RetroTO: Sustainability Engagement Strategy

January 25, 2026 | Presented by the Five Loyal Customers

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01 - Overview

- **17kg / household** Toronto clothing waste [1]
  - Municipal landfills **full by 2035** [2]
- **65%** textile waste is reusable and **21%** recyclable. [3]
- Toronto residential gas heating is the largest emissions source (**26%**) [4]
- **24%** of residents can't afford climate upgrades [5]
- Final Report of Toronto Residents' Reference Panel on Inclusive Climate Action
  - **Barrier 5:** Distrust in Corporations and Institutions
  - **Barrier 2:** Affordability

Credit: Getty Images

[1] CITY OF TORONTO, "Waste Reduction," City of Toronto, Nov. 16, 2017. https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/waste-reduction/
[2] City of Toronto, "Residual Waste Management," City of Toronto, Nov. 15, 2024. https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/residual-waste-management/
[3] City of Toronto, "Textile Waste Diversion and Reduction Initiatives REPORT FOR ACTION Textile Waste Diversion and Reduction Initiatives," 2020. Available: https://www.toronto.ca/legdocs/mmis/2020/ie/bgrd/backgroundfile-146525.pdf
[4] City of Toronto, "Toronto Sector-Based Emissions Inventory Dashboard," City of Toronto, Jun. 28, 2024. https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/toronto-sector-based-emissions-inventory-dashboard/
[5] City of Toronto, "Toronto Residents' Reference Panel on Inclusive Climate Action," City of Toronto, Sep. 27, 2024. https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/toronto-residents-reference-panel-on-inclusive-climate-action/

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01

Accelerate a rapid reduction in gas use in buildings

Action 1: Support programs for voluntary action in residential buildings.
Action 2: Uphold Toronto Green Standard performance measures lower GHG new construction
Action 3: Lead by example by moving City of Toronto buildings toward net zero

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Working Towards the TransformTO Vision: Net Zero Strategy Action Plan

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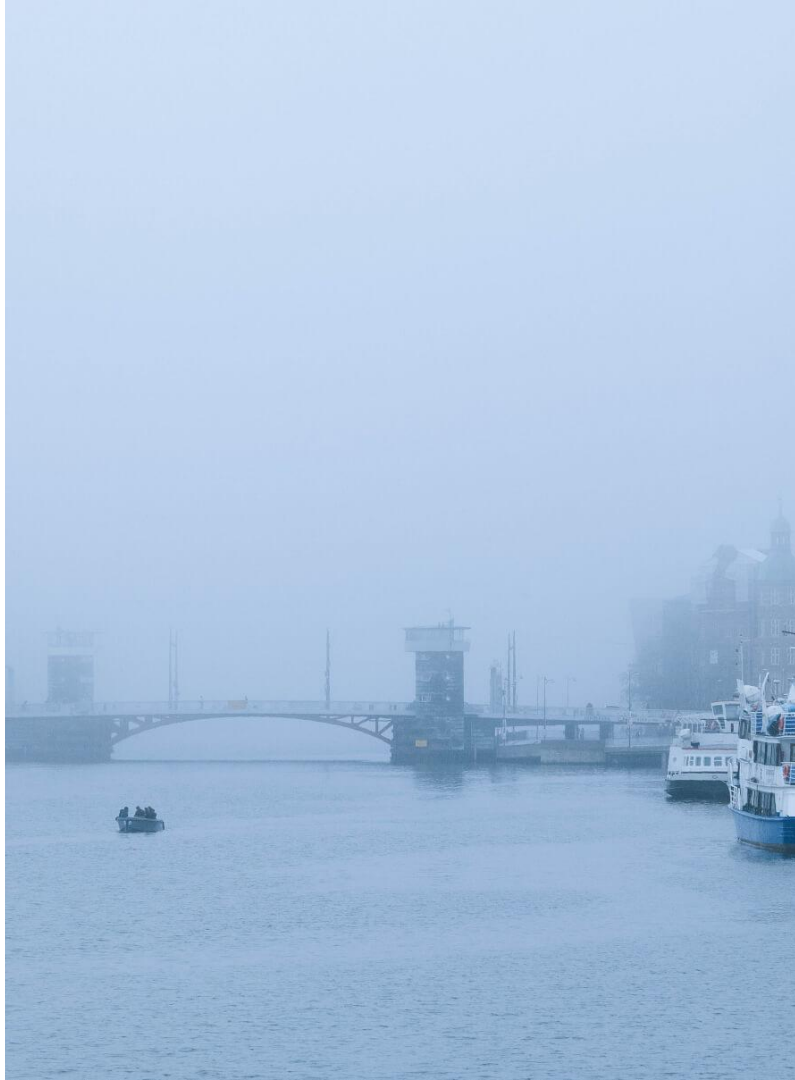

01

Retrofitting: the process of modifying an existing building to improve its energy performance, comfort, and thermal resilience. [1]

- Retrofits using eco-materials achieved an **86.6%** reduction in CO_2 emissions vs. traditional methods [2]
- Combined retrofits (sealing + insulation) had **42% to 48%** energy savings for residents in older houses in BC [3]
- Toronto residents have reduced GHG emissions by **50%** through insulation alone**.** [4]
- **Minor retrofits (i.e. insulation):** less invasive (no "fear of renoviction"), non-toxic, tenants would not have to relocate, **finishes within 3-6h** in apartments. [5]

[1] N. R. Canada, "Retrofitting - Natural Resources Canada," Canada.ca, 2025. https://natural-resources.canada.ca/energy-efficiency/building-energy-efficiency/retrofitting
[2] C. Prados, M. Alejandro, M. Conde, M. Rojas, P. Rojas, and M. Jesús, "Eco-Efficient Rehabilitation of Protected Buildings: Energy, Environmental and Economic Analysis of Two Action Strategies," Ssrn.com, 2022. https://ssrn.com/abstract=4158625 (accessed Jan. 25, 2026).
[3] British Columbia, "Innovative housing retrofits will benefit residents, environment," BC Gov News, Mar. 2022.
https://news.gov.bc.ca/releases/2022AG0039-000381#:~:text=With%20careful%20design%2C%20deep%20retrofits,health%20and%20substance%2Duse%20challenges. (accessed Jan. 25, 2026).
[4] Green Communities Canada, "Retrofitting Canada's Homes: Progress Report #1," 2023. Available: https://greencommunitiescanada.org/wp-content/uploads/2023/11/FINAL-GCC-DER-Report.pdf
[5] U. O. Pearl, "Insulation Installation Timeline: What to Expect and How Long It Really Takes," Nealoninsulation.com, Jan. 19, 2026. https://www.nealoninsulation.com/blog/how-long-does-it-take-to-install-insulation

