Advancing Textile Waste Diversion in Nova Scotia

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Executive Summary
This textile waste diversion study provides an overview of how *discarded textiles* are diverted from landfill, including methods of *reusing*, *repurposing*, *ragging*, and *shredding*. Some of the challenges and opportunities within the emerging sphere of textile waste diversion are reviewed and highlighted. Terms defined in the Glossary, at the end of the report, appear in italics at first mention.

This study constitutes a scan, which is intended to help pinpoint necessary further research and development. Nova Scotia is the initial focal point of the study, with a broader survey included of current textile diversion tactics in Canada, the United States, and Europe.

Charities, businesses, and municipalities, both in Nova Scotia and globally, are actively diverting more textiles from landfill by increasing awareness about the value of textiles. For example, textile collectors are trying to connect with householders to encourage textile waste diversion, and an app has been created to easily search preferred destinations for *textile waste*. Other emerging positive themes include *zero waste* goals and the urgent call for *green tech* infrastructure for *End-of-life (EoL) textiles* in Canada.

This study highlights some successful *closed-loop textile recycling* methods with textile initiatives and diversion tools like Europe's *Extended Producer Responsibility (EPR)*. With regard to textile export markets, themes include unease with a potential secondary textiles ban in Africa and the need to establish strong sustainability within international markets.

This report concludes with a comprehensive list of high-level options for Nova Scotia to further improve textile waste diversion. These are the most pressing recommendations:

- Increase public awareness about the value of textiles through innovative public education about the benefits of textile diversion from landfills.
- Encourage and conduct focus groups on the topic of textile diversion, including residential and business pathways. Both AFTeR members and municipalities might use various channels of communication to gather data.
- Establish partnerships between municipalities and AFTeR members as textile waste diversion will increase, thus saving the municipalities money and creating local jobs.

- Determine more resources and additional revenue streams within AFTeR itself, with an administrative staff dedicated to the association, to effectively increase textile diversion.
- Present the issue of textile waste in Nova Scotia to the Canadian Council of Ministers of the Environment (CCME) to heighten awareness and to create a textile waste management subgroup.
- Recommend textiles for local EPR regulation.
- Conduct further research into new *end markets*, collaborating with manufacturing industries in Canada, specifically to learn what we are capable of. For example, shredding textiles into new products or *Textile Shred to Thread*.
- Explore changing federal government's importation of textile regulation to ensure there is no incentive to dispose of textiles.

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Introduction

Textile waste is a growing concern in Nova Scotia, across Canada, and worldwide. Unfortunately, most Nova Scotia residents continue to be unaware of the increasing amount of textiles being disposed of in landfills and the resulting very low percentage being diverted for reuse and recycling.

Today's trend of Nova Scotia consumers purchasing two to three times as much clothing as compared to 10 years ago suggests the quantity of unwanted textiles will also continue to grow. This rate of ever-increasing clothing and unwanted textiles in Nova Scotia (and elsewhere) highlights the necessity for a more comprehensive strategy for textile waste management.

In 2000, Nova Scotia was the only province in Canada to reach a targeted 50% waste diversion goal. In 2007, Nova Scotia set a waste disposal goal of 300 kilograms per person per year. As part of this work, DivertNS conducted a series of waste audits to help determine what materials to target in order to meet this new goal. In 2011 and 2012, waste audits clearly revealed Nova Scotia solid waste resource management stakeholders must develop strategies to divert more organic materials (food/animal waste), readily recyclable plastics, and textiles from disposal. Textiles made up a surprising 12% of the municipal solid waste stream.

In 2013, the Association for Textile Recycling (AFTeR) was established in Nova Scotia with its mission to raise awareness about the importance and benefits of *textile recycling*. AFTeR includes six member organizations who are experts in recovering unwanted textiles for resale and recycling.

This study highlights new information for AFTeR textile stakeholders who ultimately want to increase and improve textile waste diversion in Nova Scotia. AFTeR members aspire to learn more about the following:

- Current models for textile diversion in Nova Scotia
- Reasons residences and businesses dispose of textiles through the garbage stream
- Best ways to identify and communicate with current "non-donors" of used clothing
- Models for successful textile diversion in other jurisdictions, both nationally and internationally

Methodology

The primary source of data for this study was 17 phone interviews conducted over the course of seven months. Interview participants were situated in Nova Scotia, New Brunswick, Ontario, and British Columbia in Canada; and in New York, New Jersey, Oregon, and Washington in the United States.

Phone interviews included conversations with existing charities, businesses, and municipalities. Detailed questions were provided to each participant prior to each phone interview.

A literature review was completed and content was analyzed from recent textile waste reports, online articles, and resource books. Relevant findings are included in this report. Please refer to References for a complete list of all resources studied.

1. Current Models of Textile Diversion in Nova Scotia

Investigation was conducted into how *discarded textiles* are diverted from landfill for reuse, repurposing, ragging, and shredding.

In Nova Scotia, a comprehensive list of the t*extiles* waste category includes clothing, footwear, household-use fabrics (drapes, blankets, bedding, rags, etc.), and other (handbags, floor mats, area rugs, etc.). Not included in the textiles category is mattress fabric, carpet, furniture fabric, luggage, tents, and other consumer products. These textile categories would be adjusted as new end markets for recycled grade materials emerge for broader textile waste diversion efforts. For example, stuffed toys, fur, and leather goods are new emerging textile categories to examine.

Below are the findings on the current state of textile diversion in Nova Scotia.

1.1 Textile Collection Donation Bins

Canadian Diabetes Association (CDA) and Big Brothers Big Sisters (BBBS)
These organizations, both Nova Scotia charities and active AFTeR members, have robust channels in place, diverting the largest amounts of textiles using donation bins located throughout Nova Scotia. All CDA and BBBS textile donations (including EoL textiles) are collected, and bulk donations are brought to Value Village (also an AFTeR member), where they are sorted according to potential use.

Within Nova Scotia, Value Village continues to process approximately 7.7 tonnes of textiles (reuse and EoL textiles) per day, roughly 2,810 tonnes of textiles per year. Of textile donations, 30% makes it to the floor and is resold as reuse; 70% of the textiles are shipped to overseas markets.

In 2015, almost 5,000 tonnes of textiles were redirected in Nova Scotia alone. Value Village's two stores in Halifax and Dartmouth, alongside its stores in Cape Breton Regional Municipality, in the Annapolis Valley, and in Pictou, handle the bulk of textile donations. Approximately 50% of textile donations were either sold in the thrift stores or sold to overseas markets (Lee, 2016). The textiles not eligible for reuse were redirected to new end markets as wiping rags or *shoddy* for alternative products, with only 5% ending up as waste.

Canadian Red Cross and LML Trading
As an AFTeR member, these two organizations partner to collect reusable clothing donations around Nova Scotia, including HRM, picking up weekly, and sometimes bi-weekly, from each donation bin. The clothing is brought to a trailer, and the trailer is sent overseas to Africa or India. The contents are shipped unsorted, as sorting is done overseas.

The Salvation Army Thrift Store
Located in HRM, this AFTeR member thrift store has a two-part collection process for textile diversion. Textile donations are collected for reuse locally, and whatever is left over goes to the National Recycling Operations (NRO) in New Brunswick. NRO handles all storage, trucking, sorting, and baling of unwanted textiles in New Brunswick, with this textile product being sold primarily overseas.

At present, NRO has a two-year project to establish a textile processing facility (including EoL textiles) in Nova Scotia by 2020.

Canadian Diabetes Association (CDA) and Halifax Regional Municipality
In 2016, HRM initiated a partnership among multi-residential properties within the municipality, working with four buildings and AFTeR member CDA. Currently, two condo buildings in HRM have textile collection bins. CDA deals with logistics and pickups.

Access to the buildings, convenience for residents, and sorting of the unwanted textiles have posed some challenges. To address these challenges, focus groups are recommended in Nova Scotia, and specifically HRM, to determine tactics for householders and textile waste diversion.

1.2 Further Approaches to Textile Diversion in Nova Scotia

Municipality of Colchester
The curbside textiles collection program officially started in May 2016. There is a two-stream system in place with one bag for dry recyclables and paper and the other bag for containers, plastics, glass, etc. Textiles were added to the dry materials only blue bag. Since allowing textiles into this recycling stream, the Municipality of Colchester has sorted over 38 tonnes of unwanted textiles (time frame is from May 2016 to June 2016). In 2017, Colchester's monthly average is collecting approximately 5 tonnes of textiles.

