

**Effects of Compostable Plastics
In
Vancouver's Organics Facilities**

by

Executive Summary

Plastic contamination in Vancouver's Green Bin composting program challenges two main goals of Vancouver's Greenest City 2020 Action plan: zero waste and a sustainable food system. The City recently amended a solid waste bylaw to forbid throwing food waste in garbage (COV, 2014). The City consequently rolled out the *green bin program*, providing every household with a designated food waste receptacle, which goes to a composting facility rather than the landfill.

Alongside this program, the City implemented marketing strategies to educate the public on what could and could not go into their green bin. The City emphasized that compostable plastics were not permitted, however, contamination in compost facilities is a major issue. Aggravating this situation, regulations surrounding the definition and composition of bags that are marketed as 'compostable' are absent, resulting in organics facilities' need to remove all plastics from the compost.

The intention of our research was to investigate the issues outlined and look into possible solutions that would help Vancouver achieve its food system sustainability goals. We therefore investigated the current challenges with the degradation and use of compostable plastics and looked at how plastic contamination can be minimized in the organics system.

To collect data for this report, the group interviewed numerous stakeholders from the local organics management industry and a Denmark-based waste management expert. The group also attended a Vancouver Sustainability Breakfast,

where they watched relevant speeches and interviewed additional representatives from organics facilities. In addition, the group read and analyzed many academic research papers.

Through these various methods of data collection, our group had two key findings. Firstly, many plastics labeled compostable do not break down completely in the standard composting duration of 180 days. This causes additional work for organics processors. Secondly, the regulations governing compostable plastics are not easily enforceable and do not mandate that compostable plastics originate from any particular material. This leads to consumer confusion, as there is little way of distinguishing fully compostable plastics from partially or non-compostable plastics. Subsequently, compost facilities have to remove all of this plastic and divert it to the landfill. This ties in as a food security issue as well, as contaminants have to be removed from the soil in order to make it usable to grow crops. What does long-term plastic contamination in our soil supply mean for our long-term ability to grow food locally?

Based on this study, the group has a couple recommendations to tackle the key issues uncovered. First, we recommend investigating policy measures that make the materials in compostable plastics universal and meet organics facilities needs. Complementary to this policy, we also suggest that compostable bags be clearly marked so that organics facilities can differentiate them from single-use plastic bags.

Secondly, educating the public on the various terminology surrounding compostable materials may be beneficial.

Introduction

Urban sustainability is a key part of Vancouver's goal to become the greenest city in the world. As outlined in the Greenest City 2020 Action Plan and Vancouver's Food Strategy, two of the main goals are zero waste, and a local, sustainable food system. These two goals are addressed by Vancouver's food waste system. Organics are diverted from the landfill and delivered to organics processing facilities. Food scraps are thus eliminated as "waste" and their nutrients are returned to the soil resulting in a more sustainable food system, and ultimately contributing to increased community food security. This system, however, is not without its challenges. Plastic contamination is entering Vancouver's organics stream and ending up in the compost after processing is complete. This contamination has created difficulties for the city and the organics facilities, and different approaches to overcoming these challenges that need to be explored.

Background

The City of Vancouver recently amended Solid Waste Bylaw No. 8417 (COV, 2014). This amendment to the law forbids the inclusion of food waste into garbage headed to the landfill. In 2015, the city of Vancouver implemented *the green bin*

