



GETTING TO A CIRCULAR ECONOMY: A PRIMER FOR CANADIAN POLICYMAKERS



Written by:

Stephanie Cairns and
Meg Ogden, with
Scott McFatridge.

Smart Prosperity Institute

Smart Prosperity Institute (formerly Sustainable Prosperity) is a national research network and policy think tank based at the University of Ottawa. We deliver world-class research and work with public and private partners – all to advance practical policies and market solutions for a stronger, cleaner economy.

Key Messages

- Current production and consumption models globally are unsustainable. Total demand for limited resource stocks could reach 400 per cent of the Earth's total capacity by 2050. Meanwhile, the safe boundaries for four of the nine key ecological processes and systems that regulate the stability and resilience of the Earth system have already been exceeded.
- The corresponding economic impacts of these current trends will be severe, with global price volatilities and supply chain interruptions leading to as much as US\$4.5 trillion in lost global economic growth by 2030, or US\$25 trillion by 2050.
- The circular economy model is an emerging response to these challenges. It provides governments, businesses and consumers with *"an approach to maximize value and eliminate waste by improving (and in some cases transforming) how goods and services are designed, manufactured and used."*
- Canadian discussion on the circular economy has been overshadowed by the national emphasis on climate change and clean growth. But in the European context, circular economy strategies have been shown to deepen projected emission reductions and create good jobs, key goals of the clean growth agenda.
- Both approaches focus on a low-carbon economy, economic growth, innovation and new technologies, but the circular economy responds to a broader set of environmental drivers, uses a broader set of responses, and looks for a system-scale, deeper level of innovation – business as well as technological. As such, it holds the potential for the deeper emission reductions critical to the climate file, but could also be more disruptive to the current model of the economy.
- Key circular economy strategies include circular supply-chains; recovery, reuse, and recycling of resources; product life extension; new business models (e.g., sharing platforms and service leases) for more efficient use of goods and capital assets; and deep technological innovations.

Acknowledgements

A sincere thanks to the reviewers who provided much-appreciated comments on drafts of this brief: Duncan Bury, Chris Lindberg, and Jason Dion.



The circular economy is also thousands of jobs across Canada.

- Circular economy approaches can improve business competitiveness by mitigating risks of price volatility and supply uncertainty, increasing efficiency and productivity, generating new revenue, creating deeper relationships with customers, and enhancing market differentiation.
- Canada has yet to see the type of integrated, comprehensive circular economy strategies and collaboration that have been critical to the acceleration of the circular economy elsewhere.
- There is an important role for governments to play in enabling and accelerating circular economy models, validated by international experience. Six top policy tools are:
 1. Extended Producer Responsibility programs and policies, in particular targets and market-based instruments;
 2. Green procurement;
 3. Public investments in circular economy related research, development, innovation and pilots;
 4. Working with cities as innovation hubs;
 5. Partnerships and collaborative initiatives with business and civil society to research, learn, innovate, collaborate and build capacity and policy for the circular economy; and
 6. National and regional roadmaps for sector-based transitions.

1. INTRODUCTION

As growing global populations increasingly aspire to the consumption patterns of the world's richest economies, clean and more resource efficient economic growth models are called for. The world's population is set to grow by 28 per cent from today's levels, to reach 9.7 billion by 2050 and, with up to 3 billion persons moving from low to middle class consumption over this period, is set to use 71 per cent more resources per capita. Per capita consumption growth has been a stronger factor than population growth in driving the growth of material use over the last three decades.¹

Without urgent steps to increase resource efficiency, total demand for limited resource stocks, like metals, biomass, minerals, and other materials, would reach 130 billion tons by 2050, up from 50 billion in 2014, and exceeding the Earth's total capacity by a physically impossible 400 per cent.² At the same time, we have already passed the safe boundaries for four* of the nine key ecological processes and systems that regulate the stability and resilience of the Earth system.³

Experts warn of severe economic consequences as supplies of non-renewable resources and the regenerative capacity of renewables ones are exhausted, and planetary processes and systems are pushed beyond their limits. The future will be a "nightmare of price volatilities, especially in food, water shortages, and...enormous interruptions in supply chains and investment, with lower output and fewer jobs."⁴ The global management consulting firm Accenture Strategy echoes this: "...unless current trends are reversed, resource supply disruptions coupled with rising and increasingly volatile prices will in the next two decades translate into trillion-dollar losses for companies and countries whose growth remains tied to the use of scarce and virgin natural resources."⁵

*Climate change, loss of biosphere integrity, land-system change, and altered geochemical cycles for phosphorus and nitrogen.

If strong economic growth is to be sustained, it will need to do more with less: to decouple the rate of growth from the rates of resource use and pollution. Production and consumption patterns will need to be fundamentally reformed to use less land, less water, less energy, and fewer raw materials, and create less pollution.

The “circular economy” model is an emerging response to these challenges. It shifts the traditional *take-make-waste* throughput model of economic production to a *take-make-reuse* circular model, retaining the value of products, materials, and resources in the economy through closed production and consumption loops. In doing so, it turns the resource and pollution challenges in to opportunity. By sidestepping the price volatilities and supply chain interruptions associated with looming supply gaps, as much as \$4.5 trillion in additional global economic growth can be gained by 2030, or \$25 trillion by 2050.⁶

This Policy Brief is the first in a Smart Prosperity Institute series on the circular economy and Canada. It is an introduction to the circular economy concepts and landscape, written for both government and business audiences. It provides a foundation in the key concepts of the circular economy (section 2), including a look at how these fit with the Clean Growth model that is the focus of present Canadian efforts to shift to a more environmentally sustainable economy (Box 1, the topic for a future Brief in this series).

The circular economy’s appeal lies in its broad value proposition, and section 3 outlines the benefits for the environment, for the economy, and for business. Because the circular economy is as much about business benefits as it is about the more evident environmental strategy, the Brief takes a deeper dive into the reasons that companies are looking to the circular economy as an opportunity to create new value. It next reviews the current landscape of key actors, initiatives, and policies first at the international level (section 4) and then within Canada (section 5).

Finally, although Canada has abundant resources, it will need to be responsive to these international circular economy driven shifts in market demands, whether for services, (re)manufactured products, or responsibly sourced raw materials. The Brief concludes with initial thoughts on how to accelerate the circular economy in Canada (section 6), including implications for Canadian policymakers and a proposed “Top 6 Tools for Accelerating the Circular Economy in Canada”.

2. CIRCULAR ECONOMY 101

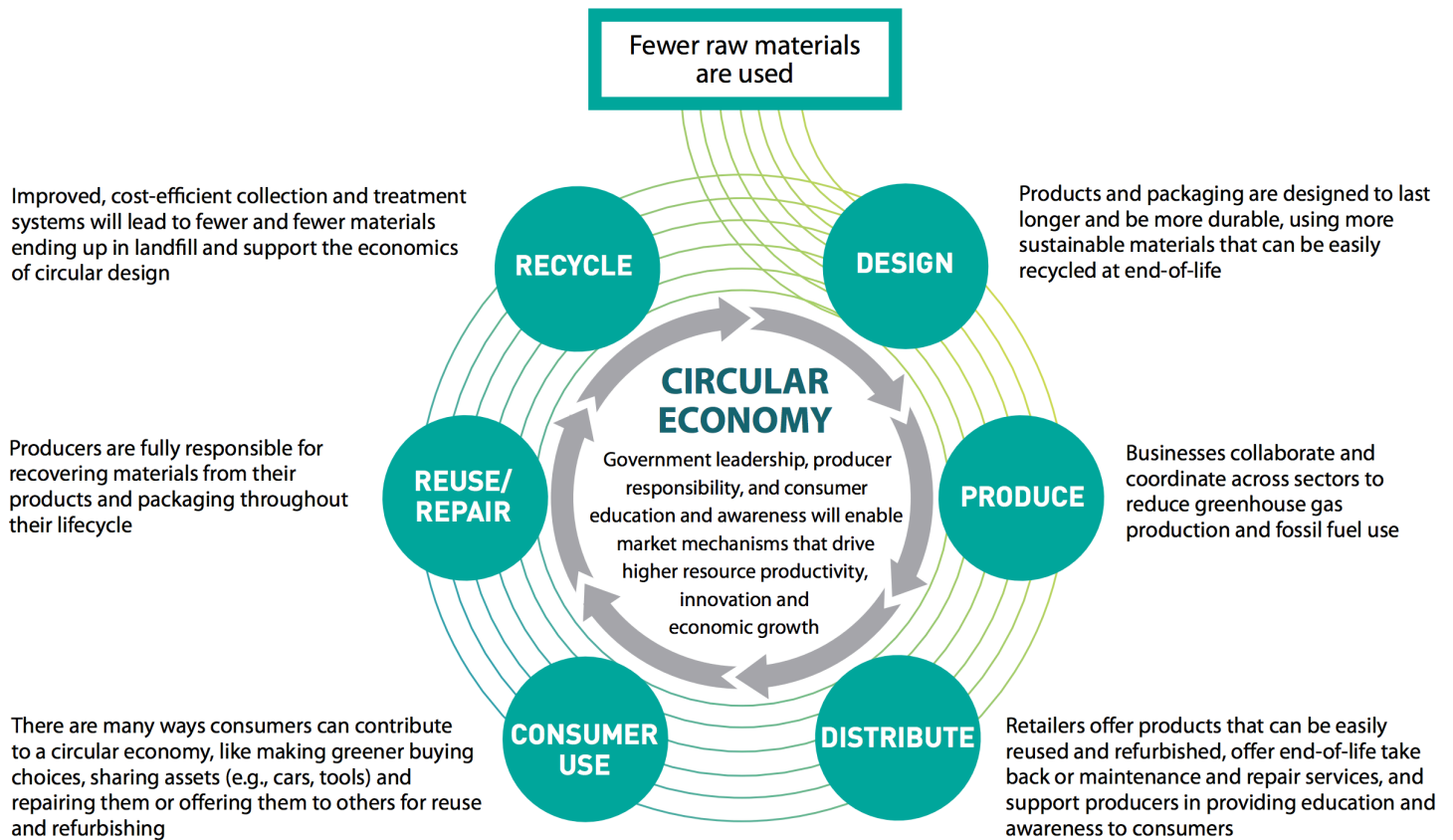
What is the circular economy? At its heart, it is a comprehensive framework for thinking about how materials and energy would flow in a fully sustainable, low-carbon economy. It has its roots in several schools of thought over the last few decades that adopt a systems design approach to reduce or eliminate emissions, pollution, and waste. Readers may be familiar with related approaches such as industrial ecology, cradle-to-cradle design, biomimicry, natural capitalism, blue economy, and regenerative design. The circular economy is a broad framework subsuming all of these, but distinguished from these approaches in its emphasis on the enabling role of innovative technologies, particularly digital technology, and new business models.

