MUTREC

# CIRCULARITY OF THE TEXTILE INDUSTRY IN QUÉBEC

## Opportunities for unloved fibers

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# MUTREC: IMPROVE TEXTILE WASTE MANAGEMENT THANKS TO PRINCIPLES OF CIRCULAR ECONOMY

Photo credit: MUTREC

The open innovation consortium MUTREC was formed in the spring of 2018 after RECYC-QUÉBEC[1] launched a call for projects. Its purpose is to look into the challenges of reusing residual textiles and Its members are researchers, designers as well as representatives of the government, industries and retail trade.

The collective brings together experts capable of understanding the flow of textile materials through Québec and using that knowledge to determine how to minimize textile waste in the province.

## What potential for unloved textiles?

Keeping the final objective in mind (i.e. improve the circularity in the textile industry of Québec), the consortium quickly structured its work into three critical steps:

**1. inventory**
Drawing a portrait of the use of textile in the province of Québec nowadays

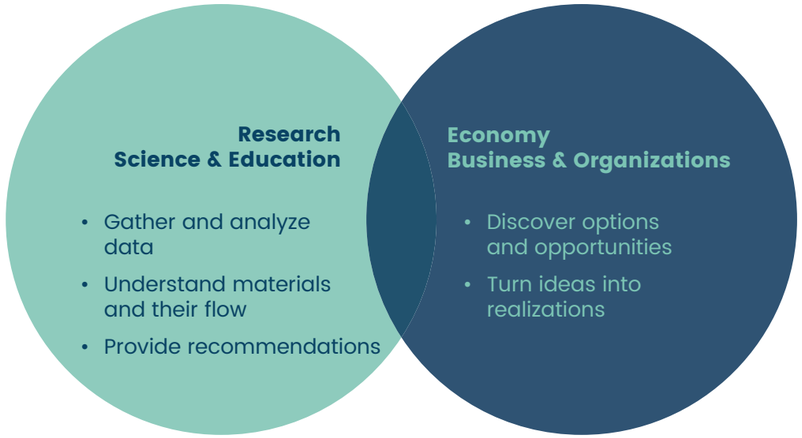
**2. analysis**
Characterize the textile materials from the ICI sector (industrial, commercial and institutional organizations) and identify opportunities

**3. solutions**
Explore, propose et prioritize future actions for improvement

This document summarizes findings from the research conducted from 2017 to 2020 and proposes ideas and further steps towards a more circular use of textiles in Québec.

[1] Programme d'aide visant les débouchés de matières résiduelles des ICI (APDICI)

## Cross-sectoral goals




## A long way to go

**2017**

**March 1st to December 1st, 2017 :**
- Collect, meet, analyze
- Map textile flows on the territory

**2018**

**January 2018 to July 2019**
- Characterization of textiles from different industrial sectors, quantify data
- Build a list of semi-industrial textile processing techniques
- Identify and prototype market opportunities

**2019**

**August to October 2019**
- Assess impacts
- Test prototypes' performances
- Propose and prioritize next action steps

**2020**

**2020**
- Disseminate results, mobilize, continue the work

## TOO MUCH LINEARITY (48%) IN THE TEXTILE INDUSTRY

**The textile industry in Quebec is a lot about consumption; not so much about recycling.**

**Local production of fiber is non-existent; finished products are widely imported; there aren't many market opportunities for textiles at the end of their life.**

**The province of Québec suffers from an essentially linear organization of this industry sector, whether it's about fashion, furnishings, uniforms or for institutional bedding.**

## Production

- Québec's production of textile fibers is anecdotal.
- Québec relies on import.
- Most of the finished clothes consumed in the Province are imported, often from China and Bangladesh.

A vast majority (82 %) of clothing come from outside the country.