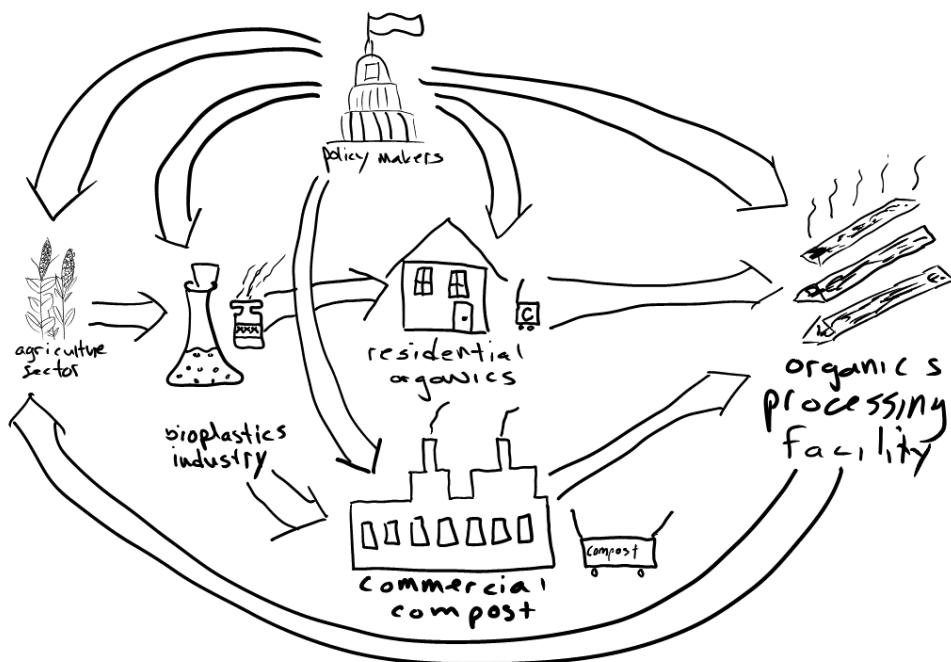
program to divert food waste from the landfill to organics processing facilities. Brochures on how to participate were provided to residents and building managers. These specified that no plastics were acceptable in green bins including compostable plastics, and solutions for lining the green bins without plastic were provided. City representatives also raised awareness about these changes by attending public events, advertising around the city and updating their website to include relevant information.

The terms compostable and biodegradable can be misleading to consumers and are often mistakenly used interchangeably. Based on the definition by the American Society of Testing and Materials (ASTM), both products are broken down by biological processes, but to be compostable, the plastic must decompose at a rate similar to other compostable materials. Plastics that are labeled “compostable” or “biodegradable” have lead some consumers to believe that they are making environmentally friendly choices by using these plastics and disposing of them in their green bins. Also, some phrases such as “environmentally friendly”, found on petroleum-based plastics, can be confused with meaning “compostable”. These inconsistencies have lead to plastic contamination arriving at organics facilities. To date, the city doesn't understand the full scope of the challenges being faced at these facilities or the potential solutions that exist. The objective of this research was to investigate the current challenges in the system and look into potential solutions

that would fit in with Vancouver's food strategy goal to improve Food Waste Management. This was guided by the following inquiry questions:

1. What are the current challenges with the degradation and use of compostable plastics
2. How can compostable plastic contamination be minimized in Vancouver's organics system?

Systems Diagram



Methods

To collect data, group 23 adopted a case study approach, drawing on academic literature and interviews with various experts and stakeholders. We used qualitative methods evaluating different pieces of academic literature such as *Sustainability of bio-based plastics* by Alvarez et al., and *Compostability of bioplastic*

packaging materials by Kijchavengkul and Auras. These papers showed us which types of plastics were best suited for composting, which gave us a better idea of what materials we should be investigating in our interviews. While the academic literature served to give general background information on our topic, the interviews really put these issues into a local perspective. One highlight from the data collection stage of our project was attending the Vancouver Sustainability Breakfast. Here, we got to hear speakers from the community discuss issues related to composting. For example, Louise Schwartz from Recycling Alternative spoke about educating the public about sorting waste and Mateo from Net-Zero Waste spoke on the challenges of removing bits of non-composted ‘compostable’ material from his facility. We were also able to interview (over email) a Danish compost management expert named Jacob Simonsen, who gave us some insights as to how this issue is handled in Denmark.

We chose our interviewees based on their role in the composting community. Essentially, any representatives from organizations involved in composting, compostable plastic bags or alternatives to single-use plastics were of interest to us. We focused on composting centre representatives as these are the people who are most on the ground with the plastic contamination issue. We made a set of interview questions that were designed in such a way that they would answer our inquiry questions. Some examples are: do you know what harm is done by plastic contamination in soil? What do you think may be a solution to this issue?

The procedures we followed for data collection were simple. In order to be able to gather the most relevant information and to compare opinions among our interviewees, we compiled a list of interview questions before engaging stakeholders. The answers to these questions acted as guidance for our research.

