

PERSPECTIVE

Circular Economy: A More Sensible Use of Resources

The circular economy (CE) is not a new sector of the economy or a parallel economy. Briefly, it is another way to meet the population's needs and reduce waste. It constitutes a break with current approaches. The CE is forcing a change in how we design, produce, consume and dispose of products once their useful life is over. It is an additional tool for taking another look at how resources are used, resources that, at the current pace, could be exhausted fairly soon. The CE requires communication, networking and sharing. It demands a realignment between the sources of supply, product design, product production, consumption and disposal. If no action is taken, severe commodity shortages could compromise economic growth and population well-being. In this context, every effort must be deployed to avoid these problems. The CE is one of the solutions.

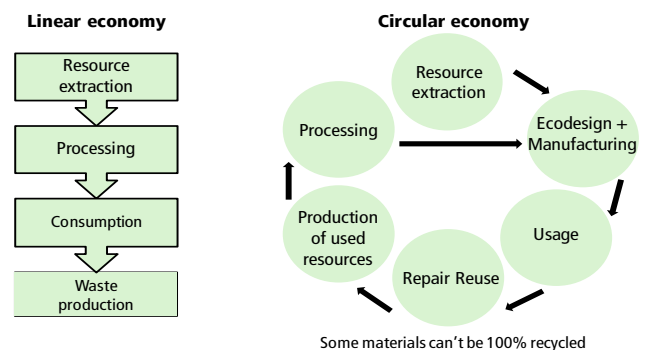
A Definition

There is no unanimous definition of the circular economy. However, some definitions are more inclusive than others. In this analysis, the definition of the [Pôle québécois de concertation sur l'économie circulaire](#) will be used. The circular economy is a "system of production, exchange and consumption that is designed to optimize use of resources at every stage in the life cycle of a good or a service, in circular fashion, while reducing its environmental footprint and contributing to the well-being of individuals and communities."

The definition contains a daring program of work and extraordinary exercise in collaboration. This is why. Implicit in it is the idea that we must change how we produce goods and services while using fewer resources. It also aims for greater utilization of products, a longer lifespan for the products and their components, and reuse of the materials in them once the products are no longer in use. This includes all types of resources and goods, from current consumption goods (such as food, food containers, computers, phones, furniture, motor vehicles, plants, etc.), goods required for manufacturing (tools, materials, machinery, reuse of industrial waste, etc.), or goods that meet other needs (homes, buildings, transportation structures, etc.).

Graph 1 compares the "linear" (more conventional) approach to the circular approach. The differences go well beyond recycling. It engages at the product and service design phase, as soon as resources must be used. In addition to reusing and recycling, it is matter of reducing consumption of resources throughout the process, from production to consumption. According to some organizations which promote the CE, it is a methodological

GRAPH 1
Linear and circular economies



Source: Drawn from various sources

revolution that involves everyone, in that we have to rethink product manufacturing, modify logistics chains as we now know them, and repair rather than replace. Some even include reconfiguring the current regulatory frameworks to accelerate the shift. This is a responsibility for consumers, manufacturers, service providers and lawmakers.

Why

The concept of the circular economy is not new. Some analysts¹ say the idea was raised at the end of the 19th (creating exchanges

¹ Gabrielle VAN DURME et collab., *Les limites et les pistes d'enrichissement du modèle : L'économie circulaire - Une transition incontournable*, Montreal, Presses de l'Université de Montréal, 2016, p. 149-174.

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NOTE TO READERS: The letters k, M and B are used in texts and tables to refer to thousands, millions and billions respectively.

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between businesses, among other things) or early 20th century. Others associate it with the concept of the closed economy, which had some adherents in the 1960s. However, the concept of the circular economy really started to take off as of the 1990s.

What are its benefits? According to [Recyc-Québec](#), it makes it possible to create wealth by valuing local materials while keeping them here, which promotes local employment and economies and encourages the development of strong businesses. It also “constitutes a lever for growth, represents a source of innovation, and proposes a sustainable solution.”

Beyond the benefits attributed to the circular economy, it is the sense of urgency about the planet’s eventual inability to sustain life and provide the required resources that is provoking reflection and action. Failing a more rational use of resources, which the CE proposes, the global economy will be faced with major shortages of raw materials. This will compromise growth and people’s well-being.

