

# **Reducing Textile Waste in Metro Vancouver Landfills**

**by**

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## **Abstract**

This study examines public policy approaches to increase the recovery of residentially generated textile waste materials in Metro Vancouver Regional District. It reports findings from a survey, conducted in Greater Vancouver in summer 2017, of consumer preferences and motivations with respect to textile waste disposal. The study also reviews the literature on factors that impact household behaviour in disposing textile waste material. Policy elements are determined from an analysis of the generalized supply chain for textile waste recovery and policy features implemented in other jurisdictions. Four policy elements are considered: disposal ban, education campaign, additional collection points, and curbside collection. The policy elements are analyzed and assessed on key criteria, with discussions informed by conclusions drawn from the literature review and survey findings. I recommend the implementation of an education campaign in the short term and further consideration of increasing collection points and curbside collection in the longer term. I also conclude that a disposal ban for textile waste in MVRD, as currently configured, should not be pursued.

**Keywords:** textile waste; education campaign; disposal ban; curbside collection; donation bins; waste diversion

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# Table of Contents

Approval .....	ii
Ethics Statement .....	iii
Abstract .....	iv
Acknowledgements .....	v
Table of Contents .....	vi
List of Tables .....	viii
List of Figures .....	ix
List of Acronyms .....	x
Glossary .....	xi
Executive Summary .....	xii
<b>Chapter 1. Introduction.....</b>	<b>1</b>
<b>Chapter 2. Background.....</b>	<b>3</b>
2.1. What is Textile Waste?.....	3
2.2. Where does it come from? .....	3
2.3. How much PCTW is in landfills? .....	4
2.4. What are the impacts of PCTW in landfills? .....	5
2.5. What are the other benefits of recovering PCTW from the waste stream? .....	6
<b>Chapter 3. Methodology .....</b>	<b>7</b>
<b>Chapter 4. Literature Review.....</b>	<b>8</b>
4.1. What factors affect the volume, frequency, and method for PCTW diversion from landfill? .....	8
4.2. How is residentially generated PCTW diverted from landfill? .....	10
4.3. Policy Instruments .....	17
4.4. Textile Waste Management Regulatory Context .....	19
4.4.1. Metro Vancouver Regional District.....	19
4.4.2. Current Textile Waste Diversion Landscape in MVRD .....	20
<b>Chapter 5. Survey Findings.....</b>	<b>24</b>
5.1. Survey Design and Implementation .....	24
5.2. Descriptive Statistics .....	27
5.3. Results on Behaviour (T1).....	30
5.4. Results on Motivation (T2) .....	33
<b>Chapter 6. Policy Elements .....</b>	<b>37</b>
6.1. Status Quo .....	37
6.2. Disposal Ban (element A).....	38
6.3. Education Campaign (element B) .....	38
6.4. Increasing Points of Collection (element C) .....	39
6.5. Curbside Collection (element D) .....	40

<b>Chapter 7. Criteria and Measures .....</b>	<b>41</b>
7.1. Effectiveness .....	41
7.2. Administrative Complexity .....	43
7.3. Optimal Valuation .....	44
7.4. Cost Consideration.....	45
7.5. Stakeholder Acceptance .....	46
7.6. Summary .....	48
<b>Chapter 8. Analysis and Discussion .....</b>	<b>49</b>
8.1. Effectiveness.....	49
8.2. Administrative Complexity for Municipal Governments .....	51
8.3. Optimal Valuation of PCTW .....	54
8.4. Cost Considerations for Municipal Governments .....	55
8.5. Stakeholder Acceptance .....	57
<b>Chapter 9. Conclusion .....</b>	<b>61</b>
9.1. Recommendations .....	61
9.2. Further studies .....	62
<b>References.....</b>	<b>64</b>
<b>Appendix A. Informed Consent and Survey Instrument.....</b>	<b>69</b>
<b>Appendix B. Information on MVRD Member Municipality Websites .....</b>	<b>76</b>

## List of Tables

Table 4.1.	Summary of Recycling Behaviour Determinants .....	8
Table 5.1.	Distribution of Sample and Target Populations Across Gender .....	27
Table 5.2.	Distribution of Sample and Target Populations Across Income Groups..	27
Table 5.3.	Distribution of Sample and Target Population Across Age Groups .....	28
Table 5.4.	Distribution of Sample and Target Population Across Age Groups .....	29
Table 5.5.	Distribution Distribution of Responses to Question T1 by Disposal Method (in % share) .....	30
Table 5.6.	Disposal Methods Ranked by Index Scores for Total MVRD Sample Population.....	32
Table 5.7.	Comparison of Consumer Survey Findings on Textile Waste Disposal Behaviour .....	33
Table 5.8.	Motivations Ranked by Index Scores for Total MVRD Sample Population .....	36
Table 7.1.	Summary of Quantitative Estimates from Skumatz (1996) and Skumatz, Freeman & Gordon (2007), and Skumatz & Green (2001).....	41
Table 7.2.	Effectiveness Criterion Scoring Scheme .....	42
Table 7.3.	Administrative Complexity Criterion Scoring Scheme .....	44
Table 7.4.	Optimal Valuation Criterion Scoring .....	45
Table 7.5.	Cost Considerations Criterion Scoring .....	45
Table 7.6.	Stakeholder Groups and Decision Rules.....	46
Table 7.7.	Stakeholder Acceptance Criterion Scoring .....	47
Table 7.8.	Criteria and Measures .....	48
Table 8.1.	Summary Evaluation for Effectiveness .....	50
Table 8.2.	Summary Evaluation for Administrative Cost .....	52
Table 8.3.	Summary Evaluation for Administrative Cost .....	54
Table 9.1.	Evaluation Summary of Policy Elements .....	62



## List of Figures

Figure 4.1.	Waste Hierarchy .....	11
Figure 4.2.	General Framework/Supply Chain for PCTW Flow Interpreted by the Author .....	15
Figure 5.1.	Relative Frequencies of Responses to question T1 .....	31
Figure 5.2.	Relative Frequencies of Responses to Question T2 .....	35

## List of Acronyms

HH	Household/s
ISWRMP	Integrated Solid Waste Regional Management Plan
MRF	Material Recovery Facility
MSW	Municipal Solid Waste
MVRD	Metro Vancouver Regional District
PCTW	Post-Consumer Textile Waste
PFPE/s	Private For-Profit Enterprises
RCBC	Recycling Council of British Columbia
RCNPO/s	Registered Charity and Non-Profit Organization/s
WTE	Waste-to-energy

## **Glossary**

Disposal	Refers to all methods of discarding PCTW including trash/landfill
Diversion	Refers to all methods of discarding PCTW except trash/landfill

## Executive Summary

This study examines public policy approaches to reduce textile waste in MVRD landfills. An estimated 30,000 tonnes of textile waste account for 5% of annual landfill volume in MVRD. Improving recovery and diversion of textile materials from the municipal waste stream will reduce the negative environmental impacts of landfilled textile waste. At the same time, benefits from reducing textile waste will be realized through cost savings in waste management and through revenue and job creation in the textile waste processing industry.

The main research questions addressed in this study are:

- How do Metro Vancouver residents dispose of their textile waste?
- What motivations are determining choices by Metro Vancouver residents in the way they dispose their textile waste?
- Which waste reduction strategies could be effective in reducing textile waste in Vancouver landfills?

To answer these questions, I conduct a review of literature on factors that impact household behaviour in disposing textile waste. I also report findings from a survey of MVRD residents conducted in summer 2017 about consumer preferences and motivations with respect to textile waste disposal.

From an analysis of the generalized supply chain for textile waste recovery and policy features implemented in other jurisdictions, I develop four elements for consideration:

1. disposal ban
2. education campaign
3. additional collection points
4. curbside collection

These policy elements are not mutually exclusive and represent textile waste program options available in other jurisdictions that could be combined. Using discussions informed by conclusions drawn from the literature review and survey

findings, I analyse the elements against five criteria: effectiveness, administrative complexity, optimal valuation, cost consideration, and stakeholder acceptance.

I recommend the implementation of an education campaign in the short term and further consideration of increasing collection points and curbside collection in the longer term. I also conclude that a disposal ban for textile waste in MVRD, as currently configured, should not be pursued.

# Chapter 1.

## Introduction

In 2015, global textile waste was estimated to be 92 million tonnes (Global Fashion Agenda (GFA) and Boston Consulting Group (BCG), 2017). Global textile waste is projected to increase up to nearly 150 million tonnes annually by 2030 (GFA & BCG, 2017). It is estimated that only 20% of clothing is reused or recycled and the remaining 80% are incinerated or landfilled (GFA & BCG, 2017).

Canada and the United States have comparable municipal solid waste volumes and have historically relegated textile waste management to the non-profit sector and have not included textiles in municipal recycling programs (Weber, 2015). With limited data on textile waste generation and diversion towards reuse and recycling, the experience in the United States is the best approximation for Canada. For the United States, the textile waste diversion rate between 2000 and 2014 is estimated to have been relatively flat with only 16% reused and recycled, while the remaining 84% is landfilled (US Environment Protection Agency (EPA) in Johnson, 2017).

Like Canada, textile waste generation and diversion data for MVRD are yet to be measured. However, a 2016 waste study estimated that 30,000 tonnes of textiles are annually landfilled, accounting for 5% of annual total waste volume (Tetra Tech, 2015).

MVRD's Integrated Solid Waste and Resource Management Plan (ISWRMP), which was approved in 2011, set to improve diversion rates in the region to 70% by 2015 and 80% by 2020 (Metro Vancouver, 2010). As of 2015, MVRD's diversion rate was only 62% (Metro Vancouver, 2015). The improved diversion of textile waste material would contribute towards achieving the ISWRMP target for 2020.

Landfilled textile waste impacts MVRD in at least three ways. First, communities fail to optimize the value of textile products by extracting revenue and jobs from the processing of textile waste. Second, the high volume of waste in landfills increases the cost of municipal solid waste management. Third, landfilled textile products negatively impact the environment with pollutants that are released as products degrade, which then contaminate air and ground water.

My research investigates the policy problem that the current participation rate of MVRD households is inadequate to reduce the volume of textile waste in landfill. This study looks specifically at residentially generated post-consumer textile waste (PCTW) and how to improve household (HH) participation in PCTW recovery.

Like other jurisdictions, most residentially generated PCTW is recovered through an informal network of drop-off locations and donation bins in MVRD. Behind these collection points is a supply chain for processing PCTW that involves registered charities and non-profit organizations (RCNPOs) and private for-profit enterprises (PFPEs).

I employ findings from a review of the literature and from primary data collection to develop my policy recommendations. I examine factors impacting HH volume, frequency, and disposal method selection for PCTW and present a generalized framework for textile waste management. I also look at policy instruments available to local governments and describe the regulatory framework and policy landscape in MVRD. With the absence of data about the disposal behavior and motivations of MVRD residents with regard to PCTW, I collected primary data through a consumer survey.

The next chapter provides a background on textile waste. The chapter that follows briefly explains the methodology for this study. I present the literature review in the fourth chapter and the survey findings in the fifth chapter. The policy elements and criteria measures are defined and elaborate in chapters six and seven. I present my analysis and evaluation of policy elements in chapter eight. The final chapter includes a summary of my evaluation and recommendations.

## **Chapter 2.**

### **Background**

#### **2.1. What is Textile Waste?**

Textile waste is generally described as discarded material from the production and use of fiber, textile, and clothing. The average American discarded 82 pounds of clothing annually in 2009, contributing to 25 billion pounds of textile waste annually (United States Environmental Protection Agency (US EPA), 2010). Meanwhile, the average Canadian is estimated to discard between 30 (TWD, 2013) and 55 (Marsales, 2016 June) pounds of textiles annually.

The popularity of affordable but highly disposable mass produced fast fashion is rapidly increasing the volume of textiles in municipal waste streams (Claudio, 2007). Replacement rates for garments have increased with the average lifetime for clothing now estimated to be only three years (USAgain, 2012) and the average consumer purchasing 1.2 garments weekly (Marsales, 2016 June). Newell (2015) cites insatiable demand, problems with fit, low durability, and the decline in repairs and alterations as key drivers fueling low satisfaction and high replacement rates for garments. The fashion industry, meanwhile, stimulates consumption by enticing consumers to prematurely replace old items with new ones, feeding desire rather than need and creating irrational consumers who end up having more than they need (Newell, 2015).

#### **2.2. Where does it come from?**

There are primarily two types of textile waste based on when they are discarded in their lifecycle: pre-consumer and post-consumer (CTR, n.d.). Pre-consumer waste is the by-product of the textile, fiber, cotton and apparel manufacturing industries, while post-consumer waste is unwanted and discarded items composed of worn out, damaged, outgrown, or unfashionable garments or articles made of textiles (Domina & Koch, 1997).



The problem is concentrated in municipal solid waste (MSW) streams. US industrial (textile-specific) programs have a pre-consumer textile waste diversion rate of 75% while municipal programs have a post-consumer textile waste diversion rate of 15% (USAgain, 2012). Diversion rates are unavailable for Canada but are likely similar. Given the efficiency of industrial programs, pre-consumer textile waste is excluded from the scope of this study and from this point forward, “textile waste” exclusively refers to post-consumer textile waste (PCTW).

In the MSW context, PCTW is mostly generated by residential and industrial-commercial-institution (ICI) sources, though some may come from demolition-and-land clearing as well. For the purpose of this study, the scope is limited to residentially generated PCTW since most ICI-generated PCTW is managed outside the conventional public system.

### **2.3. How much PCTW is in landfills?**

Estimates from a 2015 waste analysis suggests that PCTW accounts for 30,000 tonnes or 5% of MVRD’s municipal solid waste in landfills (Tetra Tech, 2015). The average MVRD resident is estimated to annually dispose of 42 lbs (19 kg) of PCTW. There is currently no estimate on MVRD’s diversion rate for PCTW.

For the US nationally, the Environmental Protection Agency (US EPA, 2016) estimates PCTW to account for over 6% of total volume of MSW and also estimates a 16% diversion rate in 2014. In the US, PCTW is the fastest growing component of MSW. Total tonnage of PCTW increased by 71% between 2000 and 2014, compared to a 6% increase for total tonnage of MSW (Johnson, 2017). Over these years, per capita textile waste grew by 51%, sharply contrasting with 6% decrease in overall waste generation per capita for the same period. (Johnson, 2017).

