



# Environmental and Economic Highlights of the Results of the Life Cycle Assessment of Shopping Bags

RECYC-QUÉBEC December 2017

This document summarizes the results of the environmental and economic life cycle analysis (LCA) of shopping bags ordered by RECYC QUÉBEC and carried out by the Centre international de référence sur le cycle de vie des produits, procédés et services (CIRAIG).

The objective of the study was to evaluate the potential environmental impacts and costs of the different types of shopping bags present in Quebec.






The results of this study provide a scientific, objective and comprehensive basis on which municipalities considering the banning of conventional plastic bags can make an informed decision.

## Bag categories and types

Nine types of shopping bags identified and grouped into two categories were submitted for study.

The environmental profile of the bag life cycle has been established according to four environmental indicators: human health, ecosystem quality, use of fossil resources and abandonment in the environment.

### Disposable "or" single-use "bags Designed to be used only once to carry groceries.

Category	Type of bag	Features
	Conventional plastic	<ul style="list-style-type: none"> <li>High-density polyethylene (HDPE)</li> <li>Plastics # 2</li> <li>Strapless</li> <li>17 microns</li> <li>Made in Canada</li> </ul>
	Oxodegradable Plastic	<ul style="list-style-type: none"> <li>High-density polyethylene (HDPE)</li> <li>Plastics # 2</li> <li>Strapless</li> <li>17 microns</li> <li>Made in Canada</li> </ul>
	Compostable bioplastic	<ul style="list-style-type: none"> <li>Starch-polyester blend</li> <li>Straps</li> <li>20 microns</li> <li>Made in United States</li> </ul>
	Thick Plastic	<ul style="list-style-type: none"> <li>Low density polyethylene (LDPE)</li> <li>Plastic # 4</li> <li>50 microns</li> <li>With cut-out handles</li> <li>Made in Québec</li> </ul>
	Paper	<ul style="list-style-type: none"> <li>Unbleached kraft paper</li> <li>Made in the United States from partially recycled fibre</li> </ul>

### Bags known as "reusable" bags Designed to be used for larger shopping. Generally larger and more robust than disposable bags.

Category	Type of bag	Features
	Woven PP	<ul style="list-style-type: none"> <li>Polypropylene (PP)</li> <li>Plastic # 5</li> <li>Made in China</li> </ul>
	Non-woven PP	<ul style="list-style-type: none"> <li>Polypropylene (PP)</li> <li>Plastic # 5</li> <li>Made in China</li> <li>Made from 100% post-consumer recycled plastic</li> </ul>
	Cotton	<ul style="list-style-type: none"> <li>Made in China</li> </ul>
	Eco-designed bag (Credo bag)	<ul style="list-style-type: none"> <li>Polyethylene (PE)</li> <li>Plastic # 1</li> <li>Made in Québec (Montréal)</li> <li>Made from 100% recycled content</li> </ul>

## Summary of LCA Results - Disposable Bags

For disposable bags, the results of the study illustrated in the table below tell us about the potential impacts alternative or replacement bags have on the environment compared to the conventional plastic 17 micron HDPE bag. Namely are the possible replacement bags equivalent to or weaker environmentally than those of the conventional 17 micron HDPE bag used just once. The conventional plastic HDPE thin plastic bag is the reference bag (17 microns).

LCA Results for Disposables: The bioplastic bag and thick plastic bag have impact scores 2 to 11 times and 4 to 6 times greater respectively than the conventional bag. The paper bag is the least performing bag with 4 to 28 times greater potential impacts than the conventional plastic bag.

### Environmental Performance Among the Five Disposable Bags studied.

	Human Health	Quality of ecosystem	Use of fossil resource	Abandonment of the environment
Conventional Plastics	Low impact	Low impact	Low impact	High impact
Oxodegradable	Low impact	Low impact	Low impact	High impact
Bioplastics	High impact	High impact	Medium impact	Low impact
Thick Plastics	Medium impact	Medium impact	High impact	High impact
Paper	High impact	High impact	High impact	Low impact

■ Low impact    ■ Medium impact    ■ High impact

The conventional plastic bag made of thin HDPE is the one with the least environmental impacts among the five disposable bags studied, grouping together the oxodegradable plastic bag, the compostable bioplastic bag, the thick plastic bag and the paper bag. The conventional plastic bag has more environmental impact when abandoned in the environment.

