OKAY, WHAT'S UP WITH COMPOSTABLE PLASTICS?

KEY INFORMATION TO KNOW BEFORE CHOOSING YOUR PRODUCTS

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ABSTRACT

Despite standardization processes that have been working since 1992 to give industries and consumers clear information, there is still a lot of confusion about what compostable plastics are made of and whether they can actually be composted. Single-use waste items are a major concern for waste management and environmental protection, and various options for reducing these items and making them less harmful to humans and ecosystems are just beginning. When working with food services, if single-use items cannot be avoided, the goals are to provide products that are useful to customers, consistent with waste management systems, and as environmentally friendly as possible. In addition, businesses find it useful when all waste disposal can be streamlined and simplified to decrease management and disposal costs. Because food contamination makes recycling challenging, and organics are banned from most landfills, composting all food service waste is desirable to achieve these goals. However, many food service items cannot be served in fully compostable wood and paper fibre products: compostable plastics are designed to fulfill this need. This document clears up general points of confusion about compostable plastic, certification standards, and composting processes. In addition, it gives an overview of composting-related progress in the Metro Vancouver area, summarizes local facilities and what items they accept, and provides potential directions for future development to reduce single-use items and divert more organic waste from landfill.

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CERTIFIED COMPOSTABLE PLASTIC

CERTIFICATION STANDARDS

According to international certification bodies such as the International Organization for Standardization (ISO), the American Society for Testing and Materials (ASTM) and third-party certifiers like the Biodegradable Products Institute (BPI), a truly "biodegradable" plastic must also be fully "compostable". This specification means that the product breaks down completely into organic molecules and does not contain any petroleum chemicals (Bastioli, 2014b; Vieira, 2011). Throughout this paper, the terms "biodegradable" and "compostable" will both refer to items that conform to these standards. To be certified by international organizations like ISO, ASTM, and BPI, biodegradable plastics generally must:

1. Be composed of organic chemicals, which can be natural or synthetic.
2. Disintegrate by 90% into particle sizes smaller than 2mm within 12 weeks, and compost completely (disappear) within 6 months in an industrial composting facility.
3. Not inhibit the industrial composting process.
4. Not have ecotoxic effects on the soil produced (Bastioli, 2014a).

Importantly, these standards reflect conditions in industrial composting facilities. Certified compostable plastics do not necessarily degrade in backyard composting methods, because this compost typically does not reach the necessary heat level for long enough. Compostable plastics also do not break down by the above standards in a landfill, litter, or ocean setting. To degrade properly within the time specifications, compostable plastics must be processed for a minimum of 2 months in an industrial composting facility that optimizes heat for microorganisms that break down organic matter.

COMMON COMPOSTABLE CHEMICALS

A common biodegradable polymer used to create compostable plastic is Poly Lactic Acid (PLA). PLA is created synthetically by using bacteria to ferment agricultural waste (Rojan, Anisha, Nair, & Nampoothiri, 2011). This fermentation leads to the creation of lactic acid (the same chemical our muscles produce when we work them too hard), which is then heated and pressurized to create PLA (Rojan et al., 2011). PLA is often combined with polyglycolic acid (PGA), another biodegradable chemical, to fine-tune certain properties such as hardness, water resistance, and heat resistance (Vieira, 2011). These chemicals are used to create single-use products such as cold beverage containers and can also line paper-based products such as coffee cups (Bastioli, 2014c). In addition, PLA can be processed at high pressure and heat to become a product known as crystallized-PLA (CPLA). Used to make utensils and lids, CPLA includes PLA, chalk, and other certified biodegradable plastics that make the product harder and less susceptible to heat degradation during use (Bio Futura, 2018). Similarly, talc-injected PLA (TPLA) is composed of PLA and talc, a natural mineral which allows PLA to be molded into harder materials like utensils (Aversa, Barletta, Pizzi, Puopolo, & Vesco, 2017; Shakoor & Thomas, 2014). There are no petroleum products or chemicals in PLA or PGA, which means they are truly biodegradable (Vieira, 2011). Other polymers that are starch-based or composed partially from organic materials are sometimes advertised as biodegradable or bio-based. However, these products are not compostable, and often are not even feasibly recyclable. Only products with a certification logo from a recognized standardization facility have undergone rigorous testing to ensure they biodegrade fully in an industrial composting setting.