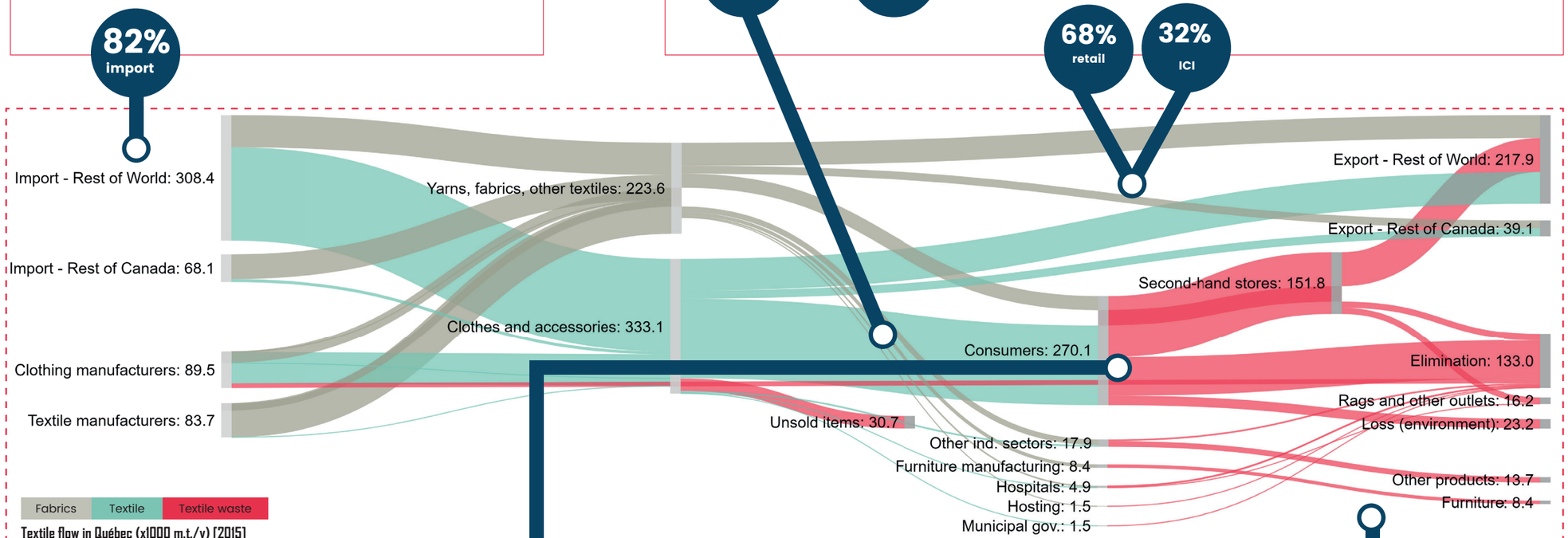
## Consumption

The inhabitants of Québec consume nearly 343,000 tonnes of new textile products per year, i.e. 40 kg/cap/year. 69% are finished products; 31% are materials (threads, fabrics and others).

**Most textiles are finished products intended for consumption:**

Nearly 232,100 tonnes (68%) belong to the retail industry.

110,900 tonnes (32%) are used by the institutional, commercial and industrial sectors (ICI), either in the composition of their products (like furniture, materials), as uniforms (workers, police, army, etc.) or other textiles like sheets in hospitals and hotels.




**Textile flow in Québec (x1000 m.t./y) [2015]**
Sources: Éco Entreprises Québec, RECYC-QUÉBEC, Statistics canada. Methodology: CTTÉI

## Recovered textiles

- Most of the textile waste are collected in urban centers, i.e. 60% the Greater Montréal and 25% near the city of Québec.
- In the other regions, the cost of transport and the low volume of textiles make them difficult to recover.
- Only the products in good condition are sent for reuse.

60% Montréal

25% Québec

## Recovery

Almost 150,000 tonnes of post-consumer textiles transit through specialized collectors. Current outcomes are:

- **133,000 tonnes (48 %) of all textiles recovered on the territory are eliminated**
- 83,400 tonnes (30 %) are exported
- 23,200 tonnes (8 %) are dissipated to the environment (wear and tear, degradation)
- 22,100 tonnes (8 %) are stocked in products such as furniture
- 16,200 tonnes (6 %) are recycled
- Less than 1 % are incinerated (energy recovery)

Few recycling channels currently exist: some clothes are turned into rags and some cut scraps are defibrated to produce felts.

Opportunities are particularly limited for post-consumer textiles.

## WHAT POTENTIAL FOR CIRCULARITY?

The MUTREC team used several methods and tools in order to facilitate the valuation of unloved textiles, such as characterizing different textile deposits, identifying the processing, packaging and valuation techniques available on the territory and exploring markets opportunities.

Photo credit: MUTREC

## Identify the materials

The analysis of several deposits of residual textile allowed to identify and better understand the available materials: fiber composition, characteristics of each batch (size, wear, presence of non-textile elements).

**Goal: define the properties and determine the best recycling opportunities.**

Three types of residues were analyzed:

- Hospital textiles
- Work uniforms
- Cut-off scrap from the clothing, boots and stuffed furniture manufactures

Even if they come from hospitals, which technically belong to the ICI sector, hospital textiles and work uniforms are considered as post-consumer waste, because they have been used already. Cut-off scrap from the clothing, furniture and shoe industries are categorized as post-industrial residues.