The Municipality of Colchester has shipped over 20 tonnes to market, with mixed reviews. They adjusted their collection system at their facility to accommodate the feedback from the markets. Initial reviews from markets following these changes have been much better. Two new employees were hired for the curbside collection program. The recycling facility did not have to be altered, as there is no automation on the paper/fibre line; employees cut open each of the clear blue bags.

Currently, the Municipality of Colchester is reviewing markets for the sale of the textiles it collects. All textiles collected are stored in a warehouse until marketed. In 2017, Colchester received textile recyclables from other municipalities.

Of the 15 municipalities that Colchester processes recyclables for, only one external municipality has agreed to add textiles to their curbside recycling programs. Three Colchester municipalities (Municipality of Colchester, Town of Truro, and Town of Stewiacke) added textiles on May 1, 2016. The Municipality of East Hants added textiles on November 1, 2016.

Colchester residents were positive about the new curbside program, having been educated about the new collection via a free app named Recollect, a municipal letter in local newspapers, and the Municipality of Colchester's website.

Enviro Depots

Since 2014, the Eastern Recyclers Association (ERA) has worked with Enviro Depots in Nova Scotia through the Canadian Breast Cancer Foundation (CBCF). Enviro Depots/ERA have a charity partnership with CBCF: ERA collects and distributes all CBCF textile donation goods. (CBCF/ERA is an AFTeR member.)

There are 78 Enviro Depots locations around Nova Scotia, and approximately half of them accept clothing. A broker finds a market for ERA, and ERA transports the unwanted textiles to a central facility. The clothing goes to a buyer/sorter. Since most of the clothing is sold out of province, it does not reach Nova Scotia landfills.

Nova Scotia Municipalities Offer New Learning about Unwanted Textiles

Several Nova Scotia municipalities now provide public education related to how to divert textiles through AFTeR members.

Waste Check is an organization located in Yarmouth, Nova Scotia, that provides waste-reduction education, enforcement, and program support for six municipal units in Region 7 (Digby County and Yarmouth County). Waste Check actively promotes the textile donation bins of the CDA and the Canadian Red Cross, directing residential and commercial businesses to use the textile collection bins.

Pictou County recently partnered with the Canadian Red Cross/LML Trading to manage textiles that were delivered for disposal to the Pictou County Solid Waste transfer station by a commercial generator.

1.3 Association for Textile Recycling (AFTeR) in Nova Scotia

Today, AFTeR is dedicated to raising awareness about the importance of textile recycling in Nova Scotia. Its six member organizations are specialists at recovering unwanted textiles for resale and recycling, thus diverting these textiles from landfills.

AFTeR Member Organizations:

Big Brothers Big Sisters (BBBS)
Canadian Breast Cancer Foundation (CBCF Atlantic) / Enviro Depots – Eastern Recyclers Association (ERA)
Canadian Diabetes Association Clothesline® (CDA)
Canadian Red Cross / LML Trading
Salvation Army Thrift Store
Value Village Inc.

Benefits of AFTeR

- Advocate for greater textile waste diversion.
- Lobby municipal and provincial governments on textile diversion efforts.

- Encourage consistent messaging from members.
- Work toward standardizing textile collection donation bins and logos (e.g., creating collection bin standards).
- Provide current information to support municipalities asking for a plan.
- Promote to the public the advantages of textile diversion with respect to the environment and the economy.

AFTeR faces certain obstacles. For example, presently, AFTeR members could be actively participating more: going into Nova Scotia schools and hospitals; attending environmental events; and circulating more promotional literature and advertisements. However, a lack of funds and an absence of staff for AFTeR create ongoing barriers to increase textile waste diversion.

Furthermore, textile collection bin messaging varies, creating information gaps and inconsistencies. Until all AFTeR members deliver the same message, this challenge will persist. Ideally, communication needs to reach *all* the partners in the chain: the retail store, the donation bins, and the Afterwear website.

Recommendations for Afterwear.ca Profile

- Create an AFTeR sticker for textile collection bins, showing that the association and the donation bin are connected and legitimate.
- Create a video presentation for the website targeted at millennials and youth.
- Hold focus groups around Nova Scotia to discern how to identify and communicate with current non-donors, and how to champion AFTeR and increase textile diversion in the Province.
- Advertise *all* the member charities on the association's website.
- Refresh the website (quarterly) with new symbols, different visuals, and keywords.

Ultimately, AFTeR members need to obtain funding to promote visibility and to improve public education. AFTeR has to consider income streams, such as non-governmental sponsors, which could also support efforts to improve their website.

2. Other Textile Diversion Options in Nova Scotia

2.1 Disposal Ban

Disposal bans act as a macro tool, compelling change in behaviour and education, and can help improve curbside compliance. For disposal bans to properly emerge they need significant investment by the private sector.

Nova Scotia is a leader in disposal bans and needs further support from high-level stakeholders. Presently, Nova Scotia's disposal bans apply to the residential and commercial/business sectors, and are applied at all disposal sites. Variable tipping fees and clear bags are common practices in these current disposal bans.

Specific questions, listed below, need to be thoroughly studied with the goal of a potential complete [textile disposal ban in Nova Scotia in mind.

- Where are the markets for the product?
- Where is the existing demand?
- How do we manage and recognize the costs and benefits of textile diversion when instituting a ban?
- If a ban did occur, what is the plan, and what is the standard?
- How do we establish a standard for a textile disposal ban while conserving costs?

"Until a formal textile ban is in place, people will continue to do what they do, disposing of textiles to landfill. A textile ban will lower the quality of clothing collected; however, excited for a ban but somewhat nervous." (Interviewee, 2016)

Municipalities, Provincial Government, and Potential Benefits of a Textile Disposal Ban

Currently, Nova Scotia municipalities and the Province need to recognize there is still a huge volume of textiles in the Province's landfills. Nova Scotia municipalities and the Province could consider a textile disposal ban similar to the one the European Union introduced (Environment News Service, 2007). For instance, most waste textiles are considered recyclable and fall under the EU's Landfill Directive, which targeted 2015 for all textiles to be banned from landfill. This means textiles need to be collected and separated from other rubbish. The Landfill Directive (1999/31/EC) obliged Member States to reduce the amount of biodegradable municipal waste they landfilled to 35% of 1995 levels by 2016, and for some countries by 2020 (European Commission, 2016).

A textile disposal ban in Nova Scotia could immediately increase used-clothing donations in the Province without increasing public spending. For example, currently in Markham, Ontario, textiles are collected by brokers who manage the bins and pay for the bins. Once the textile collection program is fully implemented, Markham would have no additional costs on textile diversion. Instead, the City of Markham would have to pay less for landfilling, since it would be bringing in less textile waste material.

As well, Nova Scotia municipalities could help connect local property managers with AFTeR members to host more textile donation bins in universities, shopping malls, and other popular public spaces. Bus transit passengers need to be valued and included in this crucial collaboration. Ensuring stakeholders are on side with a disposal ban will be key to success.

Zero Waste Model Combined with a Textile Disposal Ban

Nova Scotia municipalities might look to the City of Vancouver, which is working toward a zero waste model, and to the City of San Francisco, which is actively using a zero waste model, including a textile disposal ban. With San Francisco's commitment to zero waste, the city consistently works with charities, allowing Goodwill, for example, to have textile donation bins in most residential buildings across the city.

2.2 Extended Producer Responsibility for Textiles in Nova Scotia

Extended Producer Responsibility (EPR) schemes, whether voluntary or mandatory, place a greater responsibility on producers and importers for their products' entire life

cycle. They can reduce the environmental impact by producing textiles of better quality, designing products for reuse and recyclability, and reducing use of harmful substances. With EPR regulations, producers also contribute to collection, reuse, and recycling after use. EPR can be a powerful tool to develop robust waste policies (OECD, 2014).

For example, EPR for textiles is a highly successful model today in France, which has established legislation within textile waste management to encourage recycling efforts. Collaborative efforts with government and the private sector have helped accelerate EPR and pose an exemplary direction that other countries could learn from to adopt similar efforts.

Ongoing support for textile recycling research and development needs to be included within an EPR model for textiles and future waste policy decisions. For Nova Scotia to proceed with a comprehensive EPR model for textiles, several key considerations need attention. The following strategic questions could spark dialogue among high-level stakeholders in Nova Scotia about implementing EPR:

- Who does an EPR program potentially burden?
- Who generates the unwanted textiles? The brand owner/manufacturer? The retailer? The consumer?
- Is the identified generator producing consistent, sustainable amounts of unwanted textiles or not?
- Would brand owners be implicated in the EPR regulation? And how would their response and the plan affect retailers and consumers?