GREEN LABELED PRODUCTS

Though certified biodegradable and compostable products conform to high standards, there is a wide market of "Green-Labeled" products that confuse consumers and industries. Products that claim to be biodegradable may actually be composed of petroleum-based chemicals that disintegrate into microplastics rather than organic chemicals in a process called oxo-degradation (Adamcová, Radziemska, Fronczyk, Zloch, & Vaverková, 2017; Bastioli, 2014d). These products will sometimes contain Totally Degradable Plastic Additive (TDPA), which is an organic additive that assists in degradation of plastics (whether biodegradable or not) (Adamcová, Vaverková, & Toman, 2013). However, the microplastics resulting from degradation of non-organic plastics are harmful to ecosystems, and their use should be avoided (Adamcová & Vaverková, 2014). In fact, reduction of microplastics entering ecosystems such as the ocean is a key concern for many conservationists and has recently been prioritized in the Canadian Government's Ocean Plastics Charter (Canada, 2018). The best way to avoid consequences of using Green-Labelled products is to only purchase biodegradable plastic products that have been certified by ISO, ASTM, BPI, Vincotte OK Compost, or other international standardization bodies (see Figure 1).

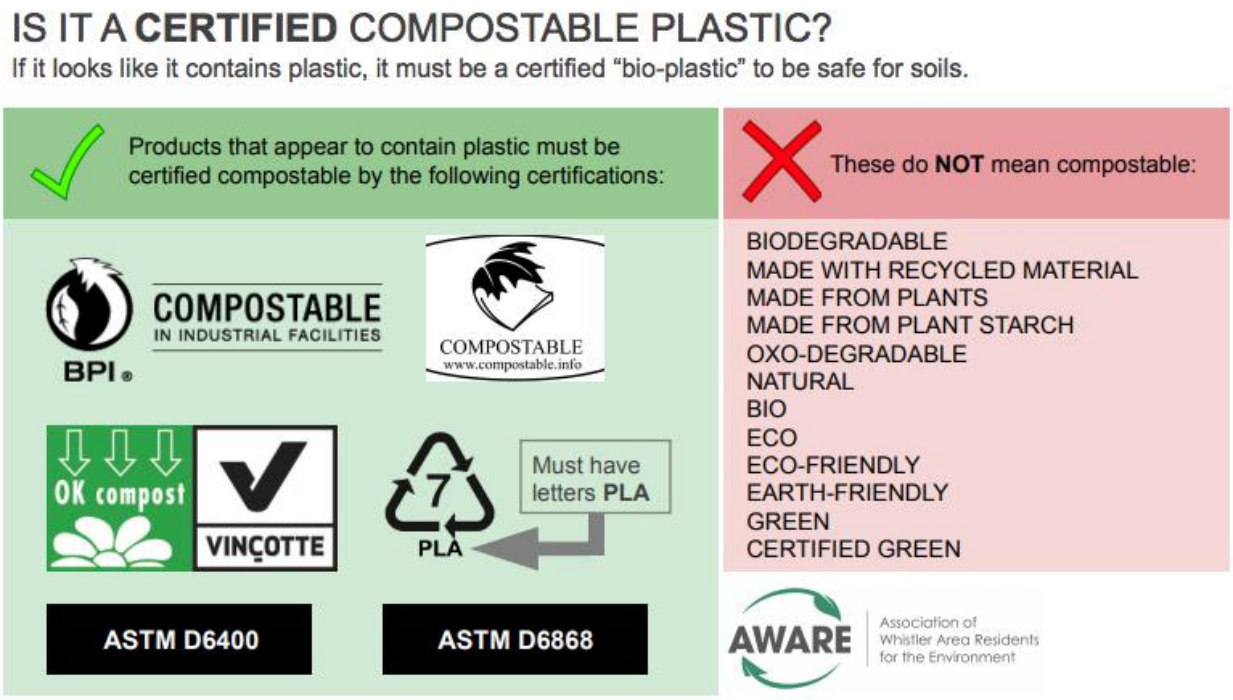

Figure 1: Compost certification labels and misleading Green-Labeled counterparts. Image from Association of Whistler Area Residents for the Environment (AWARE Whistler, 2016).

ARE COMPOSTABLE PLASTICS RECYCLABLE?

In short, no. There are three key reasons why compostable plastics should not or cannot be disposed into existing recycling programs.

1. Recycling facilities are not equipped to handle them.
At some point, all properly recycled materials are processed in a Material Recovery Facility (MRF). These facilities use a series of machines which recognize and sift out certain types of waste to be baled and eventually recycled (LeBlanc, n.d.; Recycle More NC, 2011; Rumpke Waste & Recycling, 2010). Identifying and sorting different types of plastics often requires laser and air technology to properly sort plastics. Many current MRF processes do not identify compostable plastics, which means that they must be picked out by hand and disposed of, usually in a landfill or incinerator.

2. They are often contaminated with food waste.
Food waste is problematic for recycling any product. However, since compostable plastic is marketed toward use in food service industries, food contamination may be higher. This contamination makes recycling these materials less profitable, because they must also be cleaned before they can be processed.

3. They cannot currently be collected in sufficient quantity.
These products are still relatively new, so no mechanized or universalized recycling process exists for them between consumers and recycling facilities. Thus, compostable plastics are not currently collected at rates that make it profitable to invest in expanded collection or recycling technology.

