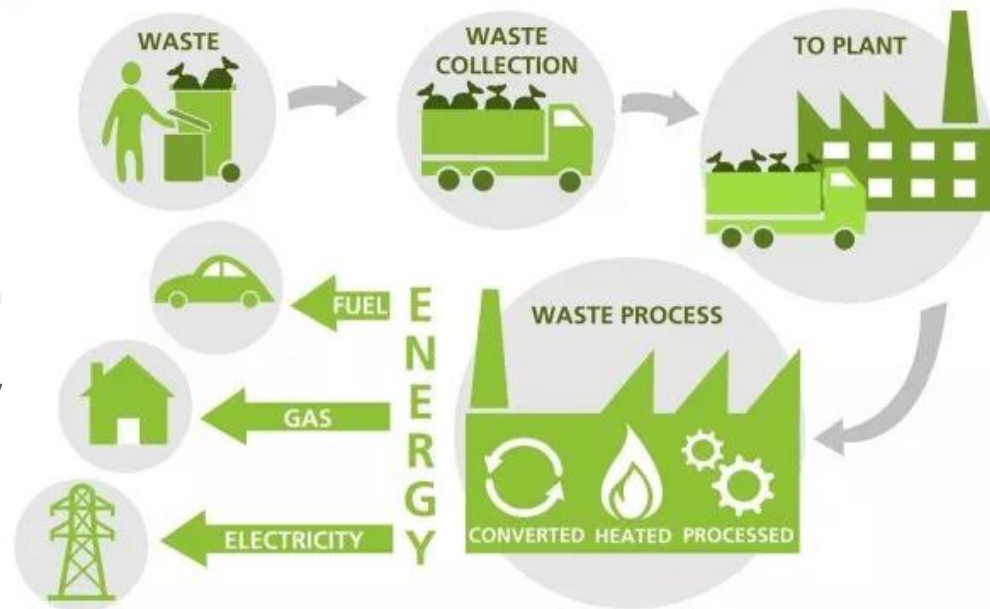




# Thermal Treatment of Municipal Solid Waste in Canada

Thermal Treatment Summit:  
Technology for Resource Recovery  
Dartmouth, NS  
May 14, 2019



Source: <https://www.ecomena.org>

# Objectives

- Characterize the waste that is disposed in Canada and the Atlantic Provinces
- Suggest when thermal treatment may be appropriate
- Provide information on Government of Canada requirements and support

# Municipal Solid Waste (MSW) in Canada (2016)

- 34.2 M tonnes generated
- 9.2 M tonnes diverted (27%)
- 24.9 M tonnes disposed (73%)
  - 41% residential and 59% non-residential
  - More than 95% is landfilled
  - **Less than 5% is thermally treated** (mostly with energy recovery, although this also includes open burning)

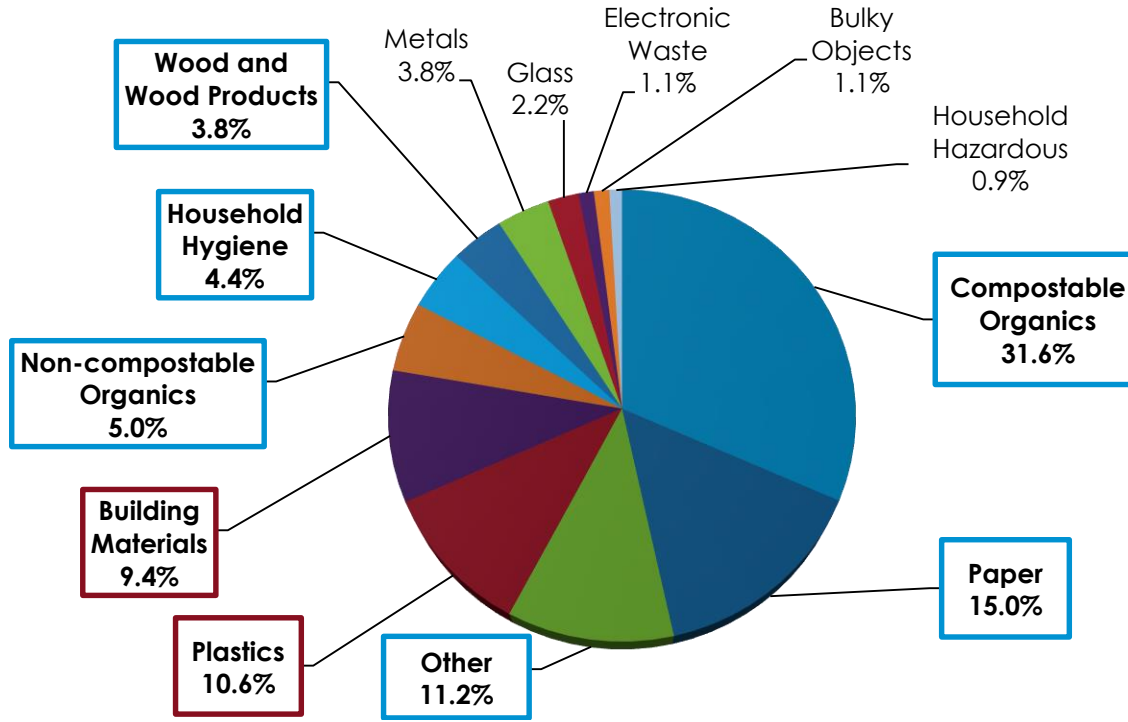
Source: Statistics Canada (<https://www150.statcan.gc.ca/n1/daily-quotidien/181005/dq181005d-eng.htm>)