The group researched multiple aspects of this issue. We began by comparing the biodegradability of different compostable bags and researching policies and facilities' operations and issues. In addition, we researched alternatives to single-use plastic bags altogether.

All of our data analysis came through group conversations based on the research and interviews we carried out. Hearing different interviewees speak on the issue in varying ways prompted group discussion that led to our final analysis.

There were few ethical considerations in our study, as it did not involve vulnerable people or sensitive situations. We did however make a concerted effort to not inject our personal viewpoints upon the interviewee, as this could have altered the way they answered our questions.

Results

Our results came from several interviews that we conducted. We interviewed as many stakeholders as time permitted in various sectors of what turned out to be a vast intertwining network of overlapping systems. The interviews broadened our research to include the identifying and layman analysis of various materials that comprise bioplastics. As it turns out, there was a need to more fully understand the

types and makeups of the various bioplastics. The results of the bioplastics research will be discussed in greater detail in the discussion section. The stakeholders also keyed us into specific issues that organics facilities are currently facing. Finally, the interviews shaped our approach to finding solutions to these issues.

Our first interview came from a city farmer named Maria at the compost hotline. The Compost hotline is a local service that anyone may call to find out more about composting or urban farming in general. Maria informed us of the key players conducting the composting throughout the city. She also informed us of some of the issues they were having with compostable plastics ending up in the compost that they collect. Finally, she touched on the issue of varying degrees of compostability of the various materials labeled compostable (Maria, 2016).

The next interview came from Amanda, a representative at Recycling Alternative. This company transfers different types of wastes to the appropriate vendors, i.e., collecting commercial compost and delivering it to an organics facility. Amanda stated that their company only uses BPI certified plastic bags, which is a requirement of the composting facility (West Coast Lawns in this case). Recycling Alternatives sells the bags directly to the clients they pick up for, and the brand of bags is EcoSafe (Amanda, 2016).

We contacted EcoSafe via phone to find out what types of materials were used to make their compostable plastic bags. An unnamed representative stated that the bags were made from polylactic acid (PLA) and poly-3-hydroxybutyrate (PHB) (EcoSafe, 2016).

Our next interview came at a sustainability breakfast held at the BCIT downtown campus on 17, February 2016. The purpose of this conference was to

address both the innovation of compostable plastics, and the subsequent confusion they cause. This conference was hosted by the mayor of Richmond, Malcolm Brodie. Mayor Brodie is also the head of the Metro Vancouver Zero Waste Committee, the organization that passed the compost mandate, or ‘Green Bin’ program, in late 2014. According to a terms of reference document, The Zero Waste Committee provides advice and recommendations on policies, bylaws etc., related to solid waste management (Vancouver, 2015) (Shwartz, Ladner, & Brodie, 2016).

Louise Shwartz, owner of Recycling Alternative and a speaker at the conference, stated several concerns with the current state of the composting industry and also posed some possible solutions to us. She said that the current regulations concerning organics contamination were largely unenforceable due to the challenge of identifying which individuals are contaminating the compost. She also recommended reducing low-grade plastic by switching to universally compostable material. She suggested working with UBC to test the quality of compostable material. Finally, she encouraged educating the public to reduce confusion of what exactly goes into the compost bin (Shwartz, Ladner, & Brodie, 2016).

Brendan Ladner, the owner of Smak – healthy fast food, spoke about the challenges of creating a business with 100% eco-packaging. He spoke of the limited options available and the challenge of obtaining quality compostable plastics that were affordable (Shwartz, Ladner, & Brodie, 2016).

The conference also gave us an opportunity to conduct an interview with an organics processor. Mateo, of Net-Zero Waste, gave us insight as to specific issues of a smaller organics facility. He stated that his company currently does not accept any compostable plastics. According to him, many compostable plastics leave some

30%-40% residue after a standard compost time of 180 days. He has two full time workers to remove the contaminants. He seemed to concur with Louise that 100% compliance would be needed before any policy could be effective and that there is little effective oversight at this time (Mateo, 2016).

