# TORONTO'S BLUE BIN PROGRAM:
# THE NEED FOR A NEW RECYCLING SYSTEM

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*Research Question:*

***Can a dual stream recycling system be beneficial for lowering the contamination rate in Toronto's Blue Bin Program*?**

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**Layla Ali Abdi**

**ABSTRACT**

The purpose of this report was to investigate the waste management system for the City of Toronto's household recyclables. In this study, a survey was conducted on residents' recycling knowledge and actions in order to identify the stress points where contamination has allowed itself to manifest. It was predicted that the current single stream recycling program employed by the City was not an effective means to waste management, as it has been unable to keep up with consumer consumption and end-market demands. The results obtained from both the literature review and survey showcase a strong correlation between single stream recycling systems and increased contamination. It was recommended that the City of Toronto implement a dual stream recycling system in order to reduce the contamination rate, keep up with market demands, and contribute to their long-term environmental goals such as the circular economy.

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## 1.0 INTRODUCTION

Dramatic shifts in consumer consumption habits over the past years have resulted in an increase of waste. This increase has resulted in virgin materials being unable to naturally replenish at the same rate as they are consumed. The process of recycling reduces the need for virgin materials in manufacturing by reusing waste materials. While the concept of recycling is recognized, the contamination plaguing it is not. Contamination occurs when non-recyclable materials and waste are disposed of in recycling bins. This results in downstream challenges as recycling processors are unable to sort the contaminated materials due to improper disposal. As a result, these materials are sent to landfills. While improper disposal and contamination of recyclables are not widely discussed, recent events have resulted in greater importance being placed on higher quality recycling methods.

Waste management is a complex task due to the growing population, changing nature of packaging waste, and limited landfill space. In Canada, waste management is regulated at a provincial level but carried out by municipalities who are required to develop their own waste management programs. Due to the differences in material acceptability in each municipality, for this research paper the City of Toronto and its Blue Bin Program will be investigated. Toronto is Canada's largest city and home to 2.95 million people (City of Toronto, 2018b). Since 2004, the City of Toronto has operated on a single stream recycling program where all household recyclables are collected in one Blue Bin (Stewardship Ontario, n.d.). This system has been cited as a successful recycling program in North America due to its ability to offer high diversion rates (diverted away from landfills) and low costs for municipalities. While this system is proclaimed to be easier and convenient for residents to dispose of their recyclables, the increasing contamination rate contradicts this. In 2019, the City of Toronto's contamination rate reached 30%, meaning almost a third of the recyclable collected ultimately ended up in landfills (Yazer, 2020). As markets demand for better quality recycled materials, it is crucial that the City find solutions to decreasing contamination and producing higher quality materials for end-markets.

When it comes to solutions for decreasing contamination and raising quality, alternative systems are not discussed at the government level. Currently, the City still relies on educating its residents about proper participation in its waste diversion program, yet these efforts have proven ineffective due to the continually increasing contamination rate. The central aim for this research was to answer the question, "*Can a dual stream recycling system be beneficial for lowering the contamination rate in Toronto's Blue Bin Program?*". To illustrate the viability of such system to the City of Toronto, a thorough analysis of the current single stream program was conducted in order to identify its shortcomings. In addition, a survey was conducted to collect data on residents' current recycling knowledge and actions, as well as willingness to participate in alternative systems such as a dual stream program.

## 2.0 LITERATURE REVIEW

While there has been much research on municipalities switching to single stream recycling due to the perceived economic and environmental benefits, few researchers have challenged this. To effectively explore the issues surrounding the increasing contamination rate in Toronto's Blue Bin Program, a subset of literature has been selected based on its relevance to single stream recycling systems and recycled materials recovery. This literature review focuses on the information presented in peer-reviewed journals, and government and company-sponsored reports in order to define the overall problem and offer solutions.

### 2.1 BLUE BIN PROGRAM: LACK OF EDUCATION AND AWARENESS

Many municipalities rely on investments to promotion and education in order to get residents to recycle effectively. The City of Toronto's Solid Waste Management Services (SWMS) found the biggest barrier for its residents was the complexity of sorting for the human user due to conflicting messages from the government and producers, as well as the differences in material acceptability between municipalities in the Greater Toronto Area (GTA) (2018a). Despite the ongoing programming for awareness and education, the contamination rate has continued to increase. To add, Lakhan (2014) found that investments in recycling promotion and education did not increase municipal recycling rates in Ontario, Canada. There is evidence of both ineffective promotion and convenience relating to the system that has encouraged speculative recyclables to be placed in recycling bins. The study by the City of Toronto's SWMS noted pain points relating to the current system such as confusing documentation, lack of incentives, and poor communications on recycling properly (2018a). It is proven that municipalities boast the convenience single stream carries for residents yet neglect to understand or care about educating its residents on the negative impacts such as contamination due to ineffective recycling. The one-bin for all solution is misleading, as it truly cannot accept all types of recyclables.

## 2.2 INCREASED CONTAMINATION RELATING TO SINGLE STREAM

Contamination in recycling has been recognized as a problem in waste management that deserves serious attention. Fitzgerald et. al. (2012) found that a change from dual to single stream resulted in approximately a 50% increase in recyclables collected, but also an increase in contamination. Tonjes et. al. (2018) did a similar study relating to the transition from dual to single stream in Long Island, New York, and found a 25% increase in recyclables collected, as well as an increase of non-recyclable items in the recycling bins. Both Fitzgerald et. al. (2012) and Tonjes et. al. (2018) point out the complexities associated with the transition such as increased promotion, larger collection bins, and increased material acceptability that came into play, and avoided stating single stream as the sole reason for the large increase in collection. In addition, they both warn that increased contamination was a result due to the switch and that municipalities should consider this detrimental factor before proclaiming it as the preferred waste management strategy.

## 2.3 INCREASED COSTS RELATING TO SINGLE STREAM

Municipalities who implement single stream systems are those whose interests are best served by cost-effective means to managing collection. Lantz & Morawski (2013) did a cost comparison on collection, processing, and administration costs of 8 Ontario-based recycling programs (4 single stream and 4 dual stream) during a 10-year period. They found that single stream resulting in approximately 22% - 26.5% higher costs than dual stream (2013). This was because while collection costs were lower for single stream, there were higher processing costs due to the mixed materials needing to be sorted into their respective material types. A similar study by Lakhan (2015) examined the differences in cost between single and dual stream recycling systems in Ontario, Canada, using data from 223 municipalities between 2003 to 2012. He found that even though single stream programs recycled more, they faced 48.7% higher material management costs (2015). Both these studies are contrary to the prevailing opinion that single stream recycling is a cheaper alternative to dual stream.

Across these studies, there was difficulty isolating the cost benefits of single stream programs due to a lack of articles and uniformity in peer-reviewed literature. For example, Ontario, Canada found higher recycling rates and overall costs for single stream, while Berkeley, California found savings and greater environmental benefits (Tonjes et. al., 2018). There is evidence that municipalities rely on cost-effective means to collection, but the processing and administration costs associated with the sorting and managing of contamination are not accounted for. In order the state the system as cost-effective, it should be throughout the system, and not just in collections. There is a clear shift in costs when it comes to processing the materials, as it is often contracted out to recycling processors who separate the materials to be sold to manufacturers.

### 2.4 SINGLE STREAM EFFECTS ON END-MARKETS

On the other side of the single stream debate are recycling processors and manufacturers that must deal with the reduced quantity and quality made available to them. Tonjes et. al. (2018) found that the visual inspection of paper bales produced at the materials recovery facility in Long Island, New York's single stream were contaminated by film plastics and glass fragments, which led to lower realized revenues from the sale of the recycled paper. They also mentioned other studies that found single stream resulted in deliverables of too much unsuitable materials such as single stream sourced paper, and the additional processing costs for paper mills as a result (2018). There is a clear shift in costs from municipalities to recycling processors and manufacturers when it comes to actually processing and sorting the recycled materials. In a similar study, Damgacioglu el. al. (2020) investigated the contamination rates of 25 pieces of old corrugated cardboard and 266 pieces of old newsprints in Florida's single stream recycling systems. They found 31.4% of the corrugated cardboard and none of the newsprint were within the accepted paper mills' standards for contamination rates (2020). As a result, the recycled materials were sent to landfills due to a loss of market value attributed to the contamination. Both these studies provide valuable insights on the need to raise the recycled materials quality in order to be accepted in end-markets. Recycling processors and manufacturers have found it

increasingly difficult to earn a profit due to the global competition in the raw materials market who prefer higher quality recycled materials made available to them by dual stream systems. They are often left out of the conversation, yet have the ultimate say as to where the recycled materials actually end up, and whether the system is truly doing what it is supposed to.

### 2.5 SOLUTIONS TO THE INCREASING CONTAMINATION RATE

As single stream recycling programs continue to gain momentum in North America, it is important to look at the alternative, dual stream. Lantz & Morawski examined recycling in the European Union (EU) and noted that single stream recycling was non-existent due to the European Directive 2008/98/EC stating, "to facilitate or improve recovery, waste shall be collected separately if technically, environmentally, and economically practicable and shall not be mixed with other waste or other material with different properties" (2013). The directive goes on to state that, "by 2015, separate collection shall be set up for at least the following: paper, metal, plastic, and glass" (2013). They suggested that Toronto, Canada's largest city, switch to dual system bins with alternating weekly collection that would have the same collection costs as single stream. This would allow the City to keep collection costs low, while also allowing for much less contamination. In a similar finding, Andrews et. al. (2013) suggested that three compartment bins (trash, mixed paper, and commingled items) provided the most accurate recycling for users. Countries that have employed dual stream recycling systems have experienced high-diversion rates, lower contamination, and recovery of higher quality recycled materials. In addition, placing mandatory policies such as the EU Directive has allowed dual stream to be successful, as countries such as Germany and Japan are experiencing high recycling and diversion rates. Single stream has been noted to be not effective in the long-term, as packaging trends increase and this system and its infrastructure not being able to keep up.

