.

Opportunities for a circular economy in Canada

Circular business models and strategies provide economic benefits such as new revenue streams, reduced supply chain risks, and improved brand reputation. Circular business models create new revenue streams by providing new services or by obtaining value from by-products and offer competitive advantages to businesses by reducing requirements for material and energy inputs. Circular business models such as PaaS create long-term customer relationships, improving loyalty and stabilizing revenue flows. Using secondary materials in place of raw materials helps mitigate supply chain risks. Collaborative strategies such as industrial symbiosis (collaboration) create opportunities for businesses to use another firm's waste products as production inputs. Collaborative networks also provide a competitive advantage for participants by improving information sharing and incentivizing optimal asset management across a supply chain. Finally, circular practices help businesses meet stakeholders' expectations, who increasingly expect businesses to engage in environmentally and socially responsible practices. Shifts to circular systems by Canada's trading partners will likely intensify the competitive advantages of circular models and practices.

A circular economy would help Canada achieve existing policy goals, such as the net-zero transition, and create economic, environmental, and social benefits.

Material and energy efficiency and sustainable production and consumption provide economic, environmental, and social benefits for high-income, natural resource-exporting countries such as Canada. The circular economy may offer a chance for Canada to become an international leader in sustainable natural resource management.

Even with a global transition towards a circular economy, increasing demand for raw materials means that Canada's natural resource exports will still be required. In particular, the material requirements of increasing renewable energy infrastructure motivate planning a transition towards a circular economy alongside Canada's climate change agenda to secure minerals essential for renewable energy production. Materials efficiency policies and improved waste management strategies could also contribute to meeting carbon emissions targets by reducing the energy used to extract and process materials and avoiding methane emissions from organic waste. This would help Canada fulfill its commitments under the Paris Agreement and the Pan-Canadian Framework on Climate Change and Clean Growth, which were both adopted in 2016. A transition towards a circular economy would also help Canada meet the United Nations Sustainable Development Goals and contribute to a resilient economic recovery from COVID-19.

Societal benefits such as increased equity and well-being could be achieved through a just transition towards a circular economy, and net effects on employment are likely to be positive or neutral. A circular economy provides an opportunity to achieve societal benefits such as poverty reduction, meaningful employment, and human well-being. A just transition approach, including collaborative and inclusive planning processes, helps ensure that the circular economy's benefits (and risks) are equally distributed through society, both within Canada and internationally. While the circular economy is expected to cause significant labour market shifts, studies suggest that the effect on employment in Canada will be a net positive or neutral, with job losses resulting from the transition offset by job gains in other sectors. Job growth in Canada is expected to occur primarily in renewable resources, waste, and clean technology sectors, with particular opportunities in reprocessing secondary metals.

Levers for Change Towards a circular economy.

While governments use many levers to advance the circular economy, policy coordination across government levels and departments is essential for the success of circular economy initiatives.

Circular procurement is a powerful lever for governments, creating demand for circular products and services and market signals. Economic instruments, such as tax policy, disposal fees, and federal transfer payments can encourage circular activities and discourage linear practices. Governments could also make public investments in circular infrastructure and support and attract private circular economy financing through regulations or other interventions. Regulations for sustainable design improve product circularity while also benefiting businesses. Provincial and territorial EPR programs have generally not resulted in greater circularity in material flows or waste reduction; however, improved incentives for circular design should result in less waste and more recycling.

Canada's federal, provincial/territorial, and municipal governments have various roles, such as making trade agreements, offering education and skills training, and engaging local stakeholders. Structures that enable collaboration across and within governments will be important in harmonizing circular policies and regulatory schemes. A key role for national governments is developing a circular economy strategy or roadmap; roadmaps can also be implemented at sub-national levels and for specific sectors or materials. Roadmaps provide an opportunity to involve diverse industry and civil society stakeholders and to adapt circular economy strategies to the Canadian context.

Businesses can advance the circular economy through circular strategies, investments, standards and certifications, and company-wide and inter-firm commitments

Company-wide commitments to the circular economy provide strong signals to policymakers, company staff, suppliers, and other companies, unlocking business opportunities while advancing the circular economy. Inter-firm partnerships such as industrial symbiosis also accelerate the circular transition. Adopting new technologies such as the internet of things, artificial intelligence, and 3D printing help businesses implement circular practices by improving design or supporting reverse logistics. For the financial services sector, private investment is essential to support companies and industries transitioning towards a circular economy and allows investors to address environmental, social, and governance issues. Businesses and industry associations can use circular standards and certifications — or play a role in developing such standards — to assure quality and compliance with circular economy principles. Such standards are useful in supporting circular procurement. Industry also plays a role in developing training for circular economy skills.

Civil society will need to be engaged to advance the transition; individual behavioural change has a limited ability to drive the circular economy

Public support will be necessary for a circular transition, and cultural norms around consumption will need to shift. However, the culture of overconsumption involves a broad social context. A systems-level view will be necessary to identify the social conditions that structure options for individuals and incentivize overconsumption. Overall, consumer interest and individual behaviour are insufficient to drive the circular economy. At the same time, education, public awareness, and skills training will be needed to support the transition towards a circular economy and promote the uptake of circular economy practices and products among consumers and producers. Incorporating the circular economy into educational curricula and offering training and retraining for workers will prepare the workforce for the circular economy labour market.

NGOs help drive circularity in Canada by contributing research, facilitating partnerships and collaboration between stakeholders, providing guidance and best practices, sharing information, engaging in advocacy, and facilitating the development of roadmaps.

Roadmaps identify priorities, objectives, and actions for the circular economy transition

Circular economy roadmaps typically define national (or sub-national) objectives and priorities, promote an overarching vision of the circular economy, and outline concrete goals and tangible actions to facilitate the transition. Successful roadmaps typically identify opportunities in specific priority sectors or industries, provide guidance, identify best practices at both the micro and macro levels, and list ongoing and planned future circular economy pilot projects, which often receive financial support from multiple levels of government. The roadmapping process also provides an invaluable opportunity to engage a wide variety of stakeholders to identify opportunities for cross-sectoral collaborations. Effective roadmaps take into account country-specific perspectives and identify relevant opportunities and challenges.

Final Reflections

As the mounting social and environmental costs and economic risks of the linear economy become increasingly apparent, the circular economy is recognized as an important contributor to moving towards a more sustainable economy. Because the circular economy specifically aims to create economic value by improving environmental outcomes, in the Panel's view, it represents a model that rejects a false dichotomy between the environment and the economy. A transition toward a circular economy will help Canada meet existing policy goals and support Canada's climate agenda while enabling economic productivity through more informed and efficient design, production, and consumption methods. Current systems and incentives are based on linear economic approaches; thus, transitioning towards a circular economy will require transformative, systems-level change. At the same time, this transformation will be advanced partly by taking advantage of "small wins" that accumulate into more significant changes. Indeed, Canada currently has many circular initiatives that can be built on to advance the circular economy. Leveraging these existing initiatives requires a collaborative cross-sectoral approach involving multiple levels and departments of government, along with different industries and stakeholders in civil society. Such an approach would need to be supported by continuous innovation and strengthened data collection. While it is not possible to achieve an entirely circular economy, the journey towards one is an opportunity to create sustainable links among the economy, society, and the environment that will benefit human well-being.