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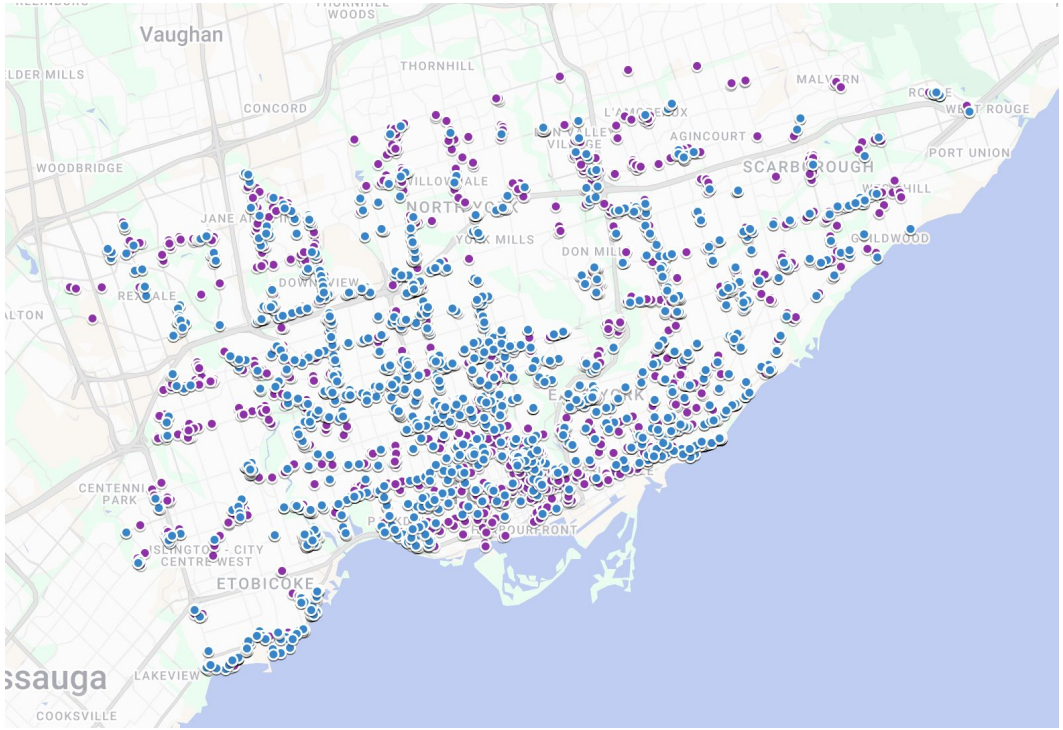
02 - Framing

Turning textile waste into R-PET insulation in retrofitting, by localizing sorting and processing in all 25 wards, focusing on pre-1980s apartment homeowners (674,170 homes) who face high utility bills and poor thermal resilience.

02 - Overview



674,170 Homes Built Before 1981 [1] **58%**

1 in 3 are **low income families** [2] **33%**

Ethnically Diverse Communities [3][4][5][6] **~66%**

● = buildings built before 1981
● = buildings built after 1981

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[1] Woodsmith Construction, "oronto's Real Housing Crisis Is Hidden in Its Aging Homes – And the Backlog Is Bigger Than Anyone Thinks," Woodsmith Construction Inc, Dec. 2025. https://woodsmith.ca/the-blueprint/renovation-resources/toronto-aging-housing-stock-renovation-crisis/
[2] Knowledge Finder, "Toronto, ON," Uli.org, Dec. 02, 2020. https://knowledge.uli.org/en/reports/aspr/2020/toronto-on (accessed Jan. 25, 2026).
[3] "Community Council Area Profile Scarborough Key demographic information based on the Census of Population." Accessed: Jan. 25, 2026. [Online]. Available: https://www.toronto.ca/wp-content/uploads/2024/01/8cdd-CityPlanning-2021-Census-Profile-Scarborough-CCA.pdf?
[4] K. Y. Leng, "8ce5 CityPlanning 2021 Census Profile North York CCA," Scribd, 2021. https://www.scribd.com/document/824780014/8ce5-CityPlanning-2021-Census-Profile-North-York-CCA (accessed Jan. 25, 2026).
[5] E. York, "Adapted from Statistics Canada," 2021. Accessed: Jan. 25, 2026. [Online]. Available: https://www.toronto.ca/wp-content/uploads/2024/01/8d42-CityPlanning-2021-Census-Profile-Etobicoke-York-CCA.pdf?
[6] Grokipedia, "Demographics of Toronto neighbourhoods," Grokipedia, Jan. 21, 1970. https://grokipedia.com/page/demographics_of_toronto_neighbourhoods (accessed Jan. 25, 2026).

02 - Why Now?

Type of Insulation	Expected Lifespan
Fiberglass Batts	20–30 years
Blown-In Fiberglass	20–30 years
Cellulose	20–30 years
Mineral Wool (Rockwool)	30–80 years
Spray Foam (Open-Cell)	50–80 years
Spray Foam (Closed-Cell)	80+ years
Radiant Barrier	10–20 years

Lifespan of common types of insulation [1]

batts to rigid board and foam. Mineral products are the best known and most widely used, fibreglass being the most common, but organic materials, specifically cellulose fibre, has become almost as popular because of its low cost, availability and good insulating properties. Though

Government of Canada, 1981 [2]

1980s - 1990s ⟶ **2010s - 2020s**

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[1] Arvada Insulation Contractors, "How Long Does Home Insulation Last? Complete 2025 Guide," Arvada-insulation.com, Sep. 06, 2025. https://www.arvada-insulation.com/how-long-does-home-insulation-last (accessed Jan. 25, 2026).
[2] Canada, "Information archivée dans le Web | Information Archived on the Web," Publications.gc.ca, 2022. https://publications.gc.ca/collections/collection_2022/schl-cmhc/NH17-359-1981-eng.pdf (accessed Jan. 25, 2026).

