

# Innovate Landfill Solution Canada: Sustainability Strategy Report

*March 21, 2024*

## **Introduction**

This report serves to provide an in-depth analysis on the potential for successful collection of multilayer plastic in Toronto and for improving the outcomes of future EcoPrize events with respect to the broader objectives of Innovate Landfill Solution Canada. The primary goal of ILS is to minimise landfill use and develop innovative and cost-effective strategies for improving urban sustainability and waste management. ILS also aims to induce behavioural change in consumers, provide corporate social responsibility support, and to reframe the individual as an essential contributor to positive recycling outcomes. These are increasingly important strategies given that consumers are losing trust in manufacturers, recycling companies, and bodies of government to fulfil their sustainability promises.

First, we will examine the existing primary research relating to recycling behaviour and policy both in Toronto and in Canada as a whole to assess the potential for improvements in recycling behaviour. Next, we will address recycling habits and practices of consumers in Toronto through a marketing lens to identify strategies for improved outreach and EcoPrize participant engagement. After considering the bigger picture of recycling in Toronto, we will discuss the multilayer plastic recycling industry and the various strategies employed by recycling companies and researchers to process this hard-to-recycle plastic. Sources for the reviews are a combination of primary literature (research articles), grey literature (newsletters, journalistic work, non-academic writing) and corporate information from the recycling industry (see [A.1.1](#) for search strategy). Finally, we will leverage this information to analyse the successes and areas for improvement with regards to EcoPrize and the larger scope of ILS' corporate social responsibility goals.

## **1.0: Recycling Practices and Habits in Toronto and Canada at Large: A Broad Literature Review**

To begin a discussion on the effectiveness of current recycling practices and the way in which EcoPrize may contribute to this industry, a literature review using popular scientific databases will be conducted ([A1.1](#)). This review will provide a comprehensive presentation of the important research being done regarding recycling practices in cities

and will identify several potential research questions in this field. First, we will examine existing policy and behaviour in Ontario (and Canada at large) and the current strategies being employed in recycling. Then, we will exclusively consider the recycling of plastics (particularly multi-layered plastics) and current initiatives in Toronto. We will also briefly discuss the research gaps in the literature.

### *1.1 Recycling in Canada: Perspectives and Policy*

Canadians have a strong societal awareness of recycling but are unsure of the exact rules where they live due to unclear guidelines and an overwhelming amount of potentially recyclable materials that must be sorted differently (Hwang & Rivera, 2020). Additionally, the marketing of recycling as the preferred method of waste management and an environmentally friendly way of diverting trash from landfills may have the paradoxical effect of increasing the amount of waste produced. By reducing consumers' guilt for producing waste and reframing waste production as eco-friendly recycling, the amount of trash actually produced increases (Westervelt, 2012, Winterich et al., 2019). This, combined with questionable knowledge of recycling practices and Canadians' lack of awareness about our recycling system, could have an antagonistic effect on recycling goals in cities. The Canadian recycling system is also heavily dependent on the export of its waste to other countries so that recyclables may be processed offshore. The cost of recycling has sharply increased since China's 2017 ban on the import of recyclable material with potential hazardous contaminants (Hook et al., 2018).

A 2005 study by Ferrara & Missios on the recycling habits of Canadians found that recycling and waste management policies can have varied effects on Canadian families' willingness to recycle and the frequency at which they recycle. User fees for recycling and routine weekly recycling increase the intensity of recycling in households, particularly for glass, aluminium, and toxic chemicals. Newspaper, plastic bottles, tin cans, and cardboard recycling are negligibly affected by weekly recycling (Ferrara & Missios, 2005). Higher education levels in households are correlated with greater rates of glass recycling, and home ownership as well as household size are positively associated with recycling intensity. Interestingly, as household income increases, the intensity of recycling decreases for most materials (Ferrara & Missios, 2005). Given the broad categories of recyclable materials examined in this study, it does not tell us much about the effects of waste management policy on the recycling of different types of plastics.

