EXECUTIVE SUMMARY

# CIRCULAR ECONOMY IN QUEBEC

## ECONOMIC OPPORTUNITIES AND IMPACTS

MARCH 2018

Last update: August 15, 2018

CPQ S'ALLIER POUR LA PROSPÉRITÉ
cpeq Le développement durable en entreprise
eeq Éco Entreprises Québec

# Acknowledgments

This report reflects the outcome of a concerted approach undertaken by the Conseil du patronat du Quebec (CPQ), the Quebec Business Council on the Environment (CPEQ) and Éco Entreprises Québec (ÉEQ). The CPQ would like to thank both organizations for their vital collaboration and recognize their unparalleled commitment to implementing sustainable development to foster prosperity in Quebec.

***The CPQ would also like to thank Éco Entreprises Québec (ÉEQ) for its financial support throughout the process.***

Finally, the CPQ recognizes the excellent work of the research team of the Research Group on Globalization and Management of Technology (GMT) at Polytechnique Montréal and the Institut de l'environnement, du développement durable et de l'économie circulaire (I-EDDEC) at Université de Montréal:

**Sarah Teigeiro**, M.Eng., research assistant, Research group GMT

**Laurence Solar-Pelletier**, Ph.D., coordinator, Research group GMT

**Sophie Bernard**, Ph.D., professor, Research group GMT and fellow, CIRANO

**Marcelin Joanis**, Ph.D., professor and director, Research group GMT, Polytechnique Montréal and VP Research, CIRANO

**Daniel Normandin**, M.Sc., M.B.A., executive director, Institut EDDEC

In collaboration with **Yves Richelle**, CEO, Daméco

# PREAMBLE

*The Research Group on Globalization and Management of Technology (Polytechnique Montréal), in collaboration with the Institut de l'environnement, du développement durable et de l'économie circulaire at Université de Montréal (I-EDDEC), conducted a study on circular economy in Quebec as part of a mandate from the Conseil du patronat du Québec, the Quebec Business Council on the Environment and Éco Entreprises Québec.*

*The objective was to carry out a scientific and grey literature review to identify the economic and environmental impacts of circular economy, as well as the barriers and legislative levers that could serve in the transition toward a circular economy. The elaboration of case studies focused on five organizations that are active in Quebec's circular economy. A preliminary study to determine the economic sectors with strong potential in Quebec was also performed.*

*This report therefore discusses the first large-scale study on circular economy in Quebec and constitutes the first step in a two-fold research project. This initial phase pinpoints the province's economic sectors with significant circularity potential. The second will make it possible to specify the results through macroeconomic studies.*

# SUMMARY

There is no doubt as to the negative impact that human activity exerts on the environment, and the international community has adopted a number of measures, such as the Paris Agreement, to minimize the medium-and long-term consequences. In Europe and Asia in particular, the concept of circular economy (CE) has become increasingly significant in view of this challenge. While calling for change to current business models, CE seeks greater efficiency in resource use and waste reduction. This report provides an analysis of relevant documentation and identifies the barriers and levers that could impact the transition toward a circular economy, whose potential benefits are also highlighted here. A number of sectors with significant potential in Quebec are brought to light, along with five case studies of organizations that already provide products and services within a circular economy.

This report adopts the following definition of *circular economy* set out by the *Pôle de concertation québécois sur l'économie circulaire*:

> ***A production, exchange and consumption system which optimizes the use of resources at all stages of the life cycle of a good or a service, in a circular logic, while reducing the environmental footprint and contributing to the well-being of individuals and communities [1].***

A range of strategies, mechanisms and tools may be adopted to develop a circular economy. They may be integrated in all production phases and are based on concepts such as the 3Rs: reduce, reuse, recycle.

A number of current tools and strategies may be coherently integrated into a CE from which five are presented here. The **functional economy** is based on selling performance or service rather than products themselves, often in economic sectors in which the products were previously available. The **sharing or collaborative economy** relies on new ways of organizing work and exchanges according to the principle of shared access to goods. It is generally driven by a digital platform that enables consumers and producers to have a direct contact and interchange their roles based on the products and services offered. **Remanufacturing, reconditioning and repair** are strategies that involve the restoration of products or product components that allow the product life extension. **Industrial symbiosis** brings together businesses in a same industrial area in which one organization's waste becomes another's input material. More widely known, **recycling** includes a series of operations to process recovered recyclable materials in an effort to reintroduce them into a new production cycle.

CE also integrates tools: material flow quantification and impact assessment methods and other means that are more focused on product development processes. In the first case, **input-output analysis** makes it possible to quantify the material flows on a given territory, while **life cycle assessment (LCA)** considers the environmental, social, cost and potential impact aspects of a product, service or process throughout its entire life cycle. In the second case, **ecodesign** accounts for environmental aspects as early as the product design phase and aims to reduce the negative impacts during the product's life cycle. Finally, **reverse logistics (reverse supply chain)** seeks to manage and optimize the flows from consumers to intermediates throughout the value chain back to the manufacturer.