## 2.6 CONCLUSION

As the contamination rate in Toronto's Blue Bin continues to increase, there is a lack of solutions that have been proposed that would yield the same results as a dual stream recycling program would provide. There is evidence that municipalities would rather rely on investments to education and awareness, as well as the convenience the system carries for users. Both these tactics have been proven ineffective, yet single stream continues to be boasted as the preferred waste management strategy. As packaging continually evolves, this system has been proven to be a short-term solution to a long-term waste management problem for municipalities. The literature reviewed in this research reflect the irregularities in relations to the benefits of single stream systems. There is a lack of research in North America in regard to municipalities transitioning to dual stream as an effective means of sorting due to the high collection costs and it being assumed inconvenient for end-users. In order to address the increasing contamination rate, it is important to look at alternative systems that can be beneficial and sustainable in the long-term.

## 3.0 METHODOLOGY

This research focuses on gaining insights from residents on Toronto's Blue Bin Program. Issues regarding single stream recycling and proposed dual stream systems would help in justifying whether the current system needs changing. This research seeks to investigate an under-researched topic on the benefits of dual stream for both end-users and municipalities. Methodologies that would yield quantitative data to evaluate how residents recycle currently and to proposed dual stream systems was most suitable. This was because how residents recycle had a direct impact on diversion and revenue for the City. Additionally, qualitative data through the use of a long answer question was collected through the survey to gauge additional insights to the growing problem. All data was collected through primary research methods.

A survey was conducted from November 12 - 16, 2020 through the use of Google Forms. This form of data collection was selected as it was an accessible methodology due to it being web-based and only required a link to access. A non-probability snowball sampling method was selected as it was convenient and cost-effective to access. Social media platforms such as Reddit (r/askTO), Facebook, and LinkedIn, as well as emails were sent out randomly and shared amongst respondents. The survey consisted of 1 linear scale, 1 long and 1 short answer, and 12 multiple-choice questions which can be found in Appendix A. The questionnaire asked respondents a variety of questions relating to their current recycling knowledge, as well as alternative systems and whether they would participate if it were made available to them. Following the collection of the results, they were automatically entered in Google Spreadsheets which was transferred into Microsoft Excel to be further processed and graphed to showcase the data both quantitively and visually. Thematic analysis was conducted on the qualitative question, which involved coding all the data before identifying and reviewing key themes. Each theme was examined to gain new knowledge and insights on how residents recycle, and whether they would participate in alternative systems. This is of significant as residents are the true end-users.

## 4.0 RESULTS

In order to keep this chapter concise, only results that were relevant to answering the research question were included. The remaining results are shown in Appendix B. The survey received 216 responses, but 7 were not included as they were found to be duplicates or respondents did not reside in Toronto or the GTA. All the questions will use a frequency distribution table and pie chart to summarize the results. Collectively, respondents scored a 3.84 on a (1-5) Linear scale. A value of (1) indicated no interest in recycling efforts, and a value of (5) indicated a strong interest. The purpose of this question was to measure respondents' general attitudes towards recycling, and a mean score of 3.84 indicated that respondents' interests towards recycling efforts were positive *(summarized in Figure 1)*.

| Response | Frequency |
|---|---|
| 1 (no interest) | 4 |
| 2 | 8 |
| 3 | 58 |
| 4 | 86 |
| 5 (strong interest) | 53 |
| **Total** | 209 |
| **Average** | *3.84* |

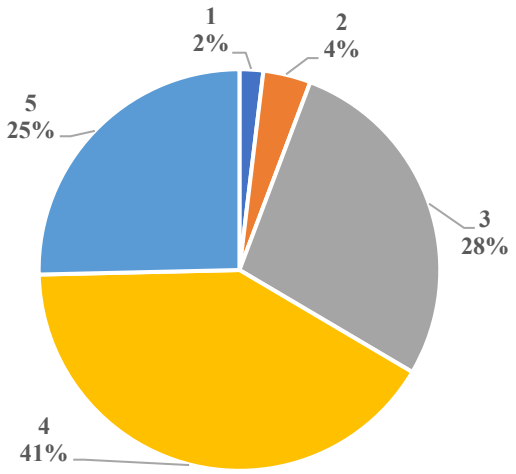


*Figure 1. Respondents interests to recycling efforts.*

### 4.1 RESPONDENTS ACTIONS DURING RECYCLING PROCESS

Questions four and five aimed to identify actions towards recycling. Question four asked respondents to classify how they determined what items were recyclable. 172 respondents, representing 82% of the study, selected they had either made an educated guess or relied on the recycling symbol to determine where items went *(summarized in Figure 2, next page)*. This is of significant as it pointed out the improper disposal techniques employed by residents, with only "Waste Wizard App" being the correct technique.

| Response | Frequency |
|---|---|
| Recycling Symbol | 62 |
| Waste Wizard App | 27 |
| Educated Guess | 110 |
| Does not recycle | 10 |
| **Total** | 209 |

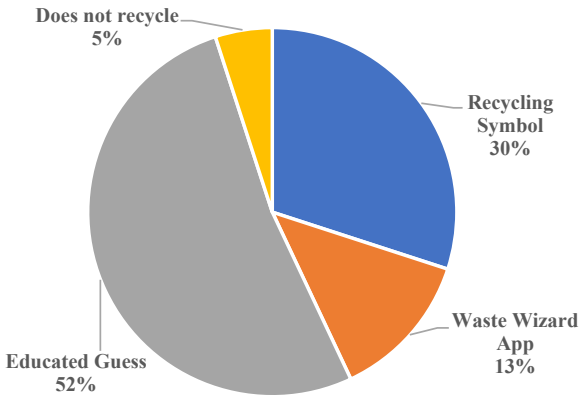


*Figure 2. Respondents on determining what items were recyclable.*

Question five asked respondents if they cleaned out their containers prior to recycling. 112 respondents, representing 54% of the study responded yes, while 97 respondents, representing 46% of the study responded sometimes or no *(summarized in Figure 3)*. This is of importance as it confirmed the direct problem associated with single stream recycling systems which is contamination.

| Response | Frequency |
|---|---|
| Yes | 112 |
| No | 25 |
| Sometimes | 72 |
| **Total** | 209 |

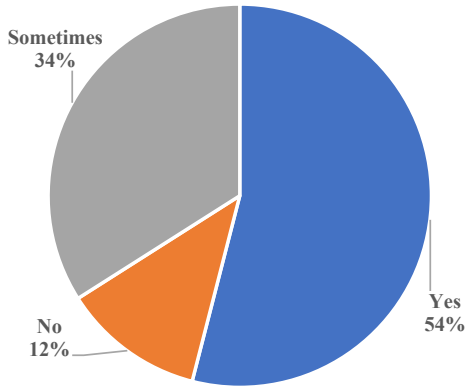


*Figure 3. Responses to cleaning out containers prior to recycling.*

### 4.2 PARTICIPATION TO ALTERNATIVE RECYCLING SYSTEMS

Questions six and nine aimed to identify participation behaviours to alternative recycling systems. Both questions relate to *Figure 4* (*next page*). Question six asked respondents to select the system they would most likely participate in. 138 respondents, representing 66% of the study chose a dual or modified dual stream *(summarized in Figure 5, next page)*.

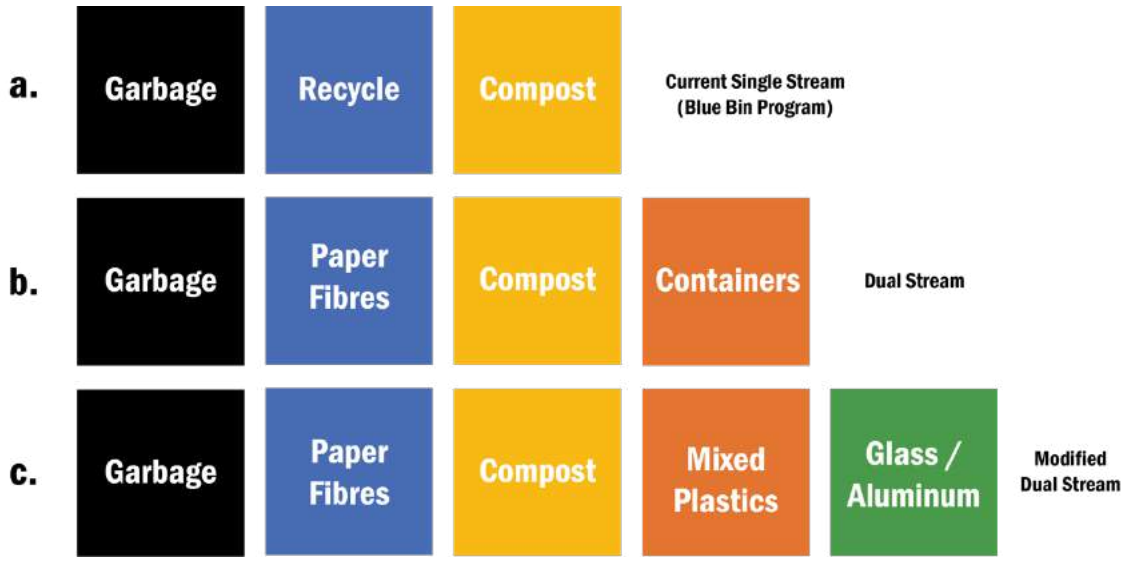


*Figure 4. Illustration of recycling stream systems provided in survey.*

| Response | Frequency |
|---|---|
| Single Stream | 71 |
| Dual Stream | 40 |
| Modified Dual Stream | 98 |
| **Total** | 209 |