### *1.2: Current initiatives and recycling statistics in Toronto*

Environmentalists and researchers have begun creating initiatives for improving recycling programs in the city. One such example comes out of OCAD University and had the goal of "empowering Toronto communities to reduce and reuse plastics through

the co-creation of pro-environmental initiatives” (Hwang & Rivera, 2020), similarly to the EcoPrize events organised by ILS. Hwang & Rivera used several unique strategies and research methods in their project, including a literature review, semi-structured interviews, trend analysis, workshops, cultural probing, surveys, behavioural nudging and educational presentations to learn how they might simplify recycling practices in Toronto. They identified various social trends (i.e., simple living, zero waste) that could be leveraged in communities for raising consciousness of waste production and recycling. They also noticed that manufacturers are interested in developing and producing effective alternatives to plastic, that consumers are generally aware that plastic is a dangerous pollutant and believe the major producers of plastic waste should take responsibility for the damage to the environment. Additionally, a change in generational values towards environmental justice was found, particularly in younger people (Hwang & Rivera, 2020). To help “ignite” their community of interest to move towards their goal, they attended relevant Toronto City Hall meetings and workshops hosted by the city.

In 2018, following the implementation of China’s National Sword Policy, Toronto lost 8 to 9 million dollars worth of recycling revenue as the city was unable to export the majority of its potentially-recyclable waste to China. Now, such exports to other countries such as Vietnam and Malaysia result in the mismanagement of recyclable waste due to their less sophisticated plastic waste management systems (Hook et al., 2018). Given these hurdles, Hwang & Rivera sought to create a framework that focuses more on “reducing” and “reusing” instead of recycling, since on the consumer-level we cannot guarantee that individual efforts for recycling will have the desired effect. They posit that recycling efforts in Toronto should focus on reducing plastic waste in the first place and planning to intentionally reuse plastic packaging. This is reflected in the City’s 2018 plan, in collaboration with the province, to divert 70% of waste by 2026 and to reframe waste management through circular economy and resource recovery. However, recycling still seems to be a municipal and social priority. Even if many people are now aware of the role of governments and large corporations in the production of the majority of the world’s waste, engagement of consumers on the individual level is essential for the success of a circular plastic economy (Ledsham, 2018).

Behavioural nudging to reduce the use of single use plastic bags is already in effect in Toronto and much of Ontario, through point of purchase fees and the offering of reusable shopping bags as an alternative. Rivers et al. (2017) found that fees were effective in pushing consumers who already used reusable bags to use them more frequently, but were ineffective for infrequent consumers. Additionally, consumers with lower socioeconomic statuses tended to be less affected by behavioural nudges (Rivers et al., 2017). External circumstances such as public health crises are also important

behavioural influencers that change the way people dispose of their waste. COVID-19 impacted the flow, diversion, and reuse of household waste due to disrupted waste & recycling collection practices, new health and safety concerns, and changes in social priorities (i.e., cessation of reusing plastic). Increased use of PPE may have even contributed to an increase in household waste (Ikiz et al., 2021).

### *1.3: Research Gaps*

Hwang & Rivera's 2020 study focuses on category 1 & 2 plastics (PET AND HDPE), which means that there exists a niche for a similar initiative with a focus on multilayered plastic. The health effects of microplastics, chemical additives (i.e., BPA), and PFAs are incredibly underresearched but have links to obesity, cancer, hormone disruption, and other adverse effects. Campanale et al., (2020) conducted a very thorough review of the literature discussing the health effects of microplastics and their additives. An interesting strategy to divert plastic from eventually ending up in landfills is to offer consumers strategies for limiting the amount of plastic they will discard. By targeting consumers' usage and disposal of single-use plastics and providing alternatives to these plastics which are notoriously hard to sort and recycle, we may be able to further increase the amount of plastic that is recycled simply by reducing the amount of hard or impossible to recycle plastics that end up in landfills.

## **2.0: Recycling Attitudes, Participation, and Compliance**

Here, we will address existing methods for improving recycling outcomes, Torontonians' views on recycling, the plastic crisis, and their overall views on sustainable living in order to evaluate how we may leverage the average resident's interest in recycling for successful participation in EcoPrize events. We will look at the factors that increase recycling guideline compliance, participation in recycling initiatives, and openness to adopting sustainable habits.