Also, when discussing EPR for textiles, Nova Scotia industry would need to have planned for textile diversion, such as creating a *circular economy* approach. Municipalities that currently receive money from tipping fees for the disposal of textiles at Nova Scotia transfer stations would need review. As mentioned, AFTeR members are paying a tipping fee that municipalities would have previously covered for materials they cannot divert.

3. Jurisdictional Review — Canada

Investigation was conducted into how discarded and EoL textiles are diverted from landfill, including reuse, repurposing, ragging, and shredding. The following is a summary of the current state of textile diversion in a few areas in Canada.

3.1 Etobicoke, Ontario

A private sector, family-run textile collection business based in Etobicoke manages a variety of collection streams, including community donation bins, together with providing broker services and reverse logistics for thrift stores and charities. A recent expansion is municipal curbside textiles collection, helped by a partnership with a textile sorter in Scarborough, Ontario. This textile diversion company covers most of Southern Ontario. In 2013, 13,608 tonnes of textiles were diverted from landfill, and in 2016, 6,803 tonnes of textiles were diverted from landfill, a decrease of waste to landfill of almost 50%.

A significant drop in tonnage in 2016 was linked with municipalities and industry imposing restrictive regulations that made approval for permits difficult to get, which, in turn, led to fewer collection bins and fewer textiles collected.

Earlier in 2016, this Etobicoke-based business started a pilot project, partnering with Glad Canada, which donated bags for the first collection from approximately 3,000 homes in Aurora, and with an independent pickup from 5,000 homes in Welland, Ontario. However, the textile collection business discontinued use of the Glad bags after the initial selected pickups, because the cost of mailing the bags was too high.

Presently, this private sector business continues its curbside programs with the Town of Aurora, independently outside of York Region, and maintains an independent collection from 10,000 homes in Waterloo.

This private textile collection business has received notable positive feedback from the general public looking to participate more in local textile diversion and also demanding more collection bins. Similarly, two municipalities have contacted this business, asking for collaboration with the private sector within textile waste diversion.

3.2 Markham, Ontario

In 2016, the City of Markham, with an urban population of approximately 350,000 north of Toronto, introduced a textile recycling program in partnership with the Salvation Army. This program includes the installation of municipally managed “high-tech” textile donation containers at all city facilities, including Markham recycling depots, fire stations, and select community centres. This recycling program is funded by a grant from the Federation of Canadian Municipalities.

Markham aspires to capture every last piece of clothing residents may discard. For well-defined examples, see Markham’s textile donations flyer (Appendix, Figure 6) and the Molok high-tech clothing collection bin (Appendix, Figure 7).

3.3 Vancouver, British Columbia

Metro Vancouver is currently looking to a possible ban on clothing and textile waste in its landfills. Metro Vancouver is still trying to determine why so much clothing is thrown out every year: whether the clothes aren’t reusable or there’s a lack of knowledge about where to donate them. Stakeholders will be consulted before any textile disposal ban is implemented, and new opportunities for recycling or donating clothing will be explored.

4. Jurisdictional Review — United States

Investigation was conducted into how discarded and EoL textiles are diverted from landfill, including reuse, repurposing, ragging, and shredding. The following is a summary of the current state of textile diversion in a few areas of the United States.

4.1 New York City, New York

Early in 2016, the Department of Sanitation's refashionNYC program provided large textile collection bins to apartment buildings with 10 or more units. Housing Works (a New York–based non-profit that operates used-clothing stores to fund AIDS and homelessness programs), received the textile goods, paying refashionNYC for each tonne collected. RefashionNYC in turn put the money toward more bins. Housing Works collected textiles from 700 residential apartment buildings in NYC. Between January and June 2016, New York residents saw the program as most convenient, with 677 tonnes of textiles collected.

In 2016, the refashionNYC program collected and diverted from landfills a cumulative 1,358 tonnes of textiles . In 2017, 890 residential buildings are enrolled in the program. Presently, the program is collecting approximately 103 tonnes of textiles per month. Since the program launched in 2011, Housing Works has opened up several new second-hand clothing retail stores.

A one-time curbside collection in New York City in 2015 took place in partnership with Goodwill. The curbside collection was very successful, but expensive. A local neighbourhood was chosen, which did not include many apartments, as these community areas needed more service. The selected neighbourhood was given two weeks to one month to gather unwanted textiles for reuse and EoL textiles for recycling. Clothing, shoes, and handbags were collected in this winning curbside collection scheme.

It was observed that convenience was key to landfill diversion for people in NYC. "If you just ask for 'end-of-life' [textiles], people will just start looking for that. What is reusable, re-wearable, [there's a need for] balancing the line [between] what is okay and useless" (Interviewee, 2016).

Textile manufacturers, apparel and shoe producers must all be encouraged to be more involved in textile waste responsibility. These producers need to communicate with their consumers about what to do with unwanted textiles. And the messaging needs to be clear.

4.2 San Francisco, California

The City of San Francisco has a goal of reaching zero waste by 2020. Currently, it has a zero waste textile initiative, sending no clothing, shoes, or other textiles to landfill. To help meet this end, San Francisco is expanding its network of free textile collection bins for businesses, apartment buildings, and community groups.

Significantly, textile collection bins are included in all municipalities with clear messaging logos (San Francisco Environment, 2015).

In February 2017, a new documentary film premiered in San Francisco. It was a creative collaboration between San Francisco State University faculty and students, encouraging consumers and industries to reuse textiles that are often discarded improperly. The film offers alternatives to textile waste in an effort to raise awareness and encourage a change in behaviour.

4.3 Seattle, Washington

Currently, Seattle's curbside efforts for discarded and EoL textiles are rapidly growing with Threadcycle, a public education campaign for King County and Seattle Public Utilities. For example, the online tools "Where Does it Go?" (Seattle Public Utilities, 2017) and "What do I do with?" (King County Solid Waste Division, 2017) support the Threadcycle program mandate.

Mitigating textile waste has become one of the areas American cities need to focus on, especially with respect to mapping successful recycle and reuse policies and bylaws. As these continue to get more attention, cities will develop more programs in the near future.

5. Jurisdictional Review — Europe

Investigation was conducted into how discarded and EoL textiles are diverted from landfill, including reuse, repurposing, ragging, and shredding. Strategies in France, the United Kingdom, Germany, and the Netherlands are summarized below, including themes about valuable textile collection methods and EPR regulations.

5.1 France

Today, France has a distinctive textile collection system whereby approximately 8% of textiles and shoes end up in landfill (together with incineration), as the country has a long history of charity and government support for unwanted textiles. One of France's biggest charities, Emmaus (founded in 1946 to fight poverty), is involved in collecting, sorting, and reselling textiles and also arranges textile collection from households.

In 2008, the French government issued a law for all retailers of clothing, textiles, and shoes to provide a real solution for the end of life of their products.

As part of France's commitment to comply with the EU's environmental standards regarding sustainable waste management, an EPR was introduced for clothing, household linen, and footwear producers, distributors, or importers in France. This rigorous program has created jobs, including sorting and grading of textiles. Companies are considered responsible by law for providing or managing the recycling of their products at the end of their use. They can either organize their own recycling

program that must be approved by the French Public Authorities or contribute to an organization accredited by law to provide for them (Eco TLC, 2016).

EoL textiles are commonly recycled into insulation (Métisse) and used widely in the construction of new and renovated buildings in Northern France and Paris (Emmaus Europe, 2015). Currently, Métisse is certified by the Scientific and Technical Centre for Building (CSTB) in France. Certification will enable the material to be chosen for regional authority public procurement contracts. Métisse was created in the Emmaus Movement and combines several traditional activities, including reuse and recycling, as Métisse represents the 10–15% of the unusable textiles that would have been incinerated and can now be used as recycled grade material.

In essence, France's government has established an ideal closed-loop system within textile recycling. It has created demand for a recycled textile product, establishing *textile value* for recycle grade material. This achievement needs to be acknowledged.

Extended Producer Responsibility in France

France has a highly effective national communications campaign to promote textile collections, which has increased since an EPR strategy was introduced in 2009. Also, it has an impressive compliance rate, with approximately 95% of businesses responsible for putting clothing on the market—both retailers and manufacturers—being legally compliant.

There are calls from across the wider European recycling industry for greater use of EPR to help deliver the circular economy package (OECD, 2016). France has a critical mass with textiles diversion, as they do not have a landfill option.