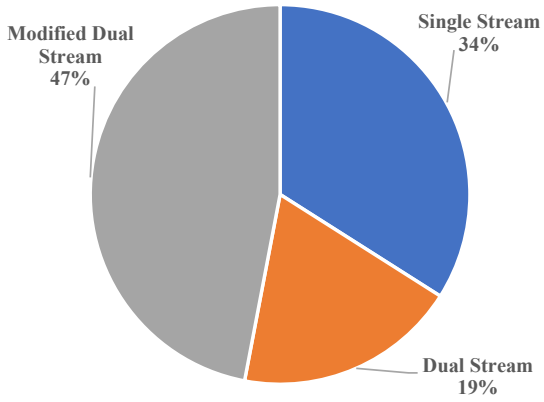


*Figure 5. Respondents participation to recycling systems.*

Question nine asked respondents if they would participate and dispose effectively if they were provided the bins relating to a modified dual stream system. 175 respondents, representing 84% of the study responded yes, while 34 respondents, representing 16% of the study responded no or preferred a different recycling system *(summarized in Figure 6, next page).* Both questions six and seven were of importance as they indicated respondents' willingness to participate in alternative recycling programs, especially if they were given the bins.

| Response | Frequency |
|---|---|
| Yes | 175 |
| No | 9 |
| Preferred Single Stream | 15 |
| Preferred Dual Stream | 10 |
| **Total** | 209 |

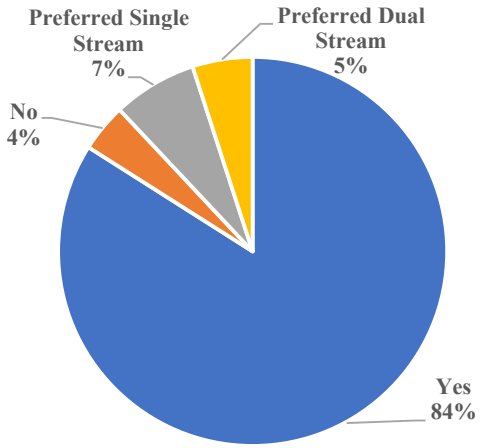


*Figure 6. Respondents participation to a modified dual stream if offered bins by the City of Toronto.*

### 4.3 SUSTAINABILITY AND LONG-TERM ENVIRONMENTAL GOALS

Questions ten and twelve seeked to understand whether respondents viewed the current single stream system as sustainable and contributing to larger environmental goals such as the circular economy. Question ten (*referencing Figure 4*) asked respondents which system they believed would be the best contributor to the circular economy. A definition of the circular economy was listed in the survey for those who were not knowledgeable with the term. 187 respondents, representing 89% of the study selected a dual or modified dual stream system *(summarized in Figure 7*).

| Response | Frequency |
|---|---|
| Single Stream | 22 |
| Dual Stream | 31 |
| Modified Dual Stream | 156 |
| **Total** | 209 |

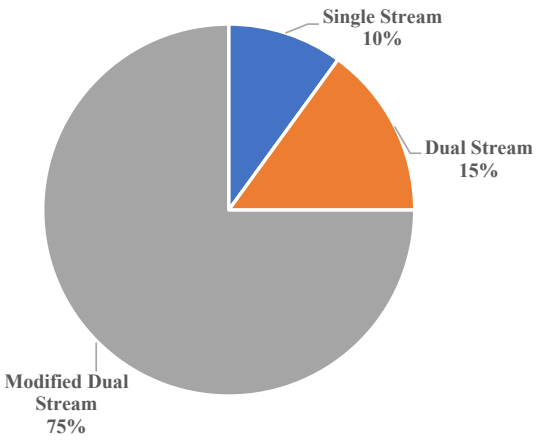


*Figure 7. Responses to as to which recycling systems was the best contributor to the circular economy.*

Question twelve asked respondents whether they believed the current single stream system was effective long-term in terms of environmental goals. 29 respondents, representing 14% of the study responded yes, while 180 respondents, representing 86% of the study responded no or not sure *(summarized in Figure 8)*. Both questions ten and twelve were of significance, as it provided insights on how respondents viewed each system in respects to long-term environmental goals. Question twelve was an interesting finding, as 1/3 of respondents were not aware of the long-term environmental goals set by the City.

| Response | Frequency |
|---|---|
| Yes | 29 |
| No | 108 |
| Not sure | 72 |
| **Total** | 209 |

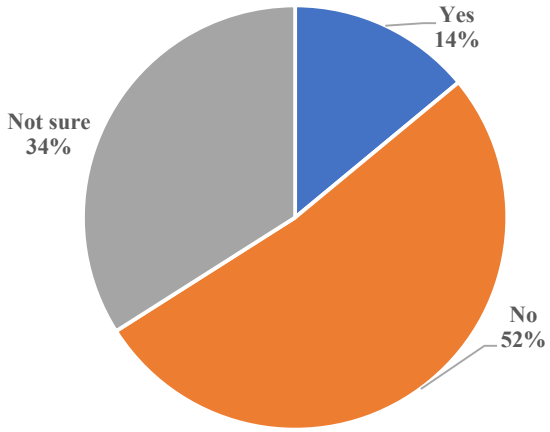


*Figure 8. Respondents on whether they believe the current single stream system was effective in the long-term environmental goals set by the City.*

## 4.4 SUGGESTIONS BY RESPONDENTS TO LOWERING CONTAMINATION

Question eleven asked respondents to identify ways to lower the contamination rate in Toronto's Blue Bin. This question allowed for long answer responses for respondents to express their thoughts without the constraints typically provided by multiple-choice questions. Thematic analysis was conducted in order to identify and analyze key themes. All answers to question eleven can be found in Appendix C. Key themes will be listed in the order that they were mentioned the most *(results listed on next page)*.

Key themes identified included:

- Better education and awareness for residents
- Separate bins
- Better signage and labelling on bins and packaging
- Cleaning out containers
- Implementing fines and by-laws
- Upgrading apartments to offer accessible recycling
- The need to be careful when recycling and check rules
- Upgrade sorting capabilities in recycling facilities
- Use less materials (pertaining to producers when developing packaging)

In addition to question eleven, question eight asked respondents which recycling system (*referencing Figure 4*) they believed would be beneficial in lowering the contamination rate. 186 respondents, representing 89% of the study stated either a dual or modified dual stream system *(summarized in Figure 9).* Both questions eleven and eight were of significance as it allowed themes to be identified to be discussed further in the discussions chapter.

| Response | Frequency |
|---|---|
| Single Stream | 23 |
| Dual Stream | 43 |
| Modified Dual Stream | 143 |
| **Total** | 209 |

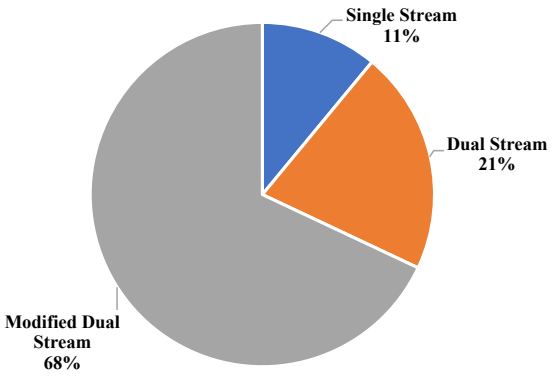


*Figure 9. Responses as to which recycling system would be beneficial in lowering Toronto's contamination rate.*

### 4.5 FACTORS RELATING TO DUAL STREAM IMPLEMENTATION

Questions thirteen and fifteen aimed to gauge respondents' reactions towards factors in addition to implementing a dual stream system such as additional costs and mandatory laws in order for the system to be successful like it has in Germany. Question thirteen asked respondents whether they would accept a price or tax increase for their single-use products. 163 respondents, representing 78% of the study responded they would pay more, and 46 respondents, representing 22% of the study responded they would not. In addition, respondents were required to select an acceptable percentage increase; 1% - 2%, 3% - 5%, or 5% - 10% *(summarized in Figure 10)*.

| Response | Frequency |
|---|---|
| 1-2% | 84 |
| 3-5% | 65 |
| 5-10% | 14 |
| Would not pay more | 46 |
| **Total** | 209 |

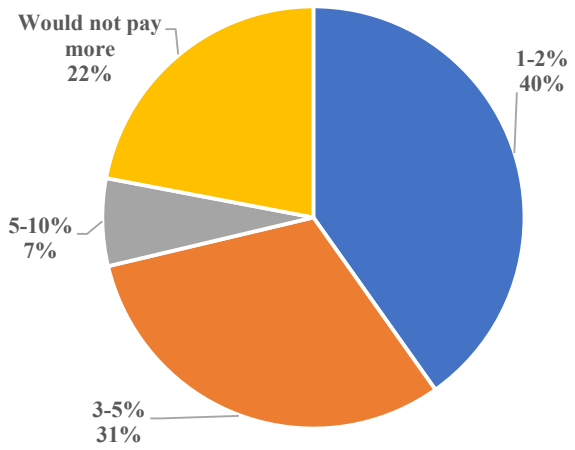


*Figure 10. Responses on an acceptable price or tax increase on single-use products for dual stream implementation.*

Question fifteen asked respondents whether Toronto would benefit in creating mandatory policies in addition to the dual stream recycling system in order to ensure consumers were recycling effectively, and imposing fines for those who were not. 170 respondents, representing 81% of the study responded yes, while 39 respondents, representing 19% of the study responded no or maybe *(summarized in Figure 11, next page)*. Both questions thirteen and fifteen were of significance as they offered insights into how much respondents were willing to pay towards a dual stream system, as well as support towards mandatory policies.

