



Report Overview

Waste Prevention: The Environmental and Economic Benefits for Canada

NATIONAL ZERO WASTE COUNCIL

MARCH 2021



The National Zero Waste Council, an initiative of Metro Vancouver, is leading Canada's transition to a circular economy by bringing together governments, businesses and NGOs to advance a waste prevention agenda that maximizes economic opportunities for the benefit of all Canadians.

Acknowledgements

Waste Prevention: The Environmental and Economic Benefits for Canada was completed for the National Zero Waste Council by Dillon Consulting and Oakdene Hollins.

External reviewers provided their expertise and insight into the Canadian economic sectors analyzed in the full report.

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Agriculture: Gordon Price (Dalhousie University);

Plastics: Mélanie St-Pierre (Cascades);

Retail: Philippe Cantin (Retail Council of Canada);

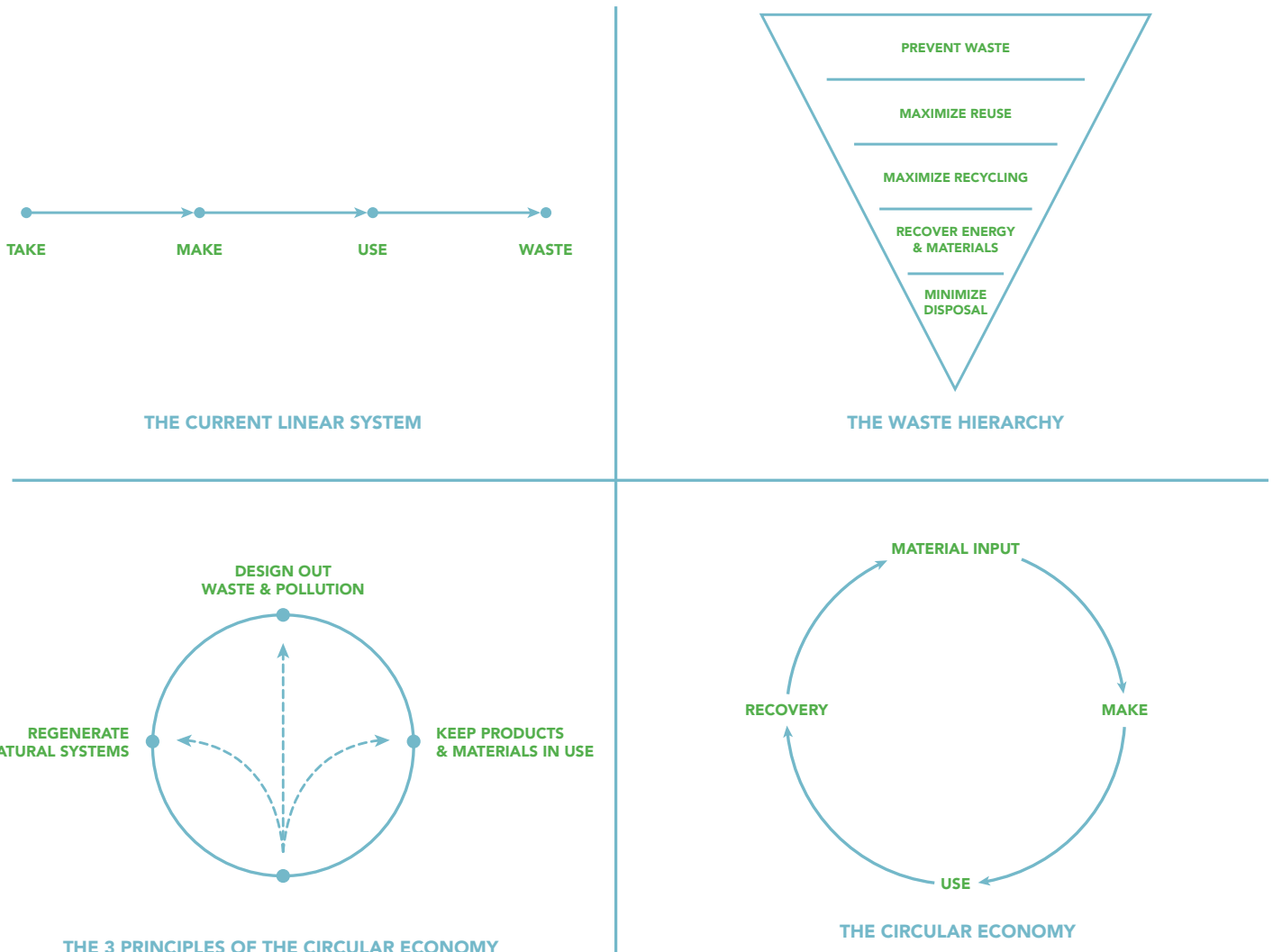
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Canada produces the most waste in the world on a per capita basis. This reflects the reality of a linear “take-make-use-waste” economy that allows valuable resources to end up in the landfill. This unsustainable system poses significant financial and environmental risks. Business as usual will no longer be accepted as companies realize these risks and are attracted to the benefits of a circular economy.