If these three limitations were accounted for, it would largely be possible to recycle compostable plastics. However, the difficulties associated with compostable plastics are, in fact, common to all plastic waste items (Welle, 2011). Compostable plastics are intended to overcome these challenges by nature of being industrially compostable, allowing processers to skip the many stages required for recycling.

LIFE CYCLE ANALYSIS, ENVIRONMENTAL IMPACTS

Regarding compostable plastics, sustainability researchers are also interested in the overall environmental impact of these products compared to other options. A life cycle analysis (LCA) is a common method for assessing a product's environmental impact because it includes a "cradle-based" analysis that considers production, use, and disposal phases. A recent literature review published by the State of Oregon Department of Environmental Quality found that compostable plastics have mixed environmental impacts when compared to traditional petroleum products (Vendries et al., 2018, p. 77). The authors reviewed 10 studies that use LCA models to compare compostable and plastic packaging in general, and 7 studies that compare compostable and non-compostable foodware. Distinctions between compostable and traditional plastics arose from different environmental crediting for disposal methods, and diverse modelling assumptions. Importantly, the review notes that compostable plastics generate high emissions through the synthesis of PLA (which uses agricultural wastes) and harvesting of trees for paper fibre products (such as coffee cups) (Vendries et al., 2018, p. 90, 2018, p. 92). Interestingly, the study which compared compostable and non-compostable utensils showed a significantly lower environmental impact from compostable cutlery (Vendries et al., 2018, p. 92). The authors express the need for more studies and consistent modeling practices to improve knowledge about compostable plastic production, use, and disposal (Vendries et al., 2018, p. 77). However, their initial conclusion is that compostable plastics, and compostable plastics combined with paper fibre, have mixed environmental impacts and should not be celebrated as a silver bullet sustainable solution.

INDUSTRIAL COMPOSTING

GENERAL PROCESS

Composting facilities typically take 2-6 months to fully compost their organic matter. Upon intake of compost material, the first stage is generally to sift through the organic input on a conveyor belt, using human or mechanic power to remove any large contaminants. Next, facilities send material through a grinder that partially disintegrates material to speed up the composting process. The input material is then mixed with a feedstock, which is composed of already-composted organic material full of microorganisms, to ensure an appropriate nitrogen to carbon ratio, moisture, and oxygen content. This mixture then goes through a high heat and intense composting phase generally lasting 3-6 weeks to sanitize and break down most of the organic material. This composting stage is where most facilities vary in their process (see Table 1). Finally, all compost must undergo a curing process that reduces heat and finalizes material breakdown. Curing usually lasts 2-4 months depending on the composting process.

FOUR MAIN METHODS

There are four main types of industrial composting processes that are often combined by facilities to refine and improve their products (Table 1). All processes involve high temperatures because organisms that degrade organic material tend to thrive in high heat (about 60 degrees Celsius) (Bastioli, 2014a). Additional factors such as moisture and oxygen are also controlled to improve microorganism functions. Three of the processes are aerobic, which means they cultivate microorganisms that thrive in an oxygen-rich environment, and the final process uses microorganisms suited for an anaerobic (non-oxygenated) environment. These processes are:

- Static Pile / Aerated Static Pile
- Turned Windrow
- In-vessel
- Anaerobic Digestion

FACILITY-BASED RESEARCH

A recent study at BC composting facilities (Zhang et al., 2017) found that all PLA products decomposed significantly better than paper fibre-based products in three out of four types of composting practices. Another study in Vermont at a static pile composting facility tested different certified compostable and Green-Labeled biodegradable cutlery and found that all ASTM and/or BPI certified compostable plastics degraded successfully in their facility, whereas all Green-Labeled products did not (Clark, 2014). These and other findings reinforce the importance of using standardized materials and increasing communication about which products industries and consumers should use.

According to this study, all composting methods except anaerobic digestion are capable of fully composting PLA. In-vessel composting most successfully composts all types of foodware products. Since these BC facilities combine methods to maximise output quality, PLA products are successfully compostable in all tested facilities, which conforms to the standards required by compostable certification standards. However, this result does not mean that all facilities accept compostable plastics. As such, the waste diversion and decontamination potential of compostable plastics has yet to be fully realized.

TABLE 1

METHODS OF INDUSTRIAL COMPOSTING AND FOODWARE PRODUCTS COMPOSTABILITY RESULTS

DATA SUMMARIZED FROM ZHANG ET AL. (2017)