| Response | Frequency |
|---|---|
| Yes | 170 |
| No | 7 |
| Maybe | 32 |
| **Total** | 209 |

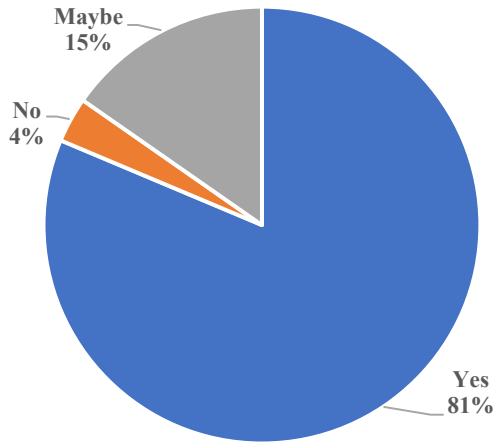


*Figure 11. Responses as to whether Toronto would benefit in creating mandatory laws for consumers to effectively recycle.*

### 4.6 BRIEF SUMMARY OF RESULTS

Based on the survey data, there are obvious irregularities in regard to recycling actions and intent. While interest in recycling efforts were positive, disposal techniques were misguided and incorrect. Alternative recycling programs such as dual and modified dual stream were presented, with a majority of respondents citing they would participate, especially if they were offered the bins by the City. An overwhelming majority of respondents found the current single stream program was not effective or sustainable in the long-term, and that a dual stream system would be beneficial, especially for the circular economy. Many respondents cited better education and separate bins as a way to lower contamination. When dealing with costs associated with the implementation of a dual stream system, a majority stated they would pay 1% - 2% price or tax increase on single-use products. Mandatory policies also garnered positive responses, with many citing the City would benefit from them if implemented. The results of the survey offered insights onto the current problems relating to Toronto's Blue Bin, as well as proposed solutions such as dual stream that will be discussed in the next chapter.

# 5.0 DISCUSSION

This study was conducted to determine whether a dual stream recycling system would be beneficial for the City of Toronto in order to reduce the contamination rate. The results from the survey indicated that while there was a positive interest in recycling efforts, there was a disconnect when it came to disposal techniques. These actions employed by the respondents prove as to why the contamination rate has continued to increase. Major findings through both the literature review and results will be discussed.

## 5.1 LACK OF EFFECTIVE PROMOTION AND AWARENESS IN TORONTO'S BLUE BIN

In this study, 82% of respondents had said they determined what was recyclable by either making an educated guess or checking whether there was a recycling symbol on its packaging. This contrasts their positive interest in recycling efforts, thus pointing there was a disconnect when it came to intent and actions. Respondents were allowed to make statements about ways to lower the contamination rate, with a large majority citing better education. One respondent stated, "more clarity and education about what can and cannot be recycled, you can never be too clear about instructions like that. I still find myself confused about many things I dispose" *(see Appendix C, Table 1, Respondent #170)*. These findings are consistent with those of the City of Toronto's SWMS (2018a) who found that while there was a high level of energy and desire towards getting recycling right, the complexity of sorting impeded this. Taken together, these findings suggest that conflicting messages from the government and producers about what is recycling, as well as the differences in material acceptability in recycling programs between municipalities in the GTA greatly impact the contamination rate. As mentioned prior, waste management is carried out by municipalities rather than provincially. What these municipalities choose to include in their Blue Bin contributes to the complexity. For example, while Brampton and Mississauga both accept black plastic in their Blue Bin, it is not accepted in Toronto's Blue Bin. To add to that complexity, packaging that is considered recyclable gets a recycling symbol printed on, yet this does not mean the material is recyclable in all municipalities.

Since the introduction of the Blue Bin Program, significant investments relating to public education campaigns and outreach initiatives were required in order to educate residents on what items do and do not go in the Blue Bin. In addition, the City of Toronto developed an application called TOwaste, that has the Waste Wizard tool integrated for residents to download *(see Figure 12)*. Despite the efforts to engage and educate residents, contamination in the Blue Bin has remained a persistent issue. It is clear that current investments in recycling promotion and education have been ineffective. This finding is consistent with Lakhan (2014) who found these investments had little effect with respects to municipal recycling rates.

A majority of respondents cited separate bins to lowering the contamination rate, with one respondent going on to state, "creating more bins with specific examples of what belongs in each bin to eliminate confusion" *(see Appendix C, Table 1, Respondent # 163)*. This finding was in line with the research question, as separate bins would be beneficial for municipalities in cleaner collection. One respondent opposed to the dual stream system stated, "education, it would waste money to have more than one stream, like everyone would need to get more bins and waste time sorting" *(see Appendix C, Table 1, Respondent # 187)*. While this response is valid, the Blue Bin Program does not carry an incentive for users to care or participate in recycling, and investments in education has been proven to be ineffective. By implementing a dual stream system with mandatory policies, residents can have lesser confusion on what goes where, as well as contribute to lowering the contamination rate.

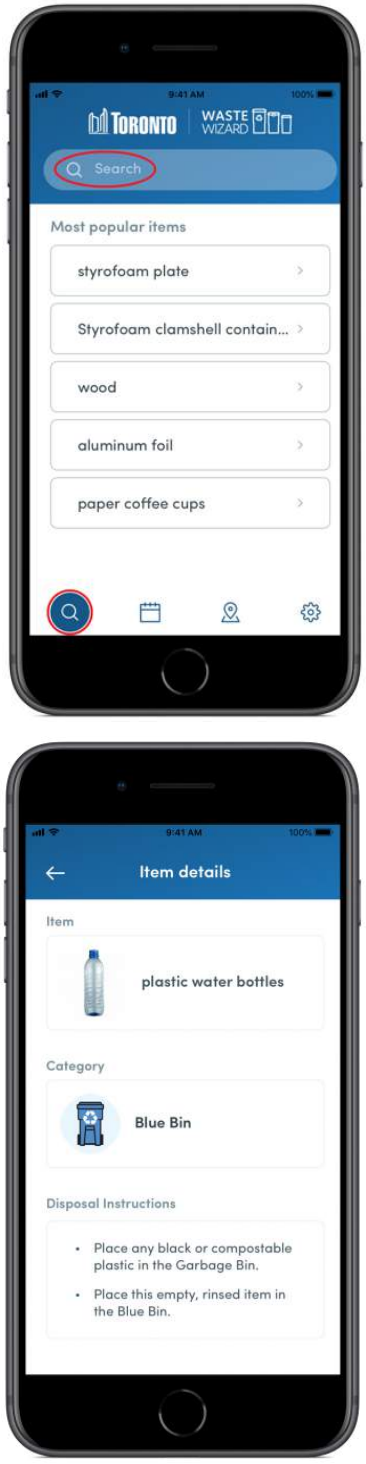


*Figure 12. TOwaste mobile application. City of Toronto. (n.d.). [Digital Image]. Retrieved from https://www.toronto.ca/services-payments/recycling-organics-garbage/towaste-app/*

### 5.2 INCREASED CONTAMINATION IN TORONTO'S BLUE BIN

As mentioned prior, an overwhelming majority of respondents incorrectly determined what was recyclable, showcasing that they did not actually know what went into the Blue Bin. This finding is consistent with Tonjes et. al. (2018) who stated the increase in recycling was due to the inclusion of much more unrecyclable materials in recycling bins. They pointed out that single stream did encourage "speculative" recyclables and sloppier sorting (2018). Together, these findings suggest that single stream might not be as effective as municipalities in North America proclaim it to be. To add to this problem, 54% of respondents stated that they did clean out their containers, while 46% stated sometimes or not as all. This nearly equal split illustrates the growing contamination problem, as perfectly good recyclables have a significantly high chance of becoming contaminated in the single stream system. This problem has even been listed as one of the top Blue Bin Offender by the City of Toronto, as they cite containers with leftover food and organic waste as one of the largest issues plaguing the Blue Bin due to food residue and particles getting soaked up by paper and ruining large batches of otherwise good recyclables (City of Toronto, 2020).

Contamination in the Blue Bin has increased overtime due to a number of factors such as confusion regarding waste disposal practices as new materials are introduced into the market, differences in municipalities recycling programs, problematic packaging such as laminated pouches, and a lack of awareness on the implications of improper disposal of non-recyclable items (McKay, 2018). Currently, the contamination rate is 30% in Toronto, meaning almost a third of recycling gets sent to landfills (Yazer, 2020). These results build on existing evidence that a one-bin solution for all is ineffective, and that an alternative system that allows for sorting by material types would contribute to decreasing contamination rates. In addition, it is easier to sort and clean containers together, rather than with paper in recycling facilities, so separate collection through the use of a dual, or even better, modified dual stream would be beneficial in lowering the contamination rate.

### 5.3 INCREASED COSTS WITH THE BLUE BIN AND ITS EFFECTS ON END-MARKETS

Opponents to single stream can include environmentalists, recycling processors, and manufacturers who believe the single stream systems carry increased costs associated with sorting and cleaning the materials. Through the literature review, it has been proven that the single stream system is not cost-effective as it is made out to be by municipalities. The City of Toronto's SWMS estimated that is it costs approximately $4 million annually to manage contamination in Toronto's Blue Bin (McKay, 2018). Due to the increased contamination, municipalities and end-markets that use single stream systems have found it increasingly difficult to sell their materials due to the raw materials market placing stricter quality requirements on recovered recycled materials. In 2018, the world's largest importer of waste, the People's Republic of China, banned the imports of 24 types of waste, and set a 0.5% contamination standard for plastics and fibers (Pyzyk, 2018). This resulted in many municipalities, including Toronto, having to find new markets for their recycled materials, upgrade infrastructure to better sort their materials, or send them to landfills for incineration. On top of this, as packaging continues to evolve, additional costs such as equipment upgrades, and better sorting technology are required to keep up with demand and effectively sort through the commingled materials made available by single stream.