Table 1 illustrates the pressure currently being exerted using some consumption parameters. In 2017, Earth had 7.6 billion people; their material consumption was estimated at 11.3 tons per person. In addition, there were colossal energy needs that were still not fully met. At the end of this chain is waste production. That year, global production of solid municipal waste was estimated to be more than 2,000 million tonnes.

TABLE 1
Some dimensions of global consumption

	CONSUMPTION
World population	7.6 billion inhabitants
Material consumption	11.3 t/capital (global average)
Access to electricity	77.9% of the world population.
Energy consumption	13.1 t of oil equivalent/year
Consumption of renewable energy	25% of global energy consumption
Use in agriculture	30% of global use
Waste production	2,010 MT of solid municipal waste/year

t: tonne; MT: millions of tonnes
Sources: Platform for Accelerating the Circular Economy and Desjardins, Economic Studies

Table 2 makes it possible to measure the magnitude of current needs and provide an illustration. Paper consumption per capita is compared by continent for 2016. North America, a big paper producer, is well in the lead with 215 kg per capita, followed by Europe (also a big producer), with just over half, at 125 kg, and Oceania, at 113 kg. Asia and Latin America are well below the three leaders, with 44 and 43 kg respectively. Africa consumes the least, at 7 kg, about 30 times less than North America,

TABLE 2
Paper consumption per capita, per continent

IN 2016	IN KG/CAPITA
North America	215
Europe	125
Oceania	113
Asia	44
Latin America	43
Africa	7

Sources: Food and Agriculture Organization of the United Nations and Desjardins, Economic Studies

nearly 18 times less than Europe, and 16 times less than Oceania. However, if consumption growth in Asia, Latin America, Oceania and Africa were to head toward that of Europe and North America, the needs would be colossal; the question is whether they could be met.

Many organizations have tried to measure the pace at which natural resources are extracted based on the planet’s capacity to regenerate them. The finding is consistent: the current pace substantially exceeds the planet’s limits. It is estimated that, right now, it would take the equivalent of 1.6 Earths to sustainably support the pace of the global population’s consumption. The [Global Footprint Network](#) has developed a calculator that determines an “Earth Overshoot” date for each year. This measurement makes it possible to assess when the planet’s regeneration capacity has been exceeded for a year based on what has been extracted since the start of that year. In 1975, the date fell on December 1; it fell on July 29 in 2019. Since 1975, Earth Overshoot Day has been falling earlier and earlier in the calendar. 2020 is an exception: Overshoot Day fell three weeks later than in 2019 (August 22) because of the lockdowns required by COVID-19 and the accompanying global economic slowdown.

These observations lead to the following conclusion: the current situation is untenable. One of the most immediate consequences is, in particular, increasingly scarce resources. According to the [International Resource Panel](#), a platform launched by the United Nations Environment Program, extraction of primary materials was estimated to be 7 billion tonnes in 1970, and around 90 billion tonnes in 2017. It could reach 186 billion tonnes in 2050 if the current pace is maintained.

Clearly, there is a way to go to turn the linear economy into a circular economy. Between 2015 and 2017, according to the data reported in the [Circularity Gap Report 2020](#), the volume of resources extracted worldwide rose 9%, going from 84.4 billion to 92.0 billion tonnes.

The situation does not seem any better if we look at recent data. Examining the content of the resources used per year

to meet population needs shows that the percentage of recycled resources is very small. According to the Circularity Gap Report 2020, only 8.6% of the resources used come from recycled materials. The 2018 edition reported 9.1% circularity. It is easy to see why the call to action is increasingly insistent and that, here, the gaps are growing.

If we look at the other side of the coin, municipal waste, the picture of it in a World Bank report published in 2018² is quite unflattering for North America. Canada produced 1.94 kg of municipal waste per capita in 2016. United States produced 2.24 kg, whereas the average for the planet that year was assessed at 0.74 kg. It was estimated that 55% of North America’s dry waste could be recycled. However, this is not to say that the North American continent bears all the blame for waste, or how it is disposed of. A look at graph 2 shows that, in 2019, the export of plastic waste was not the sole prerogative of North America. Couldn’t this waste get a second life with the circular economy?

At the [Ellen MacArthur Foundation](#), a British organization founded in 2009 to promote the circular economy, they do not hesitate to say that the circular economy breaks with conventional production modes. It goes without saying that, in today’s competitive world, openness and the sharing of industrial processes is meeting with some reticence.