MVRD is currently conducting waste studies to measure the PCTW diversion rate and improve understanding of the current PCTW diversion framework. There are insufficient data to establish a trend line for MVRD’s PCTW levels. However, the volume of PCTW in landfills is likely increasing at rates similar to the US, due to the increased availability of inexpensive clothing. While the prices of most goods increased between

1983 to 2013, prices for apparel were flat or declining, which contributed to the increase in consumption and subsequent disposal (Basset, 2017).

## **2.4. What are the impacts of PCTW in landfills?**

The large volume of textile waste in landfills imposes avoidable costs to waste management programs. A crude calculation suggests textile waste in MVRD landfills has cost \$2.6 million in tipping fees based on current rates.

Environmental impacts of textile waste in landfills hinge on their biodegradability, which is determined by volume, fiber composition, and the combined treatments and embellishments to which textiles are subjected (Weber, 2015).

The disintegration of biodegradable textile waste releases greenhouse gases, toxic compounds and acid leachate (Weber, 2015). Landfill leachate is the resulting substance from water contaminated by soluble materials including those produced during biodegradation, and if released to the environment will pollute soil and ground and surface water. Acid leachate is highly toxic with devastating impacts on water quality and fisheries (Russell & Helmke, 2002; Kjeldsen et al., 2002).

Textiles made of natural fibers subjected to various treatments like bleaching, dyeing, printing, cleaning (i.e. dry cleaning) and surface treatments (i.e. Teflon coating) will disintegrate and release residual chemicals from those combined processes. These treatments affect the speed of disintegration of natural fiber textiles. (Eberle et al., 2004; Li, Frey & Browning, 2010; Weber, 2015).

To further complicate degradation, most apparels today are constructed with fabrics made with blends of natural and synthetic fibers and there is no cost-effective way to separate fibers (Newell, 2015). Garments are increasingly embellished with different materials. Proper sorting and grading becomes more difficult as items need to be dismantled into their components so they can be separated properly into biodegradable and non-biodegradable streams (Weber, 2015).

Non-biodegradable textiles will not disintegrate and will instead accumulate in landfills. Increasing landfill volume adds pressure to expand operations and search for new sites. Landfills compete with alternative land uses such as agriculture, housing and

commerce. They are socially undesirable and difficult to maintain or establish near urban centers where they are most needed. As a result, landfills have been migrating farther away from waste-generating sources, increasing the cost of waste management due to higher transportation costs and emissions (Palmer, 2011).

## **2.5. What are the other benefits of recovering PCTW from the waste stream?**

According to the Secondary Materials and Recycled Textiles Association (SMART) (n.d.), second-hand markets provide more affordable clothing choices, in addition to the environmental benefits of less PCTW in landfills. The RCNPOs involved in collecting donations use the revenues from the sale of second hand items at local thrift stores to fund social welfare programs. The PFPEs involved in recovering PCTW operate sustainable businesses that provide jobs (Cuc & Vidovic, 2011), and drive innovation and development of recycled products and markets. (SMART, n.d.).

## **Chapter 3.**

### **Methodology**

I employ a literature review and findings from primary data collection to develop my policy recommendations.

The literature review has four parts. First, I examine factors impacting HH volume, frequency, and disposal method selection for PCTW to understand how different policies will impact HHs and which policies would increase diversion. Next, I examine a generalized framework (supply chain) for textile waste management to identify the players and understand their different roles and implications for policy implementation. Then I examine the policy instruments available at the local government level by summarizing policies in other jurisdictions. Lastly, I describe the regulatory framework and policy landscape in MVRD.

Since data on PCTW disposal behavior and motivations among MVRD residents did not exist, I collected primary data through a survey to establish a baseline, which I use to evaluate policy elements.

While a cost-benefit analysis would have been useful in this study, there are insufficient data and information at this time. Metrics for textile waste volume and the quantitative estimates associated with different textile waste diversion options are unavailable to inform the necessary calculations. Some components are included in the policy analysis, assessed as part of several criteria in evaluating the policy elements proposed in this study. In particular, costs and benefits to households arising out of convenience by way of proximity and accessibility are addressed in effectiveness.

# Chapter 4.

## Literature Review

I begin the literature review by examining factors that affect volume, frequency, and method of disposing PCTW. I follow with an examination of the framework/supply chain that facilitates the diversion of PCTW. Then I summarize diversion policies in other jurisdictions to determine what interventions are available at local government levels. Last, I examine the regulatory framework and policy landscape in MVRD.

### 4.1. What factors affect the volume, frequency, and method for PCTW diversion from landfill?

The factors that impact the volume, frequency, and methods for diverting PCTW away from landfills are similar to factors for other recyclable materials. Through a systemic study, Hornik et al. (1995), determined that recycling behaviour is impacted by the following four main groups of factors: Extrinsic Incentives, Intrinsic Incentives, Internal Facilitators, and External Facilitators. A summary of their framework is in Table 4.1.

**Table 4.1. Summary of Recycling Behaviour Determinants**

Group	Determinant
Extrinsic Incentives	Monetary Rewards/Economic Incentives Social Influence/Shame/Moral Suasion Laws and Regulations
Intrinsic Incentives	Locus of Control/Personal Agency Hedonic Value/Personal Satisfaction Psychological Attachment/Identification
Internal Facilitators	Awareness of the Importance of Recycling Knowledge about Recycling Programs
External Facilitators	Convenience: Time, Money, Effort required in Preparing, Storing, and Transporting Recyclables

Note. Summaries from Hornik et al (1995).

They found that internal facilitators were the strongest predictors for general recycling behaviour, followed by extrinsic incentives, and least by external facilitators and intrinsic incentives. Knowledge and perceived social influence were found to be the strongest predictors for general recycling, along with convenience (Hornik et al., 1995).

Below, I elaborate on the current findings as they relate to HH volume, frequency of participation, and method selection for PCTW diversion.

Awareness and knowledge of the importance of PCTW diversion can increase participation in textile waste diversion. HHs are likely to increase reuse and recycling motivated by concerns about the rising costs of landfilling and by the benefits directed to local communities through programs supported by clothing donations.

Awareness and knowledge about items that can be diverted impacts volume diverted. The general consensus among studies is that HHs lack the simple understanding that nearly all PCTW, of all types and conditions, with some exceptions, have value and can be diverted from landfills (e.g. studies by Bianchi & Birtwistle, 2010; Ha-Brookshire & Hodges, 2009; Sego, 2010; Ungerth & Carlsson, 2011; Björnman & Kaloper, 2012; Ekström et al., 2012, cited in Laitala, 2014; Newell, 2015; Weber, 2015). At the same time, HHs lack knowledge about what types of items are acceptable by various diversion programs (e.g. studies by Shim, 1995; Domina & Koch, 2001, 2002; Ha-Brookshire & Hodges, 2009; Morgan & Birtwistle, 2009, cited in Laitala, 2014). These gaps in awareness and knowledge have led HHs to dispose of PCTW into general trash instead of diverting to other channels.

Awareness and knowledge about different diversion programs directly impacts the selection method of disposals. HHs mostly use reselling, donating, and giving away to friends and are largely unaware of options like clothing swaps, retailer take-backs, and HH recycling (e.g. studies by Domina and Koch, 2002; Fisher et al., 2008, cited in Laitala, 2014; Newell, 2015; Weber, 2015). Studies find educational campaigns that increased the visibility of diversion programs improved diversion rates (e.g. studies by Koukouvinos, 2012; Stall-Meadows & Goudeau, 2012, cited in Laitala, 2014).

Convenience impacts the frequency of diversion. A higher number and closer proximity of collection points contribute positively to frequency (e.g. studies by Shim, 1995; Domina & Koch, 2001, 2002; Ha-Brookshire & Hodges, 2009; Morgan & Birtwistle,

2009, cited in Laitala, 2014). Another measure of convenience is the accessibility of collection points in terms of time.

Financial incentives for improving PCTW recovery have not been shown to be significant drivers for overall recovery, though some studies note that incentives were significant for motivating resell behaviour (Laitala, 2014). The declining quality and durability of most apparel and the availability of cheaper replacements have reduced positive economic incentives in reselling used clothing. Unlike general recyclables, mechanisms to discourage placing PCTW in trash are rare, relatively new and empirically unexplored. One example is textile disposal bans with penalties applied to HHs. These would entail charging fees, or tagging and rejecting contaminated bags.

Demographic factors have not been found to be consistently significant for PCTW diversion (Laitala, 2014; Newell, 2015). That said, a number of studies found that women divert more PCTW than men (Laitala, 2014). Older groups have been found to divert PCTW towards charities and younger groups are more likely to gift to family and friends (Laitala, 2014). The impacts of income and education were not tested as much as gender and age, and there is currently no baseline for their impacts on PCTW recovery (Laitala, 2014).

## **4.2. How is residentially generated PCTW diverted from landfill?**

A simplified waste hierarchy of Reduce-Reuse-Recycle-Recover explains the general strategies available in reducing PCTW (Laitala, 2014). Reduce involves preventing and minimizing new items from entering the waste stream. Reuse involves removing items from the waste stream and putting them back to use in their current form. Recycle involves taking items from the waste stream and transforming them into other useful products. Recover involves incinerating items to generate heat and energy. Figure 4.1 shows that benefits are reduced as we move from one strategy to the next.



**Figure 4.1. Waste Hierarchy**

Residentially generated PCTW can be diverted either at the HH or industrial levels. HHs employ reuse and recycling strategies while industry engages in reuse, recycling, and recovery.

HH members categorize items on criteria of desirability and usefulness (Newell, 2015; Weber, 2015). Items wanted and still useful to the HH can be worn again or repurposed. Items that are useful but no longer wanted by the HH are set aside for gifting, donation, swapping or resale to other HHs. Items neither wanted nor perceived as useful to the HH are discarded.

Reuse within and between HHs is the optimal method of reduction as it prevents the addition of items into the waste stream. Reuse can be achieved by gifting to family and friends, donating, or swapping. Newell (2015) and Weber (2015) note that items selected for gifting, donation, resale and swapping are perceived to be most presentable and potentially useful to others.

Reuse through hand-me-downs are most common, particularly with HHs of larger families. Items with the least wear and tear, like those for babies and children, are often handed down to their siblings and other familiar contacts within a small network of family and friends. Clothing swaps are essentially wider networks for hand-me-downs. Resale,



meanwhile, is exemplified by activities from simple garage sales to selling items on consignment and online platforms.

HHs engage in recycling, which may involve either down-cycling or up-cycling. Down-cycling involves transforming the unwanted item into something of lesser value, most commonly done by cutting items into rags and wipes. Up-cycling involves transforming the unwanted item into something of equal or higher value. Doing so requires creative talent and technical skills. HH upcycling involves altering used clothes and other textiles into other useful items, either as restyled clothing or other textile-based goods.

Residentially generated PCTW moves from HHs to industry through donations. In Canada and the United States, registered charities and non-profit organizations (RCNPOs) are largely responsible for channeling PCTW from HHs into the textile waste management industry. RCNPOs provide the industry entry point for PCTW, mostly by collecting used clothing donations. They are central to informal networks that involve PFPEs. RCNPOs collect used clothing either through donation bins or through central drop-off locations.

RCNPOs have two operating models for used clothing donation bins. On one hand are RCNPOs that own and operate their own network of bins. On the other are those that enter partnerships with PFPEs.

RCNPOs use donated clothing in three ways: redirect for reuse, resell for reuse, and resell to used clothing industry (Weber, 2015). Some donate select items in kind to other non-profit programs that require specific purpose clothing like Dress for Success, which provides professional business clothing to those less privileged wanting to enter/re-enter the job market, and Cinderella programs, which provide fancy and formal dress to less privileged youth for special occasions.

RCNPOs with storefronts (thrift stores) take used clothing with high resale values and attempt to sell them. Of the clothing donations that they receive, RCNPOs sell and donate an estimated 10-20% (CTR, n.d.). The remaining 80-90% of used clothing donations are sold to PFPEs. Proceeds from sales to PFPEs offer the lowest returns and some unsold inventory is landfilled (Weber, 2015).

RCNPOs enter into partnership agreements with PFPEs, which own, maintain, and operate donation bins with the name and branding of RCNPOs. In return for the use of their name and branding, RCNPOs receive some share of the PFPE's revenue from the liquidation of used clothing donations.

PFPEs that offer these partnerships typically operate collections/hauling from the donation bins, and a material recovery facility, where they manually or mechanically sort, grade, bale, label, and package donated items. These so called "sorter-graders" separate items by wearability, seasonality, and fiber composition, which ultimately lead to three distinct categories: second-hand clothing, down-cycling/conversion, and recycling into fiber (Weber, 2015). In the US, 45% are directed to second-hand clothing, 30% are recycled and converted, 20% are recycled into fiber, and 5% are considered waste (CTR, n.d.).

Used clothing deemed wearable is separated into different grades based on condition and seasonality. Each sorter-grader may have its own system but the open market for second-hand clothing has standardized grades based on condition and potential end market. Winter garments are baled and set aside for resale in North American or European markets, while summer garments are baled for export to markets in Asia and Africa. Best grades sell for the highest prices and include the best quality items. Unsorted items in the original packaging from donors are called "credential" grade and sold to niche markets such as used clothing and vintage store operators who essentially gamble and hope the credential packages they receive contain "diamonds" (Hawley, 2006). These stores sell unsold items back to sorter-graders at lower rates to maximize their revenue, the same way RCNPOs sell their unsold inventory to PFPEs. As with thrift stores, some inventory is landfilled.

Sorted Items deemed non-wearable are further segregated into different groups by fiber composition. Those classified for down-cycling / conversion are cut and shredded, then sold to specific end markets. Natural fibers are converted into wipes and fiberboard insulation, while synthetic fibers are converted into wadding and stuffing. Items classified for recycling into fiber are subjected to various processes that break down fabric. Items containing natural fibers are subjected to "pulling" where cotton and wool are recovered to create recycled thread, yarns, and fabric. Synthetic fibers are recovered through chemical or heating processes and converted into plastic, specifically

polyethylene terephthalate (PET). Innovative technologies are currently being developed to improve the recovery of fiber from all types of textiles to create more products that can be sold back to manufacturers.

To facilitate sales, “brokers” find buyers for these products on behalf of sorter-graders. Brokers typically charge sorter-graders a fee for their service. While there are independent sorter-graders and brokers, most PFPEs in textile recycling are vertically integrated, offering collections/hauling, sorting-grading, and brokerage.

Figure 4.2 shows a general framework for the flow of PCTW from HHs. This figure is adapted from original infographics in Berthon (2016), Newell (2015), and CTR, (n.d.).