The recent ban by the People's Republic of China was an estimated $5.2 million loss in revenue from the sale of recyclables in Toronto's Blue Bin (McKay, 2018). This finding is similar to Tonjes et. al. (2018) and Damgacioglu et. a. (2020), where single stream materials that were contaminated by items such as film plastics and glass fragments, resulted in lower realized revenues from the sale of the recycled materials. An analysis conducted by London, Ontario, found that a dual stream system would be most appropriate as it would reduce processing costs, produce better-quality materials for end markets, and capture more recyclables (Lantz & Morawski, 2013). This finding is in line with the research question, in that a dual stream recycling system would be beneficial in lowering the contamination rate, and that the current system is ineffective long-term as markets cite better quality recycled materials made available through dual stream systems.

### 5.4 TORONTO'S BLUE BIN IN THE LONG RUN

In the survey, over half the respondents stated the current single stream system would not be effective in the long-term environmental goals stated by the City. These goals are outlined in Toronto's *Long-Term Waste Management Strategy*, which includes their waste strategy goal of 70% diversion by 2026, and their ultimate aspirational goal of zero waste and a circular economy (City of Toronto, 2018c). Toronto's diversion from landfills through recycling programs has flatlined at 53% for several years (Yazer, 2020). It is important to note that this number is not accurate, as over the past decade packaging has gotten significantly lighter (light-weighting) which can have a significant effect on the actual tonnage collected and diverted from landfills. Nonetheless, in order for the City to reach its goals, it must look at its waste management strategy. Single stream can be considered an open-loop recycling process, where recycled materials are recycled with other types of products, also called downcycling. This process is often associated with the degradation of the material being recycled as it is combined with similar products before ending up as waste, diminishing its lifecycle (Reeves, 2019). This is to opposite to what recycling should be about, especially for a circular economy.

A circular economy is based on three principles: (1) design out waste and pollution, (2) keep products and materials in use, and (3) regenerate natural systems (Ellen MacArthur Foundation, 2017). The second principle pertains strongly to recycling, as the main reason to recycle is to keep materials in use without significant degradation or waste (closed-loop recycling). 89% of respondents in the survey found the best contributor to the circular economy was a dual stream system, as it relies on separate bins for specific material types in order to avoid contamination and recover higher quality materials. This system is viewed as a sustainable long-term solution to waste management as it keeps materials of different properties separate from one another. There are many uncertainties plaguing the single stream system, such as increasing packaging types, continuous equipment upgrades and the risk of single stream materials further decreasing in value in favour for higher quality materials made available through dual stream systems (Lantz & Morawski, 2013).

## 5.5 OPPORTUNITY FOR CHANGE: DUAL STREAM SYSTEMS

Based on the survey results, there are obvious shortcomings in Toronto's Blue Bin Program. While interest in recycling efforts were positive, actions employed is waste disposal provided evidence as to why the contamination rate has been continually increasing. In order to lower the contamination rate, reach diversion goals, and contribute to the circular economy, a dual stream recycling system should be looked at as a waste management strategy. A dual stream system relies on end-users to sort their recycled goods in their respective bins before they are collected by the City (Reeves, 2019). It has been opposed by many municipalities in North America due to it not being as convenient for residents, and typically suffers from higher collection costs because the number of bins required automatically doubles (2019). Conversely, Lantz & Morawski (2013) suggested that if Toronto was worried about high collection costs, offering alternating weekly collections would have the same collection costs as single stream. In order to further discuss the benefits of a dual stream recycling system, Germany, the leader in recycling recovery in the EU will be examined.

In Toronto, the diversion rate for household recyclables was 53% in 2019 and has been stagnant for several years (Yazer, 2020). 30% of that diverted waste was contaminated and sent back to landfills resulting in the actual diversion rate being around 37%. In Germany, strong government policy, strict separation programs, and its residents embracing recycling has allowed the country to recycle 68% of its household waste (Jaron & Kossmann, 2018). They have established producer responsibility, mandatory one-way deposit schemes for refillable drinks packaging, and separate collection that foster high quality recycling and high recycling rates as required by the EU Directive. They offer six different bins: black for general waste, blue for paper, yellow for plastic, white for clear glass, green for coloured glass, and brown for composting. They require their residents to do the sorting themselves, which allows the government to save on sorting costs, all while reducing the amount of contamination through the use of separated bins (Brassaw, 2017).

This waste management system employed by Germany was prompted in the 1980s due to a shortage of landfill capacity, the need to curb the use of raw materials, and contribute to the circular economy. Since then, they have proved to be the recycling leader due to the many policies and programs set in place. In order for Toronto to reduce contamination, save costs in processing, and generate higher revenues for their recycled materials, they must look at countries that have achieved their environmental goals. Germany's success is in line with Andrews et. al. (2013) who suggested that three compartment bins (trash, mixed paper, and commingled items) provided the most accurate recycling. In the survey, a single, dual and modified dual stream system was presented to gauge respondents' participation into each program. 66% of respondents stated they would participate in a dual or modified dual stream system, and 84% said they would participate if the bins were offered by the City. A modified dual stream system was proposed due to the increasing array of mixed plastics packaging becoming available into the market. In addition, a separate bin for aluminum and glass would allow for glass fragments to not contaminate paper fibers and plastics. The survey findings suggest that while single stream does offer convenience, a dual stream system would be effective as respondents would willingly participate in them.

In order for a dual or modified dual stream to be effective, significant investments would be required for infrastructure. In the survey, 78% of respondents stated they would accept a price or tax increase on single-use products if it was necessary in order to implement a dual stream system. A 1 % - 2% price or tax range increase was selected by 40% of respondents, followed by a 3% - 5% increase by 31% of respondents. These findings are positive, as it showcased respondents' willingness to pay more to contribute to a better waste management system, which is in line with their positive interest in recycling efforts. Following Germany's strategy, in order for a dual stream system to work, mandatory policies are required in order for residents to effectively recycle. In the survey, 81% of respondents believed Toronto would benefit in creating mandatory laws in addition to separate bins for effective recycling. This too was a positive finding, as residents have a direct impact on diversion.

## 5.6 LIMITATIONS

### *5.6.1 SAMPLE SIZE*

The generalizability of the results is limited due to the small sample size, but nonetheless, the results are valid for the purpose of answering the research question. It is important to note that there is a higher risk of sampling bias in a non-probability snowball sampling method employed in the methodology, and that it cannot be used to make valid statistical inferences about all of Toronto's residents. Even so, the insights gathered in this research would be beneficial for the City of Toronto and in future studies on the benefits of dual stream recycling system on recycled materials and overall circular economy.

### *5.6.2 PROPOSED EXTENDED PRODUCER RESPONSIBILITY*

This research is made aware that Ontario has proposed a plan to shift the costs of the Blue Bin Program to full responsibility by 2026. This extended producer responsibility (EPR) ensures that the producers are assigned full financial and operation responsibility for the end-of-life management of their materials sold to residential households and some public spaces in Ontario (Keliher, 2020). The benefits cited by this regulation include cost savings for municipalities, improved diversion rates, and a common collection system to eliminate confusion for residents. Until the final regulation is approved by the Province on December 31, 2020, it is difficult to know exactly how Toronto and its residents will be impacted by the transition. It is important to note that while the costs are being shifted, the problem still lies within the single stream waste management strategy. In order for producers to achieve high diversion targets set by the Province, they must look at a dual stream recycling program as an effective means to achieving those targets. The regulation does allow producers to create an alternative collection system, in which the research presented in this paper hopes to advise producers the benefits of a dual stream system in relations to supporting both economic and environmental goals.

## 6.0 CONCLUSION AND RECOMMENDATIONS

Through the analysis of Toronto's Blue Bin Program, this research has demonstrated the connection between contamination rates and recycling system programs. Notably, it was found that the implementation of a dual stream system would directly reduce the contamination rate. Based on the quantitative analysis of residents recycling behaviours, it can be concluded that better education and separate bins are important factors to consider when designing a waste strategy.

In the survey, both a dual and modified dual stream system were presented, with a dual stream being the simplest with just one additional bin for fibre collection. The results indicated that respondents would willingly participate in either dual stream recycling systems if it were made available to them. The methodology employed was effective in answering the research question as it seeked to gauge respondents recycling behaviours as they have a direct impact on diversion. In addition to answering the research question, it was important to analyze single stream systems as a whole and understand what the benefits truly were. It can be concluded that a single stream system should not be looked at as a waste management strategy, and that it should be obsolete due to its inability to keep up with the market demands for higher quality recycled materials.

Based on these conclusions, it is recommended that the City of Toronto, and potentially producers, should investigate implementing a dual stream recycling system like those employed in countries such as Germany. Incrementally changing the recycling system (from single, to dual, to modified dual) would help mitigate the logistical challenges of a large-scale system change. This research has illustrated a potential solution to a current problem, as well as provide a method to meet future targets put forth by the City of Toronto. The switch towards a dual stream system would result in decreased contamination and further contribute to a circular economic model.