How

So far, we can see some progress around the world. Platforms and organizations have been created to set standards to guide deployment of the circular economy. Processes and protocols have been developed, and work has been done to bring firms together to create networks. These ties can be cross-border, particularly when it is a matter of creating partnerships and contemplating supply chains, although the idea is to privilege short loops.

The circular economy was the topic of a special debate at the 2019 Forum in Davos. Four priorities emerged from the discussions. The first was advancing leadership on the circular economy and, in this respect, recognizing and publicizing initiatives and successes. The second was to leverage the potential of the fourth industrial revolution. One factor is artificial intelligence, which could be used to drive the circular economy. The third was to develop circular value chains for metals. The fourth was to focus on collaboration, a major core premise of the circular economy.

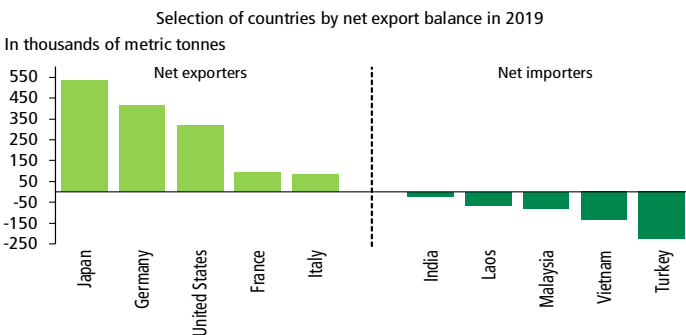
However, we must not lose sight of the fact that shifting to a circular economy could create winners and losers. A decrease in natural resource extraction could be viewed negatively by producer countries whose economy is mainly built on that activity. We can expect those who are losing something (market share, operating sites, jobs, suppliers, etc.) to put up some resistance. It will take more than technological means to make the transition. We will also have to work to reduce resource needs and on how we meet the resource needs of individuals.

The Circularity Gap Report 2020 team refers to three steps for closing the gap between the current use of resources and the planet’s ability to regenerate. Initially, global collaboration will be needed to collect and share data (for example, extraction, utilization, disposal after use, recycling, reuse, etc.). Secondly, global trends must be expressed in national policies: each country will have to take initiatives and create a plan. Lastly, a diversified, inclusive global coalition for action must be built.

From the perspective of product design and manufacturing, we must assume that such a transformation will require time and resources from businesses. Partners must be found to establish networks, conduct cost/benefit analyses, reorganize production, as well as the input and output flows of resources and products.

More concretely, the example of metals provides a good illustration of the diversity of strategies that can be used to

GRAPH 2
North America is not alone in exporting plastic waste



Sources: UN Comtrade Database, Statista and Desjardins, Economic Studies

Fundamental Principles

Concretely, the circular economy is based on ecosystem thinking in which the flows of merchandise, waste and all types of emissions (water vapour, water, scrap materials, etc.) are reorganized. In business, for example, we could imagine one company’s waste becoming another’s resources. Companies are asked to create closed circuits. To minimize the impacts on the environment, short, local loops are preferred. This approach requires changes in how we conceptualize products, industrial processes and waste management. It requires openness from the various actors in the loops created, and mutual confidence. It is easy to see that one challenge in this approach lies in sharing information.

² World Bank, [What a waste 2.0 : A Global Snapshot of Solid Waste Management to 2050](#), 2018, 295 p.

achieve better resource circularity. Among the 18 strategies common to metals and products containing metals identified by the Institut de l'environnement, du développement durable et de l'économie circulaire in a study released in 2016³ are the recycling of mine tailings, recovery of the metals available in urban settings and landfills, reuse, a sharing economy for parts and equipment needed in the event of breakdown for mines in the same territory or same company, 3D printing, product ecodesign (minimization of alloys and dispersive uses, development of durable, repairable and recyclable products), to name just a few.

The same study also identified about twenty circularity strategies specific to metal-containing products. These include the ecodesign of modular wires for reuse and recycling, marketing of small, repairable appliances, ecodesign for mobile phones for reuse, repair or reconditioning, buyback of these phones and selective dismantling, for example. The idea is to create loops that are as short as possible to foster the circulation of metals and increase their productivity. Some of these strategies are proven, others are being developed, and many are new. Clearly, there is no one answer, and it will take human ingenuity to develop means that are suited to the environments and materials they are for.