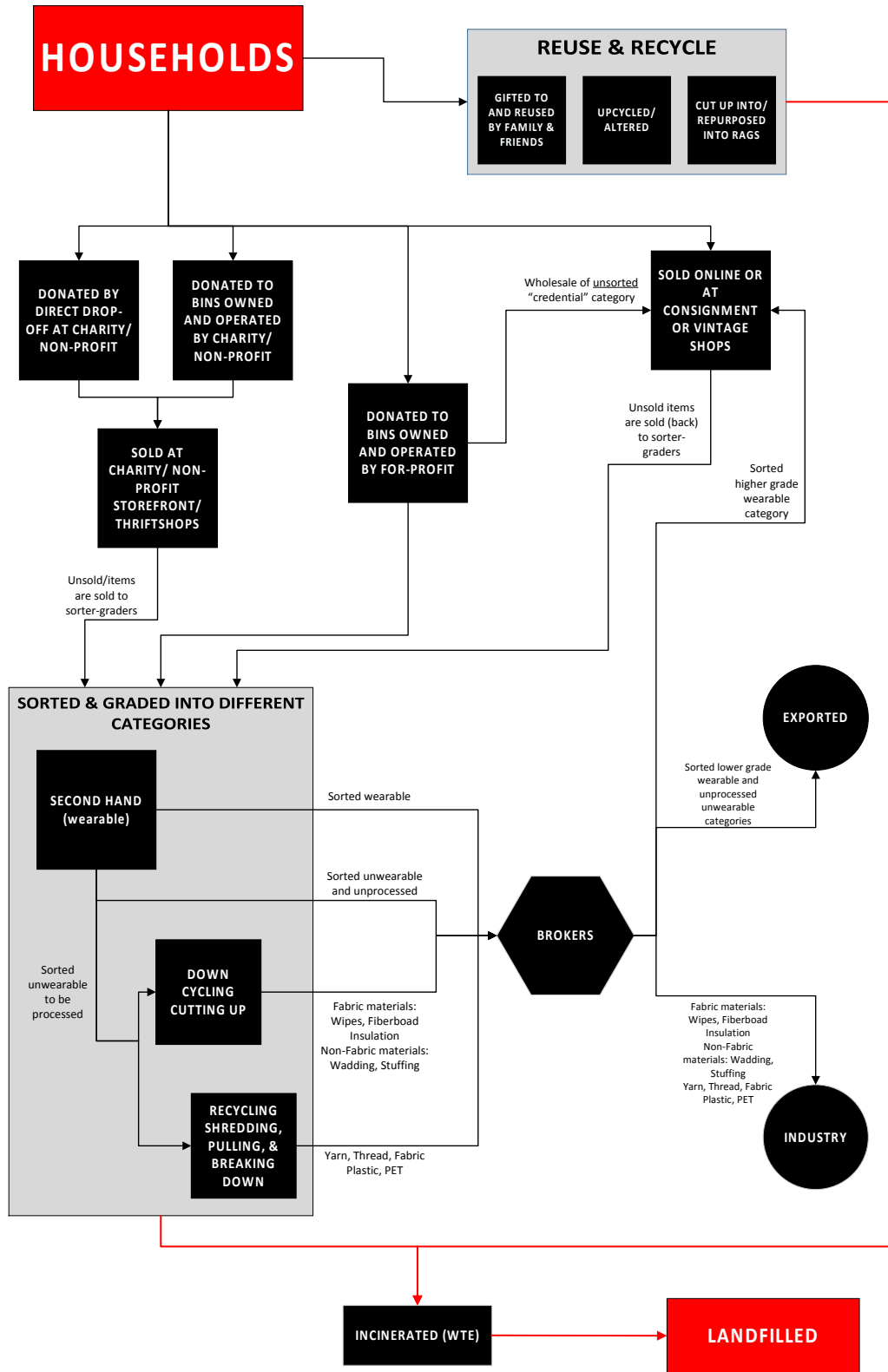


Figure 4.2. General Framework/Supply Chain for PCTW Flow Interpreted by the Author

Retailer take-back programs are relatively new and are the adaptive response of retailers to growing consumer awareness of environmental impacts. Through such programs, major retailers accept used and worn clothing from consumers at their various retail locations or central drop-offs, offering rewards such as sales and discounts on next purchases. Some accept only specific items or item from their brand, while others accept all items no matter the type or brand.

There are some concerns about the capacity for recycling given the fluctuations in the end markets, particularly for exports of second-hand clothing and lower grades of PCTW (Bianchi & Birtwistle, 2010). Some of these end markets are set to shrink. China and East African countries are implementing import bans on second-hand clothing and other textile waste products to protect their domestic markets. These so-called “Green Fence” initiatives will shrink export end markets for textile recycling PFPEs, creating bottlenecks that will likely result in the redirection of recovered textiles into incineration or landfilling (Goldberg, 2016; Morawski, 2017).

The supply chain is analogous to the waste hierarchy in figure 4.1. As PCTW moves further down in the supply chain, there is much less value being extracted, not only because the items are of lower value but also because there are more players involved. Unsorted or “credential” grade material will contain more wearable items in better condition. Conducting the first sorting of donations from their original packaging gives an advantage of being more likely to find items that can be reused or sold. I call this first-sorter advantage. Once sorted, PCTW items are significantly lower in value, not to mention likely more damaged from additional handling. As PCTW moves into the industrial level, there are also more players increasing the transaction cost incurred – namely the brokers who facilitate the sale, the shippers who transport, and all other parts of the back-end supply chain. Values recovered from PCTW are maximized the earlier the first sorting occurs in the supply chain, where there are fewer players and recovered PCTW items are reused more than recycled.

There are efforts to transform the prevailing linear economy of “take, make, dispose” into a circular one aimed at reducing the extraction of raw materials, maximizing the uses and lifespans of products, and finally, recovering and regenerating the most material from the products at their end-of-life (Ellen MacArthur Foundation, n.d.). Various industry initiatives are looking at upstream innovations in the materials and

designs of their products and they are also innovating in consumer-oriented programs such as retailer take-backs and leasing/rental programs not just for formal (special occasion) garments but for everyday items such as jeans (MUD Jeans, n.d.).

### **4.3. Policy Instruments**

Policy instruments to improve material recovery from waste streams can target either the supply or demand side for PCTW. Supply-side policies target HHs that generate PCTW while demand-side policies target the industry and end-markets that consume PCTW. Demand-side policies are generally beyond the existing operational jurisdiction of regional and municipal governments and are not relevant for further consideration in this study. Other supply-side policies, which are beyond municipal jurisdiction or cannot be directly specified for PCTW recovery, are also excluded from further consideration.

Local government involvement in improving the recovery of PCTW has historically been minimal, and is limited to providing general information and awareness about all available PCTW disposal options through print and online platforms. Some local governments have become more involved through partnerships with different players in the textile waste management industry. Most such partnerships are between municipalities and RCNPOs.

Another type of partnership between municipalities and RCNPOs includes major capital investments in infrastructure. Markham (Ontario) and San Francisco (California) have implemented programs that required capital investments in donations bins that bear the name and branding of partner RCNPOs. These agreements are essentially the same arrangements that PFPEs offer except that, in these public arrangements, 100% of the proceeds are directed to the partner RCNPOs, which in turn are responsible for operating the bins.

Due to the increasing potential profitability of the PCTW market, some PFPEs have also entered the market providing PCTW collection services. Using agreements similar to those with RCNPOs, some local governments have partnered with PFPEs on collection agreements. These collection agreements can be cost-free as demonstrated by Simple Recycling, a PFPE able to offer cost-free PCTW curbside collections services

to partner municipalities in the US. It has secured contracts in at least nine municipalities in five states and is optimistic about their growth. Simple Recycling's novel self-funding business model is cost-free to municipalities through the recovery of costs from the value of the PCTW collected.

Other local governments provide curbside collection using their own fleet or through service contracts with collectors/haulers. While essentially a simple addition to existing frameworks for other recyclable items already collected curbside, PCTW curbside collection may include additional costs in ensuring items remain clean and dry and are not damaged during collection. This may mean additional capital investment in specialized equipment and instructions to HHs about packaging that facilitate the separation of PCTW from other collected items to prevent contamination and also weather damage. In addition to cost implications from collecting PCTW, the local government will need to partner with PFPEs such as material recovery facilities and brokers.

PCTW disposal bans are slowly being introduced by local governments. Bans vary in implementation and enforcement levels. Some bans are "passive" as they would only involve charging tipping fee surcharges for bags containing banned materials at the end points of the waste stream, during inspection at transfer stations and landfills. Other bans are more active, such as those complemented by a clear bag policy that enable inspection at earlier points in the waste stream, including curbside, where collectors can reject bags with banned materials and penalize HHs directly. Passive bans indirectly impact HHs through costs passed from higher disposal taxes or service fee charges from waste collection services.

Donation bins present special problems, namely fraud and public nuisance if badly managed. Some jurisdictions have identified donation bins falsely claiming connections to RCNPOs. The proliferation and co-location of bins in some areas resulted in illegal dumping and the idling of vagrants. Some municipalities have invested in donation bins and drop off points to improve diversion. Other municipalities have implemented regulations that limit number and locations and require labeling and formats for donation bins (McLaughlin & Green, 2016). The restriction of licences to bins operated by or supporting RCNPOs is a reaction to fraud. The overall impact of regulations on donation bins has been a reduction of disposal methods.

Most municipalities employ a combination of these instruments. For example, Markham (Ontario) employs an active textile waste ban, a partnership with RCNPOs for additional bins, and regulations on donation bins. Colchester County (Nova Scotia) employs an active textile waste ban and a municipally administered curbside collection program.

To summarize, the following policy elements are available to affect the recovery of residentially generated PCTW.

1. Education Campaign
2. Donation Bins
3. Curbside Collection
4. Disposal Ban

It should be noted that policy interventions in PCTW recovery are limited and still developing.

## **4.4. Textile Waste Management Regulatory Context**

### **4.4.1. Metro Vancouver Regional District**

Metro Vancouver Regional District (MVRD) is a federation of 23 local authorities, mandated to conduct planning, provide services, and maintain facilities for regional solid waste management. They share jurisdiction with each member's waste management departments, which are responsible for municipal operations, including waste collection.

MVRD's waste management programs employ a network of transfer stations, a landfill, and a waste-to-energy (incineration) facility. MVRD is also responsible for implementing bylaws to enforce landfill bans on designated recyclable and hazardous materials and administer tipping fees. Most of MVRD's recyclables are processed and transferred to end markets by private for-profit enterprises. In the context of textile waste, these activities are conducted by a combination of for-profit enterprises, non-profit organizations, and registered charities.



The current MVRD Integrated Solid Waste Regional Management Plan (ISWRMP) calls for increasing the diversion rate to 80% by 2020 from the current 65% as of 2016 (Metro Vancouver, 2010). The plan outlines the goal of reducing waste and maximizing reuse, recycling, and material recovery. Though it does not specifically mention textile waste, it sets broad prescriptions applicable to textile waste:

- provide more information and education on options to reduce waste
- transfer costs, risks, and responsibilities of managing waste to producers and consumers
- increase opportunities for reuse
- increase effectiveness of existing recycling programs
- provide opportunities to increase private sector recycling
- develop contingency plans for the loss of recycling markets

#### **4.4.2. Current Textile Waste Diversion Landscape in MVRD**

In August 2016, the MVRD announced it is considering a disposal ban of PCTW from landfilling pending further consultation with stakeholders (Zeidler, 2016). At that time, a study commissioned by MVRD did not support a PCTW disposal ban. At the time of writing, consultations are underway and the plan for MVRD is expected to be unveiled at the Zero Waste Conference in Vancouver scheduled for November 2017 (personal communication with K. Storry, October 2017). MVRD is empowered through bylaw to establish tipping fees and solid waste disposal regulations, including banning certain types of waste from landfill.

Like other jurisdictions, the textile waste management framework for MVRD is still developing. The current framework relies on voluntary drop-off at donation bins and charities to facilitate the collection of textiles through bins and scheduled collections. A few retailers offer take-back programs as do active clothing swap organizers. Leasing/rental programs are limited to special occasion garments. As with other jurisdictions, these initiatives are quite limited in scope and scale. At least one member municipality (North Vancouver City) is being served by a local company, Waste Control

Services (WCS) that offers scheduled collections and pick-up at central drop-off locations as of January 2017 (WCS, 2017).

Various charity organizations in Metro Vancouver directly accept clothing and textile donations and maintain and operate 24/7 clothing donation bins. Organizations that have storefront operations resell the best quality reusable clothing donations and forward the rest to local sorter-graders.

MVRD has at least seven large scale industrial textile sorter-grader-brokers:

- Canam International Ltd.
- Dominion Textile
- Odyssey International
- Trans-Continental Textile Recycling Ltd
- Delta Textiles
- Pacific Clothing Recyclers Inc.
- Green Inspirations British Columbia Ltd.

These firms operate specialized material recovery facilities for sorting and grading textiles and also function as brokers for their products. They do not however perform shredding or recycling through fiber recovery, and instead they ship sorted and graded materials to specialized processing operations elsewhere (personal communication with K. Storry, October 2017).

Of these companies, Trans-Continental Textile Recycling Ltd. (TCTR) and Green Inspirations British Columbia Ltd. (GIBC) run a similar partnership program with local charitable non-profit organizations. This arrangement is cost-free to the partner organizations, which lend their name and branding to clothing donations bins owned, operated and maintained by TCTR and GIBC. In most cases, the charity non-profit organization is responsible for recruiting site/bin placement sponsors. In return for lending its name and branding, the registered charity/non-profit organization receives some revenue from the sales of used clothing collected.

These partnerships are most appealing to registered charities and non-profit organizations that do not operate storefronts/thrift stores. However, critics of these partnerships point to the lack of transparency in their operations and absence of any regulation on these partnerships to protect the interest of the partner organization. The arrangements have not been transparent: investigations have concluded that organizations receive only a flat fee or very small share of proceeds (“Clothing donation bins spark turf war”, 2012). In Ontario cities such as Brantford and Markham, some clothing donation bins were “ghost bins” that did not contribute to any registered charity or non-profit organization (Shypula, 2015; McGillivray, 2017).