The following section summarizes the key concepts behind the circular economy, the links to Canada’s related and predominant policy lens of clean growth, and the core strategies for implementing circularity.

The circular economy is a comprehensive framework for thinking about how materials and energy would flow in a fully sustainable, low-carbon economy.

*For a full discussion, see [Ellen MacArthur Foundation](#).

Figure 1: Circular Economy



Credit: Ministry of the Environment and Climate Change (2017)
 Strategy for a Waste-Free Ontario: Building the Circular Economy, Queen's Printer for Ontario.

Key Concepts

The circular economy, as defined by Canada's Circular Economy Lab (CEL), is:

...an approach to maximize value and eliminate waste by improving (and in some cases transforming) how goods and services are designed, manufactured and used. It touches on everything from material to business strategy to the configuration of regulatory frameworks, incentives and markets.⁷

Others add:

- It aims to minimize waste, goes beyond recycling and maintains the value of products and services for as long as possible (Ontario Ministry of Environment and Climate Change).⁸
- It is a system where the value of products, materials and resources are maintained in the economy for as long as possible, and the generation of waste is minimized (European Commission).⁹

- It moves away from the traditional *take-make-waste* economic model to one that focuses on *make-use-return* or *take-make-take-make* (Accenture Strategy).¹⁰
- It is an economic model that seeks to ultimately decouple global economic development from finite resource consumption (Ellen MacArthur Foundation).¹¹

As a term and concept, many may find shifting from linear to circular to be novel. In reality, there are familiar examples of the circular economy all around. For decades, residential water heater companies have leased water heaters to Canadian households — assuming responsibility for maintenance and replacement of the heaters for a monthly fee — thereby increasing the likelihood of longer life through repair, and the recycling of materials at end of life. Also, many businesses and governments now lease rather than buy photocopiers to guarantee maintenance from photocopier service providers, and then return printer cartridges to these providers to be recycled. And some lighting companies now offer circular lighting services — through which consumers don't purchase lighting, but instead purchase a service whereby lighting equipment is installed, maintained, and replaced as needed, again ensuring greater longevity of the equipment and increasing rates of re-use, re-purposing, and recycling.

The circular economy, put into practice, could affect global models of economic production by catalyzing new relationships between businesses, customers, and natural resources. As circular economy initiatives begin to come to scale in selected markets, they can prove disruptive to traditional markets. For example, the Eastman Kodak Company, once globally dominant in the photographic film and cameras business, was unprepared for the rapid shift to digital products, and came close to bankruptcy in 2012 before shedding much of its legacy business lines and reorganizing with a starkly reduced focus on digital printing for business. As such, the circular economy concept warrants attention as a mainstream economic and environmental shift.

The Circular Economy and Clean Growth

Canadian discussion on the circular economy has been overshadowed by the national emphasis on climate change and clean growth. In fact, the two approaches have significant goals in common: a focus on a low-carbon economy and on economic growth, innovation and new technologies (Table 1).

However, the circular economy responds to a broader set of environmental drivers, uses a broader set of responses, and looks for a system-scale, deeper level of innovation — business as well as technological. In the European context, circular economy strategies have been found to deepen emission reductions and create good jobs, key goals of the clean growth agenda. A Club of Rome study of five European economies identified the materials-efficiency element of the circular economy as one of three key strategies to decouple emissions from growth (together with energy efficiency and renewable energy; see Box 1).¹² This might be particularly true in an economy with carbon-intensive energy sources.

The circular economy therefore potentially offers a next tranche of deeper emission reductions critical to the climate file, and Canada's immediate priority on the clean growth agenda need not, indeed should not, exclude medium- and longer-term consideration of the circular economy.

Circular economy touches on everything from material to business strategy to the configuration of regulatory frameworks, incentives and markets.

Box 1: Clean Growth and the Circular Economy

Clean growth, not the circular economy, is the dominant template for Canada's sustainable economy initiatives, formalized in the 2016 Pan-Canadian Framework on Climate Change and Clean Growth. How do these two approaches fit with one another?

Clean growth, as described in federal documents, involves meeting Canada's climate change commitments while building a "clean-growth economy... with sustainable and globally-competitive natural resources sectors that create good, middle-class jobs and prosperity for Canadians".¹³ The circular economy, as described elsewhere in this Brief, encompasses all of this but responds to a broader set of environmental drivers, uses a broader set of responses, and looks for a systems-scale, deeper level of innovation—business as well as technological—than clean growth. As such, it is potentially more disruptive to the current model of the economy. So while the two approaches have elements in common, they also have significant differences (Table 1).

Is this broader, deeper circular economy approach aligned with clean growth? A study conducted by the Club of Rome of five European economies looked at the impact on carbon emissions and net employment of three elements of the circular economy: energy efficiency, renewable energy, and material-efficiency through a circular manufacturing model. The material-efficiency element added a 3-10% reduction in carbon emissions to the

30% and 50% reductions in emissions, respectively, from energy efficiency and renewable energy that would be standard in a clean growth agenda. In other words, potentially the important last "tranche" of reductions as nations stretch to meet reduction commitments. The gains in employment from the materials-efficiency element were much more striking: depending on the country, from 66% to 166% as many jobs were shown to be created through the materials-efficiency strategy as from the energy efficiency and renewable energy strategies combined. These jobs were permanent in nature, primarily as a consequence of the changes in the goods-to-service ratio in the economy.

These results are, obviously, deeply dependent on the employment, economic and energy profiles of the economies studied, as well as on internal assumptions in the modelling. However in this European context, the conclusions are clear: circular economy strategies can re-enforce clean growth goals of meeting climate change commitments and creating good jobs.

Would a circular economy strategy help deliver the goals of the Pan-Canadian Framework? If so, what additional policy measures would be needed to tap these deeper emission reductions and additional jobs? How would these emission reductions compare on a cost per tonne? The Smart Prosperity Institute will explore these links between the circular economy and clean growth in a future Policy Brief.

Strategies for a Circular Economy

Many organizations have contributed to scoping and identifying the key elements and characteristics of the circular economy: Accenture Strategy, the Ellen MacArthur Foundation, the World Economic Forum, the World Business Council on Sustainable Development, the Club of Rome, and the European Environment Agency, to name a few. These approaches share many core concepts. Accenture Strategy's models for the circular economy are among the most influential globally.

Accenture Strategy Models

Accenture Strategy's research¹⁵ identified five circular economy models for achieving competitive advantage through innovative resource productivity improvements:

- **Circular Supply-Chains:** introducing fully renewable, recyclable or biodegradable materials that can be used in consecutive lifecycles.
- **Recovery & Recycling:** creating a production and consumption system in which everything that used to be considered 'waste' is recaptured, reused, or revived for other uses.
- **Product Life-Extensions:** maintaining and improving products through improved design, along with repairs, upgrades, remanufacturing and remarketing to prolong their lives.
- **Sharing Platforms:** sharing platforms to rent, share, swap or lend, to get the greatest productivity out of rarely used goods, and help users to both make and save money.
- **Product as a Service:** manufacturers and retailers leasing products instead of selling them, shifting the profit emphasis from volume sales to performance of a product (longevity, reliability, and reusability).

Table 1: Comparison of Clean Growth and Circular Economy

In common	
Goals of enabling continued economic growth and rising standards of living with reduced environmental impact	
Focus on innovation and new technologies as a key strategy for achieving goals	
Low carbon economy as an outcome	
Differences	
Clean Growth	Circular Economy
Environmental drivers	
Climate change as main driver	Resource efficiency to address finite natural capital as main driver
Resource efficiency as a strategy for more carbon-efficient production	Decarbonization as an outcome of resource efficiency, including the shift to renewable energy sources
Responses	
Make growth more carbon-efficient by adopting clean technology, including lower-carbon energy sources, and energy efficient products and production systems	<p>Redefine growth to decouple economic activity from the consumption of finite resources by systematically designing waste and pollution out of the system:</p> <ul style="list-style-type: none"> Use fully renewable, recyclable, or biodegradable materials Maintain the embedded resource value of products and services for as long as possible Tap underused capacity of rarely used goods through sharing platforms Minimize physical production and use through virtualization
Innovation focus	
Emphasis on clean technologies within an otherwise largely unchanged throughput (take-make-waste) model of economic production	<p>Emphasis on redesign of economic activity, to transition to a fundamentally changed circular (take-make-reuse) model of economic production;</p> <p>Leverages clean technologies as well as emerging innovations in digital, biological, and engineering technologies, along with new business models for the ownership and use of products.</p>

Accenture Strategy and others identify innovative technologies as key to enabling these circular economy models to be deployed at large scale. This intersection between the circular economy and new digital, physical, and biological technologies, like the internet of things (IoT), innovative energy storage, bio-based materials, advanced green chemistry, and artificial intelligence, is seen by many as “disruptive”.¹⁶ Accenture Strategy highlights the influence of engineering technologies (such as modular design, advanced recycling, and life and material sciences), hybrid technologies (such as trace and return systems and 3D printing), and, most especially, digital innovations in social, mobile, analytics, cloud and machine-to-machine (M2M) communication.¹⁷

The circular economy's appeal lies in its broad value proposition, which promises benefits for the environment, for the economy, and for business competitiveness.

Notably, leading thinkers and practitioners on the circular economy explicitly link these approaches to building business value. They embed these resource productivity strategies into core business strategies to mitigate risks, increase efficiency and productivity, generate new revenue and create deeper relationships with customers, and enhance differentiation. For example, in the first three of Accenture Strategy's circular economy models above, business opportunities arise from reduced costs, increased predictability and control of potentially scarce resources, and lengthier relationships with customers. In the last two, business opportunities result from entirely new business lines, and a changed relationship between manufacturers/retailers and customers. These opportunities are driving the interest of business leaders and organizations such as the World Business Council on Sustainable Development (WBCSD) and others, as summarized in the next section.

3. THE CIRCULAR ECONOMY: A BROAD VALUE PROPOSITION

The circular economy's appeal lies in its broad value proposition, which promises benefits for the environment, for the economy, and for business competitiveness. This section reviews these benefits, with extra depth on the business value of the circular economy, a feature that distinguishes this environmental strategy from many others.

Environmental Value

The environmental case for reforming economic production is summarized in the Introduction: the growing risks over the coming decades of non-renewable resources hitting supply constraints, the regenerative capacities of renewable resources reaching their limits, and planetary processes and systems pushed into high risk zones. The circular economy's emphasis on efficient use of natural resources, use of non-toxic materials, and elimination of waste has cascading benefits for resource security, pollution prevention, energy use and emissions reductions, and nature conservation.