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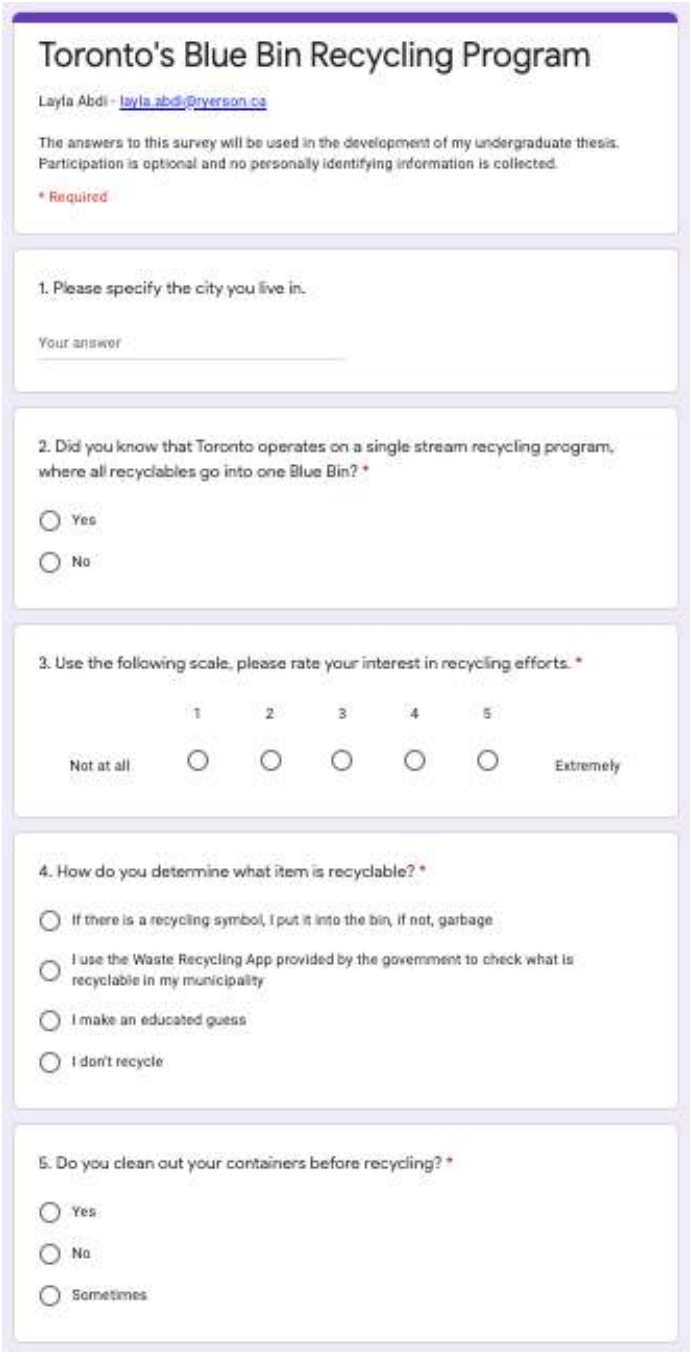
# 8.0 APPENDICES

## APPENDIX A. SURVEY DESIGN



Toronto's Blue Bin Recycling Program

Layla Abdi - layla.abdi@ryerson.ca

The answers to this survey will be used in the development of my undergraduate thesis. Participation is optional and no personally identifying information is collected.

* Required

1. Please specify the city you live in.

Your answer

2. Did you know that Toronto operates on a single stream recycling program, where all recyclables go into one Blue Bin? *

- Yes
- No

3. Use the following scale, please rate your interest in recycling efforts. *

| | 1 | 2 | 3 | 4 | 5 | |
|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

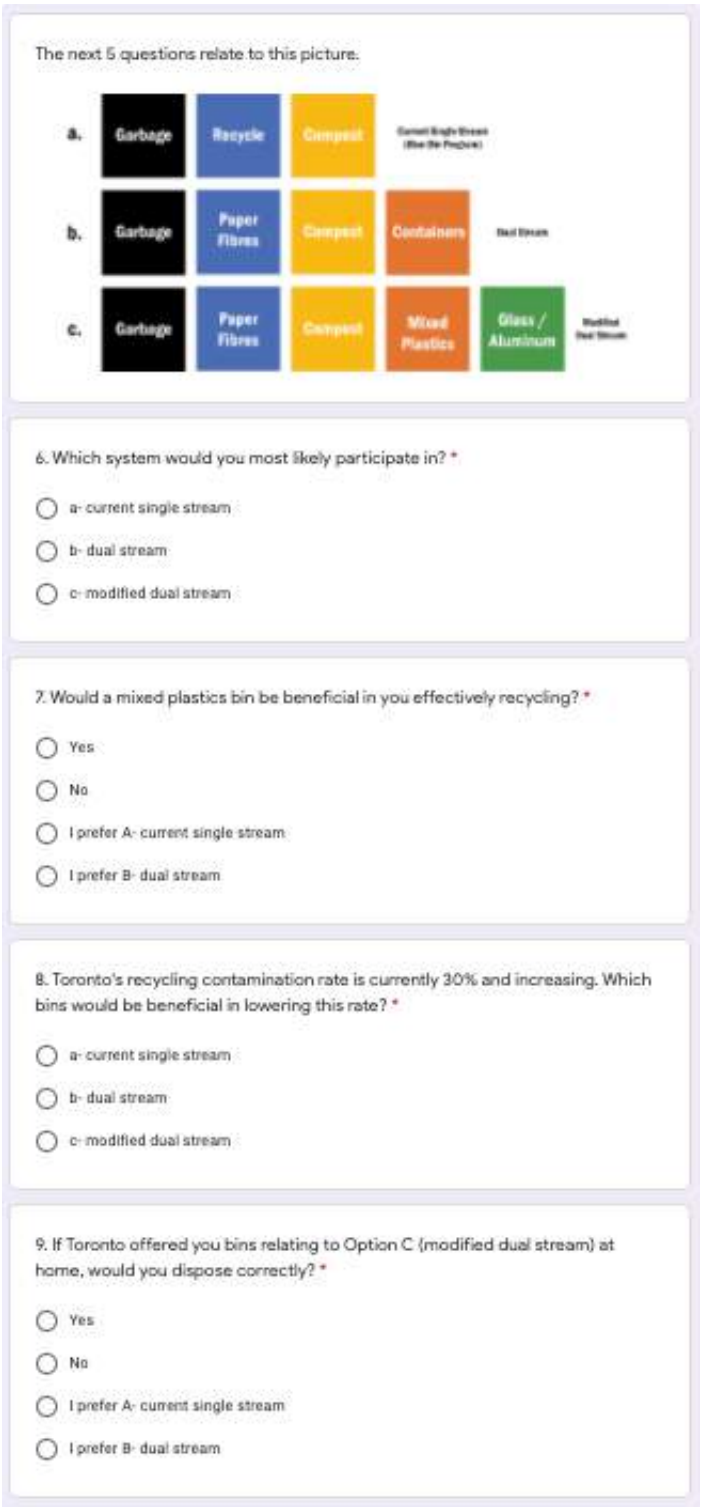
4. How do you determine what item is recyclable? *

- If there is a recycling symbol, I put it into the bin, if not, garbage
- I use the Waste Recycling App provided by the government to check what is recyclable in my municipality
- I make an educated guess
- I don't recycle

5. Do you clean out your containers before recycling? *

- Yes
- No
- Sometimes

*Figure A- 1. Survey Design, Questions 1-5.*



The next 5 questions relate to this picture.



6. Which system would you most likely participate in? *

- a- current single stream
- b- dual stream
- c- modified dual stream

7. Would a mixed plastics bin be beneficial in you effectively recycling? *

- Yes
- No
- I prefer A- current single stream
- I prefer B- dual stream

8. Toronto's recycling contamination rate is currently 30% and increasing. Which bins would be beneficial in lowering this rate? *

- a- current single stream
- b- dual stream
- c- modified dual stream

9. If Toronto offered you bins relating to Option C (modified dual stream) at home, would you dispose correctly? *

- Yes
- No
- I prefer A- current single stream
- I prefer B- dual stream

*Figure A- 2. Survey Design, Questions 6-9.*

10. Which system do you believe is the best contributor to the circular economy? A circular economy aims at eliminating waste and the continual use of resources. *

- a- current single stream
- b- dual stream
- c- modified dual stream

11. What are ways you think would lower the current contamination rate? *

Your answer

12. Do you believe the current single-stream system is effective in the long-term environmental goals? *

- Yes
- No
- I'm not sure

13. A dual-stream recycling program switch would require significant capital investments from the city. What would be an acceptable price/tax range increase for your single-use products? *

- 1-2%
- 3-5%
- 5-10%
- I would not pay more

14. Would an incentive provided by the government motivate you to recycle more effectively? *

- Yes
- No
- Maybe

***Figure A- 3. Survey Design, Questions 10-14.***

Germany's Recycling System

15. In Germany, there are laws relating to recycling. They operate on a multi-stream system (1 bin for paper, lightweight packaging, glass, compost, and garbage). Do you believe Toronto would benefit in creating mandatory laws and having appropriate bins for consumers to effectively recycle? *

- Yes
- No
- Maybe

*Figure A- 4. Survey Design, Question 15.*

## APPENDIX B. REMAINING RESULTS FROM SURVEY

| Response | Frequency |
|---|---|
| Yes | 136 |
| No | 73 |
| **Total** | 209 |

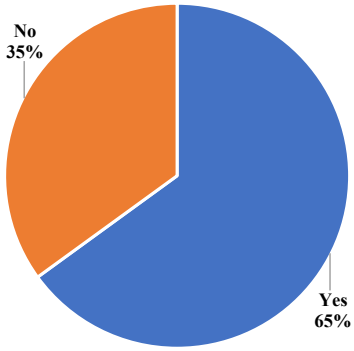



*Figure B- 1. Respondents on whether they were aware of Toronto's recycling system (Question 2).*

| Response | Frequency |
|---|---|
| Yes | 128 |
| No | 6 |
| Preferred Single Stream | 31 |
| Preferred Dual Stream | 44 |
| **Total** | 209 |