The Circular Economy Is Already at Work

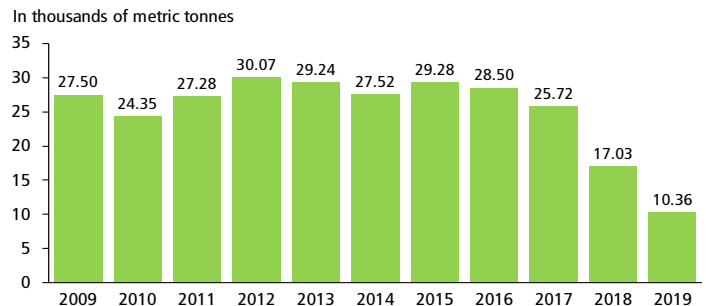
The circular economy is already rolling. Although there are organizations in Canada and Quebec that have been working to create networks for several years, some government departments promote it and even have dedicated headings on their websites, many countries are ahead in terms of what has begun here and throughout North America. There are initiatives around the world, but some countries in Europe, and China, seem to be leading the pack.

According to the Platform for Accelerating the Circular Economy (PACE),⁴ China has been working on this project for more than 15 years. The first steps involved managing waste. Here, the Middle Kingdom firmly signalled its intentions to the rest of the world in 2017, limiting imports of 24 categories of waste (including paper, plastic and textiles). The number rose to 32 in 2019. Unsorted paper was among them. The net volume of waste paper imported has dropped substantially over time (graph 3). Since then, Indonesia, Malaysia and Thailand have partially followed suit, going so far as to return containers of waste to the countries that shipped them. This makes the producers of the waste responsible for recycling and sorting it, and exerts additional pressure to apply CE principles to deal with it.

³ INSTITUT DE L'ENVIRONNEMENT, DU DÉVELOPPEMENT DURABLE ET DE L'ÉCONOMIE CIRCULAIRE, *Rapport de l'étape 2 : Synthèse des stratégies de circularité pour le cuivre, le fer et le lithium*, December 13, 2016, 66 p.

⁴ PACE is a platform for accelerating the circular economy. It was launched in 2018 by over 40 partners, including the World Economic Forum, the World Resources Institute and the United Nations Environment Program.

GRAPH 3
China's net waste paper import volume fell from 2009 to 2019



Sources: Statista and Desjardins, Economic Studies

China is also focusing its effort on ecodesign. It has also developed five-year plans and passed a law to promote the circular economy; life cycle analyses are being done at industrial parks. For its part, Europe has already adopted its second circular economy plan (April 2020). Concretely, partnerships have been created, such as the [Building as Material Banks \(BAMB 2020\)](#); it includes eight countries that want to think about a systemic change in construction by, for example, recovering the materials in existing buildings that are slated for demolition.

For its part, the Netherlands wants to become a 100% circular economy by 2050. Sweden, for example, has cut the value-added tax (VAT) by half on repairs of certain goods (refrigerators, washers, clothing, bicycles).

The circular economy is not just a matter for a country or businesses. Cities are also getting into it. Amsterdam, in the Netherlands, set up two CE programs in 2017, with a resulting 70 projects. The municipal administration garnered some lessons from these experiences, such as the need to include business people and to give everyone the same information, as well as the need for metrics.

In Canada, there is no shortage of initiatives. On the government side, information on the circular economy (definitions, explanations, links to platforms and projects, etc.) is easily accessible on the Ministère de l'environnement et des changements climatiques website. However, some⁵ criticize Canada's approach, noting that the focus on climate change has overshadowed efforts to advance the circular economy.

In 2019, the Canadian Council of Ministers of the Environment launched the [Canada-wide Strategy on Zero Plastic Waste](#). Toronto was to have hosted the World Circular Economy Forum

⁵ Stéphanie CAIRNS, Meg OGDEN, Scott FATRIDGE, « [Getting to a Circular Economy: A Primer for Canadian Policymakers](#) », Smart Prosperity Institute, Policy Brief, January 2018, 34 p.

in 2020; it has been postponed to September 2021. There are many initiatives by civil society and business people, including the National Zero Waste Council, which launched the [Circular Economy Business Toolkit](#) in 2016 and The Natural Step Canada Circular Economy Lab. Projects are emerging in food packaging. Food retailers are testing reusable packaging with their customers. COVID-19 has not made these experiments any easier but, once the public health situation has been resolved, these kinds of initiatives could proliferate.