For instance, sustainably managed forests can ensure long-term availability of renewable resources for producing bio-based materials, and applying circular economy principles to water management can contribute to greatly reducing water stress, and improved water security in key regions.¹⁸

The "product as a service" model can improve pollution prevention by creating an incentive for reduce and reuse of materials. For example, the re-use rate of lubricant oil globally is only 10 per cent. A Finnish firm offering 'lubrication as a service' on a monthly charge to industrial production plants and logistics firms has reduced customers' oil consumption by 40 to 80 per cent, with customer cost savings of 10 to 50 per cent by using real-time oil-performance monitoring. In addition to cost savings, the service has improved the operational reliability of the serviced plants.¹⁹

Energy use and associated emissions can also be reduced through circular economy approaches. One study found that overall European energy consumption could be reduced by 37 per cent if the chemical industry teamed up with the European transportation and housing sectors on circular economy solutions.^{*20} Another study on the potential greenhouse gas reduction benefit of a circular economy in India's agricultural sector concluded that emissions could be lowered by 31 per cent by 2050, compared to business as usual.²¹ And it has long been known that it requires less energy to recycle metals than to produce primary metal (95 per cent less in the case of aluminum),²² which avoids corresponding emissions.

Canadian studies also demonstrate the circular economy's potential for reducing greenhouse gas (GHG) emissions, although only a handful exist and they typically have a narrow focus on recycling and waste management. For instance, the Ontario Waste Management Association estimates that Ontario's material reuse and recycling programs reduce GHG emissions by 14.5 Mt CO₂ equivalents per year²³ –equal to almost 9 per cent of Ontario's total GHG emissions in 2014.^{**} Another Ontario study estimated that recycling and organic waste diversion could generate an additional 15 Mt of offsets under Ontario's cap and trade program.²⁴ Diverting organic materials from landfill sites, a key measure in achieving a circular agro-food economy, could reduce the 4 per cent of Canada's emissions associated with the decay of organic materials in landfills, and would create valuable products such as compost and biomethane.²⁵

Further, the circular economy provides a promising strategy to delivering results for some of the more complex environmental issues governments are trying to manage. This is true for the United Nation's 17 Sustainable Development Goals (SDGs), recognizing the complexity and integrated nature of what is being achieved under the 2030 Agenda for Sustainable Development – in particular, SDG 12 that aims to ensure sustainable production and consumption patterns.²⁶ This is also true for the 2016 Paris Agreement, as well as the 2016 Pan-Canadian Framework on Climate Change and Clean Growth,²⁷ under which implementing policies that stimulate circular economy approaches may prove an attractive way to achieve the last tranche of emissions reductions not identified through current measures (see Box 1). As such, the circular economy could be a critical part of the deep decarbonization pathway to deeply reducing greenhouse gas emissions.

Economic Value

The circular economy offers benefits for continued economic growth and employment.

As outlined in the Introduction, today's business practices are projected to lead to a global gap between supply and demand of natural resources, as demand from growing populations and rising per capita consumption outstrips supply. This supply gap is projected at 8 billion tons by 2030. The attendant price volatility and supply-chain interruptions would translate to \$4.5 trillion of lost global economic growth by 2030, and as much as \$25 trillion by 2050.²⁸ By reducing dependence on scarce



Diverting organics from landfills reduces GHG emissions and creates valuable products such as compost and biomethane.

* This study focussed on the potential from innovations in the products supplied to these sectors by the chemicals industry. For example, in the transportation sector chemical products can help reduce emissions; increase efficiency; enhance recyclability and reusability; and prolong use cycles by contributing to lightweight cars, e-mobility and more-durable cars with longer average usage. In the housing sector, chemical companies can provide products for passive house energy standards such as high-performance and more durable insulation materials for walls, roofs and pipes; high-performance sealants for buildings; and high-performance window materials.

** Ontario's GHG emissions were estimated at 170 Mt CO₂ eq. in 2014. See Environmental Commissioner of Ontario. 2016. *Facing Climate Change: 2016 Greenhouse Gas Progress Report*. Toronto: Environmental Commissioner of Ontario.

resources, widespread adoption of circular economy models could avoid this loss. Another study, of the potential impact of major investments in circular economy opportunities in the in the European Union (EU), identified the potential to increase EU GDP by up to 7 per cent by 2030,²⁹ although the robustness of this study has been questioned.^{*30}

Canadian studies are limited and have a narrower focus on recycling and waste management. One study looked at the GDP and employment impacts of increasing waste diversion in Ontario from the current 23 per cent diversion rate to 60 per cent, and found a boost to the province's GDP of \$1.5 billion.³¹

The circular economy brings opportunities to localize supply chains and build local economic growth, employment and labour forces. The Ontario study cited above estimates that increasing the province's waste diversion rate to 60 per cent would create nearly 13,000 new direct and indirect full-time jobs for the province.³² Since this estimate is based on a waste-diversion strategy only, the full employment potential of a comprehensive circular economy strategy could be much greater. The input-output study conducted by the Club of Rome of five European economies looked at the impact of a hypothetical package of comprehensive circular economy changes on net employment, and found significantly positive effects on employment, primarily as a consequence of the changes in the goods-to-services ratio in the economies. For example Spain, a country with roughly the same size labour force as Canada, would gain 400,000 additional jobs.³³

New circular economy-based business lines could also mitigate potential negative impacts on jobs in raw material-producing economies within the global supply chains, if these are affected as others move toward the circular economy. However, the social and employment impacts of some circular economy solutions could also be disruptive: the digital and sharing economies may in fact eliminate more jobs than are gained, while also lowering security and wages (Box 2).

Box 2: Understanding the social and employment impacts of the circular economy: what we need to know

The circular economy has the potential to create benefits for businesses, the economy, and society, but it could also be disruptive for some businesses and workers. Careful consideration and research are needed to understand the social and employment impacts of the circular economy and how to manage them, such as:

- *What, if any, are the trade-offs between greater specialization and economies of scale for circular economy supply chains, versus opportunities for localizing supply chains and building local economic growth, employment and labour forces (particularly in regions that are struggling economically)?*
- *What are the implications of circular economy business models – such as product life extension or sharing platforms — for job security and decent work? How can potential disruptions be mitigated and managed? This is especially pertinent in light of concerns surrounding the 'gig economy' and the closure of traditional retail giants (e.g. Sears) in the face of online competition.*
- *What are the distributive impacts of policies for promoting the circular economy (e.g. waste diversion targets, pollution and waste pricing)? Could they potentially be regressive in the absence of financial support for low-income households?*
- *How might various circular economy technologies and practices – such as take-back schemes for goods, sharing platforms, or more reusing, recycling and composting – increase or decrease households' leisure time? How might these technologies and practices affect the division of unpaid labour between men and women within households?*

* In part because the computable general equilibrium models used in this analysis may be limited in their ability to portray changes as fundamental and far-reaching as the ones considered.

Business Value

While the risk of \$4.5 trillion of lost global economic growth by 2050³⁵ is enough to catch any CEO's attention, businesses are looking to turn this risk into opportunity by adopting new relationships between markets, customers and natural resources (section 2). These CEOs are adopting circular economy approaches to mitigate risks, increase efficiency and productivity, generate new revenue and create deeper relationships with customers, and enhance differentiation. Organizations such as the World Economic Forum and the World Business Council of Sustainable Development are spearheading initiatives to help to scale business-driven circular economy innovations.³⁶

Circular economy strategies focused on resource efficiency support business competitiveness by:

- **Mitigating risks of resource price volatility and supply uncertainty:** As population and economic growth drive resource demand and consumption, scarcity and resource price volatility – as outlined above – will be the new norm.³⁷ New business lines that recover materials, and mitigate risks and disruptions in supply chains and security of resources – not just within Canada, but also as they affect competitors' business models and products within global markets – will be the ones who come out ahead.
- **Increasing resource and energy efficiencies, as well as productivity:** Circular economy approaches view waste as a potential resource or revenue stream (e.g. from sales of reused, recycled and composted materials), ensuring greater resource and energy efficiencies and productivity, and hence increasing cost savings, improving the bottom line and the economics of production.

As well, changing customer preferences are shifting demand toward more resource-efficient and pollution-friendly products – products that are more durable, repairable and recyclable. As a result, circular economy approaches can bring with them enhanced reputation and brand capital.

- **Optimizing asset design, use and value through modularity and reuse:** Modularity and reuse demand closer producer control over a product through its entire lifecycle. Such closer producer control requires different relationships with users and provides opportunities to have deeper, more loyal and longer-term relationships with customers. It also enables producers to monitor how products perform, and are used by customers. When combined with a shift to service-based business models (below), these approaches provide important design insights.

Other strategies, as suggested, focus on new lines of business to generate new revenue:

- **From product-based to service-based models:** Suppliers are developing new business lines focused on servicing customer needs rather than selling products. In this approach, revenue shifts from being based on volume of product sold, to an ongoing service relationship. This responds in part to emerging consumer preferences toward more supportive services: consumers want to focus on their own core business, while allowing someone else to manage the assets required to deliver that business. These new business models also create new service-based revenue streams, and improve consumer loyalty and market share.



Service-based models lead to greater product longevity and increase rates of re-use, re-purposing and recycling.

Businesses are gaining competitive advantage drawing on intersections between the circular economy and disruptive digital, physical and biological technologies.

One example of this strategy is the leasing model – similar to the earlier examples of extending the concept of photocopiers, home water heaters and lighting with the asset owned by a third party who manages all repairs, servicing, and replacement. This concept is being adopted in many different sectors. Chemical companies, such as the lubricant companies profiled above, are experimenting with service models, acting from the insight that with chemicals, the supplier is the expert and the product can be used more efficiently and managed more safely under a service-model of stewardship. A Finnish furniture company now not only builds and supplies high-quality furniture, but assists customers in developing complete, sustainable work environments – not only enhancing customer engagement, innovation and productivity, but also improving company branding and showing environmental responsibility.³⁸ Service-lease models like these work well from an environmental perspective, resonate with the millennial generation’s preference for flexible services over ownership, and can also provide businesses with access to invaluable data on how consumers use their products and how products perform.

- **Getting ahead of disruptive digital, physical and biological technologies:** Businesses are gaining competitive advantage drawing on intersections between the circular economy and disruptive digital, physical and biological technologies, including the “internet of things”, bio-based materials, product life extension and innovative energy storage.³⁹ An example is the shift from the sale of individual CDs and DVDs to monthly-subscription streamed music and media such as Apple Music and Netflix. Circular economy approaches allow businesses to enjoy first mover advantages to get ahead of these disruption curves.
- **Withstanding current and potential government sustainability policies or investor requirements:** Businesses recognize that circular economy-based business lines are positioned to be more resilient to both current and anticipated government sustainability policies that will impose costs on emissions and waste – including pricing externalities, regulations and/or potential shifts in taxation models, be these in Canada or in export markets. One example is the Government of Canada’s pan-Canadian approach to carbon pricing, which will apply carbon pricing to a broad set of emission sources throughout Canada by 2018 with increasing stringency over time – either through provinces’ and territories’ own pricing systems or a federal pricing backstop based on a carbon levy applied to fossil fuels and an output-based pricing system for industrial facilities emitting above a certain threshold.⁴⁰ Another is the anticipated increased cost of waste disposal and environmental compliance with implementation of the Waste Free Ontario Act.