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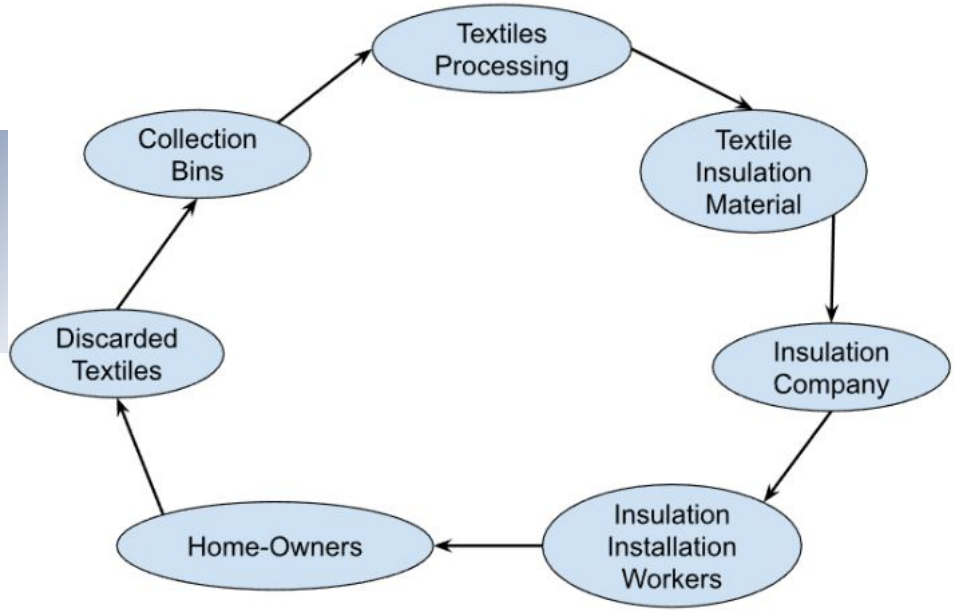

General Pipeline of Implementation Circular Economy

The greener insulation would be available to consumers at cheaper costs (**20-60% cheaper than fibreglass**), and they would be notified of their future savings.

Think: Recycled glass sales

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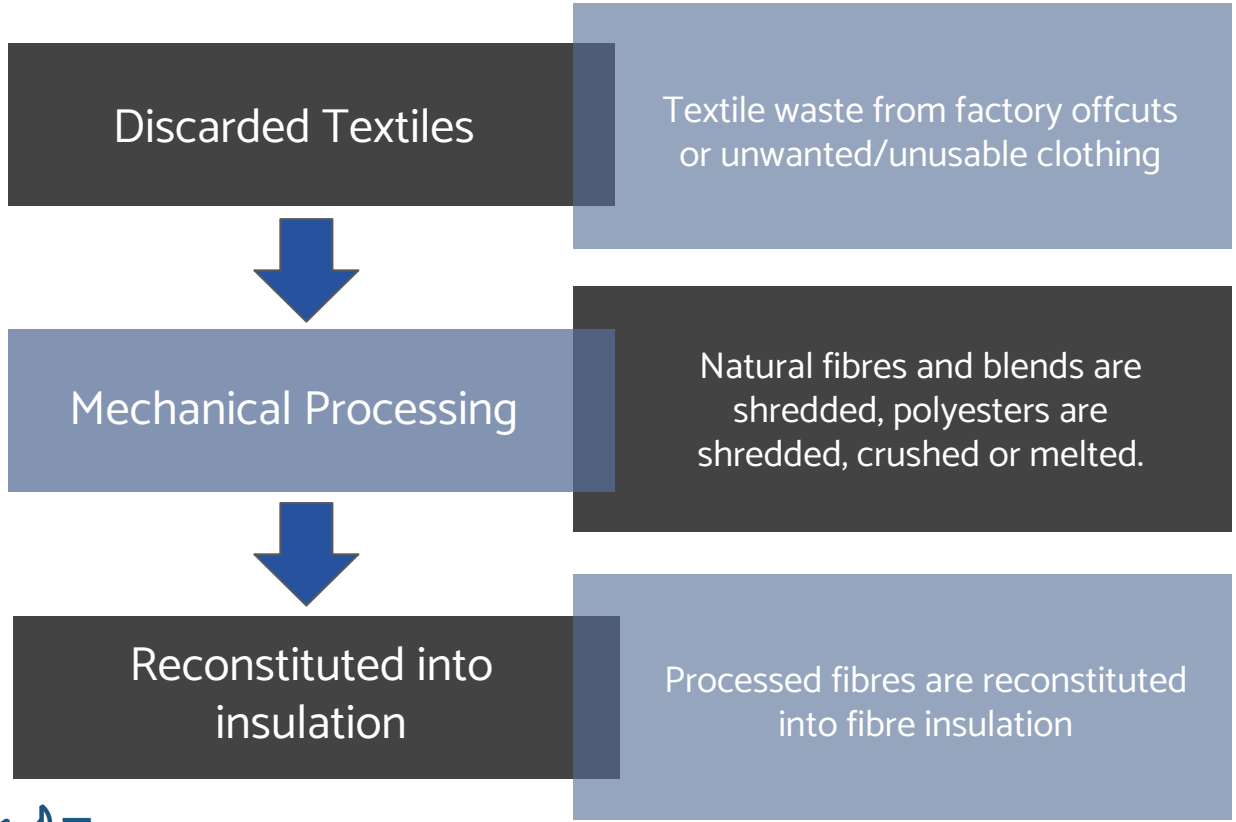
03 - Implementation



Textile Pipeline

- Recycled polyethylene terephthalate (R-PET) is **20–60% cheaper** than virgin raw material [1]
- **50–70%** less energy consumption [1]
- **50–60%** reduction in petroleum feedstock consumption [1]
- Reduced carbon emissions by **42%** compared to new plastic production [2]
- Able to achieve R-40, standard for walls [3]