In a circular economy, manufacturers deliberately design out waste and pollution at the outset, keeping products and materials in continual cycles of use and reuse, and regenerate natural systems. It offers fresh opportunities for businesses and communities to thrive in a resource-constrained and carbon-neutral world. The circular economy is set to become the new standard for sustainable business.



These illustrations demonstrate the circular economy concepts described above.

WASTE PREVENTION

Waste prevention plays an integral role in the transition to a circular economy. However, the concept of waste prevention and its role in the circular economy is not well understood in Canada. To address this gap, the National Zero Waste Council commissioned a first-of-its-kind a report identifying fifteen waste prevention interventions for six important economic sectors in Canada and estimating the environmental and economic benefits resulting from these interventions.

The prevention of waste is taken here to include unused or underutilized materials and products, as well as solid waste, and the embedded material and energy included therein – that is generated along the supply chain, primarily as a result of poor or inefficient:

- design decisions;
- procurement and management of feedstock and materials;
- production and distribution processes; and
- end of life or end of use treatment.

The focus of *Waste Prevention: The Environmental and Economic Benefits for Canada* is on actions that prevent or reduce waste from being created in the first place. This report does not examine the potential positive impact of changing behaviour or levels of consumption.

METHODOLOGY

The six sectors included in this analysis of the value of waste prevention are:

- construction,
- manufacturing,
- healthcare,
- agriculture,
- plastics, and
- retail.

These sectors were chosen because they are both important in the Canadian economy and they generate large volumes of waste. In addition, the researchers could use available data to examine the opportunities for waste prevention.

Waste prevention interventions examined in this analysis fall into five broad categories:

- utilizing new technology;
- designing products for resale, reuse and repair;
- reducing the volume of input materials;
- capitalizing on goods-as-a-service business models; and
- finding new markets for unused outputs.

The waste prevention interventions and associated targeted waste for each sector are listed below.

Sector/Subsector	Intervention	Targeted Waste
Construction 	Adaptive Reuse	Construction materials
	Offsite Modular Construction	Construction materials
	Design for Disassembly	Construction materials
Manufacturing 	Furniture Remanufacturing	Furniture
	Facilitated Repair	Appliances
Healthcare 	Reprocessing of Single Use Devices/Purchasing of Durable and Reusable Devices	Single Use Medical Devices
	Servitization of Equipment	Medical and Other Equipment
Agriculture 	Tackling “Left In Field”	Food Crops
	Precision Agriculture Technologies	Food Crop Inputs
	Building Integrated Agriculture	Food Crops
Plastics 	Optimizing Packaging Design	Single Use Plastics
	Plastic Packaging Reuse	Single Use Plastics
	Minimum Recycled Content Mandates	Virgin feedstock
Retail 	Mass Customization	Consumer Products
	Improved Reverse Logistics	Consumer Products

A business case was developed for each intervention. This involved estimating the potential impact of a specific waste prevention intervention in terms of reductions in greenhouse gas emissions and in the weight of generated waste, including plastics; changes in profitability resulting from increased revenues or decreased expenses; and new jobs created.

The analysis involved establishing a baseline for the amount of waste generated for each of the six sectors, identifying a handful of global best practices in waste prevention intervention for these sectors, and then estimating the environmental and economic impacts of implementing these interventions.

For example, a compelling waste prevention intervention in the construction sector is design for disassembly. By designing for disassembly and reconstruction of buildings or the reuse of its components and materials at the front end, less resources will be wasted at the back end. The research found that if all buildings demolished or renovated in Canada were disassembled and reused, an estimated 2.5 million tonnes of waste, 116,000 tonnes of plastic waste, and 1.3 million tonnes of embodied CO₂e could be avoided each year. The business case for this eco-design strategy is very strong.

More details on the sectors included in this study, the waste prevention interventions and the estimated benefits of each intervention can be found in the business case summaries on the following pages.

FINDINGS

The findings of the report confirm that there are waste prevention interventions that would have broad socio-economic, financial and environmental benefits for firms, governments, and individuals in Canada. The estimated cumulative impact of these interventions are:

- avoidance of 4.9 million tonnes of waste, including 1.1 million tonnes of plastic waste,
- reductions of 5 million tonnes of avoided CO₂e emissions,
- generation of almost an additional 20,000 jobs and
- \$41 billion in additional revenue and/or cost savings.

More details on the sectors included this study, the waste prevention interventions and the estimated benefits of each intervention can be found in the business case summaries on the following pages.

The intention of this report is not to suggest that the profiled interventions are the most important or impactful nor is it meant to be the final word on waste prevention in Canada. This report is meant to be a first step in generating a better understanding of what waste prevention involves and the associated benefits.