Businesses adopting circular economy business practices are also better placed to get a head of additional investor requirements, such as corporate social responsibility.

4. LEADING THE CIRCULAR ECONOMY: INTERNATIONAL INITIATIVES

Interest in the circular economy at the international level is being driven by Europe, with Asia and North America beginning to step up. Innovative collaborations, businesses, and governments have created circular economy approaches and models, tools and products. This early generation of innovation offers valuable best practices and lessons for others.

International Partnerships and Collaborations

The circular economy, by its nature, depends on partnerships between sectors and throughout supply chains. Many collaborative, network- or partnership-based initiatives have been formed to stimulate the circular economy at the global or regional scales. Principal initiatives include:

- [Ellen MacArthur Foundation's Circular Economy 100](#)⁴¹ – or CE100 – is a unique, global multi-stakeholder platform, established in 2013, that brings together corporations, governments, academic institutions, and emerging innovators and helps them learn, build capacity, network and collaborate, to accelerate their circular economy projects. Its members – including well-known brands like [Google](#), [Coca Cola](#), and [Apple](#) - represent 21 different sectors, located in 23 different countries throughout the world. Through two-day Acceleration Workshops held twice each year, members develop collaborative research or pilot projects – Co-Projects – that leverage the CE100 network to overcome challenges and explore opportunities that organizations may otherwise not be able to address in isolation. These Co-Projects range in focus from finance, the built environment and bio-mimicry to 3D printing, electric vehicles and cross-border enablers. Set up in 2015 and 2016 to move beyond the initial European focus, CE100 Brazil and CE100 U.S. are hubs of the global program, intended to help member organizations take advantage of opportunities in those markets.
- The [World Business Council for Sustainable Development \(WBCSD\)](#)'s June 2017 [CEO Guide to the Circular Economy](#)⁴² is based on [Accenture Strategy's](#) business models and list of disruptive technologies.⁴³ Signed by 14 CEOs from companies including Unilever, Danone and Tata, the Guide provides CEOs and business leaders the tools they need to implement circular economy principles. The Guide's Call to Action challenges companies to: set a circular vision, choose a circular model, work in teams, start small and scale, collaborate, and track progress.
- [The British Standards Institution](#), the world's first national standards body established in 1901, published BS 8001: Framework for implementing the principles of the circular economy in organizations in May 2017.⁴⁴ The new standard is the first of its kinds – in the UK and globally – and is intended to be used flexibly by any organization, regardless of sector, size, location or type. Six principles of the circular economy – innovation, stewardship, collaboration, value optimization, transparency and systems thinking – are the bedrock of the standard; and, it provides practical guidance around specific issues surrounding transition to a circular model – measurements,

liability and insurance, logistical concerns, and materials – as well as associated business models, including leasing, the sharing economy, and remanufacturing. The standard provides a process to help organizations secure smaller ‘quick-wins’ and re-think holistically how to manage resources to enhance financial, environmental and social benefits.

Other partnerships and collaborations are working on sectoral innovation, for example:

- **Buildings as Material Banks (BAMB2020)**⁴⁵ is another partnership-based project, funded through the European Union Horizon 2020 program. It brings together 16 parties from eight European countries to create circular solutions and enable a systemic shift in the building sector. Whereas today building materials often end up as waste when no longer needed, BAMB aims to sustain the value of these materials to mitigate resource scarcity risks, and the associated with the destruction of ecosystems and increasing environmental costs. With dynamic and flexible design –demonstrated and refined through six pilots – buildings would function as banks of valuable materials, leading to waste reduction and use of fewer virgin resources.
- **The Circular Fibres Initiatives**⁴⁶ was launched at the Copenhagen Fashion Summit in May 2017. Supported by core corporate partners **H&M** and **NIKE** Inc., and a consortium of organisations including the Danish Fashion Institute, the Initiative aims to build a circular economy for textiles, starting with clothing. It is also led by Ellen MacArthur Foundation.

International Government Strategies and Programs

While movement toward a circular economy has been led by individual businesses, businesses cannot do it alone. Businesses need to work closely together to close the loops in their supply chains, and these business clusters need enabling government policies to accelerate the circular economy. Governments’ main functions include fixing market failures, fixing regulatory failures and legislating targets, and stimulating market activity. Governments can also, as appropriate, be champions of circular economy at both the broad and the sector specific levels, and have an important facilitation role such as convening the development of strategies needed for innovation,^{*47} for instance circular economy road maps (see Box 3).

Box 3: The World’s First National Roadmap for the Circular Economy

Created in March 2017 under the direction of Sitra—the Finnish Innovation Agency, “Leading the Cycle”⁴⁸ brings together pilots to create new clean and smart solutions to address the challenges of climate change, dwindling natural resources, and urbanization, as well as stimulate growth, investments and exports. Tangible actions fall under areas of Finland’s traditional strengths - sustainable food systems, forest based loops, technical loops, transport and logistics, and common action – and could make it possible to generate 2 to 3 billion euros in added value each year by 2030 and over 75,000 new jobs (Sitra and Club of Rome). Finland’s hosting of the World Circular Economy Forum in June 2017 was one of the road map’s first steps.

* Previous research highlights the importance of convening and supporting functions (e.g. research and development, risk-sharing) from governments and other public bodies in facilitating environmentally-friendly, system-wide innovations in areas such as transportation and resource-efficient manufacturing.

A few governments have established economy-wide strategies and action plans, with goals and supportive legislation and policies. Some of these are described below. The relevance of these approaches to Canada will depend on local circumstances and current economic and policy frameworks; however, the integrated and comprehensive nature of the strategies is of interest. Many governments have also implemented narrower policies, summarized further below in section 6, in Table 2.

- The [European Commission's Circular Economy Action Plan](#),⁴⁹ adopted in December 2015, includes detailed measures to be undertaken by 2019 (see Box 4). In 2016, the Commission established the Circular Economy Finance Support Platform, bringing together representative innovators and investors, as well as representatives of the Commission and other stakeholders (member state ministries, NGOs, etc) to find financing solutions for circular economy projects, under three pillars: coordination and awareness raising, advisory services, and financial instruments. In March 2017, the Commission announced the European Circular Economy Stakeholder Platform - a "network of networks" going beyond sectorial activities and highlighting cross-sector opportunities and challenges, through a knowledge-gathering hub and place for stakeholder dialogue. In January 2018, a major strategy for plastics was announced.

Box 4: Closing the Loop - the EU's Circular Economy Action Plan⁵⁰

On 2 December 2015, the European Commission put forward a package to support the EU's transition to a circular economy. Closing the Loop is composed of both general and material-specific actions. General measures pertain to product design, production processes, consumption, secondary raw materials, and cross-cutting issues such as innovation. The plan also includes actions for specific materials and sectors: plastics, food, critical raw materials, construction and demolition, biomass and bio-based products, and fertilizers. Detailed measures include legislative proposals on waste, with long-term targets to reduce landfilling and increase recycling and reuse: a common EU target for recycling 65 per cent of municipal waste by 2030; a common EU target for recycling 75 per cent of packaging waste by 2030; and a binding target to reduce landfilling to maximum of 10 per cent of municipal waste by 2030.

The January 2018 Strategy for Plastics in the Circular Economy⁵¹ sets out a vision for a sustainable plastics economy with emphasis on product design to make plastics recycling easier; reuse, repair, and recycling of plastics and plastic products; and the goal of ensuring that all plastic packaging is recyclable by 2030.

- [Scotland's 2010 Zero Waste Plan](#)⁵² is another example of a national government supporting the circular economy. It sets out the Scottish government's vision for a zero-waste society, where all waste is seen as a resource – it is minimized or sorted so that valuable resources are not disposed of in landfills. The plan involves the following:
 - Development of a Waste Prevention Programme for all wastes, ensuring the prevention and reuse of waste is central to all actions and policies;
 - Landfill bans for specific waste types therefore reducing greenhouse gas emissions and capturing the value from these resources;
 - Separate collections of specific waste types, including food, to avoid contaminating other materials, increasing reuse and recycling opportunities and contributing to renewable energy targets;
 - Two new targets that will apply to all waste: 70 per cent target recycled, and maximum 5 per cent sent to landfill, both by 2025;

- Restrictions on the input to all energy from waste facilities, in the past only applicable to municipal waste, therefore encouraging greater waste prevention, reuse and recycling;
- Encouraging local authorities and the resource management sector to establish good practice commitments and work together to create consistent waste management services, benefitting businesses and the public;
- Improved information on different waste sources, types and management highlighting further economic and environmental opportunities; and
- Measure the carbon impacts of waste to prioritise the recycling of resources which offer the greatest environmental and climate change outcomes.

Box 5: A Circular Economy in the Netherlands by 2050⁵³

This initiative was launched in September 2016 as a government-wide programme. It confirms the need for involvement of business and government working together, starting with a Cabinet-led National Raw Materials Agreement with the business community signed by 180 signatories in January 2017. This programme establishes as its first “ambitious but achievable” milestone: using 50 per cent less raw materials by 2030. It also includes plans for the government to draw up “transition agendas” for five highest priority chains or sectors: biomass, food, plastics, manufacturing, construction and consumer goods. The Netherlands has other related initiatives that support green growth such as Green Deals, including its Green Deal on Zero Waste Festivals which involves a deposit system for reusable cups and composting waste.

- **China** put into force the [Circular Economy Promotion Law](#) of the People’s Republic of China⁵⁴ in 2009, to facilitate the circular economy, raise the resources utilization rate, protect and improve the environment, and realize sustained development. The law outlines not only a basic administration system, but also recycling and resource recovery requirements, as well as incentive measures such as tax preferences for industrial activities conducive to promoting the circular economy, investments and pricing policies prioritizing resource conservation, and government procurement. China also has a number of circular economy-related pilot projects, including reconstructing circulation in industrial parks, urban mining, and processing household waste in cement kilns. It has also taken action on preventing the import of poor quality recyclable materials and, in December 2017, imposed strict restrictions on plastic waste imports.
- **Japan** has put into force several pieces of legislation over recent years which support recycling, including the [Law for the Promotion of Effective Utilization of Resources \(2000\)](#)⁵⁵ and then the [Fundamental Plan for Establishing a Sound Material-Cycle Society \(2013\)](#).⁵⁶ The latter provides a framework and clarifies processes (including roles and responsibilities) for reforming the society’s lifestyles based on mass production, consumption and disposal. Its legislative system establishes a general scheme with laws focused on waste management and effective utilization of resources (including extended producer responsibility), as well as legislations focused on specific products - containers and packaging, home appliances, food, construction materials and vehicles – and procurement.