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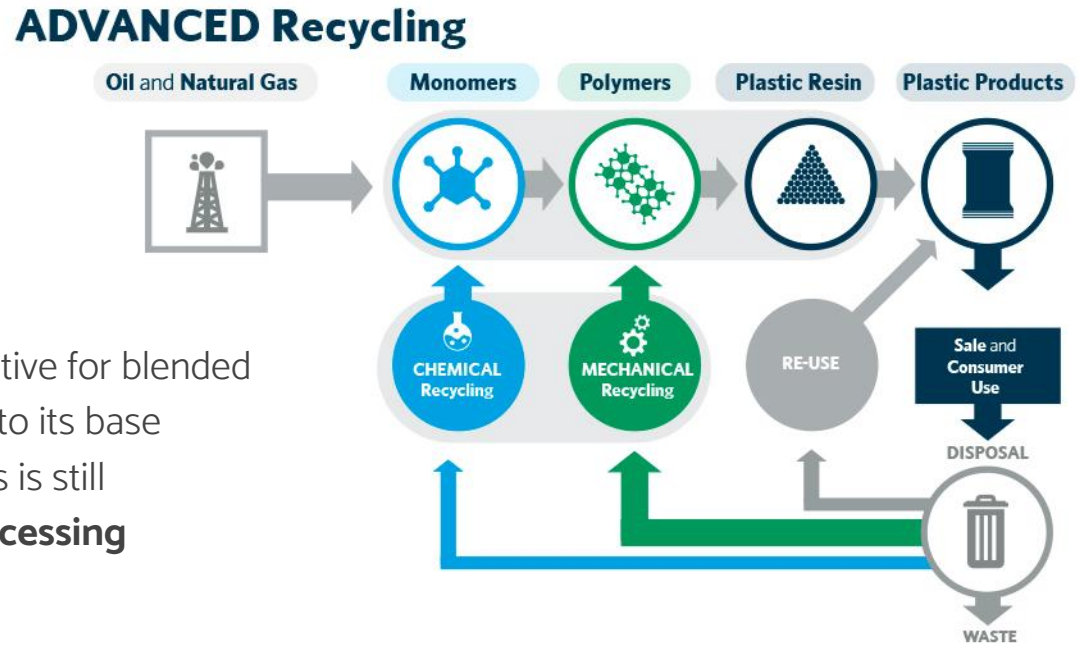
[1] A. Hegyi, H. Vermeşan, A.-V. Lăzărescu, C. Petcu, and C. Bulacu, "Thermal Insulation Mattresses Based on Textile Waste and Recycled Plastic Waste Fibres, Integrating Natural Fibres of Vegetable or Animal Origin," Materials, vol. 15, no. 4, p. 1348, Jan. 2022, doi: https://doi.org/10.3390/ma15041348.
[2] J. Saleem, F. Tahir, M. Z. K. Baig, T. Al-Ansari, and G. McKay, "Assessing the environmental footprint of recycled plastic pellets: A life-cycle assessment perspective," Environmental Technology & Innovation, vol. 32, p. 103289, Nov. 2023, doi: https://doi.org/10.1016/j.eti.2023.103289.
[3] Yasir B, "What Does R40 Insulation Mean? A Complete Guide for Homeowners - Sprayfoam Solutions Toronto," Sprayfoam Solutions Toronto, Apr. 08, 2025. https://spfsolutions.ca/2025/04/08/what-does-r40-insulation-mean/ (accessed Jan. 25, 2026).

Why mechanical processing?

- While chemical processing is also used it produces **more chemical waste**, including PAHs, VOCs, and heavy metals[1]

- Chemical processing is more effective for blended textiles, since it can break it down to its base components, however this process is still **inefficient and not meeting processing capacity**[1]



[1] E. Fox, "Chemical Recycling: A dangerous deception," Beyond Plastics - Working To End Single-Use Plastic Pollution, https://www.beyondplastics.org/fact-sheets/chemical-recycling (accessed Jan. 25, 2026).
Image: https://www.amcor.com/insights/educational-resources/chemical-recycling-flexible-plastic-packaging

04 - Stakeholders & Equity

Targets:

- Targeting people who pay **utility bills** to save energy costs and improve infrastructure [1]
- Homeowners will face an increased property value (up to **60%**) [2]

- Homeowners get a cheaper insulation when replacing insulation every 15-20 years [3]
- Human Centered Design → **involving stakeholders** in development plans.
- For clothes sorting and manufacturing, long-term unemployed people can find small gigs, through sorting of clothing or within the recycling. [4]

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[1] [1] M. Papineau, "Understanding Energy Consumption Behavior in a Landlord-Tenant Context: What Do the Numbers Tell Us?," Carleton University, https://carleton.ca/cserc/wp-content/uploads/Landlord-Tenant_CSERC_2015.pdf (accessed Jan. 25, 2026).
[2] [1] "Your guide to building retrofits," BDC.ca, https://www.bdc.ca/en/articles-tools/sustainability/climate-action-centre/articles/practical-guide-retrofitting-building-energy-efficiency#:~:text=Upgrade%20your%20building%20to%20save,interior%20environment%20for%20your%20employees (accessed Jan. 25, 2026).
[3] "Net zero building retrofit guides insulation technology companion guide," City of Toronto, https://www.toronto.ca/wp-content/uploads/2025/08/8f5b-P3.13-Insulation.pdf (accessed Jan. 25, 2026).
[4] "Labourers in textile processing and cutting," WorkBC, https://www.workbc.ca/career-profiles/labourers-textile-processing-and-cutting#:~:text=Yarn%20salvager-,Duties,other%20textile%20workers%20as%20needed (accessed Jan. 25, 2026).

05 - Competitors

Existing solutions

- Retrofitting insulation in older homes cut GHG emissions by **25%** [1]
- France uses retrofit insulation to provide jobs for people, although costly because of no grants.

  Uses **85% cotton, 15% polyester** which are fireproof. [2]
- Current HELP program supports the **Transform TO (Net Zero) initiative.** However, does major *and* minor retrofits (invasive) [3]

What makes us novel

- Support both **TransformTO and Circular Toronto**, using **50 - 70% less energy** while achieving **20 - 60 % lower cost** than virgin insulation, decreasing waste by **1,685 Tonnes** at pilot. Provide lower cost and higher savings targeted to lower income families to achieve equity.