### *2.1: Attitudes Towards Recycling and Effectiveness of Messaging*

People living in Western society tend to be uncomfortable with the idea of the garbage they produce and have a social aversion to confronting their relationship with waste. According to de Coverly et al. (2008), there exists a "systemic avoidance" of waste deeply rooted in consumerist society stemming from the intentional deception of consumers and the speed at which waste disposal occurs. If consumers were faced with the "hidden [waste] mountain," or the visual representation of the sheer amount of waste produced by the average consumer as a byproduct of the modern lifestyle, they would suddenly become uncomfortably aware of the extent to which the waste they

produce is “out of sight, out of mind.” People don’t think about their disposition habits and their “throwaway culture” because waste is so efficiently and quickly removed from people’s homes. Torontonians received a cruel reminder of this in 2009, where parks and ice rinks became urban landfills during a five week municipal workers’ strike (Wilkins, 2022). Waste is not sociologically addressed in our society despite being the most succinct metaphor for the footprint we leave in the world around us every day (Coverly et al., 2008). The less we as consumers think about waste and recycling, the more complacent we become when faced with recycling guidelines and messaging.

The manner and valence (i.e., positive or negative) in which recycling information is delivered to its intended audience matters. A highly influential study of the American Marketing Association published by Winterich et al. in 2019 discusses how product transformation salience (i.e., the knowledge of the new products created through recycling) can positively affect recycling outcomes and attitudes towards compliance with recycling guidelines. They noted that the frequently negative and guilt-inducing recycling messaging that emphasised pollution and environmental damage resulted in “aspirational recycling,” wherein consumers would feel coerced to place more of their (non-recyclable) waste into recycling bins leading to contamination. Instead, messaging that emphasises the transformation of products from one form of plastic to a new product made from post-consumer recycled material, such as building materials or clothing, increases compliance with recycling guidelines compared to negative messaging or simply informing people about proper sorting (Winterich et al., 2019). Placing images of product transformations on bins themselves reduces the amount of recyclables placed in the trash, and recycling campaigns have begun adopting this marketing technique to raise consumer awareness of the possible useful end products of their waste (Cooley, 2020). We can see this first-hand in Ridwell’s showcasing of the various partner companies to whom they sell their collected multilayer plastic; consumers are more compelled by product transformation salience rather than being made aware that the MLPs can be once again reduced to raw materials (i.e., STRAP).

## *2.2: Distrust in the Recycling Business*

Even if consumers are provided with effective messaging to improve recycling outcomes and change waste disposal behaviours, they do not live in a closed system where consumer behaviour is the sole determiner of recycling outcomes. According to a 2020 study of 1518 conducted by Leger Opinion, only 46% of Ontarians trust their recycling system to properly recycle waste. This shows a decrease in trust compared to the previous time they conducted this survey in 2018 (Leger Opinion, 2020). This is not without reason; in 2020, CBC journalists asked 3 popular waste management companies in Canada to recycle cleaned and baled plastic, in the containers of which they placed tracking devices to see where the bales would end up. Only one of the

companies (Merlin Plastics) ended up sending the plastic to a recycling facility, where the resulting material was verified to have been sold to a customer who would use the resin to create a similar material as the virgin plastic. The bales originally sent to GFL Environmental Inc. ended up being incinerated in a waste-to-energy facility (after which they told the journalists that no one would have bought the recycled plastic). The bales contracted by Waste Connections Canada ended up in landfills and junkyards despite assuring the incognito journalists that they would be sent to a recycling facility. All three of these companies rely on “green” messaging in their marketing and claim to prioritise sustainability in their business practices (Pedersen et al., 2019). The tracking strategy employed by the journalists is reminiscent of ILS’ Waste Recycling Tracking Service proposal, in which a QR code scanning system may be used to track the final destination of plastic products. Given that producers lack visibility of where their packaging will end up, a large-scale tracking initiative may help to provide transparency to manufacturers and consumers about the reliability of recycling claims.