5. LEADING THE CIRCULAR ECONOMY: CANADIAN INITIATIVES

Canadian discussion on the circular economy has been overshadowed by a national emphasis on climate change and clean growth,^{*} but pockets of circular economy research, collaborative activity, and public policy initiatives have been emerging. Despite this, Canada has yet to see the type of integrated, comprehensive circular economy strategies and collaboration that have been critical to acceleration of in circular economy in numerous other countries.

Canadian Partnerships and Initiatives

Canada has a small number of circular initiatives led by civil society and/or business groups, although these are less mature than many at the international level. Prominent among these are:

- **The Natural Step Canada's** *Circular Economy Lab* was launched in 2016 (see Box 6) and is preparing to launch its next phase focused on the development of a national circular economy strategy for Canada.
- The **National Zero Waste Council**, founded in 2013, brings together governments, businesses and non-government organizations to advance waste prevention in Canada, and is highly engaged in promoting a circular economy in Canada. It has strong leadership from local government, including Canada's six largest metropolitan regions. In addition to a group working on encouraging the broad adoption of the circular economy and publication of a *Circular Economy Business Toolkit* in 2016,⁵⁷ it has established working groups on food, product design and packaging, and construction, renovation, and demolition.
- **The Conference Board of Canada** published "*Business Transformation and the Circular Economy*" in 2017,⁵⁸ which outlines case studies of successful companies, such as Dell, Dupont and Phillips, to examine how business can transform their models to capture value and minimize risk in a circular economy.
- In June 2017, **IKEA Canada** announced a *partnership* with Setsuné Indigenous Fashion Incubator – a Toronto-based social enterprise—to create a handmade limited edition collection called ÅTERSTÄLLA, made entirely from salvaged IKEA textiles that have been upcycled.^{**59}
- **Unilever's** 2010 *Sustainable Living Plan*⁶⁰ is its global blueprint with three main goals: to help more than a billion people improve their health and well-being by 2020, to halve the environmental footprint of its products across the value chain by 2030, and to enhance the livelihoods of millions of people by 2020. Under this Plan, Unilever Canada is accelerating its efforts toward the circular economy – particularly in waste and packaging, where it has reduced its total footprint per customer by 28 per cent since 2010 (with a goal of 50 per cent by 2020) and reduced plastic components of bottles by up to 15 per cent (with an overall commitment to design fully reusable, recyclable or compostable plastic packaging by 2025).

Canada has yet to see the type of integrated, comprehensive circular economy strategies and collaboration that have been critical to acceleration of circular economy in numerous other countries.

* As evidenced by the 2016 Pan-Canadian Framework on Clean Growth and Climate Change, arguably the most ambitious federal-provincial-territorial sustainability agreement ever.

** Upcycled: reuse of materials in such a way as to create a higher value or quality than the original.

- **Celestica** is a Canadian multinational electronics manufacturing services company, which has been named twice to the Global 100 Most Sustainable Corporations in the World (Global 100) Index and four years running as one of Canada's Best 50 Corporate Citizens. It is one of the top overall sustainability performers in its sector, including a waste diversion rate in 2016 of 90.8 per cent – approaching its aspirational goal of 100 per cent diversion by 2020.⁶¹

Box 6: Canada's Circular Economy Lab (CEL)

Launched by The Natural Step Canada in 2016, the *Circular Economy Lab (CEL)*'s mission is to accelerate the transition to a low-carbon, circular economy in Canada. It brings together public and private sector leaders from different sectors and value chains to co-develop and implement circular economy solutions, ultimately to eliminate waste, improve productivity, reduce greenhouse gas emissions and foster value-creation and innovation. CEL works collaboratively with its partners to:

- Define the circular economy opportunity: help governments and businesses understand the opportunities, barriers and strategies for advancing the circular economy within their organizations, their value chains and the province as a whole.
- Accelerate promising ideas: work with its partners to identify, incubate and scale circular economy initiatives, including:
 - Strategic, collaborative initiatives to address systemic barriers that individual organizations can't tackle alone
 - "Innovation moonshots" with the potential to transform the economy,
 - New or improved circular products, services, policies, business models and strategies.
- Build momentum for change: increase circular economy awareness, understanding and commitment through strategic research, communications, education and engagement activities for stakeholders across Canada's economy.

A small number of Canadians are conducting research on varied aspects of the circular economy. For example,

- In February 2017, **Policy Horizons Canada** published "What if... the Internet of Things (IoT) facilitated the development of a Circular Economy?" as part of their Insights series.⁶² Featuring Ellen MacArthur Foundation's RESOLVE Framework, the article outlines examples of Canadian businesses at the forefront of this shift (such as Hewlett Packard) and the implications, positive and negative, of the IoT.
- **L'Institut d'environnement, du développement durable et de l'économie circulaire (EDDEC)**, founded in 2014 by three Montreal universities, convenes stakeholders, specialists, researchers and students to shape a CE implementation model in the province of Québec. The EDDEC has led the development of a provincial roadmap, as well as various strategic projects, toolboxes and training.
- Queen's University's Dr Warren Mabee work on advanced biofuels – as part of **BioFuelNet**, aiming to produce wood or cellulose-based ethanol – includes a pilot project with Nipissing University exploring uses for forest waste, as well as moving away from current forestry practices to more managed approaches on smaller pieces of land. **Other research** explores potential environmental impacts of repurposing wood materials for use in several products over their lifetimes.⁶³

- The University of Victoria’s new **Department of Civil Engineering**, opened in 2013, trains students in green buildings, sustainable cities, industrial ecology and water resources. Its research includes a stream on industrial ecology: the study of energy and material flows in industrial society and of opportunities for resource recovery from waste streams.
- Dr Calvin Lakhan of York University is co-investigator of the **‘Waste Wiki’** project devoted to advancing the understanding of waste management research and policy in Canada. These include evaluating the efficacy of municipal policy instruments used to promote waste diversion, and optimizing the recycling system to achieve increased diversion while minimizing material management costs.

Canadian Government Strategies and Programs

Canadian governments’ emphases have been on extended producer responsibility (EPR) programs, an approach on which Canada is an international leader. Broader circular economy strategies have just begun to be introduced by selected provinces and local governments. Examples of Canadian government programmes and strategies include:

- **Extended Producer Responsibility** for specific materials has existed in Canada since the 1990s. British Columbia first introduced EPR for a paint program (1994) and Western Canada for used oil and containers (1996).⁶⁴ There are over 120 EPR programs currently operating in Canada for a wide array of products including electronics, paint, tires, batteries, pesticide containers and pharmaceuticals: British Columbia initiated a 100 per cent EPR program for printed paper and packaging in 2014, Quebec’s blue box program is 100 per cent EPR funded but still operated by municipalities, and EPR is at the heart of Ontario’s 2017 circular economy strategy (see Box 7).
- The **Canadian Council for Ministers of the Environment** (CCME) released a Canada-Wide – federal, provincial and territorial - **Action Plan for EPR** in 2009,⁶⁵ mandating coordinated and harmonized EPR action on priority products over two phases:
 - Phase 1 (by 2015): printed paper and packaging (priority area), mercury containing lamps, electronics; household hazardous and special waste, and automotive products; and,
 - Phase 2 (by 2017): construction and demolition wastes, furniture, textiles, carpet, appliances, and ozone depleting substances.
- The 2017 **Strategy for a Waste-Free Ontario** (Box 7) is Canada’s first provincial circular economy strategy. It provides the blueprint for the province to close the resource loop and fight climate change by diverting organics from landfills and reducing landfilled materials that could otherwise be reused, recycled, composted and reintegrated into the economy. By moving to a circular, low-carbon economy, Ontario aims to seize the opportunity to be a leader in a global movement toward a more sustainable economic production model with significant economic, social and environmental benefits. The strategy addresses all sources of wastes and focuses attention not just on residential waste managed by municipalities but wastes generated by the industrial, commercial and institutional (ICI) sectors.



Wood materials can be repurposed for use in several products over their lifetimes.

Box 7: Strategy for a Waste-Free Ontario: Building the Circular Economy

The Strategy for a Waste-Free Ontario⁶⁶ includes 15 concrete actions to build up the province's circular economy and help reduce greenhouse gas emissions from landfills, such as:

- Transitioning existing waste diversion programs to new producer responsibility frameworks;
- Requiring producers to take full responsibility for the environmental and financial management of their products and packaging, for products including small appliances, electrical tools, batteries, fluorescent bulbs, mattresses, carpets, clothing and furniture;
- Implementing a framework to reduce the volume of food and organic waste going to landfill;
- Requiring industrial, commercial and institutional sectors to divert more of the waste they produce from landfills;
- Banning certain materials, such as food waste, beverage containers, corrugated cardboard and fluorescent bulbs and tubes, from disposal and driving creative strategies to reuse and recycle these items; and
- Improving oversight and accountability in the waste management sector, including by requiring producers to register and report on their waste management activities.⁶⁷

- The **City of Vancouver** has a 2020 goal to reduce solid waste going to landfill by 50 per cent from 2008 with textile waste being one focus of attention. Textile waste is estimated to be a large and fast growing waste stream in many countries, including Canada.⁶⁸ Under research conducted by the Vancouver Economic Commission, seven influential Vancouver businesses came together in 2015 to help define the context, barriers and local policy needs for stimulating the shift to a circular economy in the city's fashion and textiles sector. They found that businesses are striving to reduce waste and interested in moving toward circularity, but the drivers to move toward circular economy business models are not strong enough and government can play a vital role in providing policy levers and incentives for change. Textiles-related recommendations included: implementing extended producer responsibility, implementing a waste disposal ban, encouraging research and development for recycling, managing or facilitating collection programs, providing or encouraging uptake of recycling infrastructure, building education and awareness, implementing pilot take-back programs, education around full lifecycle impacts, providing financial incentives and green credits for waste reduction, enabling local manufacturing and encouraging regional material loops.

6. ACCELERATING THE CANADIAN CIRCULAR ECONOMY: THE ROLE FOR GOVERNMENTS AND POLICY

Despite all the benefits of and drivers for the uptake and diffusion of the circular economy - and notwithstanding Canada's long-standing leadership on the Extended Producer Responsibility and blue box programs and Ontario's leadership with its Strategy for a Waste Free Ontario – a comprehensive and integrated strategy and framework to support the circular economy is lacking in Canada. Significant obstacles to circular economy solutions exist. Business and civil society have a key role in tackling these, and indeed, many of the circular economy-related initiatives that are underway in Canada stem from the efforts of these sectors. Policymakers however retain a critical role in setting the enabling conditions for a circular economy through market signals, regulations and targets, market stimulation, and supportive facilitation functions.

This section explores barriers to the circular economy, the toolkit of public policies to accelerate the circular economy, and knowledge gaps for smart Canadian policy design. It concludes with a discussion of the implications for Canadian policymakers of the gap between global and Canadian interest in the circular economy, and proposes a 'Top 6' list of tools for accelerating the circular economy in Canada.