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[1]"Energy Improvements in Older Homes - Vancouver Heritage Foundation," Vancouver Heritage Foundation, Jul. 07, 2021. https://www.vancouverheritagefoundation.org/resources/building-owners-guide/energy-improvements-in-older-homes/ (accessed Jan. 25, 2026).
[2] B. McCulloch, "Old clothes turned into home insulation and sold in French DIY shops," Connexionfrance.com, Nov. 25, 2022. https://www.connexionfrance.com/practical/old-clothes-turned-into-home-insulation-and-sold-in-french-diy-shops/181068 (accessed Jan. 25, 2026).
[3] "TransformTO Net Zero Strategy Action Plan 2026-2030," City of Toronto, Oct. 31, 2024. https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/transformto-net-zero-action-plan/

05 SWOT Analysis

Strengths

- **Unique** solution combining retrofitting and textile recycling in Toronto
- Targets **residents** otherwise unconcerned with energy use and insulation

Weakness

- **Engineering assessment** is required for load-bearing capacity [1]
- Implemented by the **city**, progress will be slow
- More thickness may be required to reach ideal R-values.

Opportunities

- Expand initiatives to throughout the GTA
- Enhanced community involvement
- So many old buildings → easier to scale and standardize this approach

Threats

- Lack of engagement and trust due to cultural barriers

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[1] Baeumler Approved, "Baeumler Approved," Baeumler Approved, Sep. 18, 2024. https://www.baeumlerapproved.ca/blog/renovating-a-heritage-home-in-ontario-what-you-should-know/ (accessed Jan. 25, 2026).

06

Scenario	Homes Converted	Clothing Waste Diverted [5]	Landfill Space Equivalent [5]	Energy Saved (GJ) [1]	CO2e Reduced (Tonnes) [2]	Total Money Saved by Residents [3]	City "Profit" (Avoided Costs) [4]
1% Pilot	**6,741**	**1,685 Tonnes**	**~85 Garbage Trucks**	**252,814**	**11,309**	**$2.02 Million**	**$1.56 Million**
50% Adoption	337,085	84,271 Tonnes	~4,200 Garbage Trucks	12,640,687	565,460	$101.1 Million	$78.2 Million
100% Target	674,170	168,542 Tonnes	~8 NBA Arenas worth of waste	25,281,375	1,130,920	$202.2 Million	$156.4 Million

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[1] TransformTO Net Zero Strategy Action Plan
[2] T. Semba, Y. Sakai, M. Ishikawa, and A. Inaba, "Greenhouse Gas Emission Reductions by Reusing and Recycling Used Clothing in Japan," Sustainability, vol. 12, no. 19, p. 8214, Oct. 2020, doi: https://doi.org/10.3390/su12198214.
[3] "Why Seal and Insulate? | ENERGY STAR," www.energystar.gov. https://www.energystar.gov/saveathome/seal_insulate/why-seal-and-insulate
[4] "City of Toronto approves 2026 interim rates and fees for Toronto Water and Solid Waste Management Services," City of Toronto, Dec. 16, 2025. https://www.toronto.ca/news/city-of-toronto-approves-2026-interim-rates-and-fees-for-toronto-water-and-solid-waste-management-services/
[5] N. R. Canada, "Keeping The Heat In - Section 3: Materials: insulation, house wrap barriers and weatherstripping - Natural Resources Canada," Canada.ca, 2018. https://natural-resources.canada.ca/energy-efficiency/home-energy-efficiency/keeping-heat-section-3-materials-insulation-house-wrap-barriers-weatherstripping

06

10 YEAR TIMELINE

Toronto has already allocated **$13.87 Billion** to its 10-year Capital Plan for net-zero goals, a $100 Million allocation represents less than 1% of the total budget but addresses two major strategic goals (Net Zero and Circularity).

Years 1–2 (Pilot): $10 Million. Establish the first five neighborhood retrofit 6,700 homes.

Years 3–10 (Scale): $90 Million. Expand to all 25 wards, targeting 10% of the pre-1980 housing stock (approx. 67,000 homes).

PLAN (2026 - 2027)

Ensuring Toronto has the necessary **business-input resources.** Creating a "**Community Partner Model**" between stakeholders through surveys, engagement tables.

BUDGET (2027 - 2029)

Establishing and **allocating funding** from taxpayer money to start incentive for pilot.

PILOT (2029 - 2034)

Simulate this project on **5 "Micro-Hub" Communities**, retrofitting around **6700 homes**. . Testing dependent variables and external stimuli. Analyze and iterate on results with stakeholders.

INCUBATE (2034 - 2044)

Scale up towards more apartments through marketing and increased funding -> work to **50%**
****Expect an ROI of 1.5x****

MONITOR (2036 - ...)

Conduct **regular assessments** with community to ensure design for social justice, equity and sustainability.