5.2 United Kingdom

Currently, 72% of textiles in the United Kingdom go into landfill. Textile industry stakeholders urgently need to work more collaboratively and to invest in research and innovation in order to establish a stronger textile recycling market. This is the view of a leading textile recycling industry chief, who has called for the introduction of EPR regulations to provide greater stability to a United Kingdom market, which has seen prices for used-clothing drop significantly in the past few years. A well-designed plan for textiles could provide significant benefits in terms of improving the overall sustainability of the United Kingdom clothing supply chain (Mathews, 2016).

In 2016, Waste and Resources Action Programme (WRAP) created the *Textiles Collections Procurement Guide*, which aims to help United Kingdom local authorities and textile collectors to introduce and operate effective collection arrangements that strike a balance between service costs and quality of items collected. WRAP developed the guide as part of its work for the Sustainable Clothing Action Plan (SCAP). SCAP's intention is to improve the sustainability of clothing across its life cycle. By bringing together industry, government, and the third sector, SCAP aims to reduce use of resources and secure recognition for corporate performance by developing sector-wide targets (WRAP, 2016).

5.3 Germany

At present, no textiles in Germany go to landfill due to landfill bans and incineration. Significant quantities of clothing are collected in textile donation bins, resulting in very high textile waste diversion numbers. Germany ranks third worldwide in selling used clothing. The rest of the textile waste is incinerated.

Unusable clothing (torn or stained) in Germany is used for shredding. The portion of this category ranges between 22% and 27%. Either knits or woven garments are converted into fibres through mechanical processes such as cutting, shredding, and carding. Fibres are re-engineered into value-added products, such as “flocks for mattresses and upholstery” and “flocks for filling and felts.” Some of the items are sent to paper factories to produce banknotes, filter paper, and insulation material. Low-quality remnants are sold to cardboard factories to be used in building materials (e.g., roofing felt, carpet underlay). Woollen garments are sold to specialist firms for fibre reclamation to make new yarn (Haner and Bartl, 2010).

Lastly, a new international solutions provider for clothing and shoe reuse and recycling has one of its main offices in Germany (I:CO, 2017). Through its innovative retail take-back system and worldwide infrastructure, it aims to keep consumers’ clothing and shoes in a closed-loop production cycle, where all textile goods can be reprocessed and reused again and again. Also, customers who bring in undesirable clothing to specific stores receive a redeemable voucher toward a future purchase. This arrangement ultimately reduces waste, preserves material resources, and protects the environment.

6. Canadian and International Textile Recycling Markets

The extent and location for textile recycling and shredding markets were examined for this report, including the amount of textile materials that cannot be sold locally or overseas. Textile recycling markets in Canada, the United States, and Europe are featured below.

6.1 Canadian Textile Recycling Markets — Crisis and Solutions

6.1.1 Etobicoke, Ontario

A crisis exists in Ontario, where increasing amounts of unwanted textiles are in need of an end user. Highlights of recommendations encourage green technology solutions alongside further research and innovation within the textile recycling sector in Canada.

Currently, a private sector textile diversion business in Ontario has over 272 tonnes of lower-quality clothing sitting in trailers, which it cannot sell. In addition, local textile grading facilities have dropped their prices to an unsustainable level, refusing to purchase bags at all.

In the past, this textile diversion company serviced 32 charity thrift stores in Ontario by brokering the textile product the charities couldn’t sell on their behalf. However,

very recently two major global textile traders suddenly dropped their price of the same quality goods far below what it costs to collect them. And now these global textile brokers dominate both Canadian and American markets. Consequently, without a buyer for the lower-grade clothing, this Ontario business is left with a substantial volume of undesirable textiles sitting idle. Also, Ontario textile grading facilities are placing major restrictions on what they are accepting: only “gently used,” as it is the higher-quality textiles, and not “clean, dry, odourless,” which are primarily used in textile recycling. The new textile sorting margins inhibit any chance of a textile disposal ban in Ontario.

This crisis of accumulated unwanted textiles in Ontario directly reveals the necessity of new end markets and Canadian green tech solutions, to create value and support for *recycle grade textile material*. *Reprocessors* would ultimately get more value for recycle grade textile material and could help divert more textiles from landfill.

6.1.2 Stellarton, Nova Scotia

A family-owned Canadian manufacturer of workwear and uniform apparel since 1978, this Stellarton business sells products nationally and internationally and has approximately 100 employees. Currently, this company continues to generate between 38 and 45 tonnes of scrap fabric per year. This leftover fabric is clean edge cuttings, made of 60% cotton and 40% polyester. In 2008, the company switched from landfilling to selling this scrap fabric to a United States company, which shredded the fabric for use within the auto industry. But demand has dropped off from this buyer.

This Stellarton company would like to see a local solution for the scrap fabric. The only interest so far is to use the scrap fabric as rags; however, this fabric is unsuitable for rags. A local textile recycling solution could possibly be established in Nova Scotia. Currently, the absence of a local solution highlights a challenge to any potential textile disposal ban in Nova Scotia.

To that end, more discussion among stakeholders is necessary, as well as further research and action in Canadian textile recycling markets.

6.1.3 Vancouver, British Columbia

In 2008, an innovative textile shredding private sector business, located in Vancouver, started with a goal to help companies with their brand waste. Brands have security issues, and this textile recycling business helped find a solution, as resale is not an option.

Textiles are partially shredded on-site and then sent via truck to a US partner, where garments are further reduced to fibres and made into insulation, padding, etc. Building insulation is produced in large volumes. Other padding is produced for various uses in the automotive industry, for furniture, thermal insulation for packaging/shipping products, punching bags, gymnastic/athletic mats, and acoustic

fill. This reliable demand for the textile shred is essential for Canada's textile recycling industry to flourish.

Since 2015, local interest in textile shredding has increased, with British Columbia municipalities reaching out to this private sector company, together with uniform sectors, including ambulance, police, and airlines.

> "From an environmental standpoint, shredding is a good one. Yet, it is a tricky business as you need to have some sort of demand that can feed that product." (Interviewee, 2016)

6.1.4 Pointe-Claire, Quebec

A well-established private sector business located in Pointe-Claire is engaged in manufacturing and recycling textiles, along with transforming recycled fibres (shredded denim) into added-value finished products. It is one of the leading manufacturers of high loft and densified non-wovens in Canada. Specifically, it develops and produces non-woven fibre products to meet specific requirements in a multitude of areas, such as bedding, furniture, architecture, filtration, construction, and transportation.

6.2 United States Textile Recycling Markets

Existing textile recycling shredding markets are highlighted below, including new technology for *garment regeneration* of both cotton and polyester fibres. These new progressive markets are developing rapidly with growing support from apparel manufacturers, the auto sector, and construction and carpet industries.

6.2.1 Seattle, Washington

This new technology company in Seattle, founded in 2014, addresses the problem of the natural resource-intensive, environmentally negative impacts of the textile and apparel industries. The company safely converts post-consumer cotton garment textile waste by breaking it down to the molecular level and transforms it into a high-quality, premium textile fibre. Mills weave this new fibre into fabric, which in turn is used by brands to manufacture their goods. (Evrnu, 2016).

6.2.2 San Francisco, California

A new high-tech San Francisco company converts waste textiles into high-value chemicals. This company is working to develop a chemical technology to produce conventional polymers, such as polyesters, from a variety of fibrous waste streams. Current methods for disposal and reuse of waste polymer materials are inefficient, low value, and altogether broken. This company believes that breakthrough science and engineering can deliver more efficient reuse of these materials (Ambercycle, 2016).

In July 2016, another textile recycling solutions provider, also in San Francisco, announced the extension of its partnership with a renowned denim apparel brand. This San Francisco–based apparel company has now expanded its clothing recycling initiative to all of its mainline and outlet stores in the United States. Consequently, the company continues to display its corporate commitment to sustainability and creating an infrastructure that supports a circular economy (Levi Strauss, 2016).

6.2.3 Lincoln, Nebraska

A pioneering company located in Lincoln specializes in the development and commercialization of sustainable materials using renewable bio-based components blended with recycled and reclaimed materials. Valuable materials that are normally thrown away, down-cycled, burned, or otherwise discarded can be used in this process. This company sources post-industrial and post-consumer denim textile scraps from different parts of the United States and is currently processing denim material in-house, which allows for textile donations from the local community.

Once this denim product has been processed, it is a cotton fibre biocomposite that is highly mouldable, lightweight and durable, with no off-gassing of toxic chemicals. Possibilities for automotive and aerospace applications along with other custom production make this product unique. Biocomposites are a growing, innovative industry, and this company is pushing the limits of what materials can be used to make them. (Shear Composites, 2016).