Information about used clothing disposal methods is lacking and inconsistent across MVRD municipalities. A review of websites for MVRD member municipalities reveals that only some of them promote charity organizations and donation bins in their respective areas (see appendix B for summary of available information from municipal website). Some municipalities even indicate that textile waste can be disposed of into garbage. Most member municipalities display relevant information about textile recycling, including relevant information about where to donate used clothing in their interactive search and information tools (“Waste Wizard” developed by Recollect / “Recycle Coach” developed by Recycle Coach). These tools are available online. Several sources, including municipal governments, provide the locations of used clothing donation bins through lists and maps available online.

Other resources/directories available online for recycling different materials, including textiles, are managed and maintained by the Recycling Council of British Columbia. Additionally, the Metro Vancouver Recycles website and search tool provides a map of all used clothing donation bins across MVRD.

Information about where clothing donations are directed and who benefits from them is sparse. The proliferation of donation bins is confusing and misleads donors to believe they are donating to social welfare causes. Transparency is lacking and inconsistent between different actors involved in operating donation bins.

In addition to information gaps, clothing bins themselves have become a public nuisance (“Charity donation bins in Richmond”, 2016). The number and clustering of poorly maintained donations bins have attracted illegal dumping and littering. While most

are placed with permission from the relevant property owner, many others are placed without permission at public rights-of-way or have become obstructions. These issues have prompted some local authorities to pass bylaws targeting donation bins, using some combination of bans, licensing, zoning, and regulation.

## Chapter 5.

### Survey Findings

I conducted a survey to establish a baseline understanding of how MVRD residents currently dispose of PCTW and what they consider most important in selecting a disposal method. This section describes the survey design and presents the findings and their implications for policy development.

#### 5.1. Survey Design and Implementation

The design of the consumer survey for this study is based on similar consumer surveys conducted by Newell (2015) and Weber (2015) to address the questions about textile waste disposal behavior and motivations in the State of New York and the Province of Ontario, respectively. Copies of the informed consent form and the survey instrument/questionnaire are in appendix A.

The first question – question T1 - asked the participants about their behavior with respect to nine textile waste disposal methods, which were distilled from lists used by Weber (2015) and Newell (2015) in their surveys on textile waste disposal.

T1: How often do you use each of the following methods for disposing of clothing and other textiles/cloth you no longer want?

Participants were asked to rate how frequently they use each method using a Likert scale with the following options: Always, Often, Sometimes, Rarely, Never.

The nine options for textile waste disposal are the following:

- a) Resell
- b) Donate to charity directly
- c) Give away to friends or family
- d) Clothing swaps
- e) Alter/transform (up-cycle) into other items

- f) Drop off at donation bins
- g) Dispose of into trash
- h) Cut-up and use for rags
- i) Bring back to retailer

This list of disposal methods is intended to be exhaustive, mutually exclusive and plainly written.

The second question – question T2 – asked the participant to rank five categories of attitudes or motivations towards disposing textile waste based on each category's importance. These categories were also distilled from concepts used by Weber (2015) and Newell (2015).

T2: How important are each of the following factors to you personally when you are deciding how to dispose of unwanted clothing and other textiles/cloth?

Participants were asked to rank each category from 1 to 5, where 1 is most important and 5 is least important. The participants were also given the option of indicating they Don't Know or that the question is Not Applicable to them on account of never having disposed of any textile waste.

The five categories for motivation/attitude are the following:

- a) Get money or other rewards (by reselling your unwanted clothes/textiles on websites or through consignment stores or by taking your unwanted clothes them back to retailers that may offer rewards such as discounts on next purchases or other shopping perks)
- b) Convenience (you have donation bins or charity organizations accessible in your area or somewhere centrally located)
- c) Social welfare (you want to help a cause or charity you support)
- d) Gifting (you feel your unwanted clothes/textiles could still be re-used by others)
- e) Eco conscious (you don't want your clothes/textiles to end up in a landfill)

The broad question statements, lists of waste disposal methods and motivational factors/categories were designed to minimize response bias that may result from

unfamiliarity, question format, and question context by providing definitions/elaborations on novel concepts, using simplified language, and providing exhaustive options within the Likert scale.

Other than the promise of anonymity, no other mechanism was employed to mitigate social desirability bias in the survey design. This bias is anticipated to be a factor as participants self-report on their activities and way of thinking. Social desirability bias is the tendency for survey participants to respond in such ways to select ideal socially acceptable answers rather than factual ones.

Insights West (Vancouver, BC) conducted the survey and collected a sample population of Metro Vancouver resident aged 19 and over with a minimum sample size of 300. Insights West offers an online survey sampling service and platform called Omnibus Tool and fields survey questionnaires to a panel of potential participants recruited from the Metro Vancouver area who are rewarded with monetizable items upon completion of the survey.

The survey asks participants for demographic information such as age, gender, income level, and city of residence. Responses to age and residence were used as screening questions - participants must currently reside in one of Metro Vancouver member municipalities and be 19 years in age or older at the time of the survey. The survey tool and screening mechanism were programmed by Insights West. For questions T1 and T2, the order in which the list of behaviours and motivations were presented was randomized for the purpose of reducing bias from visual design of the questionnaire as it appears on screen.

Between July 12 and August 1, 2017, Insights West fielded the survey instrument and made contact with 806 potential participants. Among these 806 participants, 430 met the screening criteria. Among these 430 screened-in participants, only 408 are valid since 22 participants, residents of Langley City and District, were screened out due to a technical glitch. Among these 408 valid responses, 27 are incomplete and the remaining 381 are complete. 27 participants did not complete the entire survey and had no responses to question T2, either voluntarily choosing to skip questions or as a result of some technical issue during data entry.

## 5.2. Descriptive Statistics

The following describe the target and sample (based on valid complete response) populations. Calculations with respect to the target population, where possible, include residents of Metro Vancouver who are 19 years and older in the 2016 Census count, narrowing the effective target population from approximately 2.5 million to 2 million.

Male and female respondents comprise respectively 46% and 54% of the sample population, a slight over-representation of females. See Table 5.1.

**Table 5.1. Distribution of Sample and Target Populations Across Gender**

Gender	Sample Population (% Share) n=408	Target Population (% Share) n=1990390
Male	46	48
Female	54	52

The sample size is reduced in the process of analyzing income since 86 participants chose not to report their income level, reducing the sample from 408 to 322 viable responses. Of the remaining viable responses, 41% of participants reported a HH income between \$50K and \$100K, 34% reported a HH income over \$100K, 26% of participants reported HH income below \$50K. The comparison of the sample's three income groups with corresponding groups from the target population in the 2016 Census count show significant disparities between sample and target populations. In particular, the lowest income group, those with HH incomes below \$50K is under-represented in the sample. Meanwhile, middle and upper income groups are over-represented.

**Table 5.2. Distribution of Sample and Target Populations Across Income Groups**

Income Group (HH Income)	Sample Population (% Share) n=322	Target Population (% Share) n=483840
Less than \$50k	26	62
\$50K to \$100K	41	19
More than \$100K	34	19



The sample population is older with a mean age of 55 compared to the target population mean age of 48 in Census 2016 data. In a comparison of age groups in table 5.3, the sample population has an underrepresentation of younger groups and an overrepresentation of older groups.

**Table 5.3. Distribution of Sample and Target Population Across Age Groups**

Age Group	Sample Population (% Share) mean = 48 n = 408	Target Population (% Share) mean = 55 n= 1990390
19 to 30	9	21
31 to 40	14	17
41 to 50	21	18
51 to 60	24	17
61 to 70	21	14
71 and up	11	12

Census 2016 indicates the population across member municipalities of MVRD is concentrated in the following cities: Vancouver (26%), Surrey (21%), Burnaby (9%), Richmond (8%), Coquitlam (6%), with less than 5% each for the remaining MVRD members. Table 5.4 shows the sample population roughly reflecting the census distribution. Nearly a third (27%) of respondents indicate their city of residence as Vancouver, followed by 19% from Surrey, 8% each from Burnaby and North Vancouver, and the balance divided into small fractions across the remaining areas in the MVRD. Proportionately large deviations from the latest Census are Langley obviously, New Westminster, and North Vancouver. New Westminster and North Vancouver are overrepresented in the sample population.

**Table 5.4. Distribution of Sample and Target Population Across Age Groups**

City	Sample Population (% Share)	Target Population (% Share)
Vancouver	27	26
Surrey	18	21
Burnaby	8	9
North Vancouver City & District	8	6
Richmond	6	8
New Westminster	6	3
Coquitlam	5	6
Delta & Tsawwassen	5	4
Maple Ridge	3	3
Port Moody	3	1
Port Coquitlam	3	2
White Rock	2	1
West Vancouver	1	2
Bowen Island	1	0
Pitt Meadows	0	1
Belcarra	0	0
Electoral Area A	0	1
Indian Reserves	0	0
Anmore	0	0
Lions Bay	0	0

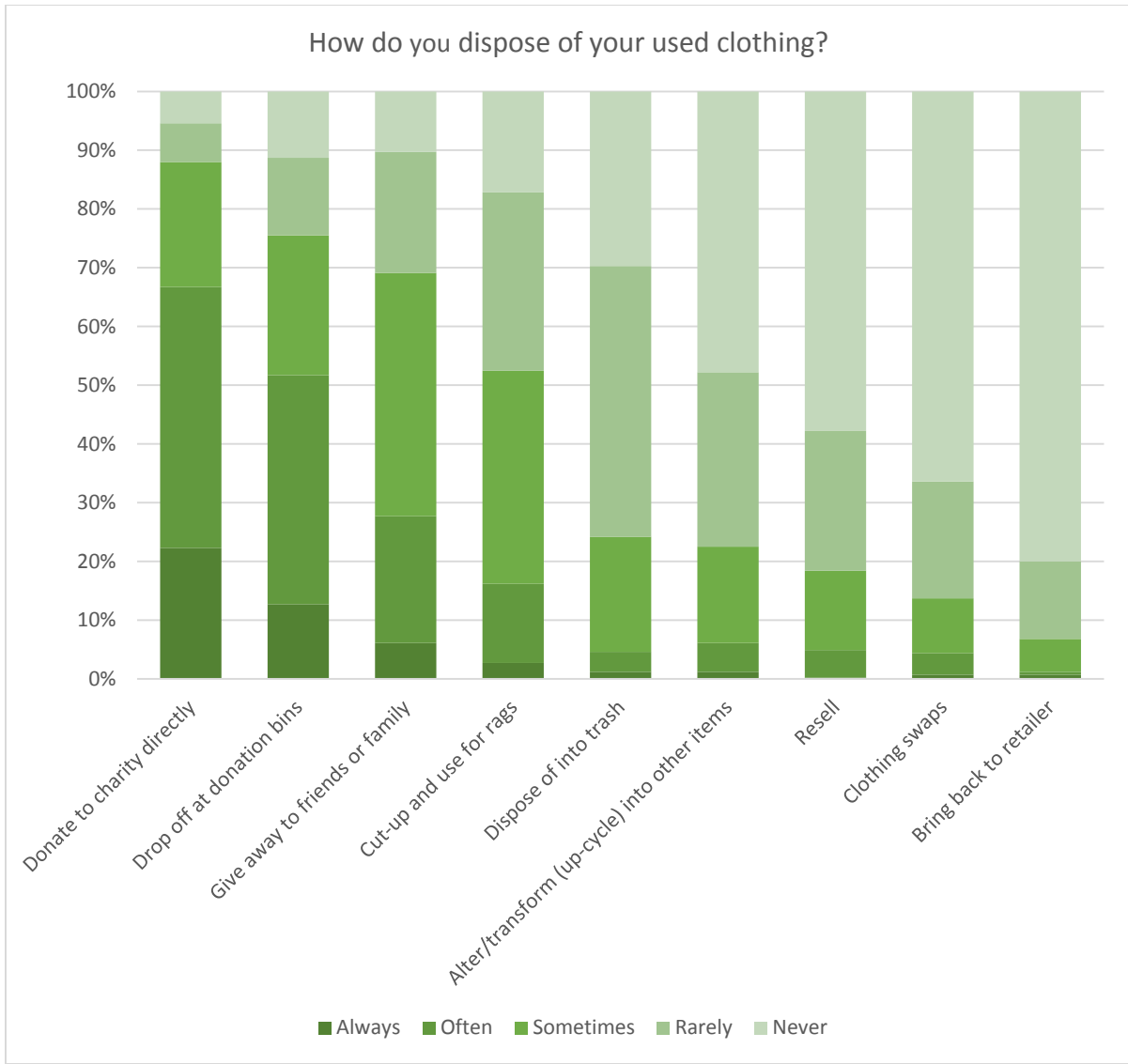
### 5.3. Results on Behaviour (T1)

Table 5.5 shows that Donating to Charity Directly and Dropping off at Donation Bins are the most frequent methods used by survey respondents. More than two-thirds of respondents indicate they always or often donated to charity directly and over half indicate always or often donating to donation bins. Clothing Swaps and Bring back to retailer were the least frequent methods used by respondents. Over 90% of respondents indicated they rarely or never bring used clothing back to retailers and over 85% indicate the same low frequencies for using clothing swaps

**Table 5.5. Distribution Distribution of Responses to Question T1 by Disposal Method (in % share)**

Method of Disposal	Always	Often	Sometimes	Rarely	Never	
Donate to charity directly	22	44	21	7	5	100
Drop off at donation bins	13	39	24	13	11	100
Give away to friends or family	6	22	41	21	10	100
Cut-up and use for rags	3	13	36	30	17	100
Alter/transform (up-cycle) into other items	1	5	16	30	48	100
Dispose of into trash	1	3	20	46	30	100
Clothing swaps	1	4	9	20	66	100
Bring back to retailer	1	0	6	13	80	100

Figure 5.1 illustrates the distribution of responses to T1. The responses to Clothing swaps and Bring back to retailer are more skewed than for other methods. The high frequency of Rarely or Never suggests respondents are unfamiliar, inexperienced or uninterested in such disposal methods. The survey questionnaire was not robust enough to dig deeper into the question the way Weber (2015) and Newell (2015) did in their consumer surveys.



**Figure 5.1. Relative Frequencies of Responses to question T1**

Responses to question T1 were indexed using the following weights.

- Always = 4
- Often = 3
- Sometimes = 2
- Rarely = 1
- Never = 0

By taking an average of these weighted responses, an index score is created for each disposal method. The index score ranges from 0 to 4, with higher scores indicating higher frequency of use.

According to index scores for each disposal method using the entire survey sample as shown in Table 5.6, an average MVRD resident disposes textile waste most frequently by Donating to charity directly, followed by Dropping off at donation bins, and Give away to friends and family. At the other end of the spectrum, the average MVRD resident in the sample infrequently uses the methods of Resell, Clothing Swaps, and Bring back to retailer.