Despite the fact that many consumers are worried about the effectiveness of recycling and tend to distrust waste management promises on dealing with recyclables properly, there is a lack of information about what is really happening in Toronto. The recycling business in Toronto fails to deliver on its promises on sorting recyclables correctly and ensuring that they do not end up in landfills. Extended producer responsibility (EPR) policy has existed in Canada since 2009 and is being implemented in Ontario, as well as several other provinces. In Ontario, the program is producer-funded and municipality-operated. This initiative serves to help move Canada towards zero plastic waste through the recycling and reusing of single use plastics (Diggle & Walker, 2020). As the City of Toronto begins its transition from handling waste municipally (Ontario’s Blue Box program) to an EPR system, many municipal workers and staffers are committing to not competing for new jobs in this sector once the transition occurs. This may be because the provincial regulator for the EPR program is mandating that readers of the request for proposal for bids on curbside collection in Toronto once ERP comes into effect must sign a non-disclosure agreement. In addition to this black box of information between Toronto residents and a future waste contractor, nearly impossible standards of contamination are going to be enforced - a staggering 4% accepted contamination rate, compared to the current rate of 30% (Rider, 2023). Further, Environment Canada refuses to release names of corporations that have been caught attempting to illegally ship containers of trash and contaminated recyclables overseas given that they face low enough fines to conceal their identities (Ward et al., 2022). This raises an important question for Torontonians: if we have no way of knowing if our recycling efforts are in vain or not and the City’s recycling methods are not transparent, why should we bother recycling our own household waste effectively in such a hopeless waste management climate?

### 3.0: Urban Recycling Initiatives

This section specifically addresses multi-layer plastic and the ways in which people have begun to divert MLPs from landfills. Here, we will look at the existing initiatives in metropolitan areas including Toronto that aim to promote the collection and recycling of hard to recycle plastics such as MLPs. We will also consider some non-specific recycling events to learn how we can apply their strategies to MLP collection and recycling in EcoPrize events. Additionally, we will look at some of the most popular strategies for recycling MLPs after collection.

#### 3.1: *The Multilayer Plastic Recycling Scene*

According to Soares et al. (2022), there is no mainstream method currently available for the recycling of multilayer plastic (MLP) and there are many inherent challenges in this process that discourage recycling companies from tackling this issue. In fact, the issue of MLP recycling is so frustrating that some argue that it should simply be banned despite its usefulness and ubiquity since all manners of disposal are costly, inconvenient, and/or harmful (Gajarthi, 2020; Mukherjee, 2023). MLPs were not conceived with eventual layer separation and recycling in mind, but rather for the performance of the material (i.e., in packaging perishable food items and ensuring shelf stability). Thus, difficulty in material breakdown is an intended feature of this type of packaging and recyclers can expect numerous hurdles in their goal to turn discarded MLPs into post-consumer recycled goods or raw materials with acceptable levels of purity. Of course, this leads manufacturers to create new monomaterial MLP packaging that have specially designed breakdown methods, with easily separable layers or components that are made for compatibility with common recycling systems (Lubrizol Performance Coatings Team, 2022). Others claim to be biodegradable by anaerobic bacteria in low-oxygen landfill environments, since they anticipate that the wrappers will end up there anyway (Duropac, 2021). Nevertheless, the creation of new materials is not the goal no matter how recyclable they may be. Tamizhdurai et al., (2024) provide a comprehensive review of the current mechanical and chemical recycling methods for multilayer plastics, several of which are being used by prominent MLP recycling companies.

The City of Toronto instructs residents to throw multilayer plastic packaging in their garbage bins (City of Toronto); this is likely due to the difficulty of cleaning and sorting and the potential for clogging recycling machines. We can assume that most other municipalities instruct their citizens to do the same, which is disheartening when considering how 100 million tonnes of multi-layer thermoplastic is manufactured globally each year with 40% of it never being used (Walker et al., 2022). While it is technically possible to recycle MLPs layer by layer using the STRAP (solvent-targeted recovery

and precipitation, which was first successfully done by X) to recover the raw materials with relatively high purity, this is not commercially viable on a large scale and raises some concerns regarding the safe disposal of the reagents and solvents used during the process (Walker et al., 2022; Tamizhdurai et al., 2024).