Interest in biocomposites is rapidly growing in terms of industrial applications (automobiles and railway coaches, aerospace and military, construction and packaging) and fundamental research due to its significant benefits (renewable, inexpensive, recyclable, and biodegradable).

6.3 European Textile Recycling Markets

Prominent textile recycling activities located in Europe are featured below. New fibre technologies, including Textile Shred to Thread, are currently a major theme. Also, key drivers to initiate new global markets for *recycle grade textile material* are listed.

6.3.1 London, England

In 2005, a London-based company started with footwear made from recycled materials. Since then, it has sought better solutions to the challenges of textile waste. For instance, upcycling corporate textiles, turning waste materials like EoL textiles into desirable products, such as handbags from airline seat covers and discarded train manager uniforms. Currently, this company is engaged in full-time development of a circular recycling technology for the textile and clothing industries (Worn Again, 2016).

6.3.2 Almere, the Netherlands

A sustainable and fair trade certified denim brand is achieving the principles of the circular economy. Currently, a Netherlands-based company leases its apparel to consumers, and after the lease period of one year, consumers can switch jeans for another pair and continue leasing, return their used ones for recycling or upcycling, or keep them. The lease contract includes free unlimited repair services.

6.3.3 Stockholm, Sweden

A Swedish innovation company is recycling cotton, viscose, and other cellulose-based materials and is building the world's first production line for textile pulp from recycled textiles. Potential customers of the recycled cellulose fibres are fibre producers of viscose and lyocell and producers of dissolving pulp and non-woven products, such as medical gowns, diapers, and sponge cloths (re:newcell, 2016).

6.3.4 Lenzing, Austria

A new cellulose fibre has been created using cotton scraps and wood. It is one of the first fibres of its kind produced on a commercial scale using a high volume of recycled material (Lenzing, 2017). This innovation will push new solutions in the textile industry toward a circular economy by recycling production waste.

This latest innovation in Austria is an important example of the radical potential to repurpose previously unusable textile material - a promising development that could reduce textile waste across the value chain, as well as reliance upon raw materials.

6.4 Key Drivers to Initiate Markets for Recycle Grade Textile Material

Recycle grade textile material is a new, valuable product. It is important for key stakeholders to support and encourage its requirement in industrial manufacturing. Some key drivers to help initiate new markets include:

- Compel governments globally to create demand for all EoL products and packaging.
- Government agencies need to adopt a textile procurement policy that meets standard specifications.
- Recycled content and a material standard are essential to encourage (new) businesses to use recycle textile-based materials in product manufacturing.

7. Sustainability of International Textile Export Markets

Investigation was conducted into how textiles exported overseas are managed to determine whether or not overseas export is sustainable. This analysis includes reused, repaired, sold, ragged, and recycled textiles.

What follows is a synopsis of Africa as a central theme in textile export markets, including benefits, whether or not textile export markets degrade the local African textile manufacturing industry, and if any threat of oversupply of EoL textiles exists. Also, to truly determine if textile export markets are sustainable, Corporate Social

Responsibility (CSR) and due diligence emerged from the findings as significant spheres that need in-depth review and candid participation from all export market stakeholders.

7.1 Africa

Today, the textile export markets to East Africa are a significant global reuse market, with a mammoth volume of clothing being graded for the specific consumer demand in those markets. Africa's second-hand clothing industry dramatically helps close the loop on post-consumer textile waste and provides many people around the world with the only affordable access to quality apparel.

Yet, in March 2016, the East African Community (EAC), made up of Burundi, Kenya, Rwanda, South Sudan, Tanzania, and Uganda, proposed banning all imported used clothing and shoes by 2019. Such a significant move could have serious implications for the sustainability of overseas textile export markets. This is actually the third proposed ban by the EAC in the last 40 years. Further collective dialogue is necessary among global stakeholders regarding a potential textile ban, as it is an issue that will impact the export of textiles globally.

The Bureau of International Recycling's Textiles Division and Secondary Materials and Recycled Textiles (SMART) are presently working with the United States Department of Commerce to understand the broader issue. The importation of clothing into East Africa has been cited as a technical trade barrier for specific countries.

By August 2016, two leading textile recycling associations had refuted recent mainstream media suggestions that western exports of second-hand clothing were hurting textile manufacturing sectors in East African countries. "There are a number of countries like Pakistan, Guatemala, and Honduras where the second-hand clothing and new textile manufacturing sectors coexist harmoniously. It is not necessary for the EAC to take away access to affordable, quality second-hand apparel through a ban in order to champion the development of a thriving textile manufacturing industry of their own" (SMART & TRA, 2016).

The critical question of who would be negatively affected by an African secondary textiles ban was explored. Ultimately, the crisis would be global. Over half a million tonnes of affordable, quality second-hand clothing would not be available. The ban would hurt those consumers in the African market who are able to dress their household members with their current daily wages. The textiles ban would create barriers in an existing robust market, and would create a significant imbalance in the global textiles export market. Currently, over 900 tonnes of clothing are being traded globally with African countries because the infrastructure is in place and the demand is there. Thus, to determine if there is any threat of oversupply of EoL textiles, a systematic investigation on-site, in Africa, would be necessary to assess accurate disclosure.

Based on this research, there is no evidence that shipped exported textile goods are burned or landfilled overseas, as the exported textile product is too valuable.

7.2 Pakistan, Honduras, and Guatemala

Presently, Pakistan, Honduras, and Guatemala have growing second-hand export markets. It is worth mentioning as overhead costs in the sorting of reuse textiles is particularly high in Canada, the United States, and the United Kingdom. The textiles sorting happens overseas in Pakistan and the sending of unsorted product increases due to lower costs. These three countries are influential examples to observe in the future, as more and more textile reuse markets are moving overseas.

7.3 China

It was stated in several phone interviews that China would like to see an African ban on second-hand clothing to create their own advantageous second-hand clothing market. This provocative observation reflects the pressing need to follow China carefully, as it's a significant player with influence in global textile markets.

7.4 Corporate Social Responsibility and Due Diligence

Presently, we don't accurately know what percentage of EoL / recycled textiles is wasted overseas. There is a lack of open source information on this subject. Hence, a third party audit with respect to Corporate Social Responsibility (CSR) and due diligence for all textiles sold overseas is advised. This review could include new education about the critical need for ongoing due diligence in textile export markets.

There is a small amount of textile waste that remains unattended to, making it impossible to gauge the full measure of success of export markets for second-hand clothing. This is where due diligence would play a role in securing a more accurate picture.

8. End Market Opportunities for Nova Scotia

With clear understanding and foresight about textile waste diversion, Nova Scotia could become a trailblazer in Canadian textile recycling markets. Collaboration with Nova Scotia stakeholders along with an openness to discuss new ventures in textile recycling are imperative and vital for any progress.

8.1 Business Cluster in Interest of Textile Recycling Market

The current global textile industry needs to strengthen its textile recycling market with more research and development in how to establish a stable textile recycling scheme. All the other material streams are trying to move the waste hierarchy from recycling to reuse, remanufacturing, and reduction. More support is needed in the recycling stream. The challenge is that the global textile recycling market is not stable enough.

Nova Scotia could take this much-needed opportunity to establish a business cluster—a geographic concentration of interconnected businesses, suppliers, and

associated institutions—in the interest of a new textile recycling market. Also, a business cluster would be a pivotal aspect for strategic management and long-term vision within an emerging market of textile recycling.

For example, the County of Colchester and other municipalities that are actively diverting textile waste could work with the local manufacturing company in Stellarton to increase access to textiles and EoL textiles needed for shredding, highlighting a new potential textile recycling market in Nova Scotia.

8.2 Fibre-to-Fibre Technology

Fibre-to-Fibre technology includes stimulating recycle grade textile material, moving away from reuse to create new end products. In the coming years, with a cleaner, pure stream within textile waste diversion, there is good potential in fibre-to-fibre technology largely with regards to the auto sector and carpet and insulation industries. Nova Scotia stakeholders need to engage with this emerging scheme. It is recommended that Nova Scotia explore local shredding business and using recycle grade textile material for recycle grade products.

8.3 Textile Rag and Fibre

Nova Scotia stakeholders might further study the WRAP 2014 *Final Report: Evaluation of the End Markets for Textile Rag and Fibre within the UK*. (Refer to Appendix, Figure 8.) The WRAP report highlights several end markets for textile recycling and includes a complete list of conclusions on the potential opportunity for EoL textile recycling in various end markets by 2020.