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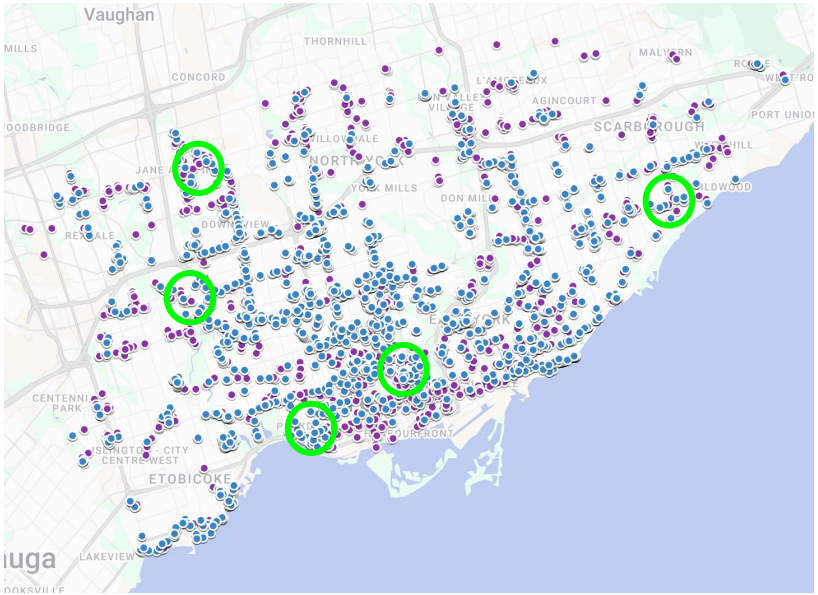
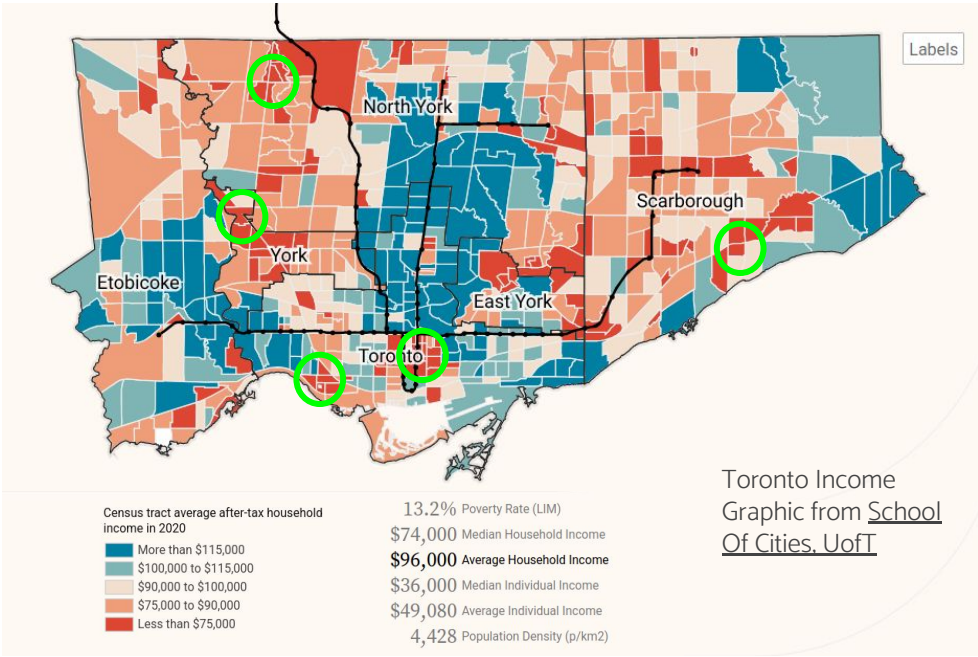
PILOT



● → Apartments built before 1980 ● → Apartments built after 1980

Data from Apartment Building Registration from CoT Open Data



Toronto Income Graphic from School Of Cities, UofT

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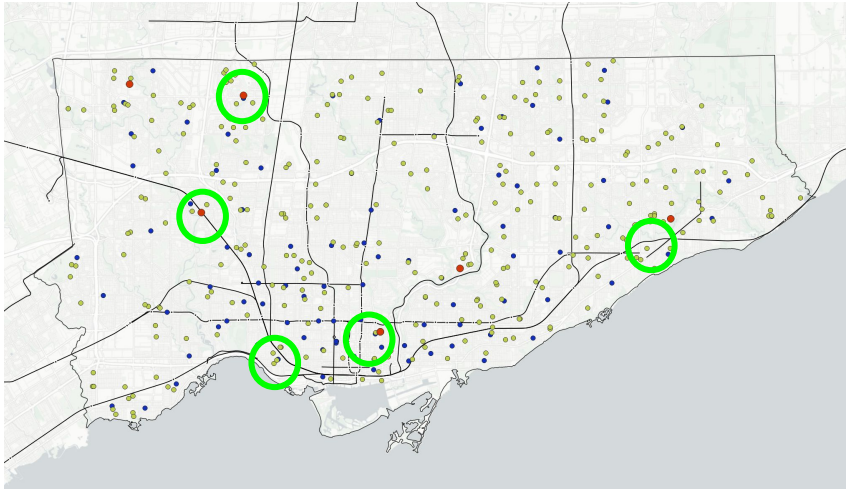
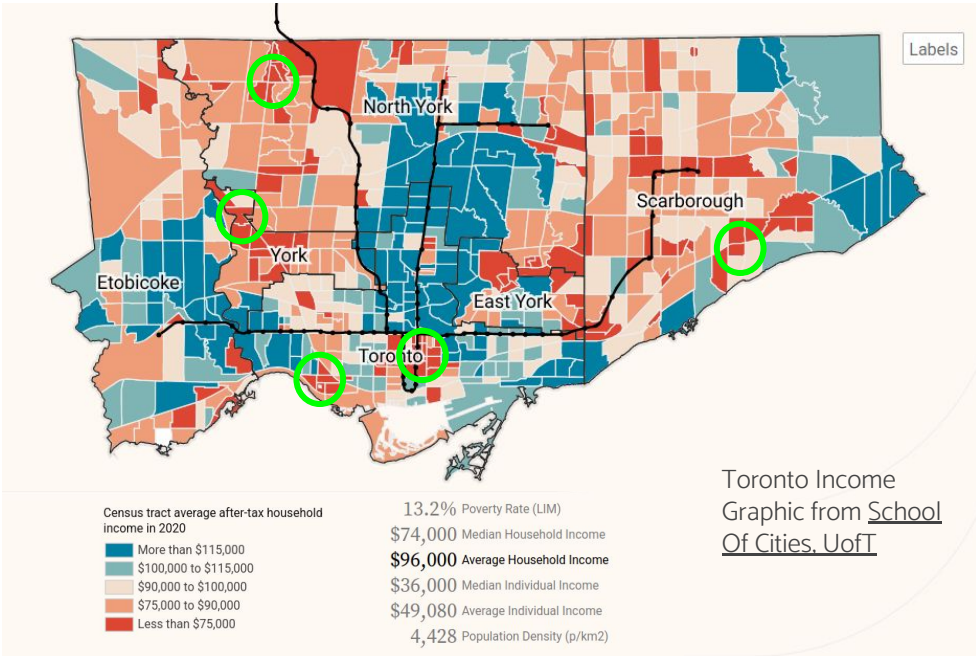
PILOT



- Libraries data from School Of Cities, UofT
- Community Centre data from Parks and Recreation Facilities from CoT Open Data
- Organization data from CoT's Community Reduce & Reuse Program Schedule



Toronto Income Graphic from School Of Cities, UofT

06

Anticipated Behaviour Change

Homeowners Invest in Retrofitting

- Cheaper insulation provides **financial incentive**, effective since financial strain is the biggest barrier (Barrier 2) to retrofitting homes [1].
- Apartment homeowners are anticipated to most receptive (changing wall insulation is less accessible), but **other types of homeowners may also benefit.**