## POTENTIAL IMPACTS

The potential impacts of a CE remain relatively unknown. The vast majority of the studies that were reviewed highlight the potential economic and environmental benefits of CE.

The **environmental impacts** of CE include the reduction of the environmental impact generated by human activity. Studies on the topic have especially focused on greenhouse gas (GHG) reductions, specifically through waste management. Generally, they have shown that GHG emissions decrease by several percentage points according to the studied scenarios. The optimization of the use of primary and secondary resources may also reduce water, energy and fertilizer use and curb the need to extract raw materials.

**Economic impact** studies mainly tackle the impacts of CE on employment and economic activity. Most show that a CE can lead to GDP growth and job creation, which would compensate for losses in more traditional sectors. In addition, wasting fewer resources and adopting new consumption patterns could lead to savings for individuals and businesses.

However, while increased resource efficiency in a CE generates GDP growth, this growth can lead to a **rebound effect** which takes place when material efficiency gains are offset because they lead to greater consumption and environmental impacts.

## BARRIERS AND LEVERS : ROLE OF PUBLIC POLICIES

The policies and the economic tools may be aggregated into three broad categories: regulation, tax system and government support. An overview is provided in the following table.

## Regulation, tax system and other levers available to governments to foster CE

| | | | |
|---|---|---|---|
| **Regulation** | End-of-life regulations | Residual materials management | ▸ Using the life cycle approach<br>▸ Ban on landfill and incineration sites<br>▸ Ban on waste exports |
| | | Resource efficiency | ▸ Reuse and recycling<br>▸ Biodegradable materials processing<br>▸ Chemical fertilizer elimination/reduction<br>▸ Water management<br>▸ Extended producer responsibility (EPR) |
| | Environmental management | Industrial production | ▸ Process, product and service improvements |
| | | Hazardous substances | ▸ Reduction in use<br>▸ Increase in control |
| | | Renewable resources | ▸ Increase in renewable energy sources<br>▸ Energy efficiency |
| | Standards | Ecodesign | ▸ Setting minimum requirements |
| | | Labelling | ▸ Validation of product origin |
| | | Standards | ▸ Minimum quality guarantee |
| | Procurement policies | Public procurement | ▸ Purchasing by government authorities based on responsible or green procurement policies |
| **Tax system** | Tax measures | Residual materials management | ▸ Extended producer responsibility (EPR)<br>▸ Extended consumer responsibility<br>▸ Carbon market |
| | | Taxation | ▸ Landfill tax<br>▸ Ecotax (e.g. taxation of non-renewable resources) |
| **Government support** | Support and funding | Information | ▸ Determination of best practices<br>▸ Awareness building among stakeholders |
| | | Funding | ▸ Direct funding<br>▸ Support in the search for funding<br>▸ Research and development support<br>▸ Waste exchange |

Through **regulation**, the government directly influences the ways in which waste is managed. Above all, end of life disposal regulations aim to avoid the elimination of waste or create waste reduction at disposal sites. In some cases, regulations promote the ban or reuse of waste as a raw material. The policies implemented in the studied countries target specific activity sectors, the most common of which are construction, renovation and demolition waste and food waste, which all have significant recovery potential. Resource efficiency policies contribute to end of life efforts and essentially focus on reuse and recycling.

Environmental management involves a range of measures within industrial systems and processes. Industrial production legislation helps reduce the environmental impact of production. With regard to hazardous materials, Europe enacted the REACH regulations to better control the substances as early as the design stage. In an international effort to fight climate change, a number of countries are fostering the development of clean renewable energies, as well as energy efficiency.

Standards ensure quality and compliance and may be supported by governments. For instance, the European Union has adopted ecodesign guidelines. Labelling and standards help inform consumers and serve as communication and product differentiation tools. Finally, public public procurement require that certain purchases meet a series of environmental criteria, thus contributing to the implementation of the CE. Responsible procurement policies have been applied by the governments of Japan, Taiwan, South Korea, Malaysia and the United States.

In addition to regulation, governments may rely on certain **tax measures**, which, among other effects, introduce a cost to the externalities associated with resource development. With regard to waste management, the concept of extended producer responsibility (EPR) is based on the "polluter pays" principle and attributes the responsibility of the environmental impact of the end of life of products to the producers and sellers, while encouraging waste reduction. Incentive pricing systems (ex: Pay-as-you-throw [PAYT] schemes) make consumers more responsible through a charge on waste based on weight or volume. The carbon markets make it possible to negotiate and exchange GHG emissions trading. Taxation of waste sent to disposal sites is viewed as an incentive to reduce residues, recycle, reuse and recover, thus stimulate the development of new products and services.

Finally, government **support and funding** create a leverage effect, for example by informing target audiences about CE. By reducing the risks and reassuring investors with regard to the transition's viability, government support is the key to the success of the transition to a CE.