**Table 5.6. Disposal Methods Ranked by Index Scores for Total MVRD Sample Population**

Index Score	Disposal Method
2.72	Donate to charity directly
2.29	Drop off at donation bins
1.93	Give away to friends or family
1.54	Cut-up and use for rags
1.00	Dispose of into trash
0.82	Alter/transform (up-cycle) into other items
0.66	Resell
0.52	Clothing swaps
0.29	Bring back to retailer

Findings from this survey of MVRD residents are consistent with expectations based on other survey findings (Newell, 2015; Weber, 2015). Table 5.7 compares findings of consumer surveys on textile waste disposal methods ranking in order from most to least frequently used.

**Table 5.7. Comparison of Consumer Survey Findings on Textile Waste Disposal Behaviour**

Metro Vancouver Consumer Survey Results n= 408	New York State Consumer Survey Results, Newell (2015) n=779	Ontario Province Consumer Survey Results, Weber (2015) n=410
<ol style="list-style-type: none"> <li>1. Donate to charity directly</li> <li>2. Drop off at donation bins</li> <li>3. Give away to friends or family</li> <li>4. Cut-up and use for rags</li> <li>5. Alter/transform (up-cycle) into other items</li> <li>6. Dispose of into trash</li> <li>7. Resell</li> <li>8. Clothing swaps</li> <li>9. Bring back to retailer</li> </ol>	<ol style="list-style-type: none"> <li>1. Donate to Charity</li> <li>2. Gifting</li> <li>3. Turn into Rags</li> <li>4. Donation Bins</li> <li>5. Resell</li> <li>6. Trash</li> <li>7. Upcycle</li> <li>8. Clothing Swap</li> <li>9. Other</li> </ol>	<p><b>Disposal</b></p> <ol style="list-style-type: none"> <li>1. Donate</li> <li>2. Dispose</li> <li>3. Resell</li> <li>4. Retail Take-Back</li> <li>5. Clothing Swap</li> </ol> <p>Reuse</p> <ol style="list-style-type: none"> <li>1. Wearing garments for hands on work</li> <li>2. Using garments as cleaning rags</li> <li>3. Passing on garments</li> <li>4. Restyling garments into new things</li> </ol>

A direct comparison across all three surveys is not possible as the data categories and style/manner of questioning differ between surveys.

## 5.4. Results on Motivation (T2)

There are 381 valid responses to question T2; 27 participants either indicated they did not know or that the question did not apply to them.

In choosing what they consider their most important motivation, over a third of the sample selected Social Welfare, followed by a virtual tie between Convenience and Eco-consciousness as shown in table 5.8.

**Table 5.8. Distribution of Most Important Motivation (% Share)**

Motivation	Social welfare	Eco-consciousness	Convenience	Gifting	Getting money or other rewards
1st Most Important	35	23	22	15	5

Table 5.9 shows the distribution of responses to second, third and fourth most important motivation. The shares of responses between Convenience, Gifting, and Eco-

consciousness were near or virtually equal particularly in the distributions for 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> most important motivations. This suggests that MVRD residents are largely indifferent in the prioritization of these three motivations.

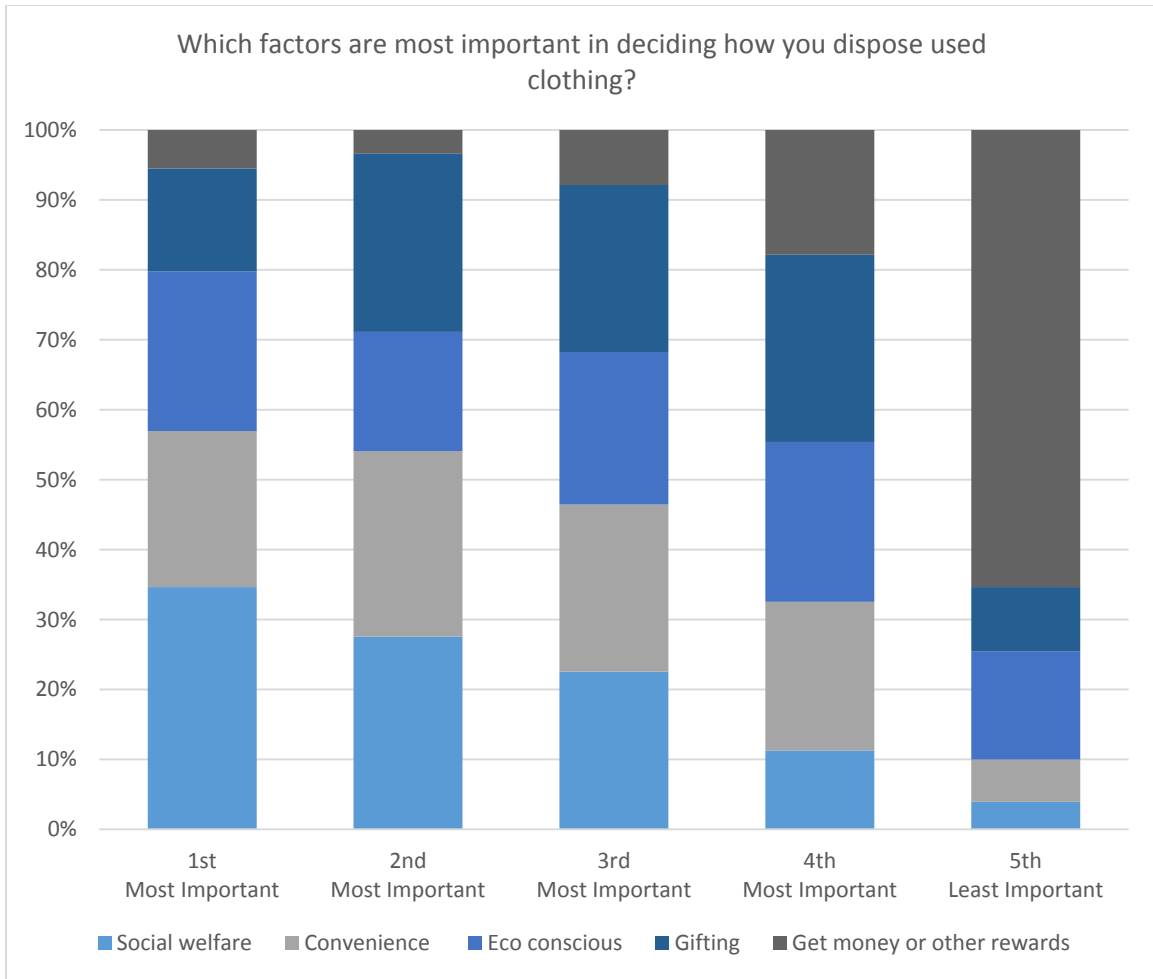
**Table 5.9. Distribution of 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> Ranked Motivations (% Share)**

Motivation	Social welfare	Convenience	Gifting	Eco-consciousness	Getting money or other rewards
2nd Most Important	28	27	25	17	3
3rd Most Important	23	23	24	22	8
4th Most Important	11	21	27	23	18

For least important (5<sup>th</sup> ranked), the majority (65%) of MVRD residents selected Getting money or other rewards is shown in table 5.10.

**Table 5.10. Distribution of Responses for 5th Ranked Motivation (% Share)**

Motivation	Getting money or other rewards	Eco-consciousness	Gifting	Convenience	Social welfare
5th - Least Important	65	16	9	6	4



**Figure 5.2. Relative Frequencies of Responses to Question T2**

Figure 5.2 shows the side-by-side comparison of the distributions of motivations for each level of importance. Definitive trends are most clear for Social welfare and Getting money or other rewards, while less conclusive information can be drawn about Convenience, Eco-consciousness and Gifting. It shows that the Social welfare share of ranks declines consistently in moving from most to least important motivation. The reverse is true for Getting money or other rewards.

Responses to question T2 were indexed using the following weights.

- Most Important = 4
- 2nd most important = 3
- 3rd most important = 2



- 4th most important = 1
- Least important = 0

By taking an average of these ranked responses, an index score is created for each motivation. The index score ranges from 0 to 4, with higher scores indicating greater importance. Table 5.8 shows that the sample population ranked Social Welfare as the most important and Getting Money or Rewards as the least important. Convenience is second to Social Welfare, followed by Gifting and Eco-consciousness separated by a single

**Table 5.8. Motivations Ranked by Index Scores for Total MVRD Sample Population**

Index Score	Motivation
2.78	Social welfare
2.38	Convenience
2.10	Gifting
2.09	Eco-consciousness
0.66	Getting money or other rewards

## **Chapter 6.**

### **Policy Elements**

In this section, I introduce policy elements developed from the analysis in section 4.3. Instead of policy options, policy elements are not mutually exclusive and can be combined. The policy elements have been configured to align with MVRD's ISWRMP strategic prescriptions, which are:

- provide more information and education on options to reduce waste
- transfer costs, risks, and responsibilities of managing waste to producers and consumers
- increase opportunities for reuse
- increase effectiveness of existing recycling programs
- provide opportunities to increase private sector recycling

Various combinations of elements form a suite of policy options reflective of implemented programs in other jurisdictions. This approach better fits the governance framework for MVRD, where jurisdictional responsibilities are divided between MVRD and member municipalities. Divided jurisdiction will generate different responses in different municipalities. This policy menu approach caters to the autonomy of each MVRD member municipality and enables each to formulate a customized policy suite to meet the specific needs of their jurisdiction.

#### **6.1. Status Quo**

The status quo features minimal involvement from local governments. PCTW disposal methods available to MVRD residents include the informal network of registered charity organizations and 24/7 drop-off donation bins, along with less frequently used methods such as retailer take-back programs and resale programs. PCTW waste collection services are not widely available and only offered by one PFPE collection/hauler for a specific area.

There is a network of PCTW drop-off locations and donation bins, composed of bins owned and operated by RCNPOs and bins managed by PFPEs in partnership with RCNPOs. Some MVRD member municipalities have ordinances that involve licensing and regulation of donation bins.

MVRD authorities currently provide inconsistent and inadequate information about what, where and how used clothing and other textile waste can be donated on print and online platforms. There is no disposal ban and the current diversion rates, which are yet to be officially measured, are probably low.

## **6.2. Disposal Ban (element A)**

This element involves a ban on placing PCTW in the landfill waste stream. It follows the precedent of disposal bans implemented for other recyclable materials and organic waste. MVRD's disposal ban against PCTW will require changes to the Tipping Fee Bylaw No. 302 to include PCTW among banned materials.

Once implemented, auditors at MVRD disposal facilities who currently inspect loads for other materials will include PCTW among those items they monitor. If and when PCTW is found, auditors will apply surcharges the same way they apply to other banned materials

## **6.3. Education Campaign (element B)**

This element involves an education campaign to increase the awareness of the importance of PCTW diversion and knowledge of PCTW diversion programs among MVRD residents.

This proposed educational campaign will include the following key messages and information:

- discuss costs and benefits of diverting PCTW beyond the basic and general information available in the status quo
- emphasize and clarify that nearly all types and conditions of PCTW are acceptable

- list all available channels for PCTW diversion by specific program and organization, including what they accept, where they are and how they can be accessed
- redirect to existing resources such as Metro Vancouver Recycles, and Recyclepedia and the Recycling Hotline operated by Recycling Council of British Columbia

Key messages and information will be disseminated through the readily available variety of multimedia platforms including print, online, social media, door-to-door outreach, and promotional opportunities at public events, along with other relevant local campaigns. There will be some significant capital investment in initial outreach/marketing but all efforts will be made to use existing communication networks for subsequent campaign activities.

#### **6.4. Increasing Points of Collection (element C)**

This policy element involves increasing the number of points of collection in MVRD and is adapted from the program of the City of Markham, Ontario and the partnerships offered by PFPEs to RCNPOs.

This element can either increase unmanned donation bins or increase manned drop-off points. Many manned drop-off points for other recyclable materials already accept PCTW, so for simplicity and the purpose of this study, the policy element for further evaluation will be restricted to increasing the number of unmanned points of collection, i.e. donation bins. These additional bins will be of similar or improved design from conventional bins that are currently accessible 24/7.

This element will involve a significant capital investment in new donation bins that will be owned by the municipal government but will bear the name and branding of partner RCNPOs. Following Markham's model, the new bins will be maintained by partner RCNPOs that will be expected to service bins (collect, empty, clean) as needed. Using municipal authorities, these new bins will be placed in strategic public locations with optimal accessibility.

## **6.5. Curbside Collection (element D)**

This policy element involves a curbside collection program for PCTW. Both single and multi-family residential collection or hauling services for recyclables across MVRD member municipalities are provided by both municipal fleets and contracted service providers. This will require changes to current curbside processes for municipal fleets and contract amendments for those municipalities serviced by PFPE haulers. To preserve the value of PCTW being collected at curbside, this element will also require some capital investment in new bags separate and distinct from other recycling bags already in use. The bags must be durable and able to protect contents from moisture and prevent damage from handling.

## Chapter 7.

### Criteria and Measures

I present five criteria by which I will evaluate my policy elements and discuss corresponding definitions and measurements. Table 7.6 at the end this section summarizes criteria definitions and measures.

#### 7.1. Effectiveness

Effectiveness refers to the degree to which the policy element is estimated to increase the PCTW recovery rate. Because public policy interventions on PCTW are relatively new, there are no empirical estimates specifically for PCTW recovery programs. However, there are quantitative estimates for general recycling based on comprehensive empirical surveys [Skumatz (1996) and Skumatz, Freeman & Gordon (2007), and Skumatz & Green (2001)]. These studies established quantitative estimates of percentage point increases in diversion rates resulting from specific recycling program elements, such as a disposal ban, curbside collection, drop-off, and education, which are summarized in the table 7.1:

**Table 7.1. Summary of Quantitative Estimates from Skumatz (1996) and Skumatz, Freeman & Gordon (2007), and Skumatz & Green (2001)**

Recycling Program Element	Quantitative Estimates for Diversion Rate Improvements (in percentage points gained)
Education campaign	Up to 12
Disposal ban	Up to 6
Drop-off	3 to 4
Curbside	6 to 9

While the quantitative estimates are helpful, I believe they have limited applications to PCTW. I will use further analysis to inform my assessment of this criterion by assessing how each policy element affects the factors identified in section 4.1:

1. Awareness and knowledge of the importance of PCTW diversion
2. Awareness and knowledge of types and conditions of items that can be diverted
3. Awareness and knowledge about different diversion programs
4. Convenience from number and proximity of collection points
5. Convenience from longer hours of accessibility of collection points
6. Economic incentives and disincentives

To measure effectiveness, I ask the question, how many factors are affected by the policy element. I make the simplifying assumption that all factors individually impact PCTW diversion in the same way. Affirmative answers are scored “1” and negative answers are scored “0,” and the sum is used for comparing policy elements. Table 7.2 summarizes the scoring scheme, which has a range from 0 to 7.