**Hospitals**

Cotton/polyester, lightweight woven, large dimension, presence of holes, PVC lamination, blue/green colors

**Uniforms**

Acrylic, cotton/polyester, polyester/wool, woven and knit, presence of stains, buttons, snap buttons, zippers, corporate branding elements

**Clothing scrap**

Viscose/spandex, polyester/spandex, lightweight knit with interlining and iron-on pieces, presence of paper and plastic wrap

**Boot scrap**

100% polyester, wrap knit/non-woven black thick fleece, metallic plastic wrap

**Furniture scrap**

Polyester, rigid jacquard woven with polymer coating

## Explore opportunities

To feed the reflection, artisanal methods and textile techologies have been inventoried. The below table portrays technologies and explore their links to various textiles in order to identify the best added-value market opportunities.


Tested - Possible
To be tested
Tested - Impossible
Non applicable

**Applicability of transformation processes for each material**

## Technology

Québec manufacturers offer a wide variety of transformation processes that can be applied to the deposits under study.
Nevertheless, the study demonstrated a lack of local expertise and equipment for defibrating, topping and felting post-industrial or post-consumer textiles.
This constitutes a major obstacle to the developement of outlets for these materials.

# Explore opportunities (continued)

## Ideation


Participants in the co-creation and networking workshop, from left to right: Pablo Tirado, Cindy Couture, Alexandre Ferrari and David Dussault

Collective thinking completed in «open innovation» mode with researchers, industrial designers and stakeholders highlights the importance of the collaboration between different sectors: applied research, manufacturing industry, retail and product development.

- Imagine recycling and transformation methods of materials that would leverage on their intrinsic value
- Evaluate how retailers, manufacturers and designers can collaborate

Several reuse opportunities were considered: redesign, promotional objects, home accessories, bedding, acoustic panels, padding, etc.

**House & household rags**

A promising outcome

**Bed throws**

Promising output; to be confirmed

**Mycelium promotional items**

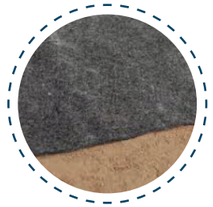
Promising output; friability defects to be neutralized

**Redesign of uniforms into fashionable clothes**

Promising but costly outcome due to unadequate design of uniforms

**Furniture stuffing (non-woven)**

Promising, but flammability defect to be neutralized; mechanical tests shall be conducted.



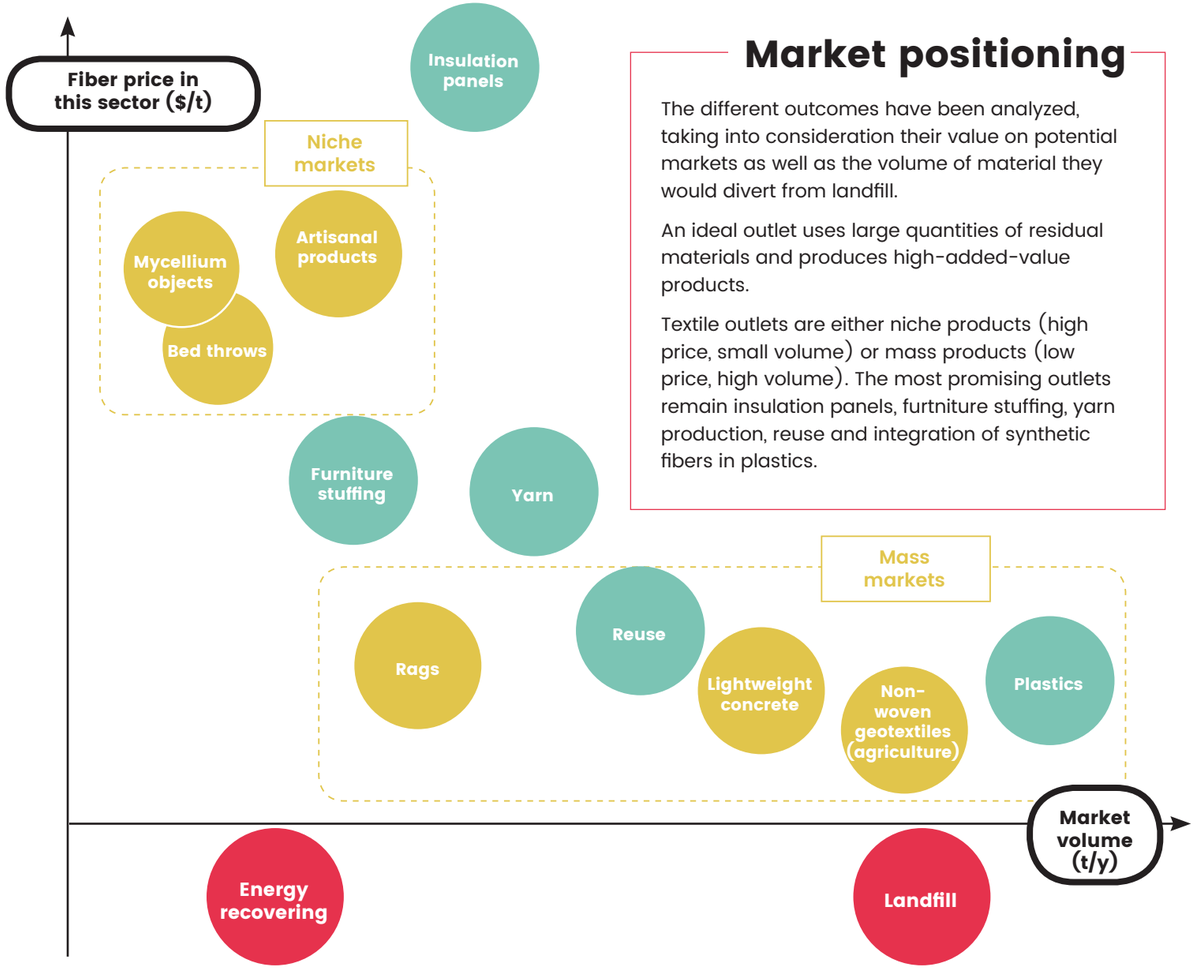
**Production of non-woven geotextiles for agriculture**