Québec is also fertile ground for the circular economy. In addition to the information available and links on government websites, there is action in many spheres of the economy. Naturally, this includes Recyc-Québec, an organization that has been well known for years, [QuébecCirculaire](#), a platform that helps network interested parties, the [Pôle québécois de concertation sur l'économie circulaire](#), the [Centre de transfert technologique en écologie industrielle \(CTÉI\)](#), the [Institut EDDEC \(for the environment, sustainable development and the circular economy\)](#), to name just a few.

Business people are also in on it. Last fall, [Desjardins](#) committed \$2 million over five years in collaboration with the École de technologie supérieure; the goal is to introduce a set of pilot projects designed to accelerate the transition to the circular economy. The CSN's Fondation is also working on CE projects which are, among other things, intended to get Montreal going to counter the effects of the COVID 19 pandemic. In 2018, the Conseil du patronat published a [study](#) on the CE in collaboration with the Conseil Patronal de l'Environnement du Québec and Éco Entreprises Québec. Among other things, this rich study presented a literature review, concrete business cases, and an initial assessment of the Quebec economic sectors with a lot of potential. Sectors identified include agri-food, energy, construction, metal and electronic products, recyclable materials, textiles, metals, minerals and chemicals as well as agriculture and forestry.

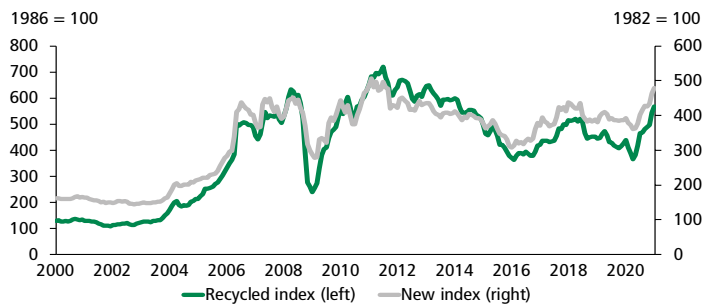
A Movement, Not a Tidal Wave

The movement has started, but is meeting with some scepticism for various reasons. As mentioned earlier, the changes introduced by this approach may antagonize those who will be hurt, or those for whom the changes will be radical (both businesses and countries).

Also, the materials recovered and sent to recycling are not problem-free. Problems include the quality of the materials. Contamination poses substantial difficulties: paper and plastic recycling and reuse, for example, can be compromised for this reason. Metal alloys can make the recovery process more complex, or make the recovery cost prohibitive and sometimes even harmful to the environment. Lastly, those who believe that disposing of resources that have already been extracted ensures stable prices and a stable supply will be disappointed. Price fluctuations for "tested" materials are part of the recycling and

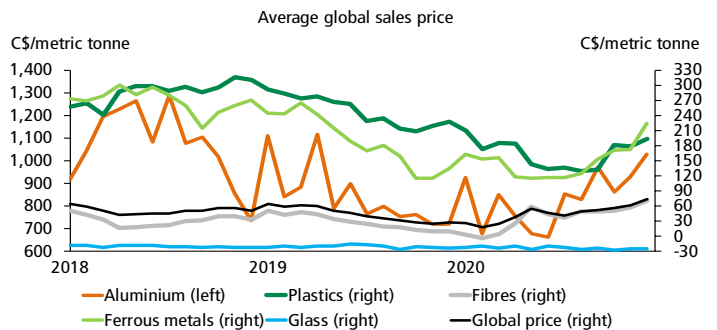
reuse dynamic, as graphs 4, 5 and 6 attest. These examples show that, for copper (graph 4), the price indexes for new and recycled copper fluctuated somewhat, in a coordinated way. Graph 5 illustrates the changes in average sale prices for various materials in Quebec from 2018 to 2020. Here again, there is some variability over time. The last example (graph 6) compares the

GRAPH 4
The recycled copper price index and new copper price index move comparably