We invite you to read the full report or review the specific sectors of most interest. Each intervention is presented as a stand-alone case study with specific background information and well-illustrated examples. In full, the report is a clear and easily understandable case for waste prevention in Canada.

Business Cases

These business case summaries provide the high-level findings of each intervention. In-depth analyses with key challenges and enablers can be found in the full report.

CONSTRUCTION

With a sales turnover of \$141 billion, the construction sector is the fourth largest sector in the Canadian economy providing many jobs. While construction plays a vital role in creating the built environment, it generates a large volume of waste from new build, renovation and demolition activities.

Waste Prevention intervention	Avoided CO2 equivalents (tonnes)	Avoided Waste (tonnes)	Avoided Plastic Waste (tonnes)	Cost Savings (millions CAD\$)
Adaptive Re-use	45,000	106,000	4,900	N/A
Offsite Modular Construction	173,000	400,000	18,400	3,300
Design for Disassembly (DfD)	1,300,000	2,500,000	116,000	N/A

MANUFACTURING

Canadian Government statistics show that the manufacturing sector generated sales income of nearly \$688 billion in 2019¹. A majority of this activity deals in the processing of food and natural resources such as seafood, wood, oil and gas, with clusters of engineering in aerospace, automotive and heavy-duty vehicles. Given the broad range of manufacturing activities within Canada and the limited scope of our analysis, we chose to focus on two waste prevention interventions: remanufacturing and appliance repair.

Waste Prevention intervention	Avoided CO2 equivalents (tonnes)	Avoided Waste (tonnes)	Avoided plastic Waste (tonnes)	Additional Jobs Created	Additional Revenues (millions CAD\$)
Furniture Remanufacturing	440,000	135,000	13,500	2,760 -7,464	\$770
Facilitated Repair	N/A	10,000	7,200	N/A	N/A

HEALTHCARE

The healthcare sector is an essential service provider and a significant contributor to the Canadian economy. In 2016, this sector spent \$264 billion, or 11.6% of GDP², providing a variety of healthcare services primarily in institutional settings such as hospitals, long term care and rehabilitation facilities. Healthcare operations not only present waste challenges; they have a high carbon impact too. It is estimated that the activities of Canada's healthcare sector contribute 33 million tonnes of CO₂e emissions per year, making it among the top healthcare emitters globally per capita.

Waste Prevention intervention	Avoided CO2 equivalents (tonnes)	Avoided Waste (tonnes)
Single Use Device Reprocessing	20,000	1,800
Equipment Servitization	1,000	200

AGRICULTURE

Agriculture is a fundamental part of Canada's economy. Agricultural practices can also generate large amounts of GHG emissions and waste. It is estimated that this sector generates approximately 73.1 million tonnes³ of CO₂e and 660,000 tonnes of avoidable food waste per annum in Canada⁴ including 40,000 tonnes of plastic⁵.

Waste Prevention intervention	Avoided CO ₂ equivalents (tonnes)	Avoided Waste (tonnes)	Additional Jobs Created	Value of Additional Output (millions CAD\$)
Tackling Left-In-Field	1,300,000	660,000	9,370	\$2,900
Precision Agriculture Technologies	16,000	N/A	N/A	N/A
Building Integrated Agriculture	330,000	N/A	N/A	N/A

PLASTICS

In 2017, the plastics manufacturing industry in Canada employed 89,000 people, generated \$25 billion in sales (excluding resin sales) and produced \$15 billion of plastic for the domestic market⁶. An additional \$12 billion of plastic was imported.

Waste Prevention intervention	Avoided CO ₂ equivalents (tonnes)	Avoided Waste (tonnes)	Avoided plastic Waste (tonnes)	Additional Jobs Created	Cost Savings (millions CAD\$)
Optimizing Packaging Design	469,000	462,000	462,000	N/A	N/A
Plastic Packaging Reuse	2,600	16,600	2,600	N/A	\$109 to \$142
Minimum Recycled Content Mandates	465,000	465,000	465,000	1,000 to 2,700	\$50

RETAIL

The retail sector plays a critical role in the Canadian economy – providing Canadians with the products they want and need every day. In 2019, this sector generated \$102 billion in GDP⁷ and employed over 2 million people across Canada⁸. While some causes of waste in the retail supply chain are well recognized, such as the impacts of fast fashion and packaging, other environmental impacts associated with the retail sector and the purchasing behaviours of Canadian consumers are not well-publicized.

Waste Prevention Intervention	Avoided CO ₂ equivalents (tonnes)	Avoided Waste (tonnes)	Additional Jobs Created	Revenue Opportunities (millions CAD\$)
Mass Customization	281,000	42,500	N/A	\$19,000
Improved Reverse Logistics	375,000	85,000	4,500	\$15,000

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