TYPE	METHOD AND FACILITY	PROCESS	TESTING PERIOD AND TOTAL PROCESSING TIME	PRODUCTS COMPOSTED >80% (5 TYPES OF PRODUCTS TOTAL)
1	Static Pile Harvest Power (Richmond, BC)	Organic waste is mixed, piled and aerated from underneath to add oxygen for aerobic bacteria. Pile is watered regularly.	**Test:** 2 months **Processing:** 2-4 months (including turning and curing)	1. PLA 2. Fibre (tree) 3. Fibre (bagasse)
2	Turned Windrow Revolution Resource Recovery (Lytton, BC)	Organic waste is ground and piled into rows, which are turned mechanically about every 2 weeks to maintain heat and oxygen levels.	**Test:** 4 months **Processing:** 8-10 months composting, 8-12 months curing	1. PLA *Low compostability of fibre products may be due to low moisture.
3	In-vessel (followed by roofed windrow) Whistler Composting Facility (Whistler/Squamish, BC)	Organic waste is mixed and piled indoors in temperature, oxygen, and moisture-controlled tunnels, with trays that turn the waste. Then, material is sifted and cured in covered windrow.	**Test:** 5 months (about 3 weeks in-vessel, 4 months curing) **Processing:** 6-8 months	1. PLA 2. Fibre (tree) 3. Fibre (bagasse) 4. Fibre (cellulose) 5. Fibre lined with PLA
4	Anaerobic Digestion (followed by Static Pile) Harvest Power (Richmond, BC)	Organic waste is processed in water to maintain low-oxygen conditions, supporting anaerobic bacteria. After 2 weeks, material is moved to a static pile that is turned monthly to maintain oxygen levels.	**Test:** 2 months **Processing:** 3 months (including curing in static pile)	1. Fibre (cellulose)

ONGOING RESEARCH

Though the products are not new, facilities and regulatory bodies are in the process of learning more about them. Understanding compostable plastic and how they are processed at various composting facilities is an increasing priority for Metro Vancouver and municipalities such as the City of Vancouver, which has included a special focus on compostable plastics in their Single-use Item Reduction Strategy (Vancouver, 2018c). Results are upcoming from their research.

A project currently underway is the International Field Testing Program, that focuses on certified compostable plastics' degradation success (McGill & Oshins, 2018). The program was produced by the Compost Council Research & Education Foundation (CCREF), a nonprofit which strives to clarify composting standards (CCREF, 2018), and BSIbio Packaging Solutions/BÉSICS® (BSIbio), a Vancouver company that produces compostable plastics (BSIbio, 2018). Through the project, composting facilities are provided materials such as plastic mesh bags and a sample of certified compostable products which they may send through their composting process to evaluate compostability of materials (the same methodology used by Zhang et al., 2017). In this way, facilities are empowered to evaluate whether certified compostable plastics degrade in their system and may upload this information on an open-source database (McGill & Oshins, 2018).

As this project is currently underway, no results are currently available. However, the research is promising because it will allow facilities to determine which products their process successfully composts, with the potential for opportunities to upgrade or expand their systems to include compostable plastics in certain streams.

COMPOSTING FACILITY CHALLENGES

FACILITIES, LICENSING & CONTRACTS

Composting facilities ultimately determine whether compostable plastics will be accepted or not (Metro Vancouver, n.d.). Acceptance is based both on their facility process and licensed waste item allowances (Table 2). Private waste haulers typically contract with composting facilities, while some composting facilities also directly contract with businesses. The line of communication between businesses, haulers, and composting facilities includes item acceptability and maximum contamination allowances. Acceptable items and contamination levels are also affected by regional and provincial policies. BC's Organics Matter Recycling Regulation (OMRR) (Province of British Columbia, 2002) (including amendments up to July 27, 2018) specifies facility management regulations as well as which items are accepted (see Schedule 12: Organic Matter Suitable for Composting). Since compostable plastics are not currently included in BC's OMRR, there are no regulated best-practices for accepting compostable plastics from a provincial standpoint. This limitation makes it difficult for regions, municipalities, and composting facilities to regulate acceptance and processing of compostable plastics.

RESIDENTIAL VERSUS COMMERCIAL STREAM CONFUSION

Vancouver-area compost facilities do not accept compostable plastics in their residential waste stream (da Silva, 2018), and few accept compostable plastics in their Institutional, Commercial, Industrial (ICI) waste stream.

The reason for this distinction is that the widespread confusion about certified compostable plastics versus Green-Labelled products leads to high contamination of the compost stream, which the composting facilities do not have the resources to manage (Vendries et al., 2018). This difference between residential and ICI composting streams limits options for people to use compostable plastics in their homes, which confuses people about whether products are "actually compostable" or not. In addition, media sources continue to put out sensational reports and videos with highlights that mislead the public about compostable plastics (for examples, see BuzzFeedVideo, 2018; da Silva, 2018), which are not currently effectively countered by official industry and government communications to clarify the issue. When consumers encounter different regulations at their businesses and in their homes, they become confused and more likely to make contaminating disposal choices.