Lack of equipment (shredder)

**Artisanal products**

Lack of outlets/partners






## Market positioning

The different outcomes have been analyzed, taking into consideration their value on potential markets as well as the volume of material they would divert from landfill.

An ideal outlet uses large quantities of residual materials and produces high-added-value products.

Textile outlets are either niche products (high price, small volume) or mass products (low price, high volume). The most promising outlets remain insulation panels, furtniture stuffing, yarn production, reuse and integration of synthetic fibers in plastics.

## CONCLUSION

The innovative opportunities identified during this project shall allow to:

- **Divert** targeted textiles from landfill
- **Support** industry thanks to technical, multi-disciplinar expertise
- **Assess** economic, social and environmental impacts for decision-making
- **Involve** all relevant players in the value chain.

These outcomes should be considered for all post-consumer textiles (including clothes). Indeed, tonnage is more and more voluminous, and volume should be considered as the most important asset for profitable outcomes.

# LOOKING AHEAD

The research project carried out by MUTREC highlights the levers to support the industry's transition to a circular economy and thus accelerate the circularity of the textile industry.


Photo credit: MUTREC

## Anticipate

As with all manufacturing sectors, upstream design of products that holds account of the entire life cycle is conducive to developement of a circular sector. Let us focus on **eco-design**.

- Extend the life of textile products by offering quality materials and durable manufacturing that will withstand prolonged use and maintenance.
- Design products for a second life cycle, for example facilitate the removal of logos and corporate colors from uniforms.
- Choose materials free from harmful substances that could damage ecosystems if they were dispersed into the environment.
- Choose textile products made from a single fiber material, without contaminants. If accessories or other non-textile items must be present, design their separation upstream.
- Optimize patterns and their placement before cutting in order to reduce or even eliminate cuttings.
- Plan the use of scraps for other products.

## Collect

The recovery of residential textiles is well established in our territory. It is not the case for the recovery of industrial, commercial and institutional textiles. Such a system must be created or best practices should at least be established.

Sort the leftovers according to their fiber content, size and color in order to facilitate resale and recycling

Establish a network of «buyers» who could modify uniforms and unsold inventories for the purpose of redistribution

Encourage the reuse of post-consumer textiles and funding for collecting, sorting and packaging activities thanks to eco-contribution

## Recycle

Once the textiles have been recovered, our study demonstrates that they can be reused. Technologies must be developed to facilitate recycling: cleaning, automated sorting, cutting, decontamination, fraying.