The final interview we conducted was via email with a Danish waste management specialist named Jacob Simonsen. This was an attempt to investigate how other regions approach these issues. Jacob wrote that consumers have confusion with identifying what a bag is made out of so that they can dispose of it appropriately. The organics facilities in Denmark do however accept compostable plastics. He says Denmark places the onus on the output, the organics facility, to provide high quality compost rather than highly controlling the input, those disposing of waste. He writes that the regulations are targeted at controlling the quality of the compost coming the organics facilities. If the compost does not meet standards then it can not be used on farmland. He says that educating the public is left to local authorities and that they use a wide range of media to engage the public to include social media. From Jacob's responses, it may be that Denmark shares some of the same challenges that Vancouver does regarding compostable plastic contamination (Simonsen, 2016).

Analysis

There were a few main themes we identified through the various interviews with the many stakeholders. Confusion about the terminology and labeling of the various biodegradable terms add to the challenges of sorting waste. Education on these terms and proper sorting may be helpful in reducing contamination. Regulatory

modifications may reduce the number of decisions that consumers must make by making the system uniform and simple. Other municipalities may have additional solutions that can be useful here.

Discussion

Given the quantity of plastic packaging used in today's world, compostable plastics could have a significant effect on reducing the amount of waste headed to the landfill. The interviews conducted within Vancouver, however, suggest that the city still has some challenges to overcome with the way the current system is functioning. There are official standards for compostable plastics in CAN/BNQ 0017-088 that state that a product must biodegrade in 180 days or less to be considered compostable. As Kale et al. (2007) discuss in their paper, the most common bioplastic currently used, polylactic acid (PLA), is a corn-based polymer that is highly susceptible to biodegradation and will degrade in the required timeframe. The factors affecting its rate of degradation include moisture, acidity, temperature and oxygen levels. Industrial organics facilities have tightly controlled conditions that meet these requirements; however, PLA will not break down in backyard compost bins. (Kijchavengkul, Auras, 2008). Policy changes that include regulation around which compostable plastic materials can be sold in Vancouver, could allow for these materials to be composted in local facilities, while reducing the quantity of partially degraded contaminants arriving there. A clear marking that identifies compostable

plastics from petroleum-based plastics could significantly reduce confusion for residents, business owners and compost facility workers. This would likely reduce the redirection of compostable products to the landfill and help residents clearly identify which products could be discarded in the green-bin. This could also make non-compostable bags stand out during the collection process so residents could be identified if they were contaminating the organics stream with other plastic products.

To the best of our knowledge, sustainability issues around compostable plastic use have not been thoroughly investigated by the city of Vancouver. The popularly held view that these are a sustainable option may be premature. Alvarex-Chavex et al. (2011) discuss the concern associated with using industrial agriculture methods in the production of PLA. These methods commonly involve large inputs of energy and water, use of toxic pesticides and fertilizers and genetically modified crops - that do not have data to support their long-term environmental effects. Also, it requires 2.65kg of corn to make 1kg of bioplastic. This use of land for non-edible corn production draws into question whether or not this is good use of agricultural land when there are food-insecure populations. If Vancouver were to adopt compostable packing on a large scale, it would be important to consider how food security or sustainability might be affected elsewhere.

Reducing single-use-plastic waste could be a more sustainable option. This approach to waste-reduction focuses on behavior and attitude change towards how we think of disposable items. It is likely that we would still need some compostable or

recyclable plastic materials, but these could be considered a secondary option - given that many compostable plastics are also single-use items. Educational efforts, by the city, with regard to correct plastic disposal, could be modified to include a focus on reusing materials, and conserving the resources required to produce them. As was done in Denmark, social media platforms can be an effective way to reach a significant portion of the population.

Based on the discussion above, we would suggest the following to the city of Vancouver:

- Consider implementing a policy that regulates which materials can be sold as “compostable plastic”, and have a clear and obvious marking on these items that identifies them as being truly compostable and eliminates confusion for consumers and organics facility workers
- Consider focusing education efforts on informing the public about reducing use of disposable plastic - potentially using social media platforms.

Conclusion

Vancouver's food waste system is contributing to increasing the sustainability of its food system, but can be improved by reducing compostable plastic contamination. To facilitate this, the COV requested us to investigate the extent of compostable plastic contamination at organics facilities and investigate possible ways to mitigate the contamination. After our interviews we concluded that the main challenges for organics processing facilities were: (1) small particles remaining after the standard composting time of 180 days, (2) lack of enforceable regulations.