HEARING FROM COMPOSTING FACILITIES

For this report, representatives from four Metro Vancouver and Sea to Sky area composting facilities were asked about challenges with compostable plastics. Though many could not share details of their composting process, all representatives stated that the key contaminant their staff and machinery pulled out is plastic. Some expressed that their facility did not achieve high enough heat to process compostable plastic, and others did not believe that compostable plastic was truly compostable. Additional challenges involved mechanics of their sifting and mixing technology. For example, one representative stated that certified compostable plastic bags composted well in their facility, but if the bags were not ground and mixed in properly, then any organics inside the bag would not compost properly and would have to undergo another round of composting, which

is less desirable due to increased cost for lower return value. Overall, representatives expressed that contamination from plastics is their largest challenge, and confusion about compostable plastics leads to higher contamination and thus lower-quality composted material. This outcome means that that safest option is to restrict compostable plastics completely from all streams, or to only accept certified compostable plastics through a clear contract agreement and visual verification of products with businesses that wish to use compostable plastics.

HEARING FROM WASTE TRANSFER STATIONS & BROKERS

Before organic waste is processed at composting facilities, it is often collected and repackaged at a Transfer Station or Brokering Facility (see Table 2). As such, if a Transfer Station or Brokering Facility wishes to send higher-quality products to compost facilities at a greater value, they are less likely to accept compostable plastics in their organics stream due to the risk of higher contamination. Private waste haulers face similar challenges because it is only feasible to collect products which can be sold for a high enough value. Some facilities, such as Revolution Infrastructure Inc. (Table 2), require a specific contract from businesses that ensures all their compostable plastic waste is certified. Revolution Infrastructure Inc. also requires compostable plastic products to be visually verified by their staff before the product can be included in the contract. For large-scale operations like Revolution Infrastructure Inc., these specifications also determine where the facility can send the compostable waste, as only some composting facilities they operate or contract with will accept compostable plastics. Thus, it is important for businesses to communicate clearly with contracted haulers, transfer stations, and composting facilities to ensure their compostable plastics can be actually composted, rather than sifted out and landfilled or incinerated

FOCUS: SEA TO SKY SOILS

Sea to Sky Soils (SSS) was very open in discussing their composting process and key challenges, and welcome visitors to tour their facility and understand how their systems work. This facility processes compost from North Vancouver, as well as Squamish and Pemberton, using a combination of turned windrow and static pile composting (see Table 2). Jaye-Jay Berggren, the owner-operator of SSS, shared that a key challenge with compostable plastics is that their initial screening process requires employees to remove large contaminants before sending the input material through a grinder. Since employees must sift through large volumes of material, they cannot be expected to be experts on all certifications, and moreover able to identify whether a product is certified compostable when covered with other waste. In addition, picking up many small bits of plastic is more time-consuming than removing a single bag before it enters the grinder. These limitations lead to a lot of compostable plastic being removed and sent to landfill before it has a chance to undergo composting. Berggren expressed that the easiest products for compost facilities to process are wood- and paper-based, especially because these materials can be broken down for sale to certified organic farms. Currently, SSS sells compost from the residential stream (which does not accept compostable plastics) to organic farms in the area, whereas the ICI sector compost is used for other purposes such as landscaping (Berggren, 2018). Other composting facilities face similar challenges with staffing, product identification, screening, and product sale value, which all affect their willingness and ability to process compostable plastics.

CURRENT PROGRESS IN METRO VANCOUVER

CANADA'S OCEAN PLASTICS CHARTER

Throughout 2018, Environment and Climate Change Canada openly addressed the issue of single-use plastics and have developed an action plan to reduce negative impacts. Under a focus on reducing plastics that enter the oceans, some single-use plastics reduction targets they commit to are:

- Moving toward 100% reusable, recyclable, or recoverable plastics by 2030.
- Recycle and reuse 55% of plastic packaging by 2030 and recover 100% of plastics by 2040.
- Use market-based approaches and improve labelling standards to encourage consumers to make sustainable decisions on using plastics.
- Encourage intergovernmental collaboration through the G7.
- Raise awareness and clean up shorelines and the oceans. (Canada, 2018)

Though it is promising that these conversations and initiatives are being developed at an international level, it must be noted that the current federal agreement is non-binding (Pawson, 2018), however, some key international corporations such as Coca Cola and Nestle have signed on (Kurdi, 2018). Thus, to improve plastics diversion and reduce single-use items, more actionable strategies occur at regional and local government levels, such as Metro Vancouver.

METRO VANCOUVER REGIONAL DISTRICT – ZERO WASTE CHALLENGE

Since 2015, organics have been banned from entering landfills in Metro Vancouver. This was the first strategic stage of Metro Vancouver's Zero Waste Challenge Strategy (Metro Vancouver, 2011).

FOCUS: HOP COMPOST LTD.

Hop Compost Ltd. accepts compostable plastics (see Table 2), typically from the food services sector. The company operates an in-vessel composting method, so they have direct control over the organic waste mixtures entering the process to ensure compostable material breaks down effectively. The representative expressed that it is important to not overload the facility with compostable plastics because without the right conditions, they do not degrade effectively. Hop Compost Ltd. also directly collects all the waste it processes, without using any third-party haulers, to ensure the organics it collects are of good-enough quality for their process.