Companies such as Ridwell offer collection memberships for consumers and companies that are looking to have their multi-layered plastic waste recycled, where they pick up cleaned and dried waste and transport it to a partner company for downstream processing. They collect cleaned and dried MLP packaging from households (i.e., individual consumers) as well as from manufacturers, and often form partnerships with companies who are able to break down the waste and turn it into a useful post-consumer recycled material. For example, Arqlite and HydroBlox turn mixed plastic waste into plastic aggregate gravel, noodles, or planks that are used in drainage systems, ByFusion uses this waste to form building blocks as an alternative to concrete, and Trex turns it into composite decking material (Ridwell 2023). Unfortunately, there are no Canadian-owned companies who provide a similar collection and recycling service which is a huge concern for a country that produces over two million tonnes of plastic waste per year with only 1% of flexible plastics being recycled (Canada Plastics Pact, 2021; Greenlid, 2022).

### *3.2: Existing Research & Initiatives for Collecting Multilayer Plastics*

As aforementioned, the City of Toronto does not actively collect multilayer plastics due to difficulties in cleaning, sorting, and material segregation. The City does occasionally engage the community with recycling events that educate residents how to properly dispose of their household waste, but there is a definite gap in addressing the recycling potential of MLPs in a city where so much waste is produced and discarded (City of Toronto, 2022). In British Columbia, RecycleBC has begun collecting flexible plastics including MLPs to study which types of plastics are most commonly discarded, create plastic pellets to be used as feedstock for manufacturing, and to innovate new solutions for circularity and reuse with the University of Victoria (RecycleBC, 2024).

This is not to say that Canada is unaware of this problem; the Canada Plastics Pact published a 5-year roadmap for advancing the circular economy of flexible plastic packaging, much of which consists of the MLPs in which we are interested. By 2025, the CPP aims to have all its signatories evaluate and redesign their flexible plastic packaging with respect to ready-to-recycle principles. They hope to provide 90% of Canadians with reliable access to flexible plastic recycling programs and heighten public awareness of the recyclability of this material by 2026. Ideally, 30% of household flexible plastic waste placed on the Canadian market will be recycled by 2027, with a goal of 50% by 2030 (Canada Plastics Pact, 2023). Non-governmental organisations



(as well as government bodies, as seen with Canada's Plastics Challenge) are interested in bridging the gap between the production and eventual disposal of MLPs and their potential circular economy. Thus, we can expect more opportunities for partnerships with collectors and recyclers of MLPs within Canada in the coming years. NovAxia Inc., Lichens Recyclability, the Canada Plastics Pact, the Circular Plastics Taskforce, and other major players in this field are collaborating and making strides towards improving the recycling outcomes of all flexible plastics, and were able to outfit a material recovery facility with innovative technology to reliably separate many forms of flexible and multilayer plastic (Dubois, 2023). However, most researchers and NGOs in the Canadian multilayer plastics recycling scene will agree that there is still a long way to go on our roadmap towards a MLP circular economy.

Recycling initiatives for flexible plastics exist elsewhere in the world and are particularly underrepresented in Canada, with the majority of major players in on-the-ground sorting and recycling existing outside Canada. For example, Ridwell services Atlanta, Austin, the Bay Area, Denver, Los Angeles, Minneapolis-St. Paul, Portland, and Seattle with its pick-up services (Ridwell, 2023). German companies BASF, Kronos, Südpack and Tomra Recycling Sorting collaborated to demonstrate that multilayered PET and PE plastics could be recycled through sorting, debonding, and mechanical and chemical recycling methods (Dabo, 2023). Myplas, originally from South Africa, recently opened a recycling facility in Minnesota and received millions of dollars of funding to tackle the recycling of flexible plastics and produce their trademarked recycled polymer. However, they appear to not have the capacity to deal with MLPs and unexpectedly halted their operations in the United States last month (Johnson, 2024). Even at the global scale, there is a lack of scientifically-informed recycling infrastructure at the collection, sorting, processing, and recycling levels. Another issue exists in terminology, as many companies refer to multilayer plastic under the broader term flexible plastic. This means that potential partners for recycling have to specify exactly which kinds of flexible plastic they can process. For now, the most effective strategy we can take with EcoPrize is to streamline the collection of MLPs and store it until more accessible recycling infrastructure in Ontario becomes available, as it may be costly to ship this to companies across the country or even to the United States (assuming they would purchase bales of plastic to begin with). Outreach to particularly remarkable companies in this field such as RecycleBC and Ridwell could be useful in gaining perspective of the scope of the on-the-ground work and the capacity for increase in this industry.