Several questions remain and further research is required. What direction are bioplastic companies moving in? It may be that expanding the use of compostable

plastics carries only a low risk of adding to food insecurity. It may be that these companies are moving away from requiring traditional food crops for starting material. Do corn producers and other bio crop farmers feel that they will be negatively/positively affected by an increase in corn production due to more widespread use of bioplastics? How do environmentalists feel about bioplastic use? Do they have concerns of exporting food insecurity for the benefit of universal compostable plastic use if they are produced from food crops? Finally, what vision do policy makers have with regards to their community increasing the use of bioplastics? Are there possible conflicts between city, provincial, and federal policymakers?

The results of our project have led us to the following recommendations: (1) educate the public on the terms biodegradable, compostable and recyclable, (2) the need to properly sort waste as in no compostable plastics in the Green Bins, (3) investigate policy measures that make the materials in compostable plastics more universal and that meet the organics facility's needs.

Personal Reflections

Student 1

I found that taking on a real world project that was of interest to the city to be engaging and worthwhile. I found that conducting interviews with community partners who had actual issues that they looked to policymakers to address was fascinating. I gained a greater understanding of the challenges that organics facilities and eco-friendly businesses face. I also better understand the daunting task that government

has of crafting policies that encourage environmentally friendly activities, while attempting to avoid undue burden on its constituents. A driving force for me, was the passion that the stakeholders had for this cause. This is likely why most all of them were willing to speak with us. With only a few exceptions, we essentially engaged in dialog with all of the people we sought to interview.

Beyond observing the 'behind the scenes' network that helps to shape the public's behavior, my own behavior towards sorting waste has become far more vigilant. I am now conscious of every particle of waste that I dispose of. For example, I used to dispose of my dog's waste in compostable plastic bags and place them in the compost bin, I now know that is not helpful to the organics facility receiving that bin of compost. Furthermore, I read the literature on these bags and it clearly states they decompose in 12-18 months, far beyond the 180 days required by organics facilities for something to be considered compostable. I now feel as though I'm above much of the confusion surrounding this subject, which makes it a valuable exercise. Overall, I thoroughly enjoyed this activity.

Student 2

It was very interesting to see how many different perspectives there were within the Vancouver community on how to approach a complex problem such as the one explored in this project. From my perspective it seemed as though there was a lot of disconnect between how the organics facility workers saw the problems as

opposed to the city, or to residents. Without having the flexible learning opportunities to attend the sustainability breakfast or speak with those who we interviewed, we would have only understood a very narrow portion of the entire system - only what could be found through online research. Having heard from a variety of stakeholders and comparing their concerns with potential solutions found in the academic literature, we have more knowledge available to guide the solutions we recommend to the city. For future challenges with similar complexity, I will be able to approach the situation in a similar manner. I especially appreciate the idea of an asset-based approach, as this concept was completely new to me, and I think that it could make a significant difference to the success of a project.

Student 3

Coming into this project, our group was convinced that compostable plastic bags were a very simple, practical way to reduce pollution. Over the course of this project, it became clear that this was not reality. I think the most interesting part of the project for me was when we realized that ramping up implementation for these bags actually may challenge food system security due the land requirement to grow corn to make these bags. For me this really underscored the importance of holistically evaluating all potential food system issue solutions.

Another important take-away for me was learning how disconnected policy makers are from those on the ground with this issue. While the Vancouver Green Bin

program is a great local-level solution, it needed complementary federal or provincial legislation surrounding what a compostable bag exactly is. Further complicating this is that it's unclear exactly if widespread compostable bag use would be more or less sustainable than the status quo. Banning compostable bags may be the most sustainable solution.

I really enjoyed how this project got me engaged with an issue I would otherwise not really think of. I liked how we were able to take charge of our learning by deciding who to interview and what papers to read. I got more out of this class because of the community-based experiential learning style than I would have out of a traditional class. This course promotes student agency and creativity, which matches my desire to be entrepreneurial and investigative. I think there's too much emphasis on traditional learning and that every student should take at least one CBEL-based class per year.

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