Following stages address single- and multi-family residential units, construction and demolition waste, and businesses and institutions (Metro Vancouver, 2011). Pertaining to waste management, the regional district's major initiatives include developing communication material and outreach across all sectors, and improving collaboration and collection services to further reduce the amount of organic and recyclable material entering landfill (Metro Vancouver, 2018a, 2018c). An important resource they provide for all businesses is a complete system of waste management signs that can be edited and adapted to specific business needs (Metro Vancouver, 2018b). One document they provide to clarify history and progress of compostable plastics acceptance is titled Acceptance of Compostable Plastics in the Metro Vancouver Region (Metro Vancouver, n.d.). The document strongly recommends checking which items the local composting facility accepts to determine whether compostable plastics should be used. Metro Vancouver is also currently developing a Single-use Item Reduction Strategy, alongside the region's municipalities.

CITY OF VANCOUVER – SINGLE-USE ITEM REDUCTION STRATEGY

Under its Greenest City initiative, the City of Vancouver has committed to significantly reducing single-use items (paper and plastic) by 2025 (Vancouver, 2018c), following its Zero Waste 2040 plan (Vancouver, 2018a). Vancouver's priorities include reducing greenhouse gas emissions from landfills, recovering useful resources from waste, and creating social and economic opportunities through zero-waste initiatives and a circular economy (Vancouver, 2018b). Vancouver's Single-use Item Reduction Strategy addresses use of:

- Plastic and paper shopping bags
- Polystyrene foam cups and take-out containers
- Disposable hot and cold drink cups
- Take-out food containers
- Disposable straws and utensils

In the fall of 2018, Vancouver was scheduled to review bylaw details inhibiting proper organics disposal, recycling, or other challenges experienced by stakeholders, and to complete technical research on compostable packaging. Results of this investigation are expected in 2019. Importantly, a goal of the investigation was to identify compostable foodware (including compostable plastic and paper fibre products) that are not only internationally certified, but which are also approved by local composting facilities (Vancouver, 2018c). Vancouver also discusses regulating which compostable plastics may enter the market, to eventually remove Green-Labelled but non-compostable items from circulation and decrease public confusion leading to contamination. For most single-use items Vancouver consulted about, businesses supported strategies that allowed them to adapt their own systems to using alternative material, rather than the region imposing a complete ban outright. However, the Single-use Item Reduction Strategy also states that if reduction targets have not been met by 2025, then Vancouver will impose full bans on certain items to ensure compliance (Vancouver, 2018c). Thus, businesses can expect regulation of certified compostable plastics and approval in local composting facilities by 2025, and progress toward regulation starting in 2019.

WHAT CAN YOUR BUSINESS DO?

So, what's up with compostable plastics? Should they be used, or avoided at all costs? This report has aimed to clear up general confusion about compostable plastic, certification standards, and composting processes. In addition, it gives a brief overview of where the Vancouver region now stands regarding compostable plastic items, and potential directions for future development to reduce single-use items and divert more organic waste from landfill. This section describes actionable strategies that businesses can undertake to provide more sustainable products and waste management systems.

PAPER, COMPOSTABLE PLASTIC, OR PETROLEUM PRODUCTS?

When making sustainable product decisions, businesses should continuously re-evaluate their needs as well as progress in technology and regulations regarding their products. First, reduction of waste items overall is the top priority. Where this is not possible, composting facilities generally agree that wood, paper, and bamboo products are much easier for their systems to process. However, wood and paper products are difficult to implement widely across all food service industry needs because they are not suitable for all food types. Comparing environmental impacts of wood and paper products, compostable plastics, and petroleum plastics will be important as more businesses and regions begin to consider the overall environmental impacts of their products. For example, the literature review that compiles life-cycle analyses of foodware products (Vendries et al., 2018) finds that compostable plastics have mixed environmental impacts, though many impacts must be further investigated to address current knowledge gaps (see "Life Cycle Analysis, Environmental Impacts" for discussion). As more research is completed and information becomes available to facilities and policy-makers, businesses should continually re-evaluate their systems to ensure sustainability goals are met.