Barriers and Challenges

Recent work by Canada's Circular Economy Lab identified many barriers and challenges faced by Canadian firms looking to adopt, accelerated development, and further scale-up circular economy solutions in Canada.⁶⁹ For example:

- **Design:** Practices such as programmed obsolescence in some industries, competing design priorities for primary versus secondary waste diversion functions, and an absence of end-of-life feedback loops for producers in many sectors. Canada has limited influence on many of these issues, which can only be resolved in the global marketplace;
- **Reliability of materials:** Volatile markets for recycled materials and increased probability of cross-contamination leading to damaged products;
- **End markets:** Lack of viable end markets for circular economy-based products, including some waste products having little to no economic value. Producer responsibility can play a big role in growing markets for recycled materials and circular economy-based products;

Important barriers fall under the control of local, provincial, and federal governments, and supply chain and lifecycle innovation can only be realized by breaking through them.

- **Supply-chain coordination:** Diverse and sometimes conflicting interests of actors throughout the product lifecycle and supply chain, making the coordination required for circular economy models challenging. This is made more difficult in the absence of matchmaking services across businesses to facilitate market interaction between upstream and downstream actors;
- **Standards:** Lack of standards – for example, for end of life criteria regarding the processing and sales of diverted materials, or to encourage upcycling rather than downcycling;*
- **Need for policy coordination between markets:** The limited influence of local or regional CE policies and priorities beyond Canada, along with international sourcing and procurement practices which still tend to prioritize raw materials, pointing to the need for global policy collaboration and coordination;
- **Awareness and compliance:** A general lack of awareness of and experience with circular economy issues leading to lack of compliance – for example, with users placing contaminants in collection systems; and
- **Data and measurements:** Insufficient and sometimes inappropriate data and measurements to support the transition to a circular economy.

Overcoming these barriers will require business and government partnerships and collaborations, of the types described in sections 4 and 5 of this report. However other important barriers fall under the control of local, provincial, and federal governments, and supply chain and lifecycle innovation can only be realized by breaking through them. These barriers include:

- **Regulatory frameworks:** Current waste management regulations, including overly modest requirements for recycling and diversion, foster inefficiencies, fail to encourage downstream solutions, and have unintended consequences. For example, shared producer responsibility schemes active in some provinces –dividing responsibility for managing recyclable materials between municipalities and industry stewardship organizations--can prevent industry from contracting out to its choice of recycling facilities, discouraging economies of scale. Or, certain definitions of waste hinder trade and transport of product for remanufacturing. In Ontario, the Waste-Free Ontario Act, while not perfect, is a significant effort to advance these reforms.

*Upcycle: reuse of materials in such a way as to create a higher value or quality than the original; downcycle: reuse of materials into new materials or products of lesser quality and reduced functionality.

- **Low cost disposal:** Landfill is still far too cheap in most of Canada and this provides little incentive to reduce, reuse, and recycle, for example in the construction, renovation and demolition sector which is estimated to generate as much as a third of municipal solid waste streams. While regulatory approaches such as mandatory source separation and disposal bans are important tools to drive circular economy innovation, disposal charges are also key tools to stimulate designing with end-of-life in mind; designing for disassembly (modularity), and enhancing reuse. Manitoba⁷⁰ and Quebec⁷¹ also use a landfill disposal levy to fund municipal recycling and provincial waste management programs.
- **A tilted playing field:** Recycled and reused materials face a playing field tilted towards waste disposal and virgin materials. Waste disposal is indirectly subsidized through low disposal fees. The production of many virgin materials benefit from income tax treatments not available to recycled and reused materials. For example, mining companies across most of Canada receive preferred tax treatment for exploration, development, and processing investments.⁷² And the additional water and energy (and the GHGs they produce) used to create products from virgin materials are not always fully priced.
- **Price failures with the recycling sector:** Payments per tonne for waste materials, regardless of contamination, create financial barriers and material sourcing barriers to the circular economy.
- **Financing and investments:** Circular economy business models, production methods, and products are non-traditional and unfamiliar to investors, banks, and funding agencies. Finding early-stage financing, incentives or investments to support innovative circular economy initiatives can be challenging, especially for small-to-medium sized enterprises.

Enabling Public Policies

While the circular economy has gained some attention and relevance in Canada, legislators in a number of other countries, particularly in Europe, are much further ahead in terms of thinking about circular systems and implementing enabling public policies.⁷³

A range of regulatory, market-based, and informational policy tools support the high-level international strategies described in section 4; Table 2 provides a sampling of these. Many governments have implemented some of these absent a comprehensive circular economy strategy.

Table 2: Regulatory, Market-based, Market Stimulation, and Facilitation Policy Tools To Support the Circular Economy –Examples

Tool	Brief description	Jurisdiction-specific examples
Regulatory		
Extended Producer Responsibility (EPR)	The producer’s responsibility - financial and/or physical - for a product is extended to the post-consumer stage of a product’s lifecycle. Regulations usually identify designated producers or first importers, the products covered, performance measures, reporting, and targets.	<p>German Packaging Protocol⁷⁴ – the first regulated EPR program in 1991 - widely mirrored since under EU Directives for packaging, electronics, and end of life vehicles.</p> <p>Canada’s 2009 CCME Canada-Wide Action Plan for EPR⁷⁵ – over 120 operating and industry funded programs for a wide range of materials including packaging, electronics, paint, batteries, tires.</p>
Other regulations	Legislations to support the circular economy, by providing frameworks, clarifying processes (roles and responsibilities), and/or focusing on specific products (e.g. packaging, appliances) and procurement.	Japan’s Law for the Promotion of Effective Utilization of Resources ⁷⁶ (1991) and Fundamental Plan for Establishing a Sound Material-Cycle Society ⁷⁷ (2013).
Market-based		
Tax incentives / environmental pricing reform	<p>Value Extracted Tax (VET) used to decrease labour (payroll and personal income) taxes while increasing taxation of natural resource use, pollution and consumption (i.e. carbon emissions, water, fossil fuels, electricity).</p> <p>Value Added Tax (VAT) breaks on repairs to everything from bicycles, clothes and shoes to household appliances, in the form of a reduced VAT rate applied or claiming back from income tax of partial labour costs.</p>	<p>European-based Ex’tax Project proposals.⁷⁸</p> <p>Swedish government targeted VAT reduction 2017.⁷⁹</p>
Subsidy removal	Removing any subsidies that do not support the circular economy.	Netherlands’ 2050 Strategy ⁸⁰ (see Box 5).
Market Stimulation		
Circular cities or cities as innovation hubs	Knowledge exchanges or strategies for pioneering cities to explore how to approach circular economy implementation within complex and fast-growing urban systems, share challenges and showcase success stories. ⁸¹	City of Amsterdam’s circular economy strategy.
Investment	Government funding directed at accelerating the circular economy through – for example – waste reduction.	Scotland’s 2016 Circular Economy Strategy, ⁸² supported by over £70 million.
Public procurement	Partnerships focused on collaboration, capacity building and sharing of knowledge and experiences in public procurement as an enabler of the circular economy.	Denmark’s 2006 Partnership for Green Public Procurement. ⁸³
Ecolabels and certification	Often voluntary, but sometimes require (e.g. Energuide), guaranteeing that climate and related requirements are taken into account.	European Commission’s 2009 Ecodesign and Energy Labelling Framework. ⁸⁴ Nordic countries’ 1989 Swan Ecolabel. Canada’s Energuide.
Facilitation		
National road maps	Plans or strategies focused on enabling the circular economy, through tangible actions and pilot projects in areas of strength.	Finland’s 2017 “Leading the Cycle: Finnish Road Map to a Circular Economy 2016-2025” ⁸⁵ (see Box 3)

This European leadership provides helpful insights into approaches for building such broader circular economy strategies and frameworks. While specific European *policies* are not always relevant to a Canadian economic and legislative context, the *methodologies* they have used can be. One valuable resource is “[Delivering a Circular Economy: a Toolkit for Policymakers](#)”, developed by Denmark’s Environmental Protection Agency in cooperation with the Ellen MacArthur Foundation, the Danish Business Authority, McKinsey Center for Business and Environment and other international stakeholders.⁸⁶ Key insights from this project that are relevant to Canadian policymakers include:

- Sector-by-sector analyses can be valuable to address the variety of opportunity and challenges involved, usually requiring a combination of policy interventions.
- Broader changes to the existing fiscal system and the measurement of economic performance could help enable a system transition e.g. shifting incentives from resources to labour and complementing GDP metrics with measures of a country’s stock of assets.
- Industry involvement and cross-government department collaboration are crucial, and civil society stakeholders should be engaged.
- Regional-level policy interventions need to complement national policies, since value chains of many products extend across borders.

Table 3: Policy Tools for a Circular Economy

Regulatory
Extended Producer Responsibility
Other regulations such as disposal bans
Market-based
Tax incentives
Subsidies
Full cost pricing
Market Stimulation
Cities as key partners, in their roles as innovation hubs (providing opportunities for networking, collaboration, and localized co-creation of circular economy solutions)
Investment
Public procurement
Government programs and strategies – including innovation strategies
Ecolabels and certification
Reporting and accountability
Facilitation (through leadership or collaboration on multisector, often voluntary initiatives)
National economy-wide and sectoral circular economy road maps
Partnerships and collaboration at smaller, regional and mega-corporate levels
Research and development
Industry standards
Supply chain management
Outreach, education and awareness

Table 3 provides a list of the policy tools available to governments to address regulatory and market failures, stimulate markets, and work with multisector broader partnerships or collaboratives to create a supportive enabling environment for the development of circular economy solutions.

Box 8: Towards a Circular Economy Research Agenda

This brief has highlighted the ambition of the circular economy to decouple economic development from pollution, resource extraction and ecological degradation. But Canadian researchers and policymakers are just beginning to fully assess the economic and environmental impacts from a shift to a circular economy.

Policymakers and researchers will need to collaboratively investigate how the circular economy can advance Canada's clean growth agenda, as well as broader deep decarbonisation and sustainable development ambitions. Priority research questions include:

- To what extent does the circular economy contribute to deep decarbonisation and broader sustainability agendas? Is it a cost-effective contribution to these goals?*
- What are the economy-wide impacts of a shift to more circular economies on GDP, employment, and environmental quality (including GHG emissions)? Ideally, these impacts should be measured in terms of computable general equilibrium models or integrated assessment models.*
- What is the level of resource recovery that will balance social benefits and costs?*
- What are the respective strengths and weaknesses of setting waste diversion targets versus setting prices for waste collection, disposal and incineration, and subsidies for recycling?⁸⁷*
- Which material flows, practices and industries have the greatest potential for generating cost-effective environmental benefits in a circular economy? This question is particularly pressing, since previous research demonstrates that the benefits and costs of recycling vary drastically across different materials.⁸⁸*
- What are the challenges and opportunities facing Canada's natural resource sectors in a circular economy?*
- How should we measure progress in developing a circular and economy? Over and above measuring waste quantities and waste diversion, which other measures should be put in place (e.g. sectoral or activity-based accounts, similar to Statistics Canada's Clean Technology Satellite Account)?*

Knowledge Gaps for Smart Canadian Policy Design

In addition to the questions outlined in Box 2, about the employment and decent work impacts of the shift to the circular economy, many questions deserve to be explored as Canada considers the implications and opportunities of a circular economy. Box 8 lists some of these.

