

Summary of Literature on the Environmental and Operational Considerations of Reusable Food Containers for Food Services



Peter Gilgan
Foundation



This resource was developed as part of the [*Decarbonization in Action*](#) project, supporting Canadian hospitals to reduce greenhouse gas emissions across building systems, clinical activities, and organizational processes.

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THE PURPOSE OF THIS DOCUMENT

This briefing deck is a non-exhaustive review of literature on the **environmental and operational considerations** of switching from disposable food containers to a reuse system. Please refer to the accompanying Excel Workbook for a simplified life cycle emissions comparison tool to quantify the decarbonization potential.

This document addresses the following questions:

- In general, is it environmentally beneficial to switch from single-use to reusable food containers for cafeteria food services ?
- What life cycle stages are the largest contributors of greenhouse gas (GHG) emissions for single-use, clamshell-type food containers?
- Are reusables safe?
- What factors affect the environmental and financial payback of switching to reuse?

Intended Audience:

Sustainability leads: e.g. sustainability managers, executives, and committee members

Initiative leads: e.g. procurement leads, food services leads

Key stakeholders: e.g. facility leads, supplier/account managers, cafeteria staff

Disclaimer: This resource was developed as part of the *Decarbonization in Action* project as a high-level reference drawing on existing literature, resources, standards, and methodology guidance available at the time of publication (2026). It is intended to support hospitals with general information and guidance, but its applicability will depend on each organization's specific context, priorities, data, and operational circumstances. Users should consider local factors when interpreting or applying this resource, and note that relevant external standards and guidance may change over time.

In general, is it environmentally beneficial to switch from single-use to reusable food containers?

Yes, especially if there is on-site cleaning. Literature confirms that in most cases, reusable food containers for food services are generally superior to single-use alternatives across multiple environmental metrics. The minimum number of reuses required to “break even” and realize the environmental benefits of reuse systems depend on **the material selection, supplier location, and arrangements for sanitizing and returning containers** to circulation.

For organizations that require off-site dish cleaning, the **mode and distance of transport for collection and drop-off** can greatly affect the net environmental benefit.

Studies Reviewed	Key Takeaways	Links to References
Single-use plastic take-away food packaging and its alternatives	• Reuse is better: The analysed studies show that reusable take-away food packaging, if reused enough times, has a better overall environmental performance than single-use packaging. • Logistics matter: The set up of the delivery system, as well as the mode of transport and transportation distance during the use phase, are important factors influencing the environmental performance of reuse and the break even point.	• Life Cycle Initiative (hosted by the UN Environment Program), 2020
Life cycle assessment of dishware at Polytechnique Montreal	• Reuse is better: The use of reusable tableware is highly advantageous over single-use options. This conclusion holds whether the table waste is landfilled or composted. • Break even point: More than 300 uses and even less depending on the material option	• CIRAIG, 2017
The environmental, economic, and business case for transitioning from single-use to reusable in food service Greenhouse Gas Impacts of Disposable vs Reusable Foodservice Products	• Reuse is better: Based on a review of 18 Life Cycle Assessments (LCAs) by Upstream Solutions, reusable food ware generally outperforms disposable alternatives across 14 standard environmental measures, including GHG emissions and water use. • Break even point: 3 to 50 uses for plates and clamshells. This varies by the type of service ware and material composition (2 to 122 uses for cups, 2 uses for utensils). • Material selection: Most reusable products are designed to last at least 200 uses, with materials such as steel, glass, and ceramic extending beyond 1,000 uses.	• Upstream Solutions, 2021 • Clean Water Fund, 2017

What life cycle stages are the largest contributors of greenhouse gas (GHG) emissions for single-use, clamshell-type food containers?