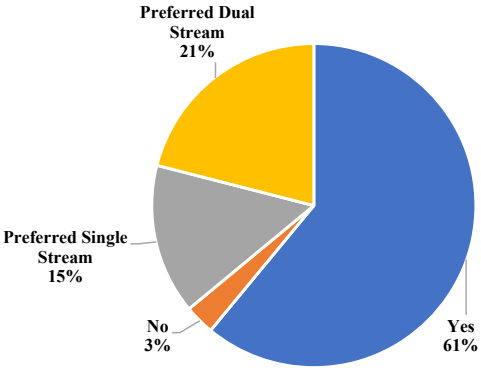



*Figure B- 2. Responses as to whether a mixed plastics bin would be beneficial for respondents to effectively recycle (Question 7).*

| Response | Frequency |
|---|---|
| Yes | 153 |
| No | 12 |
| Maybe | 44 |
| **Total** | 209 |

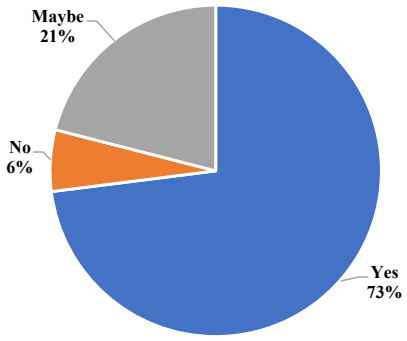



*Figure B- 3. Responses as to whether an incentive by the City of Toronto would motivate respondents to effectively recycle (Question 14).*

## APPENDIX C. RESPONSES ON WAYS TO LOWER THE CONTAMINATION RATE

*Table 1. Responses on ways to lower the contamination rate.*

| | |
|---|---|
| | Answer did not pertain to question |
| | Respondent did not answer |

| | |
|---|---|
| Respondent #1 | A better recycling program and more signs. People just throw whatever into garbage a better display of what goes into each bin on each bin would I believe help along with better bins. |
| Respondent #2 | Providing more incentive for proper recycling or having a cost associated with improper disposal. |
| Respondent #3 | More signage on how to recycle |
| Respondent #4 | better education, more recycle information on containers, access to different recycle bins |
| Respondent #5 | Not sure |
| Respondent #6 | Don't be dumb |
| Respondent #7 | Separate bins |
| Respondent #8 | N/A |
| Respondent #9 | convienience |
| Respondent #10 | N/a |
| Respondent #11 | Purchase more fresh produce, use reusable produce bags. Not something I can personally do but look into the drainage nets from Western Australia. They have the ability to create a circular economy to some extent. |
| Respondent #12 | I think as the process for recycling becomes more used eventually the system will become more efficient so that the contamination rate would be lessened. The modified multi-stream would likely lower it too as the system could become more specific in order to address what it is recycling. |
| Respondent #13 | I think people need to be educated on how to recycle. Brampton also has a single stream system and I'm constantly educating my family on what goes where. I've seen people get confused and just throw things in the garbage because they don't want to double check the rules. If people are educated on how to recycle AND they actually care about the environment enough to recycle properly, only then can this work to it's potential. Strict laws would be beneficial for those who don't care about the environment. |
| Respondent #14 | Organizing the recycling into different categories (paper, glass/aluminum, and containers/plastic) would help significantly |
| Respondent #15 | Making the labels on the bins easier, not too much thought into what goes where |
| Respondent #16 | By enforcing recycling rules more heavily, perhaps establishing clear by-laws on how people should, and must recycle. |
| Respondent #17 | |
| Respondent #18 | Precautions |
| Respondent #19 | Creating more bins |
| Respondent #20 | Na |
| Respondent #21 | Better cleaning |
| Respondent #22 | Mandatory laws |
| Respondent #23 | Labels |
| Respondent #24 | Education, little kids have big impact in the family. My seven years old ask me to buy a electric car instead of the current one. At first it was just a conversation while we drive to school, and now we are taking it seriously and thinking about it as a family decision to make. |
| Respondent #25 | Offer additional garbage chutes in apartments so that i can dispose things that are recyclable in another one |
| Respondent #26 | Different ways to sort recycling and garbage. |
| Respondent #27 | I don’t know |
| Respondent #28 | better education for what is recyclable |
| Respondent #29 | Washing the recycled packaging if there's food |
| Respondent #30 | Increasing the bins. More staffing for sorting. |
| Respondent #31 | Following the modified multi-stream method. |
| Respondent #32 | I do not recycle so I would have to learn about it |
| Respondent #33 | Take some action on climate change and air pollution. Perhaps enforce more carpooling services. Encourage people to look at the energy star label when buying products. Show them the negatives of their actions. |
| Respondent #34 | No plastic |
| Respondent #35 | Providing convenient access to more bins in general, and informing others about which which items belong in what bin |
| Respondent #36 | N/A |

| | |
|---|---|
| Respondent #37 | Proper education, better categories (such as Option C), clearer labels |
| Respondent #38 | making sure you are emptying containers, and labeling the bins correctly (I think colour coordination helps tremendously as well, but it can't be the most effective way because people with visual disabilities will be effected) |
| Respondent #39 | requiring it by law like in germany |
| Respondent #40 | n/a |
| Respondent #41 | I think making sure everyone in apartments are recycling would be a good start. |
| Respondent #42 | Law is going information once a month to those who don't recycle properly and if the problem persists, fine those who recycle incorrectly |
| Respondent #43 | - Educate children during their early years so it becomes ingrained in them<br>- Companies should use 2 materials to make the packaging for easy recycling |
| Respondent #44 | Through education |
| Respondent #45 | Wash out containers |
| Respondent #46 | Make recycling easier for those living in buildings. Often when we go to throw our the recycling in the bin downstairs, it is full of garbage leaving no room for cardboard, plastics, etc. |
| Respondent #47 | Clearer labels. |
| Respondent #48 | Public education. Incentives. |
| Respondent #49 | Information desimenation to educate the public. |
| Respondent #50 | |
| Respondent #51 | Having labeled recycle, compost, and garbage in public spaces such as restaurants |
| Respondent #52 | The modified multi stream system |
| Respondent #53 | Each home needed to have the different types of bins within or outside their home for garbage collection routes and a fine can be issued if wrong items are in wrong bin.<br>In more compact homes like Toronto community house this approach would not work rather collection will have to be mixed |
| Respondent #54 | more strict on what is recycled and garbaged |
| Respondent #55 | Easier methods to properly dispose of electronics |
| Respondent #56 | Since I live in a condominium building they should make it a requirement to separate garbage from recycling. |
| Respondent #57 | I have to think this over. Maybe a law that says products cannot be produced that are "precontaminated" such as pringles cans (they are metal, plastic and paper combined). Also I want to learn what to do when I can't clean out a container (dried fungus stuck to bottom of glass jar and I can't remove it) |
| Respondent #58 | More information to people so they can difference the recycling types. |
| Respondent #59 | Extended producer responsibility. Eliminating sources of contamination. A large issue is that a lot of people in multiresidential buildings live in small spaces, without much room for 3 bins, let alone 4 or 5. |
| Respondent #60 | Redesigning packaging to be more reusable so that less packaging ends up needing to be recycled in the first place, because when manufacturers went from glass- or metal-based packaging to single use plastics in the 1970s, our problems with waste increased significantly and it has been and continues to be exacerbated by consumer behaviours. Without buy-in from manufacturers and companies, we cannot do much to help the current situation. Recycling requires buyers and we are quickly running out of buyers for our Canadian waste |
| Respondent #61 | Recycling |
| Respondent #62 | I don't know |
| Respondent #63 | Consuming less |
| Respondent #64 | |
| Respondent #65 | posting more guidelines about what goes in each bin |
| Respondent #66 | dual stream |
| Respondent #67 | Clearer labelling of recyclability by class, the label being on the underside of products is a major limiting factor. |
| Respondent #68 | Better education on how to recycle |
| Respondent #69 | different bins |
| Respondent #70 | have better sorting at recycle centers and have laws for products to have easily recyclable packages |
| Respondent #71 | Ensuring that all the recyclable materials end up in recycling centers. |
| Respondent #72 | Making building residents more better at recycling and aware etc |
| Respondent #73 | Either education to the masses on how they can reduce the contamination rate, or the city builds facilities that reduces the contamination rate for the public (like cleaning and sorting). Lots of people don't want to pay more for water just to clean recycling. |
| Respondent #74 | education on the effects of contamination and the need to separate contaminated recycling from "clean" recycling |
| Respondent #75 | educating more people on what is recyclable and what is not |
| Respondent #76 | Banning the recycle symbol, taxing producers |
| Respondent #77 | By making it easier on the back end to use the materials |