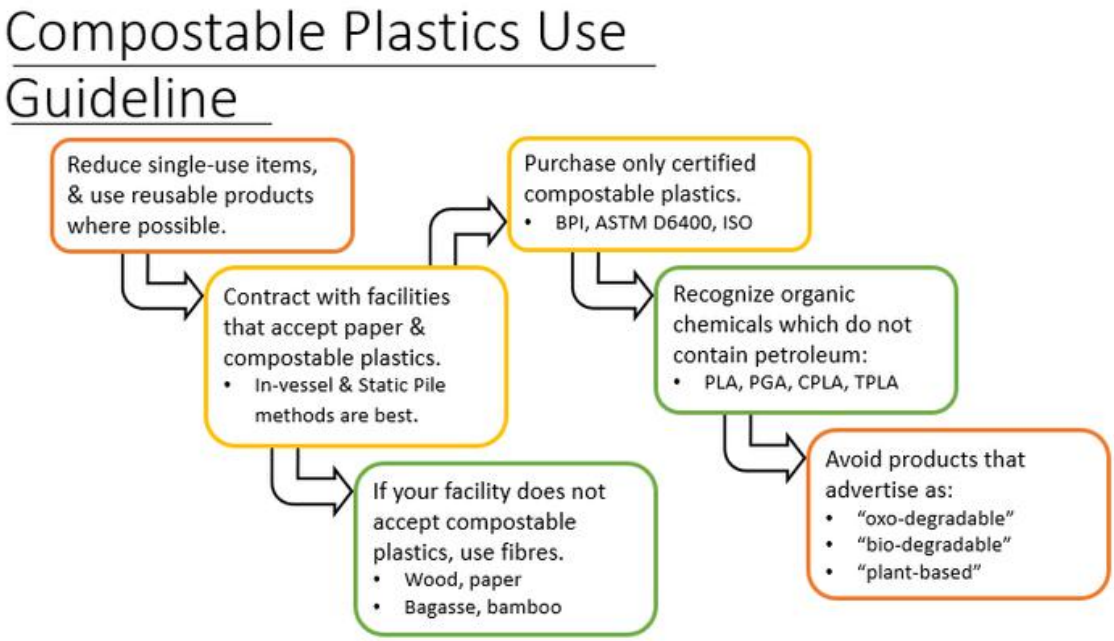

Figure 2: Compostable plastic use guideline developed by the author for this report. Generally, businesses should first continually reduce waste production, then pursue reasonable compostable and recyclable alternatives according to available waste facilities and their service needs.

STREAMLINE YOUR WASTE MANAGEMENT SYSTEM

Clearly, reducing waste items is the top priority. But if becoming 100% reusable within a year is too idealistic, using compostable plastic and fibre foodware is a reasonable decision. The key value compostable plastics bring to food service businesses is that they prevent food contamination from entering the recycling and landfill streams, both of which are banned and can result in fines and higher tipping fees. In addition, waste in landfill uses up valuable municipal space and contributes negatively to climate change through emissions and land use. Streamlined waste is important especially if the waste management system relies on customer disposal, because customer confusion from too many waste item and disposal stream options leads to contamination. Items like cutlery and straws should all be collected in the same stream, likewise with clamshells and to-go cups. Ideally, all foodware distributed should be compostable to both limit the customer's potential for making a contaminating disposal choice, and decrease the number of bins and amount of sorting that staff must do when cleaning up the waste. If regions can process compostable plastics locally at composting facilities, negative environmental impacts from transporting recyclable waste overseas will also be avoided.

STAY UP TO DATE

Where possible, businesses should contract with composting facilities that accept compostable plastics as well as fibre-based products. If it is not possible to engage a composting company that accepts compostable plastics, prioritize use of wood, paper, and other natural fibre products to ensure they are properly composted, and waste is streamlined.

Stay up to date if your waste management company or region begins to accept compostable plastics and expect improved clarity and communication about these products from Metro Vancouver's municipalities. For waste management systems to work effectively, it is important that information is consistent across sectors, and well-communicated. Standardization of compostable plastics use in B.C. will be a positive step for guiding businesses and reducing single-use item waste. Solid waste personnel at the municipal level and with Metro Vancouver can provide information about current and potential future regulations and practices regarding compostable plastics, and are thus a valuable resource to guide future decisions about waste items.

CONCLUSION: THREE PROBLEMS AND THEIR SOLUTIONS

Certified compostable plastics compost completely in industrial composting facilities. However, three challenges to their use are:

1. General confusion about the products, leading to contamination of compost, recycling, and landfill waste streams.
2. Most collection and processing systems are not currently able to handle these items efficiently, leading to compostable plastics being screened out and landfilled or incinerated.
3. Regulations are not in place to prevent Green-Labelled products from entering the market, nor to guide waste collection and composting facilities on compostable plastic processing.

To address these challenges, businesses should:

1. Clarify whether their composting facility accepts compostable plastics, and ensure they only purchase certified compostable plastics that can be composted by the facility.
2. Provide clear instructions, resources, and streamlined products to employees and customers to ensure all waste streams are contaminated as little as possible.
3. Stay up to date on municipal and regional waste management regulations relating to compostable plastics, as many updates are expected from 2019-2025.

Additional solutions will be found through government regulation of compostable plastics sale and processing, field testing at composting facilities that enables them to determine which items they can accommodate, and improved models that clarify environmental impacts of compostable plastics throughout their product life cycle. In the meantime, compostable plastics are a safe, useful alternative to non-compostable single-use foodware when they are accepted and properly composted in local composting facilities.