## OTHER BARRIERS AND LEVERS

Other barriers and levers that are independent of government policy may impact the transition to CE. They are technological, economic and social in nature.

**Technology** constitutes both a barrier and a lever to the implementation of a CE. There is a range of innovations, especially those pertaining to more sustainable product uses. Unfortunately, 100% recycling is not possible owing to the energy that is required and inherent costs. In addition, materials and energy flows extend beyond geographic borders and are likely to lead to problem displacement and problem shifting that are difficult to assess. In addition, the impact of some technologies is only observable in the long term.

From an **economic** perspective, current business models require changes and need to be reviewed. For example, the functional economy makes it possible to extend the service life of products but also brings a number of organizations to question their business models. For these businesses, managing the transition to CE may present significant challenges. The lack of information and capacity to make projections may constitute an obstacle to adequately assess the profitability of investments in the medium and long term timeframes. Finally, lock-in and path dependency phenomena may also constitute limitations since the market will not necessarily retain the best solution but rather the one that is best aligned with current infrastructures.

On the **social** level, mindset changes from all economic actors are necessary, from politicians to businesses and consumers.

## CIRCULAR ECONOMY IN QUEBEC

Quebec legislation includes certain practices that may be integrated into a CE. Even so, the government adopted the *Stratégie gouvernementale de développement durable 2015-2020* strategy, which incorporates the notion of CE and steers government bodies toward a green economy by identifying objectives for the fight against climate change.

A preliminary study of sectors with high circularity potential in Quebec highlights that among the most promising are agri-food and energy. Both sectors represent a high use value (production and consumption) of industries in terms of GDP. The metal production and construction sectors should also be considered. These preliminary findings are in alignment with the conclusions of CE impact studies particularly focused on industrial sectors.

A number of growing Quebec organizations are already active in the five CE strategies mentioned above. Among them, five organizations were chosen to be the focus of case studies. According to the stakeholders interviewed, the current trend is to reduce the environmental footprint through recycling, waste reduction and the sharing of goods. The transition is not necessarily simple and requires rethinking the supply of products and services.

## CONCLUSION

An increasing number of states are turning to a circular economy to mitigate the environmental impacts of human activity. To this end, the different government authorities have a range of legislative and fiscal tools available to enable and facilitate the transition, some of which are described in this report.

The transition to a circular economy does not imply a decline in economic activity. On the contrary, the studies identified demonstrate that in addition to reducing the environmental impacts, circular economy could potentially increase employment, lead to GDP growth and develop new markets. However, businesses must rethink their business models as well as their production methods. For example, Xerox and Michelin undertook the process by selling the usage or the performance of their products (functional economy) and keeping ownership over them in addition to selling them as proposed by traditional business models. Indeed, this transformation yields numerous business opportunities for organizations.

The work accomplished in this report has led to the recommendations listed below, which are focused on two key aspects: extend and deepen knowledge and support for the market and organizations.

### Extend and deepen knowledge

1. Circular economy is an emerging approach, and there is still a significant amount of basic and applied research that must be conducted to ensure that the transition generates the expected benefits as it takes place. For example, the European Union will dedicate one billion euros to circular economy research and innovation in 2018–2020 [97].

2. The sectors with high circularity potential in this study were essentially identified based on a review of international literature. The analysis should be further detailed by applying advanced methodologies described in this report. A better understanding of the characteristics that are specific to Quebec will facilitate the choice of priority strategies and sectors.

3. The potential economic impacts of a transition toward a circular economy described herein are also based on a review of international literature. Modeling for the Quebec context using specific data would be essential to better anticipate national impacts, for example in terms of GDP growth, job creation and greenhouse gas reduction.

### Support for the market and organizations

4. Because Quebec market stakeholders (businesses, contracting authorities, legislators, etc.) and society at large are predominantly unfamiliar with the concept of circular economy, a broad awareness campaign and targeted training programs would ensure their participation to ensure their participation in a transition to a circular economy.

5. The transition to a circular economy should include support and incentive programs, as well as appropriate taxation and favourable legislation to be fully carried out to help boost public and private investment. A number of initiatives implemented in Europe and Asia could inspire future circular economy actions undertaken in Quebec.

6. Circular economy has significant entrepreneurial potential, as it can contribute to gains in terms of productivity, efficiency and profitability and stimulate research for innovation. The application of circular economy concepts in business models and processes with a view to advancement should therefore be driven by the development of strategies, analytical tools and financial and regulatory solutions to identify high-potential material flows and determine new uses and market opportunities for them.

Conseil du patronat du Québec
1010, rue Sherbrooke Ouest, bureau 510
Montréal (Québec) H3A 2R7
Tel : 514.288.5161
1.877.288.5161
Fax : 514.288.5165

www.cpq.qc.ca

CPQ
S'ALLIER POUR LA **PROSPÉRITÉ**