**Continue testing and developing ecomaterials using textiles residues**

- Degradation and transformation by mycelium
- Use fillers in the production of solid materials (as a replacement of plastic and wood; to be mechanically tested)

**Push the development of hospitals residues further**

- Carry out a pilot project: produce household and throws with rags
- Develop supply of hospital linen in order to sustain this reuse opportunity

**Develop technological tools to recycle textiles in Québec**

- Invest in pilot equipment for sorting, defibration/needling, topping and felting
- Collaborate with institutions that are currently working on the subject like George Brown College (Ontario), the Centre Européen des textiles innovants (France), Circle Economy (Netherlands)

## Regulate

At the time of this study, Ontario, Manitoba and Québec had laws on padding materials prohibiting the use of post-consumer recycled fibers.
In 2020, Ontario revoked its legislation, opening the door to the use of recycled materials.
In Québec, the Ministry of Economy and Innovation (MÉI) began revising the Law on stuffing materials and padded items. Currently, the use of padding material is controlled and any recycled material must receive a specific approval from the MÉI inspector.

**Establish global or sectoral targets pushing the reuse of textiles in Québec**

- Minimize the landfilling of unsold items
- Establish recovery and reuse targets at the provincial level

**Modernize the law**

- Allow, facilitate and even encourage the use of post-consumer fibers for various products
- Create opportunities that will improve the reuse of all textile residues

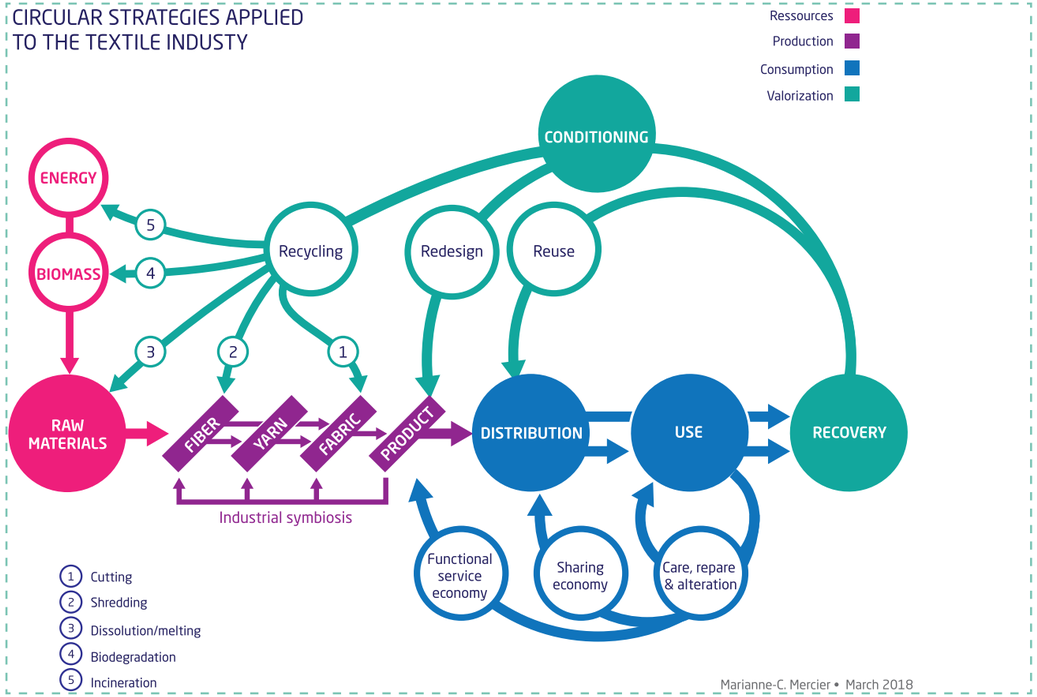
## TOWARDS MORE CIRCULARITY IN THE TEXTILE SECTOR

The circular economy is defined as *« a system of production, exchange and consumption aimed at optimizing the use of resources at all stages of the lifecycle of a good or a service, in a circular logic, while reducing the environmental footprint and contributing to the well-being of individuals and communities »* (Institut EDDEC, 2018).

In order to move towards a circular economy for textiles, MUTREC aspires to:

- Develop market opportunities for collected, second-hand textiles
- Deploy innovative business models, such as shared wardrobes, refurbishment of uniforms or closed-loop recycling by distributors
- Focus on the eco-design of textile products
- Set up an ICI textile recovery system
- Develop sorting tools and protocols
- Promote cooperation between textile actors

## Strategies of circularity in the textile economy




Source: Marianne-C. Mercier, 2018


Photo credit: MUTREC

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MUTREC is a group of experts from various disciplines, combining their know-how and creativity to approach issues associated with the valorization of the textile residues in an innovative way.

To find out more about MUTREC actions and take part in the new circular textile industry of Québec, please contact

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