**Table 7.2. Effectiveness Criterion Scoring Scheme**

Question	Answer and Score
Does the policy element improve awareness and knowledge of the importance of PCTW diversion?	Y = 1 N = 0
Does the policy element improve awareness and knowledge of types and conditions of items that can be diverted?	Y = 1 N = 0
Does the policy element improve awareness and knowledge about different diversion programs?	Y = 1 N = 0
Does the policy element increase convenience by increasing the number and proximity of collection points?	Y = 1 N = 0
Does the policy element increase convenience by offering 24/7 accessibility for collection points?	Y = 1 N = 0
Does the policy element provide economic incentives for reducing PCTW in trash?	Y = 1 N = 0
Does the policy element provide economic disincentives for including PCTW in trash?	Y = 1 N = 0

## 7.2. Administrative Complexity

Administrative complexity refers to the administrative demands on the administrators or local authorities of the new policy element, relative to the status quo. The administrative work is mostly in the administration of contracts and processes, which are common in solid waste management, particularly in recycling (Walls, 2005). Administrative complexity increases with the requirement of a contract and with specific contract clauses involving asset ownership and/or performance monitoring, as these will add to the burden of work required in evaluating and renewing contracts. I assess this criterion based on the following questions adapted from the study carried out by Walls (2005):

1. Does the policy element require the introduction of new agreements or processes?
2. Does the policy element require an agreement that will include:
  - a. asset ownership?
  - b. performance monitoring?
3. How many partners are involved?

These questions attempt to measure the transactional cost involved in administering the policy element. Affirmative answers to question one and two are scored as “-1” and negative answers are “0”. Answers to question three are scored as the number answered, converted to a negative integer. The sum of these individual scores are then used for comparing policy elements. Table 7.3 contains a summary of the scoring scheme. These measures imply a range with a maximum of zero.



**Table 7.3. Administrative Complexity Criterion Scoring Scheme**

Question	Answer and Score
Does the policy element introduce new agreements or processes?	Y = -1 N = 0
Will the agreement/process for the policy element likely include asset ownership?	Y = -1 N = 0
Will the agreement/process for the policy element likely include performance monitoring?	Y = -1 N = 0
How many partner groups are involved?	-(integer)

### 7.3. Optimal Valuation

Optimal Valuation refers to the change in the valuation of recovered PCTW. I assess this criterion based on the anticipated changes in the volume of unsorted PCTW directly received by RCNPOs, which generate more social benefits than PFPE sorter-graders. I measure this criterion based on the following two questions:

1. Does the policy element “directly change” the pattern/flow of PCTW from the status quo in a way that reduces or increases the volume of unsorted PCTW directed to RCNPOs?
  - a. An answer indicating an increase of unsorted PCTW received by RCNPOs, is scored a “+1”
  - b. An answer indicating a decrease of unsorted PCTW received by RCNPOs, is scored a “-1”
  - c. An answer is scored a “0” to indicate no change in pattern/flow of unsorted PCTW
2. Does the policy element direct 100% of the incremental volume in unsorted PCTW to RCNPOs?
  - a. Scores a “1” if 100% of incremental volume is directed towards RCNPOs
  - b. Scores a “0” if less than 100% of incremental volume is directed towards RCNPOs

For this criterion, the direct change in pattern flow refers to the policy element's effect on the supply chain, which is different from how the policy elements can change the disposal behaviour and motivation of MVRD residents.

The sum of the scores indicates the overall score of each policy element against this criterion. Table 7.4 contains a summary of the scoring scheme. The measures imply a range from -1 to 1.

**Table 7.4. Optimal Valuation Criterion Scoring**

Question	Answer and Score
Does the policy element change the pattern/flow of PCTW from the status quo in a way that reduces or increases the volume of unsorted PCTW directed to RCNPOs?	Y, increases = +1 Y, decreases = -1 N = 0
Does the policy element direct 100% of the incremental volume in unsorted PCTW to RCNPOs?	Y = 1 N = 0

## 7.4. Cost Consideration

Cost consideration refers to the additional monetary cost of implementing and sustaining the policy element on cost-bearing parties in municipal governments relative to the status quo. I assess this criterion based on information collected about capital and operational costs associated with each policy element, which will include an identification of the required equipment and human resources involved in implementing the policy across MVRD. Each policy element will be scored as substantial, marginal, or negligible as summarized in table 7.5. These measures imply a range from -1 to -3.

**Table 7.5. Cost Considerations Criterion Scoring**

Question	Answer and Score
What is the policy element's total cost consideration?	Negligible = -1 Minor = -2 Major = -3

## 7.5. Stakeholder Acceptance

Stakeholder acceptance refers to the net support among seven identified stakeholder groups. I identify stakeholder groups and create decision rules on how each group would support or oppose the policy element relative to the status quo.

I identified the stakeholder groups on the basis of the following criteria

- Which groups will be affected by policy elements?
- Which groups have decision-making powers over policy elements?
- Which groups have an interest in effecting a reduction in textile waste in landfills?

Table 7.6 is a summary of their positions and corresponding decision rules.

**Table 7.6. Stakeholder Groups and Decision Rules**

Stakeholder	Position: <b>Interested in...</b>	Decision Rule
MVRD, RCBC, other organizations promoting waste reduction	improving waste reduction, reducing PCTW in landfills increasing donations	likely to support the policy element if it reduces PCTW in landfill
RCNPOs that own and operate their own donation bins, typically operate a storefront	received directly from HHS (unsorted) and retaining first-sorter advantage	likely to support the policy element if it increases the unsorted donations directed to RCPOs
RCNPOs that lend their name and branding to PFPEs, do not operate a storefront	increasing payments received from partner PFPEs	likely to support the policy element if it increases the volume of donations in total
PFPEs (sorter-graders)	increasing donations in general, increasing first-sorter advantage	likely to support the policy element if it increases the volume of donations in total
Collections Services/Haulers	new business opportunities, new revenue streams	likely to support the policy element if it creates new business
MVRD Member Municipalities' Mayors and Councils	minimizing cost and political considerations	likely to support the policy element if associated cost and political considerations are low
MVRD Households/Residents	minimizing effort involved in disposing PCTW, ensuring PCTW is used for social welfare	likely to support the policy element if it improves convenience at the HH level or directs PCTW to social welfare causes

I make the simplifying assumption that all stakeholders are equal. I assess the criterion by scoring each supportive group as “1,” each opposing group as “-1,” and a group with neutral position as “0.”

The sum of the scores indicates the overall score of each policy element against this criterion. Table 7.7 contains a summary of the scoring scheme. These measures imply a range from -7 to 7.

**Table 7.7. Stakeholder Acceptance Criterion Scoring**

Question	Answer and Score
What is the group's position relative to the policy element?	Support = +1 Oppose = -1 Neutral = 0

## 7.6. Summary

**Table 7.8. Criteria and Measures**

Criteria	Definition	Measure	Scale
Effectiveness	The degree to which the policy element is estimated to contribute to increased PCTW recovery rate	Number of factors improved by the policy element	0 to 7 (larger indicates more factors effected)
Administrative Complexity	The administrative demands on municipal governments of the new policy element relative to the status quo	Composite measure of factors related to policy element implementation	Up to 0 (larger indicates less complexity)
Optimal Valuation	The degree to which the policy element maximizes the value of the recovered PCTW	Changes to the volume of unsorted PCTW directed to RCNPOs	0 to 4 (larger indicates more optimal valuation)
Cost Consideration	Monetary cost implications of the policy element on municipal governments	Qualitative rating of the magnitude and distribution of costs	-3 to 0 (larger indicates lower costs)
Stakeholder Acceptance	Net Level of Support among six identified stakeholder groups	Composite measure of support across seven stakeholders	-7 to 7 (larger indicates higher stakeholder acceptance)

## **Chapter 8.**

### **Analysis and Discussion**

This chapter is organized by criterion. I begin each section with a table summarizing the evaluation of the policy elements against a criterion, which is followed by sub-sections where I discuss how I determined the scores for each policy element. Evaluations are based on the short run, with the assumption that the recommended policy element is the first among multiple potential interventions. As an additional simplifying assumption, each policy element is assessed as an independent intervention to, or augmentation of, the status quo. The status quo is not further evaluated in this section.

#### **8.1. Effectiveness**

Table 8.1 presents a summary of the evaluation of policy elements against the criterion of effectiveness.

**Table 8.1. Summary Evaluation for Effectiveness**

Question	Policy Element A	Policy Element B	Policy Element C	Policy Element D
Does the policy element improve awareness and knowledge of the importance of PCTW diversion?	N = 0	Y = 1	N = 0	N = 0
Does the policy element improve awareness and knowledge of types and conditions of items that can be diverted?	N = 0	Y = 1	N = 0	N = 0
Does the policy element improve awareness and knowledge about different diversion programs?	N = 0	Y = 1	N = 0	N = 0
Does the policy element increase convenience by increasing the number and proximity of collection points?	N = 0	N = 0	Y = 1	Y = 1
Does the policy element increase convenience by offering 24/7 accessibility for collection points?	N = 0	N = 0	Y = 1	N = 0
Does the policy element provide economic incentives for reducing PCTW in trash?	N = 0	N = 0	N = 0	N = 0
Does the policy element provide economic disincentives for including PCTW in trash?	N = 0	N = 0	N = 0	N = 0
Total Score	0	3	2	1

Disposal bans (element A) do not improve any of the factors for improving PCTW recovery, based on the existing passive framework presently applied to disposal bans in MVRD. If the disposal ban in MVRD member municipalities were to become more active through the use of clear bags and the enabling of curbside tagging or rejection of contaminated bags, then this policy element would be more effective. As it currently stands, a passive ban implemented in MVRD is not expected to improve PCTW diversion. I score element A as “0”.

Educational campaigns (element B) are expected to improve PCTW diversion based on the fact that there appears to be a large gap in the information available to MVRD residents. I found the information provided by MVRD member municipalities and associated organizations to be inconsistent. If I make the simplifying assumption that the average MVRD resident relies completely on information provided by member municipalities and associated organizations, then the average MVRD resident is poorly informed on all three aspects: importance of diverting PCTW, the types and conditions of

PCTW that should be diverted, and the programs available for diverting PCTW. As such, I expect element B to improve these three factors, and I score it a “3”.

Increasing collection points (element C) by adding donation bins improves convenience in two ways – more bins within MVRD increases proximity of any bin to a resident; at the same time, these bins are also more convenient by being accessible “24/7”, offering the maximum flexibility for HHs. With two factors improved, I score element C a “2”.

Curbside collection (element D) improves convenience by increasing the proximity of collection points to HHs. Collections schedules are weekly or bi-weekly, which is less accessible than 24/7 donation bins. The effectiveness of this element will vary between different types of residences based on experience with current waste diversion programs. Multi-family residences have been observed as having a lower participation rate in diverting waste compared to single-family residences in Vancouver (Wood, 1991). It would be reasonable to expect that the effectiveness of curbside collection would follow the same pattern. As such, I estimate that element D would impact one factor and score it a “1”.

## **8.2. Administrative Complexity for Municipal Governments**

Table 8.2 summarizes the evaluation of policy elements against the criterion of administrative cost.



**Table 8.2. Summary Evaluation for Administrative Cost**

Question	Policy Element A	Policy Element B	Policy Element C	Policy Element D
Does the policy element require introduction of new agreements or processes?	N = 0	N = 0	Y = -1	Y = -1
Will the agreement/process for the policy element likely include asset ownership?	N = 0	N = 0	Y = -1	N = 0
Will the agreement/process for the policy element likely include performance monitoring?	Y = -1	N = 0	N = 0	Y = -1
How many partner groups are involved?	0	0	-1	-2/-3
Total Score	-1	0	-3	-4/-5

Material disposal bans in the MVRD context already have a long history with recyclable items such as glass, metal, plastic, and (more recently added to the banned materials list) compostable organic food waste. As such, a textile waste ban would not constitute a new process. Rather, it would augment the existing list of banned materials and this process would not require a new partner to implement the activity. There are no implementation costs. However, the addition of textiles to the list of banned materials will require additional performance monitoring and relevant tracking specific to PCTW as part of the auditing activities at transfer stations and landfill locations operated by MVRD. For this reason, I score element A as “-1” against this criterion.

Education campaigns are not expected to incur any administrative costs as there will be no contracts required. It is possible that some partnership or agreement could be struck with RCBC to deliver on some comprehensive campaign given their established information programs, but I make the simplifying assumption that MVRD and member municipalities can carry out a coordinated, consistent and comprehensive educational campaign without having to develop new processes or enter into new agreements. There are negligible administrative costs and for this reason, I score element B a “0”.

Increasing collection points will require new contracting at the minimum, which will involve complications due to asset ownership of new donation bins. Additionally, it will involve complication in the partnerships set up with RCNPOs. At a minimum, there will be some administrative cost in determining with which RCNPOs a local authority should be partnering. If the local authority wishes to partner with more than one RCNPO, additional administrative complexity would arise in determining how many bins are allocated to each RCNPO and where these bins would be placed across MVRD. I make the simplifying assumption that there would be no performance monitoring required as the only responsibility on the part of the partner-RCNPO is collecting the items and maintaining the bins. Given these complications, I score element C a “-3”.

Element D has the lowest score of “-4” on account of the need for local authorities to set-up new service contracts or significantly amend service contracts to include the collection of PCTW, the necessary inclusion of performance monitoring, and the complication from the addition of up to three additional partners, namely, RCNPOs, PFPE sorter graders, and the PFPE collectors/haulers. Even for cases where the municipality dispatches its own fleet to collect PCTW, it would still require partnerships with RCNPOs and PFPE sorter graders, as no MVRD member municipality runs a material recovery/sorting grading facility. Similar to the previous element, local authorities will face substantial administrative burden in selecting which organization/s to partner with and how to divert the collected items between multiple partner groups.