8.4 End-of-Life Textiles

Presently, there is a need to develop new end markets that are less reliant on second-hand clothing markets. Traditionally, the value of used clothing has been able to support the collection of lower value recycling grades. However, we are seeing textile collectors reduce their collection areas, and they are trying to avoid collecting recycling grade materials. A critical need for green technology infrastructure and investment in EoL textiles currently exists in Nova Scotia and Ontario.

9. New Pathways to Increase Textile Waste Diversion in Nova Scotia

Below is an extensive list of recommended new pathways for strategic direction within public and private sectors to help Nova Scotia progress in textile waste diversion. These high-level options are inclusive and might influence policy in textile waste diversion within Nova Scotia and Canada.

9.1 How AFTeR Members Could Increase Textile Diversion

<u>More Resources for AFTeR</u>

To effectively increase textile diversion, more resources and additional revenue are needed within AFTeR itself, with an administrative staff dedicated to the association. In addition, AFTeR needs to research available grants outside of government. For

instance, applying for profit sharing or possible corporate sponsorship (e.g., TD Bank's Friends of the Environment Foundation) would help support AFTeR's need for an administrative structure and support its mandate of increasing textile diversion in Nova Scotia.

More Government and Non-government Involvement with AFTeR

Given the Province's mandate to decrease disposal per Nova Scotian, the Province could encourage and assist AFTeR to find partners to help obtain funding for various needs in support of the association's greater vision. For example, securing an executive director for AFTeR, increasing the association's communications and education outreach, etc.

NSE could provide advice, specifically about communications, strategic planning, how to conduct outreach to specific stakeholders, and who to approach for support. Networking opportunities exist with key stakeholders/potential partners (municipal, brand owners, retailers, etc.), as NSE works closely with many of these.

AFTeR could help foster and organize roundtable discussions with municipalities, DivertNS, and the Province to collect feedback about how to reach out to Nova Scotia School Boards to run a school textiles return competition.

Lower Tipping Fees

By diverting textiles from the residential waste stream, AFTeR saves the municipalities money, which they would have paid in collection, transfer, and disposal. For this benefit, AFTeR member organizations might request lower tipping fees for textile waste.

Collaboration with Apparel Manufacturers and Brands

AFTeR member organizations could collaborate with clothing manufacturers and retailers, asking for clothing donations and sponsorships from their consumer base, such as the organization ME to WE (www.metowe.com).

Participation of Hotels and Hospitals with AFTeR

Large hotels and hospitals situated throughout Nova Scotia might be encouraged to collaborate with AFTeR, becoming more accountable and responsibly involved with textile waste diversion. Hotels and hospitals have member associations, and ideally if one of these could become involved with AFTeR it would greatly help increase waste diversion in Nova Scotia. Textile waste from industrial, commercial, and institutional sectors (IC&I) also needs to be included in the diversion.

Uniforms

There is an urgent need to create convenient textile donation programs in Nova Scotia for uniforms, as these continue to produce a huge amount of unnecessary textile waste. Uniforms pose a growing area of concern as businesses are challenged with what to do with outdated, unwanted uniforms.

Nova Scotia textile collectors ought to engage with local fire and police stations, transit bus lines, hospitals, restaurants, and the automobile industry around the

Province. A model to study is a private sector business located in Vancouver that is helping to divert uniforms from landfill by shredding large quantities of uniforms after all logos and notions are debranded. The textile shred is used to produce insulation and other recycle textile grade products.

9.2 Other Ways to Increase Textile Diversion

9.2.1 Standardized Messaging
Increase public awareness about the value of textiles by promoting the benefits of textile diversion. Enhance public education about the benefits of diverting textiles from landfills.

Improve definitions of textile reuse and textile recycling. By using contemporary definitions to educate the public/householder/industry, individuals can decipher basic terms and begin to understand the facts and realities associated with textile waste and the critical need for its diversion. In addition to textiles, shoes and handbags need to be included in this emerging common language.

For example, 300 kilograms of waste per person/per year in Nova Scotia translates to how much total waste per hour, per day, per year? (San Francisco Environment, 2015). Translating this amount of waste into a more accessible framework will have a greater impact on new learning and improve textile diversion. What does *reuse* imply, and what does it include? What is the difference between *textile reuse* and *textile recycling*?

Within Canada there are plenty of mistaken ideas regarding what can be done with textiles. “One of the biggest misconceptions that consumers have is that we should only donate clothing that [is] gently used” (Weber, 2016). Research shows household consumers often think that if a textile product is not clean to be resold in a thrift store, it isn’t worth donating. However, several types of unwanted textiles are incredibly valuable and need to be donated.

This misperception about what textiles can or cannot be donated highlights the critical need for increased public education messaging and for textile collectors to clearly define a comprehensive list of acceptable textile donations.

<u>Visual Symbols and Consistent Written Information for Textile Donors</u>
Critical to educating about textile diversion, standardized visual messaging on textile collection bins such as icons, symbols, and photos strengthens and emphasizes written information, and influences a larger audience of widely varying literacy levels. For example, a creatively designed Goodwill goBIN in San Francisco demonstrates clear messaging, including icons and symbols to potential textile donors. (See Appendix, Figure 1.)

As mentioned, in Nova Scotia there is a real issue regarding the discrepancy between the written messaging on specific textile collection bins and the written messaging on the AFTeR member website (Afterwear.ca). Consequently, there is a lack of clarity for potential textile donors as to what items are acceptable. For example, if someone

wants to donate a purse or article of clothing that is very worn, in practice the AFTeR member may refuse it. To support consistent messaging, all AFTeR members need to accept everything on the Afterwear website's "acceptable material list"—as long as the donated item is "clean and dry." Moreover, some AFTeR members' bin signage says ''clothing only" or "clothing and footwear only," but the Afterwear website includes a wider range of acceptable categories. (See Appendix, Figure 2 and Figure 3.)

Written messaging on collection bins, websites, flyers, etc., describing what textiles can and cannot be donated needs to be informative, clear, and consistent. For example, if the textile is dirty, can it still be donated?

The following are working examples of well-defined **keywords** used in effective messaging from various textile collection organizations in North America.

- "Take it to the boxes/bins."
- "We will take everything."
- "Every garment is welcome, no matter the condition."
- "It all can be recycled."
- "Give them everything."
- "Bedsheets, towels, single shoes, dry, odourless, not wet."

9.2.2 Increased Awareness: Communication

A variety of communication methods can be effectively combined. The County of Colchester, for example, used an app, a municipal letter in local newspapers, and its current website to educate residential householders about a new curbside collection program.

PSAs (Public Service Announcements) are messages in the public interest disseminated by the media, free of charge, with the objective of raising awareness and changing public attitudes and behaviour toward a social issue. PSAs could help develop clever textile diversion education about how to effectively use collection donation bins in a local area.

To stimulate more local household education and participation in textile diversion in Nova Scotia, greater publicity about how to use NS Municipality apps for information on unwanted textiles needs to be encouraged. For example, the Halifax Recycles app is useful for information on textiles. This web-based and mobile tool was launched in July 2015, receiving 40,000 downloads since its debut and has a higher percentage of downloads compared to other regions, such as the City of Vancouver. The Halifax Recycles app allows browsers to search what waste goes where, and subscribers can receive weekly notifications. For instance, if you type in "textiles" on the Halifax Recycles app, the first option is "reuse" and the Aftewear.ca link shows up. And the other option that shows up is "garbage." (See Appendix, Figure 5.)

Consider new education via advertising on television and on social media to increase public understanding about textile waste and the need for diversion from landfill. New

modern information about textile diversion could be promoted via bus shelters throughout HRM to help reach a large number of viewers. (See Appendix, Figure 4.)

9.2.3 Increased Convenience

Curbside collection and home pickup convenience is key for co-operation, with inclusive accessibility for all Nova Scotia householders to donate textiles. Also, transit bus passengers and people without cars need to be considered. For example, CDA and BBBS could expand promotion of their convenient home pickup service of unwanted textiles rather than residents having to find the closest drop-off locations.

9.2.4 Focus Groups

Focus groups can be promoted and conducted in Nova Scotia on the topic of textile diversion, within both residence and business pathways. Both municipalities and AFTeR members gather data to establish current level of understanding around where to dispose of used textiles.

Use focus group data to compile a householder's guide of what textiles go where when sorting household waste. "Focus Groups Data showed a strong confidence if a Municipality is involved in textile diversion" (Marsales, 2016). Clearly, asking Nova Scotia householders what they want and need to assist with textile diversion could offer valuable insight.

9.2.5 Waste Audits

Continue with textile waste audits to assess what percentage of textiles is being disposed of. Most importantly, begin to understand the *quality* of textiles being disposed of in landfills. This quality assessment will help define *recycle grade textile material* for the initiation of new end markets.