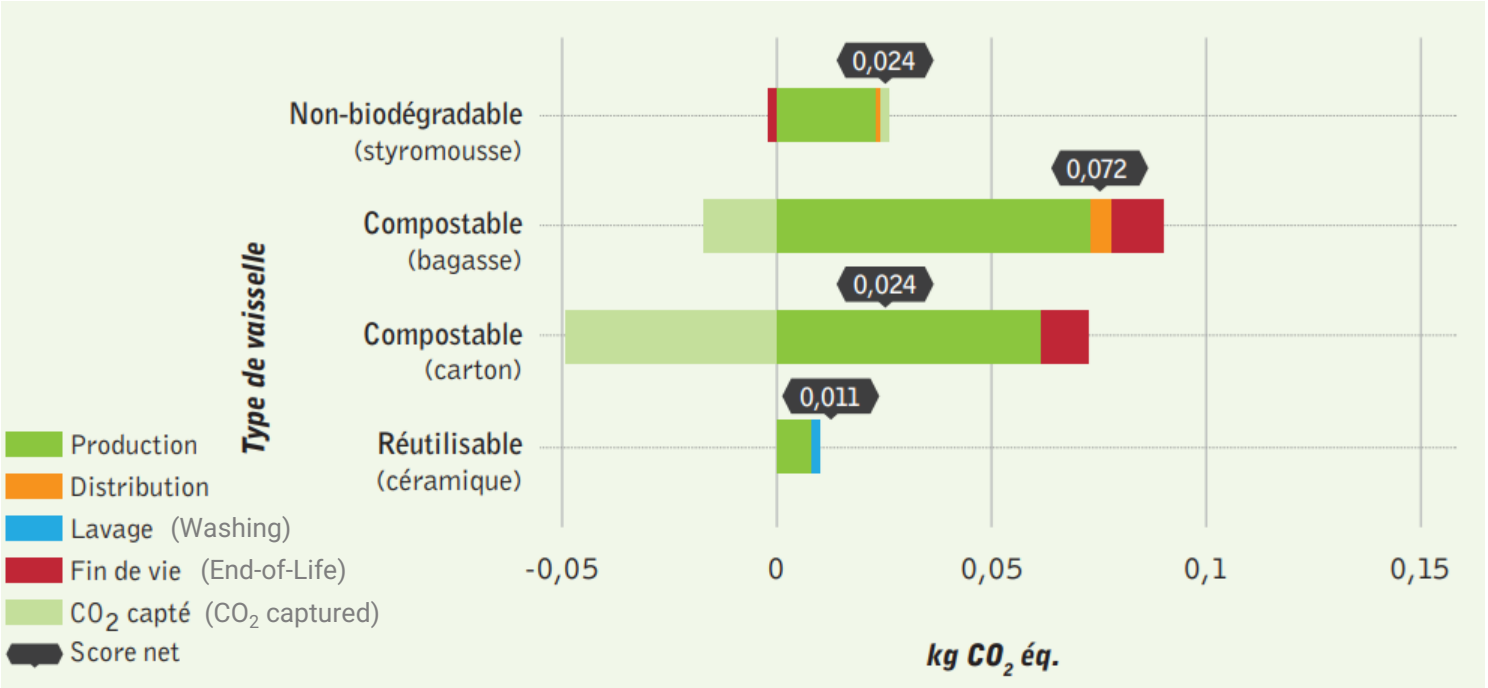
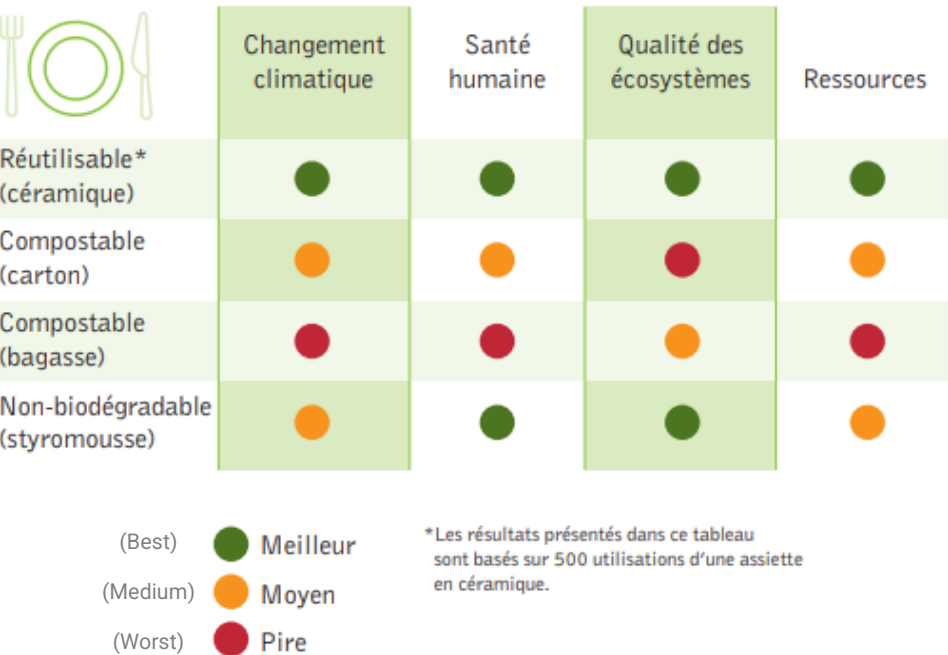
Upstream production accounts for the majority (>50%) of life cycle GHG emissions in both single-use and reusable food service containers