The conventional plastic bag has several environmental and economic advantages. Thin and light, its production requires little material and energy. It also avoids the production and purchase of garbage/bin liner bags since it benefits from a high reuse rate when reused for this purpose (77.7%).

The weakness of this type of bag is related to abandonment in the environment. It's very slow to degrade because of the persistence of plastic (polyethylene). Disposable bags made of source plant materials (such as the compostable bioplastic bag from starch-polyester type and the paper bag) have the advantage of being a limited nuisance when abandoned in the environment.

The oxodegradable bag, on the other hand, does not offer an environmental advantage when compared to its non-degradable equivalent the conventional plastic bag; its life cycle being nearly equal to identical. Except that when it is abandoned in the environment, the oxodegradable bag is subject to an environmental accelerated fragmentation into polyethylene particles (PE) invisible to the naked eye and persistent for a long time in the environment.

Some stores display the thick plastic bag as reusable. In order to make this option more environmentally-

friendly than the conventional plastic bag used just once, the thicker plastic bag should be reused between 3 and 6 times to transport groceries.

## Summary of LCA Results Reusable bags

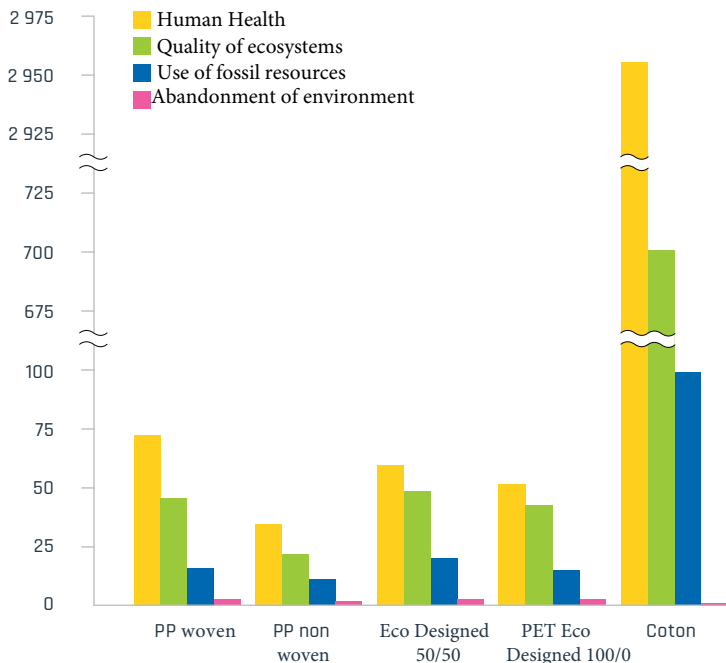
The most common reusable bags in Quebec are woven polypropylene (PP) bags, non-woven, fabric polypropylene (PP) bags and cotton bags. For this study, a prototype ecodesigned bag (the Credo bag) made of 100% recycled PET and manufactured in Quebec has been added. All these bags have the advantage of being generally larger and more robust than disposable bags. LCA Results for reusables: The PP woven and PP non-woven bags need an equivalent number of reuses to equal the thin plastic bag ranging from 16 to 98 and 11 to 59, respectively, depending on the scenario and indicator.

### Number of uses needed in order to be better or equivalent than the conventional bag\*.

(Number of reuses equivalent to the conventional plastic bag)

As an indicator and on the basis of use by week, the reusable bags must be used at least 35 to 75 times so that their impacts on Life Cycle Environmental Indicators are equivalent to or better than those of the conventional plastic bag.

The cotton bag studied is an option that is not recommended because of its significant impact on the "human health" indicator, requiring between 100 and 2,954 uses for its environmental impact to be equivalent to the environmental impacts of the conventional plastic bag.



### What about the cost of shopping bags over their life cycle?

The results show that the main cost of the bag's life cycle occurs at the stage of their acquisition by the retailer or consumer. In the case of conventional plastic bags and the oxodegradable bags, these costs are offset by the avoidance of having to purchase bags to manage household waste when the conventional bag is reused for this purpose. The cost to manage bags at the end of their life are, in turn, low compared to at the total life-cycle cost of the bags.

To view the complete report :



\* \*Refer to the Big Shopping Scenario (p. 15) in the full report.