9.2.6 Further Collaboration

More collaboration with industries, manufacturers, and non-governmental stakeholders involved with textile diversion is valuable. Also, collaborative public education efforts could be encouraged, including a Nova Scotia Textile Diversion Summit, together with stronger outreach to new end markets. The following recommendations support these goals:

- AFTeR members need to acknowledge publicly, in clear messaging, that a percentage of second-hand garments are shipped overseas to support global markets

- Municipalities could expand partnerships with AFTeR members. As textile diversion increases, the municipalities save money and create local jobs.

- The Province of Nova Scotia could bring the issue of textile waste to the Canadian Council of Ministers of the Environment (CCME) to increase awareness and to create a textile waste management subgroup.

- Nova Scotia stakeholders could organize roundtable discussions to determine if there is adequate support for an Extended Producer Responsibility (EPR) program for textiles.

- More research is required for new end-use options for textile diversion in Canada. For example, shredding textiles into new end-use textile products or creating an infrastructure for innovative Textile Shred to Thread.

- Tax incentives could be leveraged to encourage local businesses to use recycled grade textiles, enhancing textile value for recycling grade materials in textile based products.

- The federal government could consider changing its importation of textile regulation to ensure there is no incentive to dispose of textiles.

GLOSSARY

Circular economy: A traditional economy is linear: make, use, and dispose. In an alternative circular economy, resources are used for as long as possible to extract the utmost value from them, and then the goal is to recover and regenerate products' materials at the end of their function.

Closed-loop textile recycling: Representing the next generation of textile recycling, "closed-loop" or "circular textiles" occurs when mechanical hurdles are overcome, including the inability to separate blended fibre garments and dyes and other contaminants. The technology to produce a fibre comparable in quality and price to that produced from virgin-derived resources will become standard.

Discarded textiles: Unwanted textiles within the residential consumer sector and industrial sector that are disposed of into the waste stream. There is great value in these mammoth amounts of discarded textiles for reuse and textile recycling.

End-of-life textiles (EoL): "Bottom-of-the-barrel" textiles that are not suitable for reuse due to wear and tear. EoL textiles can be recycled into textile-based products, such as insulation, flocking for mattresses, automotive felt, and fibre-to-fibre products.

End markets: Include both potential and existing markets for discarded clothing and household textiles (excluding mattresses and carpets). A significant end market of textile waste in North America exists overseas. Since 2013, however, overseas demand for used clothing has been decreasing and prices have been falling. Recent trends suggest the need for a wider range of sustainable end markets, including market development for recycled grades of textiles unsuitable for reuse, including closed-loop fibre-to-fibre recycling.

Extended Producer Responsibility (EPR): An environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle.

Garment regeneration: A new garment is produced with innovative textile recycling technology by using discarded cotton textile waste that has been converted into a renewable fibre. The first prototype is a pair of jeans, which represents a future where textile waste is reduced considerably and cotton garments are continually regenerated to create a more sustainable world.

Green tech: The technology infrastructure necessary to recycle EoL textiles. In recent years. Emphasis has been put on developing cleaner, cost-effective, and value-added textile products using green technology for a variety of purposes without compromising health or the environment.

Ragging: Second-hand thrift clothing can be recycled into wiping rags/cloths or graded textile material classified for recycling into fibre.

Recycle: To convert (waste) into reusable material, or to return material to a previous stage in a cyclic process, or to use again. Recycle is a key element of modern waste reduction and is the third component of the “Reduce, Reuse, and Recycle” waste hierarchy.

Recycle grade textile material: All textiles are graded (going into reuse pile or recycle grade). A graded material, sorted by reprocessors, which would include most EoL textiles, unfit for reuse grade material, and clothing that is stained, torn, or generally worn out.

Reprocessor: Experienced thrift clothing graders who process high-quality grades of second-hand clothing that are sold worldwide. Experienced clothing graders open individual bags of collected used clothing and shoes to determine definitive grades. Some facilities use sophisticated handling systems, enabling consistent high-quality grades.

For example, in the UK, selected clothing is sorted on a conveyor belt and subdivided into categories like woollens (to be re-spun back into textiles) or flock (a heavy wool product for roof insulation or carpet underlay). Cottons unsuitable for re-wear are mostly sold to local businesses involved in manufacturing industrial wiping and polishing cloths.

Repurpose: A term used for turning used clothing into something new. Instead of throwing a piece of clothing away because it is worn or out of fashion, it can be turned into something desirable and useful. Almost any type of clothing can be repurposed.

Reuse: The action or practice of using something again, whether for its original purpose or a different purpose. Unwanted clothing or textiles for reuse includes second-hand thrift clothing.

Shred: An industrial shredder can process clothing, shoes, and other textiles. For example, like-coloured EoL textiles are put into a large shredder machine to cut the fabric into very small pieces. The resulting material is called *shoddy* and is similar to the consistency of shredded paper.

Textiles category: May include clothing, footwear, household-use fabrics (drapes, blankets, bedding, rags, etc.), and other (handbags, floor mats, area rugs, etc.) Not included in textiles category is mattress fabric, carpet, furniture fabric, luggage, tents, and other consumer products. Categories will be adjusted as new end markets emerge for greater textile waste diversion efforts.

Textile recycling: The method of reusing or reprocessing used clothing, fibrous material, and clothing scraps from the manufacturing process. Textiles for recycling are mostly generated from two primary sources of textile waste: post-consumer textile waste includes garments, vehicle upholstery, household items, and others. Pre-consumer textile waste includes scrap created as a by-product from yarn and fabric manufacture, and the post-industrial scrap textiles from other industries.

Textile Shred to Thread: Shredded cotton textiles are combed and carded to get the fibres back to a fluff stage similar to raw cotton. Recycled fibres are mixed with new fibres and then spun into thread and multiplied to form yarns. This thread would be used to make new garments. Shredding of cotton and polyester involve two different processes that use different technology.

Textile value: The inherent value and economic worth of a textile product, whether or not the product is re-wearable. The contents of any given textile product are textile fibres, which are valuable for further use in recycled textile-based materials and products.

Textile waste: Describes unwanted discarded textiles, for which the owner has no further use. There are two types of textile waste: post-consumer and pre-consumer.

Tipping fee: Also known as a gate fee, it is the charge levied upon a given quantity of waste received at a waste processing facility. In the case of a landfill, it is generally levied to offset the cost of opening, maintaining, and eventually closing the site. It may also include any landfill tax, which is applicable in the specific region.

Zero waste: A philosophy that encourages the redesign of resource life cycles so that all products are reused. No trash is sent to landfills or incinerators. The process recommended is similar to the way that resources are reused in nature.

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APPENDIX

Figure 1: Examples of visual messaging with logos/symbols to strengthen written information. Donation bin located in an office building for donor convenience, San Francisco, 2016.

Figure 2:
An example of inconsistent messaging on an AFTeR member donation bin, Nova Scotia, 2017.

Figure 3:
An example of inconsistent messaging on an AFTeR member donation bin, Nova Scotia, 2017.

Figure 4:
A working example of public education about textile waste and its diversion, Vancouver, 2013.

Figure 5:
Example from the Halifax Recycles app. Type in “Textiles.”