Studies Reviewed	Key Takeaways	Links to References
Life cycle assessment of dishware at Polytechnique Montreal	Upstream production dominates environmental impact: In terms of the contribution of the different stages to the overall impact, the production stage of the reusable plate, linked to the production of the ceramic and its shaping, is the largest contributor (between 54% and 81%) for the categories of Climate Change, Human Health, and Resources. The dishwashing stage has a lower contribution to these three categories (between 16% and 36%).	• CIRAIG, 2017
Towards Zero Waste: Case Studies and Policy Guidelines for Reusable Food Service Ware	Material selection: There are trade-offs when choosing the container material. • Plastic is lightweight and potentially has lower emissions during transport, but poses risks such as chemical leaching and microplastic contamination, and emits more GHGs over the life cycle. • Glass and ceramics are inert, but are heavy and less durable. • Stainless steel is durable and safe, but has a higher environmental impact per unit.	• Tessa Wiehr (UBC Sustainability Scholar) for Metro Vancouver, 2024
The environmental, economic, and business case for transitioning from single-use to reusable in food service	Water consumption for washing reusables is minimal when using commercial dishwashers that are highly efficient. The disposables have a greater water consumption footprint due to all the upstream production impacts than reusables.	• Upstream Solutions, 2021;

Life cycle assessment of dishware at Polytechnique Montreal

- Reusable table ware outperforms single-use alternatives (cardboard, bagasse/sugar cane fibre, Styrofoam) on 4 key LCA metrics: climate change, human toxicity, ecotoxicity, and resource depletion.
- The potential to compost plate waste with the sugar cane fibre containers do not significantly affect the LCA results.
- With on-site cleaning facilities, washing accounted for a very small portion of the life cycle emissions of reusable tableware.

Synthèse des résultats pour l'assiette



Source: [CIRAIG, 2017](#)

The environmental, economic, and business case for transitioning from single-use to reusable in food service

- Review of single-use vs. reusable food container LCA studies showed that reusable system are generally preferable.
- Polypropylene (PP) and ceramic materials have less negative impact than other types of reusable container materials according to the reviewed publications.
- The break-even points are usually far below the expected lifetimes of reusable products. Each additional use beyond the break-even point accrues environmental benefits. For example, according to existing LCA data, reusable plastic (polypropylene) plates or clamshells need to be reused 50 times to have lower impact than PLA; between three and 39 times to be lower than polystyrene foam; and 14 times to outperform bagasse (sugar cane fibre).

Summary of break-even points for reusable and disposable foodware

		Clamshells & Plates							
		Disposable							
Reusable	pp	PLA		EPS		Bagasse			
		Broca: plates (2008)		Copeland: clamshells (2013)		Gallego-Schmid: clamshells (2019)		Harnoto: clamshells (2013)	
		50		15		3-39		14	

Plate/ Clamshell Studies	Reusable				Disposable					
	Ceramic/ Porcelain	PP	Glass	Stainless Steel	Paper	Bagasse	PP	EPS	PLA	Aluminum
Pro Mo	🏆					🔍	🔍	🔍	🔍	
Broca	🏆								🔍	
Copeland		🏆					🔍			
Harnoto		🏆				🔍				
Gallego		🏆					🔍	🏆		🔍

Source: Upstream Solutions, 2021

Are reusables safe?

With precautions in place, there continue to be opportunities for reusables even during the pandemic. A report from the [National Zero Waste Council](#) has shown that with a proactive approach, reusable food ware programs can continue during a pandemic (with focus on retail settings). Some reusable in-patient/resident food ware programs did continue at hospitals and long-term care sites during COVID-19 (e.g. [Vancouver General Hospital and UBC Hospital](#)) .

Key activities suggested by the researchers include:

- Promote a comprehensive, balanced approach to assessing risks and highlight the unintended consequences of responses.
- Increase the evidence to guide decisions on fomite transmission and reusables.
- Advocate to change direction as new evidence becomes available and promote guidance that balances caution and reassurance in terms of fomite transmission risk as is warranted by the evidence.
- Clarify public health jurisdiction for retailers and the public seeking advice on use of reusables and the safety precautions available to limit the risk of transmission during infectious disease outbreaks and pandemics.

What factors affect the environmental and financial payback of switching to reuse?