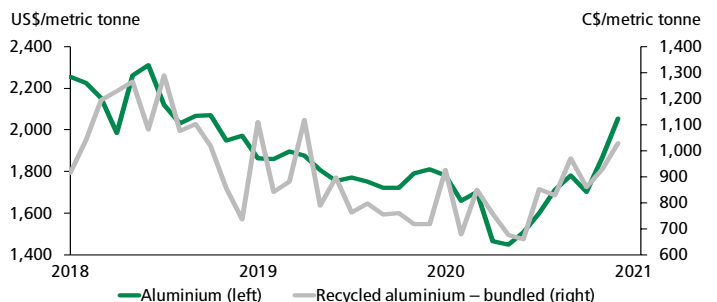
Sources: Datastream and Desjardins, Economic Studies

GRAPH 5
Quebec prices for recycled plastics, fibre, ferrous metals, aluminium and glass fluctuate a lot



Sources: Recyc-Québec and Desjardins, Economic Studies

GRAPH 6
The price of recycled aluminium (average Quebec sale price) follows the same trend as copper on the London Metal Exchange



Sources: Datastream, Recyc-Québec and Desjardins, Economic Studies

prices of recycled aluminium (average bundle price in Quebec) and new aluminium on the London Metal Exchange. Once again, it is clear that prices oscillate and, in this case, the price of recycled aluminium tracks the movement of new aluminium.

For some, the current waste of resources results from excess production. In this case, it has to be decreased, which means [halting growth or even considering economic contraction](#). The changes expected from the circular economy are not thought to be enough to save the planet: we need profound change for both individuals, and the societies they belong to. There are several limitations on what the CE proposes. For one thing, not all materials can be recycled indefinitely or perfectly. Extraction will still be required for some needs. Moreover, the productivity gains achieved could be recovered for other activities that would, in the end, result in greater use of other resources. This is called the “rebound effect.”

There are questions about the ability of technology to decrease the impact of the current lifestyle on the environment while material production and the population are both rising. This once again brings up the idea of contraction and the current modes of consumption. The collaborative economy, which tends to replace ownership of a good (purchase) with its use (leasing, rental), also has its limitations. The issue of the CE goes well beyond the framework of extraction, production and recovery.

However, contraction does not seem to be the solution to the current problems. So far, growth has made it possible to reduce extreme poverty and poverty in societies. Advances in this area have generally been the largest where growth is most rapid. Note that GDP is not a metric for well-being or progress (here, see [Is GDP the Only Way to Measure Economic Performance?](#)), but a rise in GDP per capita often comes with an increase in education level and drop in infant mortality, to only cite these examples. Promoting contraction could also result in leaving behind economies that are in the process of increasing their production capacity and improving living conditions. Does this mean we should not change how things are being done? Absolutely not. This is where the circular economy, supported by new technologies, really comes into its own.

This does not mean that we don't have to change how we consume. Here, the circular economy proposes to think about it and come up with answers. In addition to all these measures, we can send clear signals about the negative impacts of producing a given good or service. The real cost of owning and using a good could be better reflected in its price (taxes on carbon and gas are examples). Clearly, these are not popular measures.

Lastly, other observers believe that the circular economy is a [promising idea](#), in theory. However, it is incomplete: it omits achieving individual and collective well-being from the perspective of sustainable resource management. Some would like it to include social considerations, such as the quality of

jobs and equity in distributing gains. There is also debate over the respective places of the CE and sustainable development: does the CE replace sustainable development, or is it a means of achieving it? Discussion is ongoing.

It is About Time

Is the circular economy the solution to the current woes? Some are doubtful and would like us to go much further. However, the state of depletion of non-renewable resources and struggle of some ecosystems to regenerate are being challenged less and less. The current pace of exploitation and consumption is untenable, and it is accelerating. A growing number of industries will have to deal with an increasing scarcity of the materials they need for production. They will have to deal with increasingly high costs to get resources that are harder to extract. Given this outlook, the circular economy will become an increasing presence in industrial production modes. It is in everyone's interest to take part in this economic transformation. Governments have many tools: regulations, taxation, support for innovation, and more.

The circular economy may not be the only option, but it proposes a break with current methods. It forces us to think. It requires extensive communication, networking and sharing. It demands a realignment between the sources of supply, product design, production, consumption and disposal. Quebec and Canada are not leading the way. However, government authorities, businesses, research centres and business people have joined the movement, knowing that the CE offers thousands of different strategies depending on the resources used, markets served and needs to be met. If no action is taken, severe commodity shortages could compromise economic growth and population well-being. In this context, every effort must be deployed to avoid these problems. The CE is one of the solutions.

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