Curbside contracts are unlikely to name one group (whether RCNPOs or PFPE sorter-graders) as the exclusive final destination for curbside-collected PCTW. I base this on the assumption that RCNPOs face capacity limits in processing materials and will not be able to accept 100% of curbside-collected PCTW. At the same time, the MVRD strategic plan specifically identifies the need to develop the local recycling industry, which in the PCTW context means including PFPE sorter-graders as direct beneficiaries of the program. Lastly while PFPE sorter-graders have more capacity and may even be able to process 100% of all curbside-collected PCTW, public opinion would oppose such an arrangement. Given the survey findings, it is unlikely that public opinion will support local authorities partnering exclusively with PFPEs and will insist that PCTW benefits be directed to RCNPOs. Ultimately, curbside contracts will require significant consultation and negotiations adding to substantial administrative costs.

### 8.3. Optimal Valuation of PCTW

Table 8.3 presents a summary of the evaluation of policy elements against the criterion of optimal validation of PCTW.

**Table 8.3. Summary Evaluation for Administrative Cost**

Question	Policy Element A	Policy Element B	Policy Element C	Policy Element D
Does the policy element directly change the pattern/flow of PCTW from the status quo in a way that reduces or increases the volume of unsorted PCTW directed to RCNPOs?	N = 0	N = 0	Y = 1	Y = 1
Does the policy element direct 100% of the incremental volume in unsorted PCTW to RCNPOs?	N = 0	N = 0	Y = 1	N = 0
Total Score	0	0	2	1

Element A will not change the flow of items through the supply chain and is unlikely to increase the volume of recovered PCTW. To simplify the analysis, I assume that, while there could be marginal increases in volume stimulated by the ban, these would be negligible since MVRD disposal bans have no direct enforcement at the HH level. For this reason, I score element A as “0.”

Element B may change the flow of items through the supply chain, but I am making the simplifying assumption that any pattern changes are likely to be negligible since all programs would be promoted equally. Awareness of more innovative programs, such as retailer take-backs and clothing swaps, may increase items directed to those elements. However, survey findings about motivation predict that MVRD residents, who are most motivated by social welfare, will more than likely continue to donate or donate even more to RCNPOs rather than to other channels.

Under element C, new donation bins will be under partnership/s with RCNPOs that will receive 100% of all incremental volume of PCTW. This will change the flow of items through the supply chain. It will direct all the incremental volume of recovered PCTW to partner RCNPOs. For this reason, I score this element a “2,” one point for

changing the pattern flow to increase the volume of PCTW collected, and another point for directing 100% of the incremental PCTW collected towards RCNPOs.

Element D will also change the flow of items through the supply chain. This policy element will concentrate and direct the incremental volume of recovered PCTW to partner groups. Which groups to partner with will be determined by local authorities administering the relevant contracts for haulers/collection services and determining whether curbside-collected PCTW is directed towards RCNPOs and/or PFPE sorter-graders. For this policy element, RCNPOs have at least a 50% chance of receiving incremental unsorted items collected through curbside. Given these scenarios, I score element D a “1”: one point for changing the pattern flow to increase the volume of PCTW collected.

## 8.4. Cost Considerations for Municipal Governments

This criterion only accounts for cost considerations of MVRD and its member municipalities for an individual policy element. Table 8.5 presents a summary of the evaluation of policy elements against the criterion of cost consideration.

**Table 8.4. Summary Evaluation for Cost Consideration**

Question	Policy Element A	Policy Element B	Policy Element C	Policy Element D
Cost Estimates	negligible = -1	minor-major = -2.5	minor-major = -2.5	negligible-minor = -1.5

Element A will have negligible costs. Incremental costs associated to a PCTW disposal ban in MVRD may include implementation costs through additional training for auditors who conduct inspections for banned materials. There will be no additional operational costs associated with auditing loads.

Element B can be designed and implemented in various ways, and would involve initial implementation costs, followed by ongoing operational costs. Campaigns involve a big splash for initial implementation followed by a sustained effort to maintain program visibility.

Depending on whether a campaign involves outreach, workshops and events, or whether it includes print and ad buys on local papers, television stations, websites, costs of educational campaigns can be substantial. Conventional educational campaigns typically involve disseminating printed materials on a door-to-door basis and big promotional events. Cheaper and broader communication platforms, made available through new technology and better strategic communications, allow municipalities to achieve the same results with smaller budgets. Across MVRD, many municipalities have already invested infrastructure to enable public service announcement (PSA) systems such as digital screens and signboards. Given that municipalities have a wide range of options in implementing educational campaigns, I estimate cost considerations for element B to range from “minor to major”.

Element C involves the procurement of new assets and no additional operational costs as partner RCNPOs become responsible for all operational costs associated to the bin. The costs of donation bins range from \$1,400, for conventional bins, up to \$10,000, for “smart” bins, which include new features such as volume sensors and additional security (InclusionBC, n.d.; Marsales, 2016 March). The number of additional bins purchased will depend on various factors, which would include the amount of public land available and the processing capacity of partner RCNPOs. Given the variability in prices of the bins and the decision for the number of bins left to the implementing municipality, this policy element’s cost considerations are estimated to range from “minor to major”.

Costs involved in element D have been reported to be negligible (J MacFarlane personal communication; Anderson, 2017). This appears counterintuitive since there are presumptions that collecting PCTW at curbside requires special handling, which will need new equipment, or retro-fitting of existing fleets of haulers, in addition to providing residents with durable bags or bins, and additional super sacks at transfer stations to organize recovered PCTW.

The experience of other jurisdictions, such as that of Colchester County, Nova Scotia, suggests adding PCTW to curbside-collection and preserving their value can be successfully achieved with negligible costs. In their case, Colchester County reported no additional cost for transportation, infrastructure, or storage, and only spent money for additional staff to support sorting. They instructed their residents to place dry and clean

items into already provided paper/fibre recycling bags and did not spend on additional bags.

It is important to distinguish key differences between MVRD and Colchester County's operating contexts. Colchester County has its own fleet of vehicles and operates a material recovery facility (MRF) where they are able to sort and store collected PCTW. In contrast, MVRD and its member municipalities do not own and operate MRF or storage facilities, and will need to either retro-fit an existing facility or build a new one. Most municipalities do not own a fleet of haulers and instead have service contracts with PFPE collectors that operate different types of haulers. Like Colchester County, member municipalities in MVRD have established recycling programs for paper and cardboard, the bags and bins for which can be used for PCTW, eliminating the cost for new bags. The frequency for PCTW collection could be easily synchronized with the existing schedule for trash and recyclable curbside collection.

As previously discussed for section 8.3, curbside collection will require some contracting with PFPE sorter-graders as the MVRD does not operate a MRF for PCTW and will need to rely on these PFPE sorter-graders, at least for the short term. These particular contracts may offer municipal governments the opportunity to recover costs for curbside collection by extracting revenues from PFPE sorter-graders.

Additional costs for including PCTW for element D can be negligible given all the cost-effective opportunities provided by the existing infrastructures and processes for other recyclable materials and cost-recovery/revenue-generation potential from contracts with PFPE sorter-graders. I make the simplifying assumption that any MVRD member municipality wishing to pursue curbside collection will only pursue cost-effective measures and seek to recover costs in contracts with PFPE sorter-graders. For these reasons, the cost considerations for element D is scored as "negligible-minor".

## **8.5. Stakeholder Acceptance**

This criterion accounts for acceptance across seven identified stakeholders. To simplify the analysis, this assessment only looks at the impact of the policy element on the volume and direction of incremental recovered PCTW. The implicit assumption is that pre-existing diversion rates will not be impacted by the policy element and that costs

and benefits for each stakeholder will be measured relative to the status quo. Table 8.6 presents a summary of the evaluation of policy elements against the criterion of stakeholder acceptance.

**Table 8.5. Summary Evaluation for Stakeholder Acceptance**

Stakeholder	Policy Element A	Policy Element B	Policy Element C	Policy Element D
RCBC, other organizations promoting waste reduction	1	1	1	1
RCNPOs that own and operate donation bins, typically operate a storefront	-1	1	1	1
RCNPOs that lend their name and branding to PFPEs, does not operate a storefront	-1	1	0	0
PFPEs (sorter-graders)	-1	1	0	0
Collections Services/Haulers	0	0	0	1
MVRD member municipalities' <b>Mayors and Councils</b>	-1	-1	-1	-1
MVRD Households	0	0	1	1
Total	-3	3	2	3

All policy elements will be supported by the larger community of environmental groups in MVRD, best exemplified by RCBC. This stakeholder group does not bear any costs but receives benefits from each policy element.

Both RCNPO stakeholder groups, along with PFPE sorter-graders, and municipal governments are likely to object to element A, which would impose costs without any guaranteed increase in benefits. RCNPOs and PFPE sorter-graders will need to direct some unsellable and unprocessed PCTW to landfills, incurring surcharges on tipping fees. Municipal governments, being involved in collections services directly or by contract, will be impacted by the surcharges to tipping fees as a result of hauling contaminated materials.

RCNPOs that own and operate donation bins and a corresponding storefront will support all elements except for element A. The incremental benefits from each policy

element outweigh the costs, if any. Improved awareness given the strong social welfare motivation of MVRD residents are likely to result in HH behavioural changes that increase direct donations to RCNPOs. Meanwhile both elements C and D increase the likelihood for RCNPOs to receive unsorted PCTW.

RCNPOs that do not own and operate donation bins, and instead enter into partnerships with PFPE sorter-graders (partnered-RCNPOs) on the operation of donation bins, will support element A as it will likely increase donations to bins with their name and branding.

Partnered-RCNPOs will have neutral positions for elements C and D as these policy elements do not impose costs or benefits on them directly relative to the status quo. It is assumed that donation bins bearing their name and branding will continue to get the same volume of donations and they will continue receiving pay offs from the PFPE partners they have. Admittedly, this position assumes that partnered-RCNPOs ignore their relative disadvantage if additional bins and curbside collection were implemented. Because partnered-RCNPOs neither own their bins nor do they have capacity to perform collections and maintenance, they are unlikely to become participants and benefit from the implementation of elements C and D.

PFPE sorter-graders will support educational campaigns since they will benefit from incrementally diverted PCTW through donation bins they own and operate in partnership with RCNPOs. They will be neutral towards an increase in donations bins. PFPEs may see a relative disadvantage as they will not be considered for partnership under the policy element as currently proposed in this study. They will not have any first-sorter advantage over incremental unsorted items under this policy element as all items are directed to RCNPOs. Relative to the status quo, PFPEs do not bear any costs with the addition of bins, and may benefit from overflow in RCNPOs that will sell their excess inventory to PFPEs. They will be neutral towards curbside collections, which offer mutually nullifying costs and benefits. While unsorted curbside-collected materials could be sent directly to PFPEs under certain service contracts, the local authorities are just as likely to claw back some revenue to cover costs associated to their curbside collection program.



Collections services/haulers are expected to have neutral positions for elements A, B and C, as they are not impacted by costs or benefits of such policy elements. Any additional costs from tipping fee surcharges for delivering PCTW-contaminated loads to MVRD transfer stations and landfill, will simply be passed on to their clients.

MVRD member municipalities' Mayors and Councils are likely to object to elements A, C, and D based on their perception that the status quo is already efficient at diverting PCTW and that such markets do not need intervention. Local governments may be reluctant to intervene in markets perceived as efficient at the risk of alienating the existing private sector operators. At the same time, local authorities would object to all the proposed policy elements as the associated costs for these policy elements may not necessarily align with their perceived level of importance and significance of reducing PCTW in landfills relative to other priorities.

MVRD HHs will likely support element D. Disposal bans as currently practised in MVRD have no direct impact at the HH level. Neither education campaigns nor additional receptacles impose additional direct improvements in convenience for the HH. Curbside collection, in contrast to other elements, increases convenience for HHs by increasing the proximity of collection points to residences. To be exact, curbside collection would mostly impact single-family homes as multi-family homes use central building disposal systems served by recycling collection services. For simplicity, I consider the benefits to single-family homes as a significant benefit that would drive residential support for this policy element. Based on survey findings that MVRD residents are strongly motivated by convenience, curbside collection will be supported.

HHs will likely support element C and have a neutral position for all other positions based on their desire to direct PCTW benefits towards social welfare. HHs are likely to support additional receptacles dedicated to RCNPOs as survey findings suggest that MVRD residents are most motivated by social welfare. Based on convenience and social welfare motivation, HHs are likely to support both curbside collection and additional receptacles.

## **Chapter 9.**

### **Conclusion**

#### **9.1. Recommendations**

The aim of this research is to provide recommendations to reduce textile waste in landfills with policies that can increase the diversion of residentially generated PCTW. I believe that a multi-phased combination of policy elements that start with an educational campaign should be considered.

This study recommends that MVRD and its member municipalities pursue an education campaign in the immediate short term. Education campaigns are a clear improvement from the status quo as revealed by the analysis. Neither increasing collection points nor implementing curbside collection offer clear improvements from the status quo. Table 9.1 presents a summary of the evaluation of the policy elements against the criteria.

**Table 9.1. Evaluation Summary of Policy Elements**

Criteria	Policy Element A: Textile Disposal Ban	Policy Element B: Educational Campaign	Policy Element C: Increasing Collection Points	Policy Element D: Curbside Collection
Effectiveness	0	3	2	1
Administrative Complexity for Municipal Governments	-1	0	-3	-4/-5
Optimal Valuation	0	0	2	1
Cost Considerations for Municipal Governments	-1	-2.5	-2.5	-1.5
Stakeholder Acceptance	-3	3	2	3
<b>TOTAL</b>	<b>-5</b>	<b>3.5</b>	<b>0.5</b>	<b>-0.5/-1.5</b>

The combination of either policy elements C or D with element B is likely to increase the effectiveness of PCTW-diversion, particularly in the longer term. After the educational campaign has taken a foothold and contributed towards advancing behavioural change at the HH level, elements C and D may become more cost-effective.

The combination of options B and C with some specific modifications may result in the most significant improvement from the status quo. Additional bins financed by local governments can be mandated to accept all types and conditions of textile waste. And the accompanying educational campaign can simplify the instruction to households that such additional bins will accept all types and conditions of items as long as they are clean, dry and bagged in plastic.

## 9.2. Further studies

Local governments have begun to implement licensing and regulations for used clothing donation bins in response to nuisance issues and perception of fraud and

misrepresentation. Much of the licensing and regulation specifically target PFPE operators of donation bins. Moving forward, municipalities must understand the value of having both RCNPOs and PFPEs operating in their local markets and should look to develop and implement bylaws that provide opportunities for both as this would be most optimal for improving PCTW diversion.