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| Respondent #78 | Recycle better, be educated. |
| Respondent #79 | 1. clean your containers 2. Be careful with what you toss 3. Having restrictive openings on the bins so people can know where to toss their item |
| Respondent #80 | Recycling properly to ensure that non-recylable materials do not end up where they shouldn't. |
| Respondent #81 | Eliminate plastic, paper and cardboard recycling.<br>Metal recycling only. Stop wasting people's time.<br>Multi stream means we sort paper and plastic away from metals so they can be thrown out after we make the effort to sort them. The only recycling that works is metal |
| Respondent #82 | |
| Respondent #83 | Colour codes and remail out the 'calendars' for renters etc. |
| Respondent #84 | Better education on what is considered contamination and the effects that it has on real-world recyclability. Producers designing packaging that is easy to separate/clean (i.e. labels, etc.). Municipalities publishing tips on how to better prepare recyclables/make the process more efficient at home. |
| Respondent #85 | I've never thought about it. I thought Canada is pretty clean compared to other countries I don't feel educated enough to answer this. Maybe get the government to gift everyone with a TESLA |
| Respondent #86 | Incorporating intelligent technology that can sort and clean |
| Respondent #87 | Having easily accessible guidelines about how to recycle, and to know how to separate recyclables from garbage. |
| Respondent #88 | People washed out containers or don't recycle them |
| Respondent #89 | Additional efforts of preventing germ spread |
| Respondent #90 | Apartments have to make recycling easier for their residents. Also wider recycling capabilities (ie. why are we not able to recycle black plastic in Toronto, but other constituencies can?) |
| Respondent #91 | Idk |
| Respondent #92 | better learning programs to help people understand and learn about recycling etc |
| Respondent #93 | Bigger recycling bin allways full at apartment. |
| Respondent #94 | I really don't know what to say, I haven't researched anything about it to know |
| Respondent #95 | Starting off to transition to dualstream |
| Respondent #96 | rinsing items before placing them in the bin |
| Respondent #97 | |
| Respondent #98 | Making it mandatory to recycle correctly . Colour coding the different materials to distinctively identify where they go |
| Respondent #99 | Idk |
| Respondent #100 | Education. I've lived with some roommates who never did their own recycling before and I constantly had to sort through our bin. Eventually I got tired of it and stopped. People need to be more education on how to recycle, what to recycle, and why. |
| Respondent #101 | Na |
| Respondent #102 | |
| Respondent #103 | Employ people to monitor and decontaminate recycled items during processing |
| Respondent #104 | Media |
| Respondent #105 | Educating about recycling properly in schools; sending instructions on the box of recycling bins so they're not dismissable; fining bad recyclers to force people to care |
| Respondent #106 | single stream makes it more simple |
| Respondent #107 | unsure |
| Respondent #108 | rinsing jars/containers, double checking what goes into bins, using apps to help |
| Respondent #109 | I'm not sure, sorry |
| Respondent #110 | Bins for paper, glass, and mixed plastics should be readily available and accessible especially in public places. |
| Respondent #111 | Educating people |
| Respondent #112 | |
| Respondent #113 | Clear understanding of what goes in what bin. |
| Respondent #114 | More bins with pictures of things that go inside |
| Respondent #115 | Washing recycling items before |
| Respondent #116 | I don't know |
| Respondent #117 | increasing awareness and education on recycling's effectiveness; many question whether it helps at all and are therefore unmotivated to recycle properly |
| Respondent #118 | Promote what things are recyclable. Make it clear coffee cups and pizza boxes are landfill , on recycling stream results in my dad putting trash in the recycling because it's unclear |
| Respondent #119 | Education efforts |
| Respondent #120 | Education |

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| Respondent #121 | i'm not sure |
| Respondent #122 | I don't think many people are aware that you must rinse containers first before disposing. |
| Respondent #123 | educating more people on recycling and encouraging people to try their best to do it properly |
| Respondent #124 | Raise awareness on which items can and cannot be recycled |
| Respondent #125 | More readily accessible info on what can and cant be recycled. Better labels and public signs |
| Respondent #126 | Inform other on where to put their garbage |
| Respondent #127 | A clear system for distinguishing between recyclable and non-recyclable products denoted on the packaging |
| Respondent #128 | |
| Respondent #129 | More awareness regarding the topic and ways to solve it |
| Respondent #130 | More variety of bins |
| Respondent #131 | Better education and unified municipalities on infrastructure |
| Respondent #132 | set fees for contaminated recycled objects |
| Respondent #133 | better education on what is recycable |
| Respondent #134 | Less single use products |
| Respondent #135 | Inform the public more about common mistakes when recycling |
| Respondent #136 | explain how to recycle on the package (ie. different recycling symbols on different package components that match which recycling bin it should go in) or just better education on how to properly recycle |
| Respondent #137 | Have different bins available |
| Respondent #138 | Make labels on items that clearly indicate where they go in the trash |
| Respondent #139 | Educating on what is recyclable and give incentives for recycling |
| Respondent #140 | Properly identifying what is recyclable and what isn't, cleaning out containers before recycling |
| Respondent #141 | wash it before recycling |
| Respondent #142 | |
| Respondent #143 | I'm not sure sorry |
| Respondent #144 | modified dual streams |
| Respondent #145 | not being lazy to recycle |
| Respondent #146 | Better education |
| Respondent #147 | Considering condos and the multiple waste that's thrown down the chute, there should be multiple options. |
| Respondent #148 | I think the best way is to educate people. I notice that some of my neighbours (and a lot of people in public areas) don't care when it comes to throwing the right items in the right bins. I think better labelling bins would help. Some malls also hire employees to sort the garbage bins at the food court. |
| Respondent #149 | Signs to clean out containers |
| Respondent #150 | Specifying items that go into each bin |
| Respondent #151 | Using the modified dual stream |
| Respondent #152 | Separation of recycling items would be helpful in reducing amounts of contamination. if someone throws the wrong thing into the one blue bin we currently have, the whole bin is contaminated. At least with option C, there are still the other bins that can be recycled if one bin is contaminated |
| Respondent #153 | no sure |
| Respondent #154 | An easy way to remember what goes where. The modified dual-stream or a stream where you put each type of item in a separate container is best because then people who know what should get recycled have everything sorted and can easily move them where they need to go. Most people don't have the time to memorize whether dark plastic can be recycled, and if so how dark can it be? and all the other specific things that might or might not go in the recycling. |
| Respondent #155 | Putting emphasis on cleaning out your recyclables before putting them in the blue bin |
| Respondent #156 | More pictorial instructions to let people know what contents relate to each bin (more education on the subject until we're pros) |
| Respondent #157 | I think by using tetrapak like container within a circular lifecycle. Perhaps use of a circular lifecycle for cups and other beverage containers at arenas. |
| Respondent #158 | fines and some way to monitor people |
| Respondent #159 | education, make it widely known that some plastics cannot be recycled and some can, and that mixed plastics are very harmful and cannot be recycled |
| Respondent #160 | ensuring all containers are properly cleaned before recycling |
| Respondent #161 | Recycling bins with sensors to detect whether or not certain items belong in the recycling bin. |
| Respondent #162 | recycling awareness campaign, clearly marked bins for specific types of disposals, more bins placed in accessible places around the city |
| Respondent #163 | creating more bins with specific examples of what belongs in each bin to eliminate confusion |
| Respondent #164 | more education on what goes where |
| Respondent #165 | To have separate bins like modified dual stream |
| Respondent #166 | If I could use a compost bin in my apartment building and have a place to dispose of it properly. |
| Respondent #167 | Maybe for packages to mention a Symbol of what container it should be disposed in. |

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| Respondent #168 | More renewable items |
| Respondent #169 | Use external resources to correctly separate recyclables that way we can reduce contamination. Also wash containers and don't place wet items in the recycling bin |
| Respondent #170 | More clarity and education about what can and can't be recycled, you can never be too clear about instructions like that. I still find myself confused about many things I dispose |
| Respondent #171 | having a more accessible list of what can and can't be recycled, given with the blue bins and in all new rentals and apartments |
| Respondent #172 | Cleansing of products, and more specified disposal bins |
| Respondent #173 | Making single-material packaging that doesn't require detailed sorting, or a lot of knowledge of recyclable materials. |
| Respondent #174 | More accessible bins for people to throw their trash away instead of in the environment |
| Respondent #175 | more education about washing recycling |
| Respondent #176 | I think there should be some consequences imposed for not cleaning containers or recycling properly |
| Respondent #177 | more recycle bins |
| Respondent #178 | More recycling bins being offered by the city to it's residents. Recycling being better encouraged and organized throughout apartments and condos |
| Respondent #179 | more effective recycling—by implementing a modified multi stream to effectively sort and properly eliminate/ recycle waste |
| Respondent #180 | More education on recycling |
| Respondent #181 | eliminating or lowering the use of black plastics or styrofoam |
| Respondent #182 | I don't know |
| Respondent #183 | Informing householders about the importance of cleaning the containers before recycling them. |
| Respondent #184 | idk |
| Respondent #185 | dual stream system |
| Respondent #186 | Accessibility, Some buildings don't have the best accessibility to recycling bins like Apartments. |
| Respondent #187 | Education, it would waste money to have more than one stream, like everyone would need to get more bins and waste time sorting. It's better to educate ppl on what goes in the recycling in the first place. |
| Respondent #188 | easier accessibility to bins |
| Respondent #189 | I don't know |
| Respondent #190 | If everyone recycled properly and rinsed out their containers |
| Respondent #191 | promoting e-mobility, more space and accommodation for public transportation and bicycles, planting more tress and greenery |
| Respondent #192 | Better education and advertisement |
| Respondent #193 | Not sure. |
| Respondent #194 | People recycling properly |
| Respondent #195 | More consumer education on how to recycle properly, but multi-stakeholder (coming from the government, the companies, and NGOs as well) |
| Respondent #196 | Proper education on how to recycle in school other than just saying "recycle" |
| Respondent #197 | educational advertising, introduce system to schools/young people |
| Respondent #198 | If packaging stated in simple terms how it could be recycled/disposed of and in what bin does it go into. Washing out containers before recycling them is also very important. |
| Respondent #199 | Making it clear what plastics can and can't be recycled |
| Respondent #200 | More education, easy access to resources |
| Respondent #201 | Giving a poster to everyone so they could know which disposal goes in which bin |
| Respondent #202 | More informative recycling package graphics with highly noticeable designs |
| Respondent #203 | not sure |
| Respondent #204 | to clean bottles and containers before disposing of them |
| Respondent #205 | more education on the recycling bins |
| Respondent #206 | Education of recyclers through ads or media |
| Respondent #207 | Making it clear to people what is recyclable and what isn't in Toronto. Most people don't know this and let alone about the app. Also giving them some sort of incentive to do so would also be good. For example a reverse vending machine system would help for less of a contamination rate. |
| Respondent #208 | Implementing the modified multi stream |
| Respondent #209 | Properly informing the public of what is recyclable or not, as I don't believe many people know the difference fully. |