Torontonians waste less textiles

- **Long-term goal**, main source of textiles are from donations, store waste, garbage
- Residents see how textile waste is used, incentivized to dispose of them responsibly
- More participation in **textile recycling programs**

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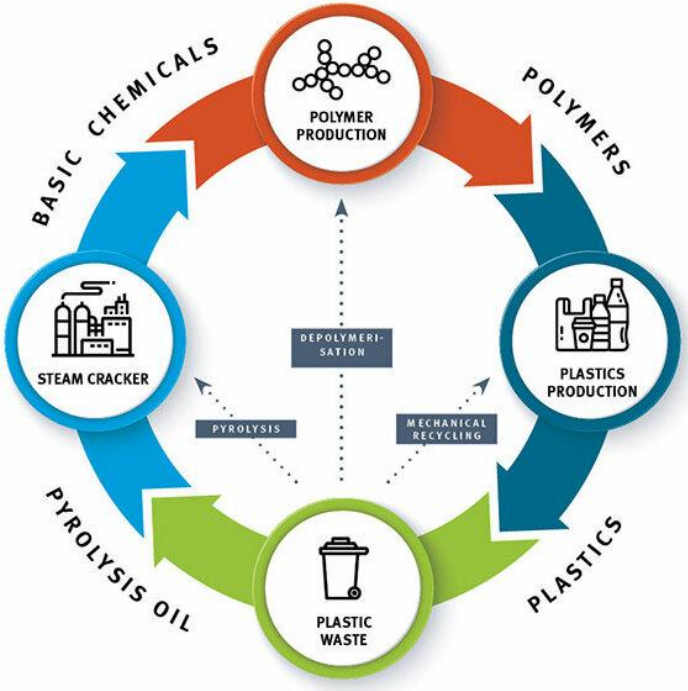
[1]"ENGAGEMENT REPORT." Available: https://www.toronto.ca/wp-content/uploads/2025/11/91e2-CAGReport-AODA-2.pdf
First Image: https://www.pexels.com/photo/unrecognizable-worker-insulating-with-stone-wool-6124239/
Second Image by Ethan Bodnar on Unsplash

06

Future considerations

Further community involvement

With potential support from **recycling companies** further community involvement can be achieved by including **members of the community** in the recycling process, such as through the CoT **Community Environment Days [1]**, allowing people to increase donations and DIY their own insulation for use.



Evolving plastic recycling technology

While the current focus is on mechanical recycling, **chemical recycling is still being actively researched**. Further improvements may make it accessible to large scale insulation production, further improving the process.

[1] Toronto, "Community Environment Days," *City of Toronto*, Nov. 16, 2017. https://www.toronto.ca/services-payments/recycling-organics-garbage/community-environment-days/
Image: https://www.achema.de/en/magazine/article/will-chemical-recycling-close-the-loop-for-plastics

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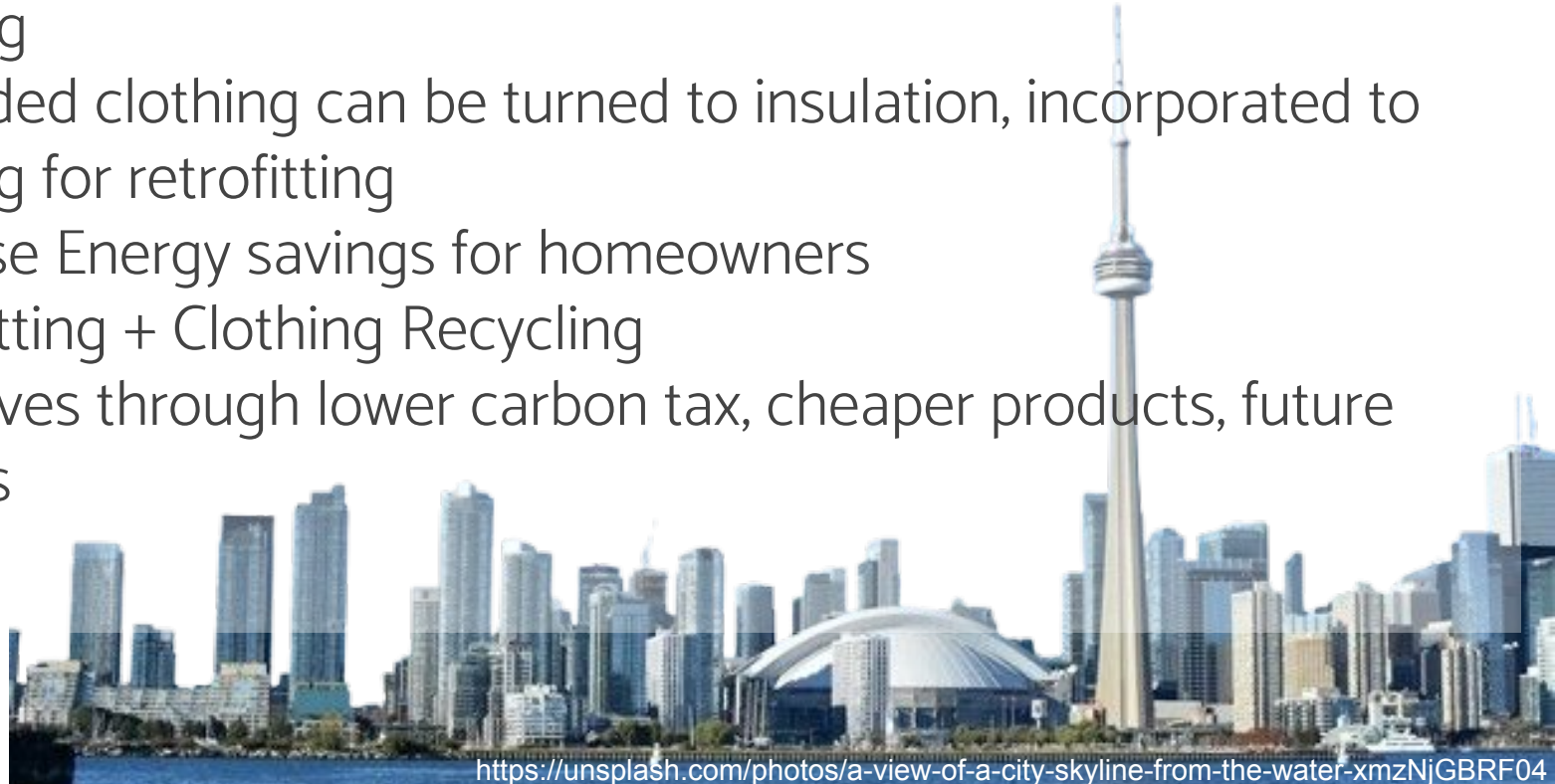
Summary

- Houses in Toronto create a lot of waste, through energy or clothing
- Discarded clothing can be turned to insulation, incorporated to housing for retrofitting
- Increase Energy savings for homeowners
- Retrofitting + Clothing Recycling
- Incentives through lower carbon tax, cheaper products, future savings



https://unsplash.com/photos/a-view-of-a-city-skyline-from-the-water-xmzNjGBRF04

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THANKS!