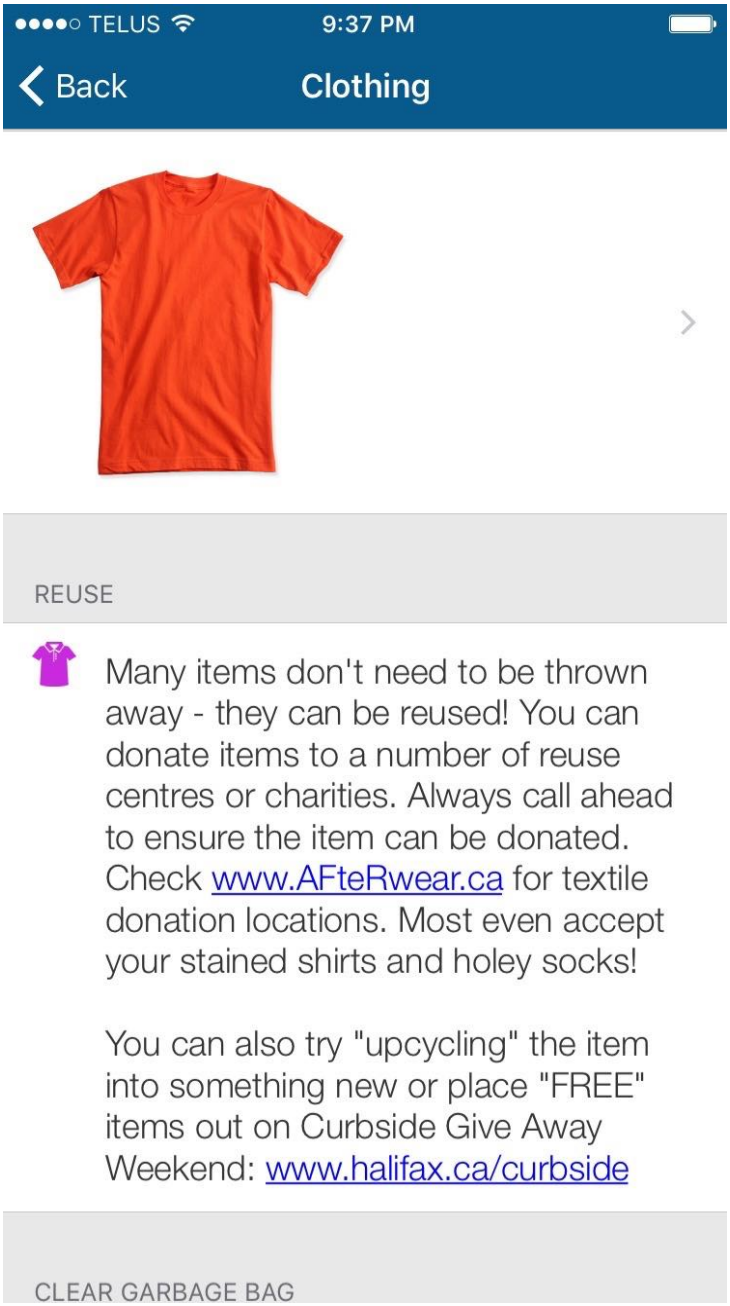

Figure 6:
Example of “every garment is welcome” in City of Markham textile donation flyer, 2016.

Figure 7:
Example of municipally managed “high-tech” textile donation containers at city facilities in Markham, Ontario, 2016.

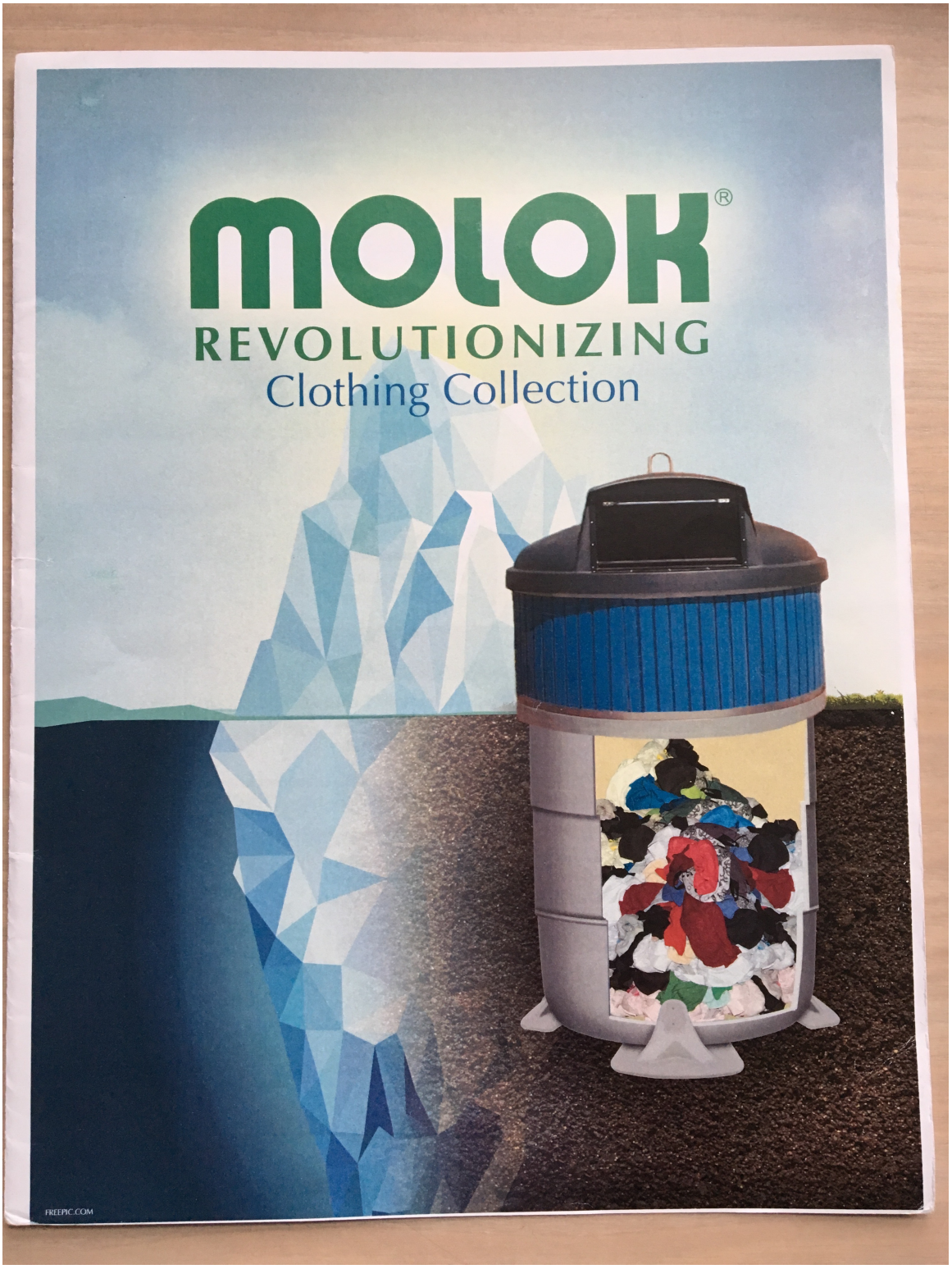

Figure 8: WRAP Conclusions from *Evaluation of the end markets for textile rag and fibre within the UK,* published in May 2014, of the potential opportunity for EoL textiles recycling in various end markets by 2020.

6.0 Conclusions

The potential opportunity for EoL textiles recycling in the various end markets by 2020 is summarised in Table 4, if measures are implemented to reduce some of the bottlenecks.

End Market	Volume in tonnes of textile rags – demand in end market	Potential revenue for EoL textile suppliers to end market[51]
Insulation	25kt	£7.5 million
Automotive	11kt	£3.3 million
Wiper	40kt	£28 million
Flocking	30kt	£9 million
Fibre to fibre – nylon	631kt	£90 million
Fibre to fibre-polyester	653kt	£105 million

Table 4: Breakdown of CS&HH consumption

This indicates that there is potential opportunity for approximately 106kt[52] of textile rags to be recycled by 2020. There is potential to further increase the demand for textile rags if the end markets were to be stimulated through various interventions demonstrated in this study.

Reuse grade material forms a major component of revenue for most UK based reprocessors. Increasing the quantity of textiles diverted from landfill towards recycling would result in higher quantities of low value clothes for collectors and sorters. This will increase the cost of collection and sorting per tonne of reuse grade material for reprocessors and reduce their profit margins; however the reuse grade will also increase in quantity.

If these end markets can be initiated so that the reprocessors could get more value for recycle grade material this in turn will cover the increased cost of collection and sorting and improve their profitability. The interventions that could help instigate the end markets, diverting textiles from landfill and incineration, could include:

- Tax incentives to encourage businesses to use recycled textile based materials;
- Funding and marketing support for new businesses in recycled product manufacturing;
- Promotion of end consumer awareness of recycled textile based products;
- Restriction of textile waste disposal to landfill and EfW plants;
- Promotion of use of recycled textile based products within public institutions;
- Levy charges to assist in funding collection, sorting, tax incentives and research and development costs; and
- Encourage research and innovation within textile recycling sector.

Further research is also required into new end markets, collaborating with manufacturing industries to link technical advances and end products.

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[50] *http://www.materialconnexion.com/Home/News/PressReleases/ICFFEditorAward/tabid/733/Default.aspx*
[51] *Refer to estimates described in previous sections. Please note- these are indicators for potential revenues for reprocessors and the profitability of the business will also depend on the costs incurred. Please refer to detailed description of end markets.*
[52] *Sum of demand in Insulation, Automotive, Wiper and Flocking end markets. Fibre to Fibre is not commercially adopted in the UK yet, hence only a potential opportunity.*