Implications for Canadian Policymakers

While early steps to explore and develop a circular economy are being taken in Canada, these efforts are fragmented, and fall far short of the concerted priority that civil society partnerships, private firms, and governments have placed on the circular economy in many other jurisdictions. Simply put, circular economy goals and ideas have low profile in Canada, and currently there is little public policy momentum for changing this, although the drivers and the value proposition for the circular economy (section 3) have relevance here. Why this disparity? Four possible reasons stand out: a lack of familiarity with the concept; the siloing of circular economy

efforts as primarily waste management strategies; Canada's identity as a resource-abundant nation, exempt from resource constraints; and the saturation of the national sustainability debate and agenda by the clean growth paradigm.

Unlike the European landscape, where well-resourced collaborative multistakeholder initiatives have popularized the concept of the circular economy and shaped a public constituency and an agenda for public policy reform, Canada has not had an organized or influential constituency for the circular economy. As a result, the concept remains largely unfamiliar, outside select circles. This has begun to change with the founding of the National Zero Waste Council in 2013, and the Circular Economy Lab in 2016.

The circular economy efforts of Canadian local, provincial, and federal governments have largely been pursued within a waste management mandate, specifically through extended producer responsibility programs regulated and overseen by environment ministries and waste management departments. Ministries and departments responsible for the other themes (supply-chain predictability, resource productivity, and business advantage) that are mobilizing interest and broad engagement in leading jurisdictions are not engaged. Elsewhere, leaders are increasingly approaching the circular economy as an integrated environmental, economic development, and innovation strategy, as reflected by the leadership roles of agencies such as the European Commission, Finland's Innovation Agency (SITRA), the Cabinet in the Netherlands, and bodies such as the World Business Council for Sustainable Development and the British Standards Institution. And, to give credit where due, a recent generation of Canadian efforts such as those of the Circular Economy Innovation Lab, National Zero Waste Council, the Conference Board of Canada, the Waste-Free Ontario Act and the City of Vancouver's Economic Commission— among others — have adopted similar framing.

Canada's abundant resources shape our identity as a resource-rich nation, and a model founded on concerns about resource limits might not be seen as being as relevant here, as in countries endowed with lesser resource wealth. But Canada cannot afford to tune out the shifts in international market expectations for economic and competitiveness reasons, as much as sustainability reasons. Canada imports many raw materials and goods, and exports manufactured goods and services as well as raw materials into markets which could, increasingly, be looking to minimize waste generation, reduce reliance on virgin materials, and turn to bold new technologies and strategies to virtualize consumption, optimize use of products and assets, and shift from non-renewable to renewable sources of energy and materials. Canadian firms risk losing market share, missing new growth opportunities, or falling behind the innovation curve as global competitors adopt disruptive new technologies and business strategies. And if, as forecast, supply-constraints lead to volatilities in the prices of non-renewable natural resources, enhanced recycling and material efficiency will allow Canada to capture greater value for these resources in the future.

A fourth reason could be the saturation of the national sustainability debate and agenda by the clean growth paradigm. The 2016 Pan-Canadian Framework on Clean Growth and Climate Change is arguably the most ambitious federal-provincial-territorial sustainability agreement ever, the result of exceptional multi-level political leadership after two decades of inconclusive efforts to build a Canadian climate policy. But the immediate priority on the clean growth agenda need not, indeed should not, exclude medium- and longer-term consideration of the circular economy. The circular economy encompasses clean growth, but strives for deeper carbon and resource efficiency gains by addressing the root causes of waste; confronts a broader range of environmental challenges by tackling potential natural resource limits; and

Leaders elsewhere are increasingly approaching the circular economy as an integrated environmental, economic development, and innovation strategy.

Accelerating the shift to a circular economy is in its infancy, and there is much to be learned and understood about how to apply these approaches to the Canadian economy, public policy context, labour force and communities.

looks beyond clean technologies to new business models and to digital, artificial intelligence, advanced life and material science, and other new technologies for radical, sometimes disruptive, innovations to ultimately decouple economic growth from pollution and the draw-down of natural resources. As such, it offers a potential final tranche of emission reductions critical to the climate file.

The 'Top 6': Tools for Accelerating the Circular Economy in Canada

Where to, then, if Canadian policy-makers want to change course and accelerate knowledge, action, and innovation on the circular economy? Considering the lessons learned from the preceding review of international initiatives, Canadian governments should focus first on the following 'Top 6' tools over the short- to medium-term. These complement industry and private sector action, which is equally needed to accelerate the circular economy in Canada.

1. EPR programs and policies, in particular targets and market-based instruments

While EPR in isolation is not sufficient to shift to a circular economy, it is a necessary element. EPR already exists in all provinces except Alberta but it is unclear whether it has driven the environmental improvements in products that help to support the circular economy, or whether the shared stewardship approach used in many provinces has been the best tool. There continue to be a number of challenges including the lack of harmonization of countrywide EPR approaches, launching new zero-waste strategies to reduce waste and increase diversion rates, and an overall alignment of EPR with other non-circular economy policies. An identification of needed supportive EPR programs and policies (targets, regulations, and economic incentives) should be on the agenda for the road map research and collaborative partnerships proposed below.

2. Green Procurement

Public procurement represents a significant expenditure: on average 13 per cent of GDP in OECD countries.⁸⁹ Governments have the opportunity to be leaders in green purchasing, by including a sustainable procurement component in strategic planning goals and documents – specifically program initiatives, implementation tasks and necessary department commitments. Such procurement policies could require governments to source individual products or services from suppliers dedicated to waste prevention objectives - incentivizing them to design with end of life in mind. Applying these same policies to larger, resource intensive projects could result in significant reductions in environmental footprints.

Green procurement in support of the circular economy has been considered in the Canadian context* and, at times, implemented. However, these practices often does not fully meet their objectives due to the challenges associated with purchasing departments still focused on lowest bids.

* The Recycling Council of Ontario, for example, held a knowledge session in 2017 entitled "Procurement: Advancing the Circular Economy through Buying Power", during which representatives of the City of Toronto, Region of Peel, Toronto District School Board and the University Health Network discussed how their organizations' procurement practices do and/or could contribute toward accelerating the circular economy.

3. Public investments in circular economy related research, development, innovation and pilots

Accelerating the shift to a circular economy is in its infancy, and there is much to be learned and understood about how to apply these approaches to the Canadian economy, public policy context, labour force and communities. While lessons can be learned from other jurisdictions, a Canadian lens is needed to identify our distinctive advantages, opportunities and threats, and Canadian capacity in these innovative approaches must be developed.

A public investment agenda for the circular economy could include, for example, funding research and development on 'circular' materials and product design; supporting design charrettes, co-creation workshops, and pilot projects to explore the potential for circular economy solutions; more comprehensive economic and environmental impact assessment (see Boxes 2 and 8); deriving marginal abatement cost curves for different materials/resources; material flow analysis for cities and sectors; the development of new indicators or metrics to measure how well companies and/or organizations are transitioning from linear to circular models (especially beyond the field of waste management); and exploring the implications of and potential applications for disruptive technologies within a Canadian-specific context.

4. Working with cities as innovation hubs

Cities have proved valuable partners in incubating circular economy experiments and start-ups due to their mandates for waste management and local economic development, their position on the front lines of providing services to swelling urban populations, and the clustering of entrepreneurs and innovators. Vancouver and Toronto are already involved in Ellen MacArthur Foundation's Circular Cities Network, a knowledge platform for pioneering cities that are embedding the circular economy into their urban operations; and Canada's six largest metro-regions participate in the National Zero Waste Council. Canadian governments could support cities as innovation hubs for the circular economy innovations, and look to existing city initiatives, such as the one in Amsterdam, to learn what to share or replicate, and relevant analysis.

5. Partnerships with business and civil society

The circular economy, by its nature, depends on new partnerships across sectors, value chains, and supply chains, and on a systemic, collaborative coordinated transition of strategies, practices, programs and policies across private, public, and civil society. Canadian governments could partner with and collaborate in initiatives with business and civil society – at first to raise awareness, improve education, and share best practices, then in the medium-term to develop action plans, industry standards and guidelines, more local or sector-specific and/or procurement practices, strategies and policies. These would build on the many precedents and potential lessons learned from experiences to date in Europe and beyond, such as Ellen MacArthur Foundation's broader CE100 stakeholder platform or more sector-specific initiatives.

6. National and regional roadmaps for sector-based transitions

The Circular Economy Lab has confirmed a need for and broad interest in developing a national circular economy strategy for Canada – based initially on a first-of-its-kind national landscape report. International pioneers on circular economy strategies have started by identifying nationally strategic focus areas through which to explore the industries, actions, and policies required for systemic change. For example, Sitra’s Finnish Roadmap to a Circular Economy 2016-2025 focused on food systems, forest-based loops, technical loops, and transport and logistics.