#### **4.0: Analysis of EcoPrize Events and ILS Initiatives**

With the information presented in [1.0](#), [2.0](#), and [3.0](#), we will evaluate the effectiveness of EcoPrize events and the potential value presented by this and other ILS initiatives. For

additional information regarding suggestions increasing the scope and breadth of activities during EcoPrize events, see [A1.2](#).

#### *4.1: Potential Strategies for Future EcoPrize Events*

In light of the complicated recycling prospects in Toronto and in Canada at large, ILS can leverage studies conducted on recycling compliance to increase successful collection during EcoPrize events. Firstly, participants can be informed of the various products that are being made using multilayer plastic, such as the building materials showcased by Ridwell. If participants are made aware that their trash can become a useful new material, their eagerness to participate and dedication to proper washing and cleaning of their MLP may increase. Further, we can survey participants on their opinions of the way Toronto handles recycling and lead a discussion on the expectations (and reality) of where our waste goes. By letting people's opinions, fears, and confusion be heard by people who can educate them on recycling outcomes, they may be less discouraged to participate and change their overall attitudes towards sustainable living. It is completely reasonable to say that we as individuals shouldn't bother with recycling because the City has no way of ensuring that our recyclables end up in a recycling plant. But, until we see alternatives to hard-to-recycle plastics become commonplace or even phased out, we must take strides to create a culture of recycling, sustainability, and waste awareness within households. This way, we can decrease recycling complacency in consumers that allows companies to get away with undocumented and unethical practices in the first place. A strong and motivated community has the potential to pressure the City and waste management contractors and raise awareness of their lack of transparency.

Given ILS' corporate responsibility strategy and intent to organise events in numerous settings, sustainability workshops, and a corporate volunteer program, it is important to leverage existing marketing research and make use of the existing sustainability community in Toronto. In order to effectively bridge the gap between the newest innovative recycling technology and commercial viability, consumers, manufacturers, and recyclers alike must share an interest in the transformative potential of plastic and a sense of urgency to participate in closing the multilayer plastic loop. Promoting a social consensus on the importance of a circular economy may be done through frequent, effective community outreach and collaboration. Collaboration with non-governmental organisations in the sustainability and recycling industries is a productive way to promote sustainability and corporate responsibility, especially within the recycling industry where transparency is so important. Organisations like the Toronto Environmental Alliance, the Carbon Neutral Cities Alliance, and EcoToronto have strong connections to communities and sustainable corporations, and often influence

sustainability policy through campaigning and lobbying. Thus, they represent productive avenues for potential collaboration.

#### *4.2: EcoPrize Beta Test*

The EcoPrize Beta Test event on February 18th, 2024 provided meaningful insight on the effectiveness of the strategies and tools employed during the event. The use of an app was particularly helpful as apps provide convenience and ease of access to important information and the event's framework. This guides users through the desired EcoPrize experience. To increase the app's success it must have a reason to remain installed on people's phones after the conclusion of the event (i.e., through a continuous plastic-collection initiative or through the distribution of educational materials for households). A digital framework also provides an opportunity to disseminate educational material. Often, knowledge barriers prevent people from making informed choices when it comes to waste management and recycling. People should know what plastics can and can't be recycled, what plastics they can safely reuse in the home, and strategies for reducing the amount of plastic that enters the home.