TABLE 2

FACILITY INFORMATION REGARDING ACCEPTED ITEMS, COMPOSTABLE PLASTICS ACCEPTANCE, AND COMPOSTING PROCESS.

PREFIXES INDICATE: B - BROKERING FACILITIES; C - COMPOSTING FACILITIES; T - TRANSFER STATIONS/MATERIAL RECOVERY FACILITIES (METRO VANCOUVER, 2018E). OBTAINED THROUGH METRO VANCOUVER'S PUBLICLY AVAILABLE DATABASE OF SOLID WASTE FACILITY LICENSES.

FACILITY INFORMATION	LICENSE (METRO VANCOUVER)	ACCEPTED ITEMS	COMPOSTABLE PLASTICS ACCEPTED?	COMPOSTING PROCESS	LICENSE SOURCE
Hop Compost Ltd. 1328 Marine Drive, Vancouver 403-860-1471	C-022	Food Waste, Wood Chips	Yes	In-vessel, followed by Covered Static Pile 8-12 days In-vessel, 5 weeks Static Pile	(Metro Vancouver, 2016l)
Revolution Infrastructure Inc. 19500 - 56th Avenue, Surrey, BC; 460 East Kent Avenue South, Vancouver, BC 604-539-1900	T-040; T-041; T-044	Single Stream Mixed Recyclables, Paper Products, Source Separated Organic Waste, Clean Wood Waste	Yes Conditional: product must be visibly confirmed and included in contract.	NA (Transfer Facility) (Uncertain)	(Metro Vancouver, 2016a, 2016b, 2016c)
Recycling Alternative 449 Industrial Avenue, Vancouver, BC 604-874-7283	B-047	Single Stream Mixed Recyclables, Paper Products, Source Separated Organic Waste, Clean Wood Waste	Yes Sends organic material to Revolution Infrastructure Inc.	NA (Brokering Facility)	(Metro Vancouver, 2016g)
Anaconda Systems Ltd. 8601 Main Street, Vancouver, B.C. 604-630-5811	C-021	Food Waste, Paper Products, Yard Waste	No	In-Vessel, followed by Static Pile 8-10 weeks	(Metro Vancouver, 2016e)
Baird Cattle & Border Feedlot Corp. 17256 - 8th Avenue, Surrey, BC 604-813-7511	C-001	Food Waste, Minimum rubber content tire fibre, Cardboard	No	Covered Static Pile 5-6 weeks	(Metro Vancouver, 2016i)
Ecowaste Industries Ltd. 15111 Williams Road, Richmond, BC 604-788-0484	C-007	Yard Waste	No	Turned Windrow Timeline not available	(Metro Vancouver, 2016j)

Enviro-Smart Organics Ltd. 4295 72nd Street, Delta, BC 604-946-0201	C-016	Food Waste, Yard Waste, Paper Products, Clean Wood Waste	No	Covered, Aerated Static Pile, followed by Turned Windrow 4-8 weeks	(Metro Vancouver, 2016f)
Harvest Fraser Richmond Organics Ltd. (Harvest) 7028 York Road, Richmond, BC 604-270-7500	C-004	Food Waste, Yard Waste, Paper Products, Clean Wood Waste	No	Aerated Static Windrows 6-10 weeks *ending service	(Metro Vancouver, 2018d)
Harvest Fraser Richmond Organics Ltd. (Harvest) 7029 York Road, Richmond, BC 604-270-7501	B-052	Packaged Organic Waste, Packaged Liquid Waste	No	Anaerobic Digestion *ending service	(Metro Vancouver, 2017)
Augustine Soil & Mulch Ltd. 17949 Kennedy Road, Pitt Meadows, BC 604-465-5193	B-031	Food Waste, Yard Waste, Paper Products, Clean Wood Waste	No	NA (Brokering Facility)	(Metro Vancouver, 2016k)
Meadows Landscape Supply Ltd. 17799 Ferry Slip Road, Pitt Meadows, BC 604-465-1311	B-032	Food Waste, Yard Waste, Clean Wood Waste	No	NA (Brokering Facility)	(Metro Vancouver, 2016d)
Cascades Recovery Inc. 12345 - 104 Avenue, Surrey, BC 604-589-4385	B-010	Recyclable Materials, Source Separated Organics	No	NA (Brokering Facility)	(Metro Vancouver, 2016h)
OTHERS (SEA TO SKY REGION)					
Sea to Sky Soils S Rutherford Creek Rd, Pemberton/Whistler. 9km S of Pemberton off Highway 99 604-907-2876	NA	Source Separated Organics, Yard Waste, Food Waste	Yes (Commercial stream)	Turned Windrow, followed by Static pile	(Berggren, 2018)
Whistler Composting Facility Whistler Waste Transfer Station, Callaghan Valley Road (15km S of Whistler off Highway 99) 604-213-6606	NA	Source Separated Organics, Yard Waste, Food waste, Biosolids	Yes	In-vessel	(Zhang et al., 2017)

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