Operational factors highlighted in *Reuse in Canada Landscape Scan: Understanding Opportunities to Advance Reuse Systems* (Cheminform Services for National Zero Waste Council, 2022)

- Business model of reusable programs (e.g. deposit system, lend and return, bring your own container discounts)
- Container unit cost (single-use vs. reusable)
- Logistics arrangement for collecting reusable containers (e.g. hub and spoke)
- Availability of cleaning/sanitation infrastructure (e.g. dishwashing capacity and turnaround time, transport mode and distance)
- On-site storage capacity for containers

Environmental and customer behaviour factors highlighted in *Comparative life cycle assessment of reusable and single use take-away lunch boxes used in student restaurants* (Aggarwal, 2024) and *Life cycle assessment of dishware at Polytechnique Montreal* (CIRAIG, 2017)

Upstream

- Material composition
- Container weight
- Supplier location and transport distance to point of use
- Number of orders (containers) per year

Use & Waste Management

- Return rate of containers
- Number of reuses per container
- Replacement rate of the stock of reusable containers (due to loss or wear)
- Employee time for cleaning
- Level of handwashing / double cleaning (dishwasher and handwashing)
- Dishwasher capacity and energy/water efficiency (minor environmental impact)
- Detergent use (minor environmental impact)
- Waste management scenario

Cost element	Reusable lunch boxes	Single-use lunch boxes
Box cost	71.3%	100%
Employee cost	52.3%	N/A
Detergent cost	6.1%	N/A
Electricity cost	1.7%	N/A
Water cost	1%	N/A
Wastewater treatment cost	1%	N/A
Drying chemical cost	0.5%	N/A
Return cash-back (from manufacturers)	-33.9%	N/A

Cost breakdown by Aggarwal, 2024

Switching to reusables generally pay back financially within 1 year

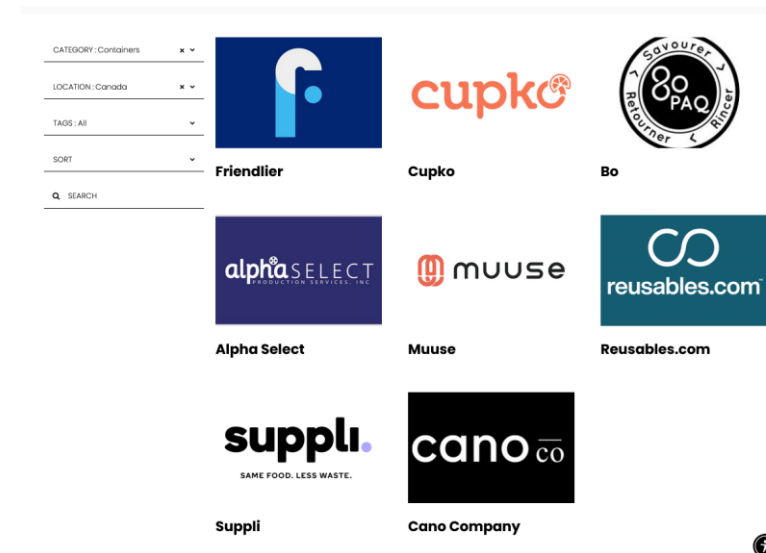
The [ReThink Disposable campaign](#) (in the San Francisco Bay Area and Los Angeles) replaces **over 28 million pieces** of single use food ware items and **saves more than \$744,000 USD per year**, across 500+ participating organizations. Participating businesses reported that the upfront investment is generally paid back with the cost savings within 1 year. Other case studies reviewed by [Upstream Solutions](#) also confirm that switching to reusables generally save businesses money.

At [St. Joseph's Health Care London](#), the Food and Nutrition Services team shifted to compostable or reusable containers with the goal of reducing our waste by 5% annually. The single-use plastic ban helped nudge manufacturers to supply more eco-friendly options, and the team exceeded their goal by **reducing single-use plastic by 10%** in one year.

- One example is replacing plastic sandwich wedges, and instead covering sandwiches on a plate with a reusable clear dome. This helped to eliminate 45,500 wedges annually from landfill.
- Aside from food packaging, the site also adopted **reusable shoe covers**, which are used to decrease falls on the dish room floors. At one site alone, the organization used to spend \$16,000 a year on disposable booties; by changing to reusables, it is **saving \$14,000 a year**.



Wash hub map for the U.S. & Canada: Directory of washing and recirculation logistics providers for returnable reusable packaging



Reuse Business Directory (U.S. & Canada): Directory of businesses offering returnable, reusable, or fillable packaging. The directory can be further narrowed down by location (e.g. Ontario) business category (e.g. containers, cups)

System boundary for the simplified life cycle emissions comparison tool