The incentivisation strategy also fostered eagerness to participate and compete with other EcoPrize contestants. Gift cards and raffles are a great way to incentivise potential participants since they know they will receive a reward for participation while also taking part in a friendly competition. This is one of the greatest values of the in-person event strategy and could be digitally translated to gathering points for redeemable rewards. After participation in the event, 53% of participants reported feeling that it is wrong to discard multi-layered plastics, and 30.4% of participants indicating that multi-layered plastics should be collected for recycling. This represents the majority of participants developing or deepening perceptions on recycling and waste production, and indicates that people's personal feelings on environmental concerns can be changed. We can take inspiration from similar initiatives in Toronto ([1.2](#)) to broaden the scope of EcoPrize events, increase their effectiveness, and extract more meaningful data. To do this, we may target culturally and socioeconomically diverse communities with EcoPrize events and using community engagement to spread awareness. We can also target eligible participants virtually through the app in an unstructured, asynchronous manner to continuously target large audiences. Using voluntary in-depth surveys and semi-structured interviews also represent an effective way to evaluate participants' opinions, knowledge, and feelings about plastic recycling. Surveys and interviews can be conducted through the app, in sign-up forms, or during the EcoPrize events.

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## Appendix

### *A1.1: Source Searching Strategy*

Search terms used in Google Scholar & Web of Science:

("Toronto" AND "Ontario" AND "Canada) AND (recycle\*) AND (plastic)

("Toronto" AND "Ontario" AND "Canada) AND (recycle\*) AND (multilayer\*) AND (plastic)

(recycle\*) AND ((multilayer\*) OR (flexible)) AND (plastic)

I pulled review articles, meta analyses, and grey literature, as well as primary research. News articles and corporate websites were found through mainstream search engines.

### *A1.2: Circular Economy and Plastic Reduction Strategies*

The synergistic effect between reducing the amount of single-use plastics that enter a home and providing consumers with alternatives to hard-to-recycle plastics can be leveraged in future EcoPrize events by coupling the recycling activity with workshops that inform consumers of waste-free options and how to use these at home. For example, beeswax wraps are a new and trendy way to replace cling film and plastic wraps in the home. While they may be impractical to use as a direct replacement since they may not form as tight of a seal on containers or around food as cling film, they provide a healthier option for everyday covering of food items for short-term freshness as well as an opportunity for a simple do-it-yourself activity that can help to reduce textile waste in the home (which is another area of interest within the sphere of plastic waste). They may also be expensive to source (either buying them new or buying the materials) but can definitely be made at home and can be a part of consumers' plastic-free strategies.

Many people are unaware that they can make cheap and multipurpose bioplastics at home using water, cornstarch, and glycerin. These materials have major limitations given that their biodegradability makes them unsuitable for storage of liquids and for airtight sealing, but their lack of durability can be exploited in the household setting for short term, eco-friendly, and healthy storage of foods and cooked dishes where preservation and freshness are less of an issue. Most mass produced "bioplastics" on the market are not suitable alternatives (not easily biodegradable and not proven to be healthier alternatives) for traditional plastic, which should be obvious to the consumer given that they are used for straws, hot beverage containers, and food wraps. This



could also be a fun, safe, and educational activity to do with kids to introduce them to plastics, recycling, and environmentally friendly habits.

As aforementioned, plastic waste may encompass the various textiles, fabrics, and clothing scraps that end up in landfills and are slow to decompose due to the presence of acrylic, polyamide, polyester, and other man-made materials. This is a lesser known source of non-biodegradable waste that ends up in landfills, and while it is dissimilar to the multi-layered plastic we are focusing on, this has potential to affect the ways in which consumers and households view waste reduction and reduce the overall amount of trash they produce. Educating people about the environmental effect of discarding their acrylic sweaters, waterproof garments (which are coated with PFAs), and activewear (man-made polymers) also end up in landfills and are particularly troublesome as textile waste is often shipped to the Global South in huge bales and misrepresented as second hand or refurbished goods. Often, the unsellable garments that make it this far will end up in offshore landfills and trash fires which is increasing the worldwide environmental impacts of waste disposal (Nkatha, 2023). Strategies for reducing textile waste in landfills include favouring organic fibres such as cotton, wool, and linen over synthetic fibres, buying second-hand or learning how to create garments (i.e., sewing, knitting; the materials for these crafts may also be second-hands) and reusing old clothes as rags and cleaning cloths.