Does anyone have any questions?

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Citations

Slide 3:

[1] CITY OF TORONTO, "Waste Reduction," City of Toronto, Nov. 16, 2017. https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/waste-reduction/
[2] City of Toronto, "Residual Waste Management," City of Toronto, Nov. 15, 2024. https://www.toronto.ca/services-payments/recycling-organics-garbage/waste-management/residual-waste-management/
[3] City of Toronto, "Textile Waste Diversion and Reduction Initiatives REPORT FOR ACTION Textile Waste Diversion and Reduction Initiatives," 2020. Available: https://www.toronto.ca/legdocs/mmis/2020/ie/bgrd/backgroundfile-146525.pdf
[4] City of Toronto, "Toronto Sector-Based Emissions Inventory Dashboard," City of Toronto, Jun. 28, 2024. https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/toronto-sector-based-emissions-inventory-dashboard/
[5] City of Toronto, "Toronto Residents' Reference Panel on Inclusive Climate Action," City of Toronto, Sep. 27, 2024. https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/transformto/toronto-residents-reference-panel-on-inclusive-climate-action/

Slide 5:

[1] N. R. Canada, "Retrofitting - Natural Resources Canada," Canada.ca, 2025. https://natural-resources.canada.ca/energy-efficiency/building-energy-efficiency/retrofitting
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[3] British Columbia, "Innovative housing retrofits will benefit residents, environment," BC Gov News, Mar. 2022. https://news.gov.bc.ca/releases/2022AG0039-000381#:~:text=With%20careful%20design%2C%20deep%20retrofits,health%20and%20substance%2Duse%20challenges. (accessed Jan. 25, 2026).
[4] Green Communities Canada, "Retrofitting Canada's Homes: Progress Report #1," 2023. Available: https://greencommunitiescanada.org/wp-content/uploads/2023/11/FINAL-GCC-DER-Report.pdf
[5] U. O. Pearl, "Insulation Installation Timeline: What to Expect and How Long It Really Takes," Nealoninsulation.com, Jan. 19, 2026. https://www.nealoninsulation.com/blog/how-long-does-it-take-to-install-insulation

Slide 7:

[1] Woodsmith Construction, "oronto's Real Housing Crisis Is Hidden in Its Aging Homes – And the Backlog Is Bigger Than Anyone Thinks," Woodsmith Construction Inc, Dec. 2025. https://woodsmith.ca/the-blueprint/renovation-resources/toronto-aging-housing-stock-renovation-crisis/
[2] Knowledge Finder, "Toronto, ON," Uli.org, Dec. 02, 2020. https://knowledge.uli.org/en/reports/aspr/2020/toronto-on (accessed Jan. 25, 2026).
[3] "Community Council Area Profile Scarborough Key demographic information based on the Census of Population." Accessed: Jan. 25, 2026. [Online]. Available: https://www.toronto.ca/wp-content/uploads/2024/01/8cdd-CityPlanning-2021-Census-Profile-Scarborough-CCA.pdf?
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04

Refunnelling taxes

Individuals are more likely to make implementations if save money + get money back [1]

Apartments & Distributional Justice

Many low-income communities in Toronto (**43%**) live in apartments, making them the primary stakeholders to save money and better their health. [2]

Job Creation

For clothes sorting and manufacturing, long-term unemployed people can find small gigs, through sorting of clothing or within the recycling. [3]

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Important Statistics

10%	Of Net-Zero goal could be achieved
168,000 tonnes	Of waste redirected
~1.5x	Total Municiple ROI, breaking even on Year 8
$3.2 Million	Saved from tipping fees
~1.5x	Total Municiple ROI, breaking even on Year 8
$300–$850 /yr	Saved per resident
24%	Reduced the risk of "heat-dome" related deaths and property
$12.4M/yr	Saved from Carbon Price

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Estimated Cost / Run

Activity	Estimated Cost	Source/Justification
Material Sorting	**$0.147 / kg**	Based on 0.55 kWh/kg electricity for mechanical processing and a high 87% yield from used clothing. [1]
Transportation	**$0.44–$0.99 per kg**	Localized trucking from collection centers (e.g., Goodwill) to ward-based Micro-Hubs, avoiding sea transport costs. [2]
Storage	**$0.20 to $0.35 per kg per day.**	Current LTL contract rates average $46.40 per hundredweight, representing a 14.3% increase year-over-year. [3]
Processing	**$0.47 / kg**	Significant cost advantage over manufacturing virgin insulation, which requires higher petroleum feedstocks. [4]
Total	**$1.257 - 1.957 / kg**	Adding up min/max

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[2] https://rollsright.ca/full-truckload-shipping-rates-in-2025/#:~:text=What%20is%20the%20average%20rate,rates%20higher%20in%20Western%20Canada
[3] https://redstagfulfillment.com/how-much-does-freight-delivery-cost/#:~:text=Less%20than%20truckload%20shipping%20represents,costs%20ranging%20$120%2D$250
[4] https://spfsolutions.ca/2025/06/13/basement-insulation-cost-in-canada/

Why fibre?

Synthetic foams can trap moisture and cause rot, but loose-fill textile or cellulose fibers are more compatible with the building's "moisture-open" design, allowing the walls to breathe [1]

[1] https://stellrr.com/why-you-should-never-seal-a-moist-surface-with-spray-foam-insulation/#:~:text=Sealing%20a%20moist%20surface%20with,costs%20homeowners%20thousands%20in%20repairs.

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