As previously mentioned in section 4.2, end markets for textile waste are set to shrink with several countries looking to implement “green fence” policies against textile waste imports, which will include second hand clothing. These policies will negatively impact the export potential of the textile waste industry and lead to the consequent stockpiling of material in markets like Vancouver. Over-supply across the globe will likely result in fluctuations, if not a reduction, of the prevailing market price for all grades of sorted textile waste, adversely impacting textile waste industry globally. The industry is also developing better recycling technology for recovering fibers from used clothing and textile.

Local governments have no real control over trade issues and local industries will be at the mercy of the global market. Nor do local governments have much leverage over industry research and development. But they can lobby the federal government to advance their interests. The federal government is in a better position to pursue new export markets and push to keep textile waste markets open for second-hand clothing, and to stimulate research and development for textile recycling.

Improving recovery and recycling of textile waste is necessary but may not be sufficient to deal with the problem of textile waste in the long run. Greater focus on the upstream industry is putting pressure on designers and manufacturers to improve products and implement programs in accordance with principles for the circular economy. There undoubtedly will be more innovations coming from the industry as circumstances evolve. Local government will need to keep their textile waste management strategy agile to deal with the fluctuations in end markets and technological change facing post-consumer textile waste.

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# Appendix A.

## Informed Consent and Survey Instrument



### INFORMED CONSENT FORM - ONLINE SURVEY

**Research Project Title:** Reducing Textile Waste in Metro Vancouver Landfills

**Ethics Application Number:** 2017s0094

#### Investigator:

Conrad Earl Malilay-Pimentel  
School of Public Policy, Simon Fraser University  
778-██████████.██████████@sfuc.ca

The Simon Fraser University Research Ethics Board has approved this research study.

This consent form, a copy of which is made available to you, is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask the investigator(s). Please take the time to read this carefully and to understand the information.

#### Purpose:

The purpose of this research is to find out the best ways to reduce textile waste in Metro Vancouver landfills. This includes understanding the different ways that Metro Vancouver residents discard textile waste and the reasons behind how they choose to discard textile waste. I will use this information to write a policy paper and recommend ways to reduce textile waste in Metro Vancouver landfills.

#### Participant Recruitment and Selection:

To be recruited for this study, you must be at least 19 years of age old and a resident of the Metro Vancouver Regional District.

#### What Questions Will I Be Asked?

I will ask you questions such as: your demographic information (i.e. your gender and age); how you dispose or discard of your unwanted clothing and textiles; and what your most important reasons are for choosing the way you dispose or discard your unwanted clothing and textiles.

#### How Long Will It Take?

It may take you up to 10 minutes to answer all the questions.

Page 2 of 3

Version: 2-20170704

Study #: 2017s0094

□

### **Your Participation**

Participation is voluntary. If you agree to participate, you will be free to withdraw at any time for any reason. However, data collected up to that withdrawal point may still be retained and used by the researchers.

### **What Type of Personal Information Will Be Collected?**

Your anonymity will be strictly maintained. The questionnaire has no personal questions or questions that may lead to your identification. All data collected will be labeled with a participant number and all documents will be kept on a secure SFU server. You will not be identified by name in any reports of the completed study. Any information collected will be reported in aggregate only (i.e. no individual information will be reported).

The survey will be administered by Insights West. Any personal contact information (e.g. phone, email addresses) that Insights West may have used to administer the survey will not be shared with the investigator.

### **Are There Benefits or Risks for You?**

You may not benefit directly by participating in the study but you will help inform the development of textile waste management policies and programs in your local region and beyond.

Your risks for participation are intended to be none or minimal. The questions in this survey will ask about how you dispose or discard textile waste. There are no personal questions or questions that may lead to your identification.

The results of this study will be reported in a graduate thesis and may also be published in journal articles and books. Information about results can be obtained by contacting the investigator:

Conrad Earl Malilay-Pimentel, 778-██@sfu.ca

### **What Happens to the Information You Provide?**

The survey will be administered by Insights West, using their corporate servers located in Canada. For online surveys, confidentiality of electronic data cannot be assured because it is being completed online and transmitted over the Internet.

Insights West will transfer the completed consent forms and the data collected to the investigator and delete any copies from their servers. The data on your responses will not be linked in any way to the data on your consent forms. Any personal contact information (e.g. phone, email addresses) that Insights West may have used to administer the survey will not be

shared with the investigator. The data that will be received by the investigator from Insights West is permanently anonymized ensuring your confidentiality.

The investigator will keep all data collected as part of the study on a secure SFU server computer in Canada throughout the study. Upon publication, the data from this study will be uploaded to SFU Radar, an online repository, where it will be openly accessible to other researchers to stimulate further use and exploration of existing data sets.

**Participant Consent and Signature:**

Taking part in this study is entirely up to you. You have the right to refuse to participate in this study. If you decide to take part, you may choose to pull out of the study at any time without giving a reason and without any negative impact on your access to services from your local authorities.

- Your signature below indicates that you have received a copy of this consent form for your own records.
- Your signature indicates that you consent to participate in this study.
- You do not waive any of your legal rights by participating in this study.

To accept this form, please check the box below and type today's date in the following boxes as a form of digital signature.

[Insert combo box here]

By clicking the button below, you are consenting to participate in the research.

[insert Button here]

If you do not wish to participate in the study, or do not consent, please close this window in your web browser.

**Questions/Concerns:**

If you have any concerns about your rights as a research participant and/or your experiences while participating in this study, you may contact Dr. Jeffrey Toward, Director, Office of Research Ethics [jtoward@sfu.ca](mailto:jtoward@sfu.ca) or 778-782-8200

**Conrad Malilay  
Textiles Omnibus Survey  
Questionnaire**

**SAMPLE:** 300n Metro Vancouver residents

**INTRODUCTION**

Thank you for taking the time to complete this survey. The survey is about a few different topics and should take about 3 to 5 minutes to complete.

**SCREENERS: ~0.6 Minutes**

S1. To begin, what is your current age?  
*Select your age from the drop down box below.*

**[DROP DOWN BOX]**

Under 18 years

18

19

20

...

97

98

99 years or older

**[SCREEN OUT IF "UNDER 18" SELECTED AT S1, ELSE CONTINUE]**

S2. Which of the following best describes where you currently live?  
*Choose one.*

Abbotsford

Burnaby

Campbell River

Castlegar

Central Saanich

Chilliwack

Colwood

Comox

Coquitlam

Courtenay

Cranbrook

Dawson Creek

Delta	Parksville
Duncan	Pitt Meadows
Esquimalt	Port Alberni
Fernie	Port Coquitlam
Fort St. John	Port Moody
Grand Forks	Powell River
Greenwood	Prince George
Hope	Prince Rupert
Kamloops	Quesnel
Kimberley	Revelstoke
Kitimat	Richmond
Langford	Rosland
Langley	Saanich
Maple Ridge	Sidney
Merritt	Sooke
Mission	Squamish
Nanaimo	Surrey
Nelson	Terrace
New Westminster	Trail
North Cowichan	Vancouver
North Saanich	Victoria
North Vancouver	West Vancouver
Oak Bay	White Rock
Okanagan region (including Armstrong, Coldstream, Enderby, Kelowna, Lake Country, Oliver, Osoyoos, Penticton, Salmon Arm, Summerland, Vernon, etc.)	Williams Lake
	Other British Columbia (please specify)
	Outside British Columbia

**TEXTILES SECTION: ~2 Minutes**

**[CONTINUE IF “Metro Vancouver AT \$1 (includes Vancouver, Anmore, Belcarra, Bowen Island, Burnaby, Coquitlam, Delta, Langley, Lions Bay, Maple Ridge, New Westminster, North Vancouver, Pitt Meadows, Port Coquitlam, Port Moody, Richmond, Surrey, Tsawwassen, West Vancouver, White Rock), ELSE SKIP TO NEXT SECTION]**

T1. How often do use use each of the following methods for disposing of clothing and other textiles/cloth you no longer want?  
*Please select one for each row.*

**[COLUMNS]**

Always

Often  
Sometimes  
Rarely  
Never

**[ROWS - RANDOMIZE]**

Resell  
Donate to charity directly  
Give away to friends or family  
Clothing swaps  
Alter/transform (up-cycle) into other items  
Drop off at donation bins  
Dispose of into trash  
Cut-up and use for rags  
Bring back to retailer

T2. How important are each of the following factors to you personally when you are deciding how to dispose of unwanted clothing and other textiles/cloth?

*Please rank each of the following factors, where "1" is the most important and "5" is the least important.*

**[RANDOMIZE]**

Get money or other rewards (by reselling your unwanted clothes/textiles on websites or through consignment stores or by taking your unwanted clothes them back to retailers that may offer rewards such as discounts on next purchases or other shopping perks)  
Convenience (you have donation bins or charity organizations accessible in your area or somewhere centrally located)  
Social welfare (you want to help a cause or charity you support)  
Gifting (you feel your unwanted clothes/textiles could still be re-used by others)  
Eco conscious (you don't want your clothes/textiles to end up in a landfill)  
Don't know **[ANCHOR][EXCLUSIVE]**  
Not applicable – I haven't disposed of unwanted clothing or textiles/cloth before **[ANCHOR][EXCLUSIVE]**

T3. How often do you personally do each of the following?

*Please select one for each row.*

**[COLUMNS]**

Always  
Often  
Sometimes  
Rarely  
Never  
Not applicable

**[ROWS - RANDOMIZE]**

Return unwanted clothing and textiles to retailers that take them back through a recycling program  
Rent or borrow clothes and textiles when possible rather than buy them  
Repair or alter clothes and textiles to extend their lifecycle  
Make sure clothes and textiles you donated to charities or drop-off bins are clean and dry

**DEMOGRAPHICS: ~0.3 Minutes**

The few last questions are for classification purposes only.

D1. Which of the following genders do you identify as?

*Please select one.*

- Male
- Female
- None of the above

D2. What range of household income do you have ?

*Please select one.*

- Less than \$100K
- Between \$50K and \$100K
- More than \$100K
- None of the above

**SECTION Z: CLOSING**

**[CLOSING – IF SCREENED OUT]**

Unfortunately you do not qualify for today's survey. Thank you and have a great day!

**[CLOSING – IF COMPLETED SURVEY]**

Thank you very much for your time today – your opinion is highly valued!



## Appendix B.

### Information on MVRD Member Municipality Websites

On September 21, 2017, the author visited the official municipal websites of MVRD member municipalities and searched for information pertaining to PCTW disposal programs for households. Information from this search is summarized in table B.1.

Anmore	Provides copies of Recycle BC (formerly known as Multi-Material BC) brochures indicating textiles are not accepted in curbside recycling; Redirects to the website for Recycling Council BC (RCBC) for information about PCTW
Belcarra	Redirects to Salvation Army, Take Back Programs and other resources
Bowen Island	No mention of textile or clothing on website
Burnaby	Provides a Waste Wizard Tool, which suggests that HHs should direct PCTW items to city-operated Eco-centre, which is a staffed self-serve public facility, open 7 days a week, except Holidays
Coquitlam	Provides a Waste Wizard Tool, which encourages donating locally and reuse; Indicates garbage pick-up as a disposal method for PCTW; Indicates PCTW can be dropped off and accepted at transfer stations, where it can be directed for donation; Provides a directory of local recycling facilities that accept clothing
Delta	Provides a Waste Wizard tool, which encourages donating wearable/reusable goods to charity; Indicates garbage as an option for PCTW-disposal
Langley City	Provides a notification/schedule tool for general waste and recycling pick-up; No specific mention of PCTW; Redirects inquiries to other resources, such as RCBC's Recyclepedia
Langley District Municipality	Provides a Waste Wizard tool, which encourages reuse but does not specifically address PCTW; Identifies garbage as a disposal method for PCTW
Lions Bay	No specific mention of PCTW; Redirects to RCBC's Recyclepedia

Maple Ridge	Redirects to the website for Ridge Meadows Recycling Society, which operates a depot but does not accept clothing and instead, redirects to secondhand/consignment/thrift stores, resell and give away, donate to charity
New Westminster	Indicates clothing is not accepted at curbside or depots; Redirects to donation bins and RCBC hotline; Provides copy of brochure that indicates textile are acceptable in garbage collection, but encourages donation in bins
North Vancouver City	Provides Waste Wizard tool, which suggests that HHs should direct reusable items to specific charity/thrift stores, donation bins, and drop off locations, and non-reusable items to retailer take-back programs, specifically to H&M, Nike, and RCBC, with instructions to place items in plastic bags
North Vancouver District Municipality	Provides Waste Wizard tool, which suggests that HHs direct reusable items to non-specific charity/thrift stores, donations, and drop off locations, and direct non-reusable items to RCBC;
Pitt Meadows	Provides Waste Wizard tool, which encourages donation and redirects to other resources such as RCBC's recycling hotline Metro Vancouver Regional District's Metro Vancouver Recycles website; Provides copies of Recycle BC brochures indicating textiles are not accepted in curbside recycling
Port Coquitlam	Provides Waste Wizard tool, which redirects to website for RCBC
Port Moody	Provides link to brochure that instructs HHs to direct worn and unusable clothing to garbage
Richmond	Provides link to brochure that has no mention of PCTW; Other parts of website has no mention of PCTW; Redirects to other resources RCBC, MVRD
Surrey	Provides link to brochure that indicates PCTW can be placed in garbage; Provides a Waste Wizard, that redirects to another website, Surrey Reused, which lists PCTW disposal options such as charitable donation, retailer takebacks, also includes RCBC website
Tsawwassen	Same as delta

Vancouver	Provides a Waste Wizard tool, which suggest that HHs direct reusable items to specific resale, drop-off locations, transfer stations, depot, and donations to Diabetes Canada; Suggests that HHs direct non-reusable items direct to specific retailer program, H&M, and donation bins Canuck Place Bins, which are operated by TCTR
West Vancouver	Redirects users to North Shore Transfer Station for drop off, and indicates that there are no charges for PCTW
White Rock	No mention of textile or clothing in recycling program, instead redirects HHs to Waste Wizard tool, which encourages donations and redirects to RCBC website
Electoral Area A	There is no website for this jurisdiction and information only available through MVRD; Waste collection services for electoral are provided by the combined efforts of local associations, neighboring municipalities, and ad-hoc arrangements on account of smaller populations and dispersed areas