REFERENCES

- 1 International Resource Panel (2011). *Decoupling: Natural Resource Use and Environmental Impacts from Economic Growth*, United Nations Environment Programme.
- 2 Lacy, P., Keeble, J., McNamara, R. (2014). *Circular Advantage: Innovative Business Models and Technologies to Create Value in a World Without Limits to Growth*, Accenture Strategy.
- 3 Steffen et al. 2015. *Planetary Boundaries: Guiding human development on a changing planet*. Science Vol. 347 no. 6223. DOI: 10.1126/science.1259855
- 4 Paul Ekins, University College London and UN Environment's International Resource Panel, quoted in International Institute for Sustainable Development (2017). *WCEF Bulletin: Summary of the World Circular Economy Forum 2017: 5-7 June 2017, June 9 2016 Vol. 208 No. 20*.
- 5 Lacy, P., Keeble, J., McNamara, R. (2014). op.cit.
- 6 Lacy, P. and Rutqvist, J. (2015). *Waste to Wealth: The Circular Economy Advantage*, Accenture Strategy.
- 7 The Circular Economy Lab (2017). *A Vision for the Future of Printed Paper and Packaging in Ontario*, The Natural Step Canada.
- 8 Ministry of the Environment and Climate Change (2017) *Strategy for a Waste-Free Ontario: Building the Circular Economy*, Queen's Printer for Ontario.
- 9 European Commission (2015). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Closing the Loop: An EU Action Plan for the Circular Economy, December 2, 2015*.
- 10 Lacy, P. and Rutqvist, J. (2015). op. cit.
- 11 Ellen MacArthur Foundation (2015). *Towards a Circular Economy: Business Rationale for an Accelerated Transition*, Ellen MacArthur Foundation.
- 12 Club of Rome (2016). *The Circular Economy and Benefits for Society*, Club of Rome.
- 13 Natural Resources Canada (2017). *New \$155-Million Clean Growth program Launched to Address Climate Change*. News Release, November 20, 2017, Natural Resources Canada.
- 14 Club of Rome (2016). op. cit.
- 15 Lacy, P. and Rutqvist, J. (2015). op. cit.
- 16 International Institute for Sustainable Development (2017). op. cit.
- 17 Lacy, P. and Rutqvist, J. (2015). op. cit.
- 18 ING Bank Economics Department, (2017). *Less is More: Circular Economy Solutions to Water Shortages*. ING and CE 100.
- 19 SITRA. *Worry-free lubrication for equipment*.
- 20 Elser, B. and Ulbrich, M. (2017). *Taking the European Chemical Industry into the Circular Economy: Executive Summary*, Accenture Strategy.
- 21 Ellen M MacArthur Foundation (2016). *Circular Economy in India: Rethinking Growth for Long-Term Prosperity – Summary of Findings*, Ellen MacArthur Foundation.
- 22 International Aluminium Institute (2009). *Global Aluminium Recycling: A Cornerstone of Sustainable Development*, International Aluminium Institute.
- 23 Kelleher, Maria, Christina Seidel, and Ralph Torrie (2015). *Greenhouse Gas Emissions and the Ontario Waste Management Industry*. Ontario Waste Management Association. Similarly, other studies have estimated that Ontario's blue box program reduces GHG emissions by approximately 1.8 Mt CO₂ equivalents per year. See Lakhan, Calvin, (2016). *Optimizing emissions targets for residential recycling programmes: Why 'more' is not necessarily better with respect to diversion*. *Waste Management & Research: 1-9*.
- 24 GHD (2016). *Cap-and-Trade Research for Ontario's Waste Management Sector*. Ontario Waste Management Association.
- 25 National Zero Waste Council (2016). *Reducing Food Waste and Cutting Canada's Carbon Emissions: Policies for Reaping the Environmental, Economic and Social Benefits*, National Zero Waste Council.
- 26 United Nations General Assembly (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*, United Nations General Assembly, September 25 2015.
- 27 First Ministers of Canada (2016) *Pan-Canadian Framework on Clean Growth and Climate Change*, Government of Canada.
- 28 Lacy, P. and Rutqvist, J. (2015). op. cit.
- 29 Ellen MacArthur Foundation (2017). *Achieving Growth Within: A € 320-Billion Circular Economy Investment Opportunity Available to Europe up to 2025 – Executive Summary*, Ellen MacArthur Foundation.
- 30 Schulze, Gunther (2016). *Short Assessment of the Report "Growth Within: A Circular Economy Vision for a Competitive Europe."*
- 31 Gill, V. and Knowles, J. (2014). *Opportunities for Ontario's Waste: Economic Impacts of Waste Diversion in North America*, The Conference Board of Canada May 28, 2014.

- 32 Ibid.
- 33 Club of Rome (2016). op. cit.
- 35 Lacy, P. and Rutqvist, J. (2015). op. cit.
- 36 World Economic Forum, Ellen MacArthur Foundation, and McKinsey & Company (2014). **Towards the Circular Economy: Accelerating the scale up of across global supply chains.** *World Economic Forum*; and World Business Council for Sustainable Development (2017). **Circular Economy and Environmental Priorities for Business,** *World Business Council for Sustainable Development*.
- 37 World Business Council for Sustainable Development (2017). **CEO Guide to the Circular Economy,** *World Business Council for Sustainable Development*.
- 38 Rantaniemi, M. (2017). **Circular Economy at Martela.**
- 39 Lacy, P., Keeble, J., McNamara, R. (2014). op. cit.; and International Institute for Sustainable Development (2017). op. cit.
- 40 Environment and Climate Change Canada (2017). **Technical Paper on the Federal Carbon Pricing Backstop,** *Government of Canada*.
- 41 <https://www.ellenmacarthurfoundation.org/ce100>
- 42 World Business Council for Sustainable Development (2017). op. cit.
- 43 Lacy, P., Keeble, J., McNamara, R. (2014). op. cit.
- 44 The British Standards Institution (2017). **BS 8001 2017: A New Standard for the Circular Economy,** *British Standards Institution*.
- 45 <http://www.bamb2020.eu>
- 46 <https://www.ellenmacarthurfoundation.org/programmes/systemic-initiatives/circular-fibres-initiative>
- 47 Miedzinski, Michal. 2016. **System Climate Innovation for a Transformative Impact.** Climate Innovation Insights Series 1.3: Accelerating the Evolution of Climate Innovation Clusters. *Climate-KIC*; Antonucci, Delphine and Mary Hanhoun. 2017. **INSPIR'ECO: Applying Circular Economy Principles to Industrial Parks.** Climate Innovation Insights Series 2.8: Accelerating the Transition to Sustainable Production Systems. *Climate-KIC*.
- 48 Sitra (2016). **Leading the Cycle: Finnish Roadmap to a Circular Economy 2016-2025,** *Sitra*.
- 49 European Commission (2015). op. cit.
- 50 Ibid.
- 51 European Commission (2018). **A European Strategy for Plastics in the Circular Economy.** *January 16 2018*.
- 52 The Scottish Government (2010). **Scotland's Zero Waste Plan,** *The Scottish Government*.
- 53 The Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs (2016). **A Circular Economy in the Netherlands by 2050,** *Government of the Netherlands*.
- 54 The Standing Committee of the National Peoples' Congress (2008). **Circular Economy Promotion Law of the Peoples' Republic of China,** *National Peoples' Congress of the Peoples' Republic of China*.
- 55 Ministry of the Environment Japan (2000). **Law for the Promotion of Effective Utilization of Resources,** *Government of Japan*.
- 56 Ministry of the Environment Japan (2013). **Fundamental Plan for Establishing a Sound Material-Cycle Society,** *Government of Japan*.
- 57 National Zero Waste Council (2016). **Circular Economy Business Toolkit,** *National Zero Waste Council*.
- 58 Singer, T. (2017). **Business Transformation and the Circular Economy: A Candid Look at Risks and Rewards,** *Conference Board of Canada*.
- 59 CBC News Toronto (2017). **Indigenous fashion incubator partners with Ikea to create salvaged collection,** *June 5 2017*.
- 60 Unilever (2010). **Unilever Sustainable Living Plan,** *Unilever*.
- 61 Celestica (2016). **Sustainability at Celestica,** *Celestica*.
- 62 Policy Horizons Canada (2017). **What if ... the Internet of Things facilitated the development of a circular economy?,** *Government of Canada*.
- 63 Mabee, Warren (2011). **Circular Economies and Canada's Forest Sector.** Presentation at Work in a Warming World Researchers' Workshop, *Toronto, Canada, 2011*.
- 64 Bury, D. (2013). **An Overview of Extended Producer Responsibility in Canada: What is it, and Where's it Going?,** *Presentation Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists, Yellowknife, NWT, April 17, 2013*.
- 65 Canadian Council of Ministers of the Environment (2009). op.cit.
- 66 Ministry of the Environment and Climate Change (2017). op. cit.
- 67 Recycling Council of Ontario (2017). **Government of Ontario Finalizes Strategy for a Waste-Free Ontario: Building the Circular Economy,** *Recycling Council of Ontario*.

- 68 Da Paoli, A. (2015). *Towards the Circular Economy: Identifying Local and Regional Government Policies for Developing a Circular Economy in the Fashion and Textiles Sector in Vancouver, Canada*, Vancouver Economic Commission.
- 69 The Circular Economy Lab (2017). op. cit.
- 70 Government of Manitoba. *Waste Reduction & Recycling Support..*
- 71 Développement durable, Environnement et Lutte contre les changements climatiques. *Redevances pour l'élimination de matières résiduelles. Gouvernement du Québec.*
- 72 Chen, Duanjie and Mintz, Jack (2013). *Repairing Canada's Mining-Tax System to be Less Distorting and Complex. SPP Research Papers Vol.6 Issue 18, University of Calgary School of Public Policy.*
- 73 Lorinc, J. (2016). *Circular economy on the rise, but Canada lags on repurposing waste, Globe and Mail, April 27, 2016 (updated June 5, 2017).*
- 74 <http://www.bmub.bund.de/en/topics/water-waste-soil/waste-management/types-of-waste-waste-flows/packaging-waste/>
- 75 Canadian Council of Ministers of the Environment (2009). *Canada-Wide Action Plan for Extended Producer Responsibility, Canadian Council of Ministers of the Environment.*
- 76 Ministry of the Environment Japan (2000). op.cit.
- 77 Ministry of the Environment Japan (2013). op.cit.
- 78 Groothuis, Femke (2016). *New Era. New plan. Europe. A fiscal strategy for an inclusive, circular economy. Utrecht: The Ex'tax Project.*
- 79 Margolis, J. (2017). *Sweden tries to curb buy-and-throw-away culture through tax breaks, PRI's The World, January 2, 2017;* and Orange, R. (2016). *Waste not want not: Sweden to give tax breaks for repairs, The Guardian, September 19, 2016.*
- 80 The Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs (2016). op. cit.
- 81 Ellen MacArthur Foundation (2017). *Cities in the Circular Economy: An Initial Exploration. Ellen MacArthur Foundation.*
- 82 The Scottish Government (2016). *Making Things Last – A Circular Economy Strategy for Scotland, The Scottish Government.*
- 83 Bech, L. and Sohn, I. (2015). *Best Practice in Regional SPP Networks: Partnership in Green Public Procurement, Denmark, European Commission.*
- 84 European Commission (2009). *Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products, European Commission.*
- 85 Sitra (2016). op. cit.
- 86 Ellen MacArthur Foundation (2015). *Delivering a Circular Economy: a Toolkit for Policymakers, Ellen MacArthur Foundation.*
- 87 Kinnaman, Thomas C., Takayoshi Shinkuma, Masashi Yamamoto. 2014. *The socially optimal recycling rate: Evidence from Japan. Journal of Environmental Economics and Management* 68: 54–70.
- 88 Ibid, and Lakhan, C. (2016). *Optimizing emissions targets for residential recycling programmes: Why 'more' is not necessarily better with respect to diversion. Waste Management & Research: 1-9;* and Lakhan, Calvin. (2016). *Calculating the Emissions Impacts of Waste Electronics Recycling in Ontario, Canada. C: Journal of Carbon Research* 2(11).
- 89 Organizational for Economic Cooperation and Development, (2015). *Government at a glance 2015, OECD Publishing, Paris.*

Policy Brief | JANUARY 2018

institute.smartprosperity.ca



**Smart Prosperity
Institute**

institute.smartprosperity.ca | info@smartprosperity.ca