# Municipal Solid Waste (MSW) in Canada (2016)

Jurisdiction	Waste Generated (tonnes)	Disposed (tonnes)	Diverted (tonnes)	Percent Diverted
<b>Canada</b>	<b>34,191,448</b>	<b>24,940,747</b>	<b>9,250,701</b>	<b>27%</b>
Newfoundland and Labrador	434,729	395,324	39,405	9%
Prince Edward Island	Not Available	x	53,261	Not Available
<b>Nova Scotia</b>	<b>668,436</b>	<b>375,258</b>	<b>293,178</b>	<b>44%</b>
New Brunswick	654,433	503,123	151,310	23%
Quebec	7,760,615	5,356,134	2,404,481	31%
Ontario	12,785,183	9,475,472	3,309,711	26%
Manitoba	1,180,268	969,289	210,979	18%
Saskatchewan	1,068,079	898,404	169,675	16%
Alberta	5,037,999	4,206,668	831,331	17%
<b>British Columbia</b>	<b>4,368,845</b>	<b>2,614,087</b>	<b>1,754,758</b>	<b>40%</b>
Yukon, Northwest Territories and Nunavut	Not Available	x	32,612	Not Available

Source: Statistics Canada (<https://www150.statcan.gc.ca/n1/daily-quotidien/181005/dq181005d-eng.htm> and <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3810003301>)

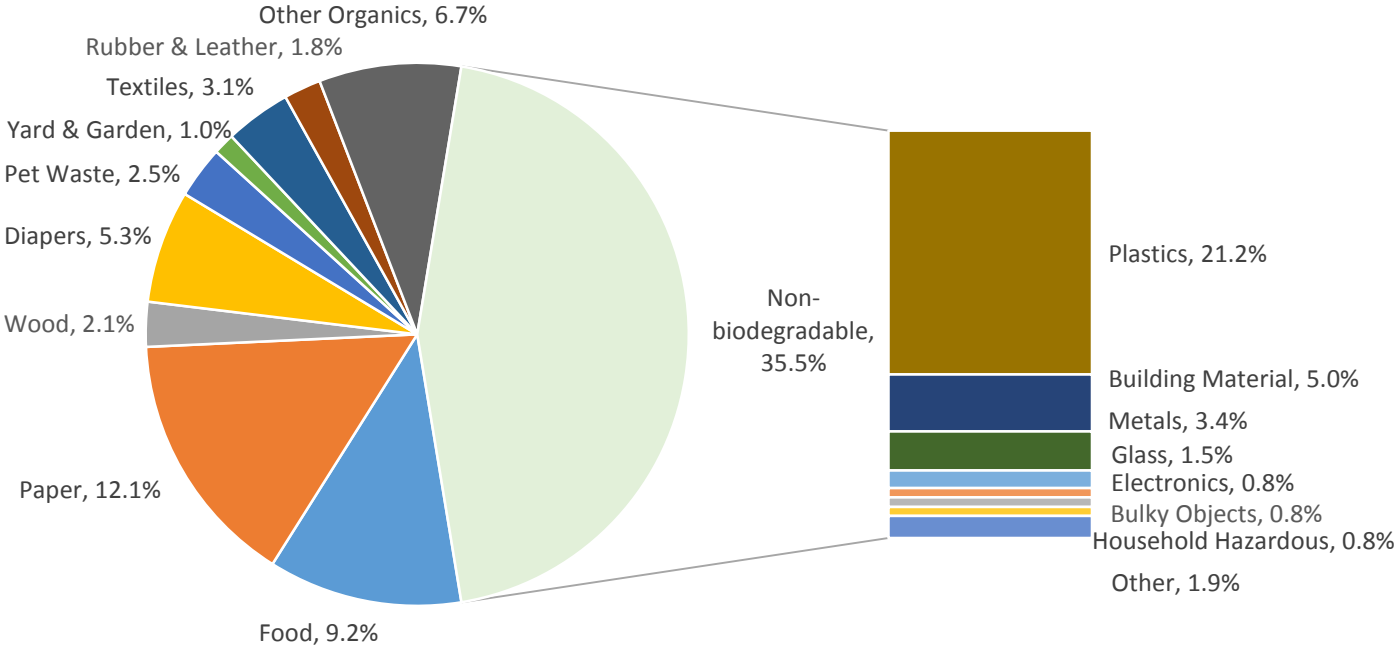
# Composition of MSW Disposed in Canada (Draft, 2018)



- **Biodegradable materials** make up more than **60%** of the waste currently landfilled
- **Plastics and other high energy value wastes** make up **at least more than 15%**

# Nova Scotia Waste Characterization

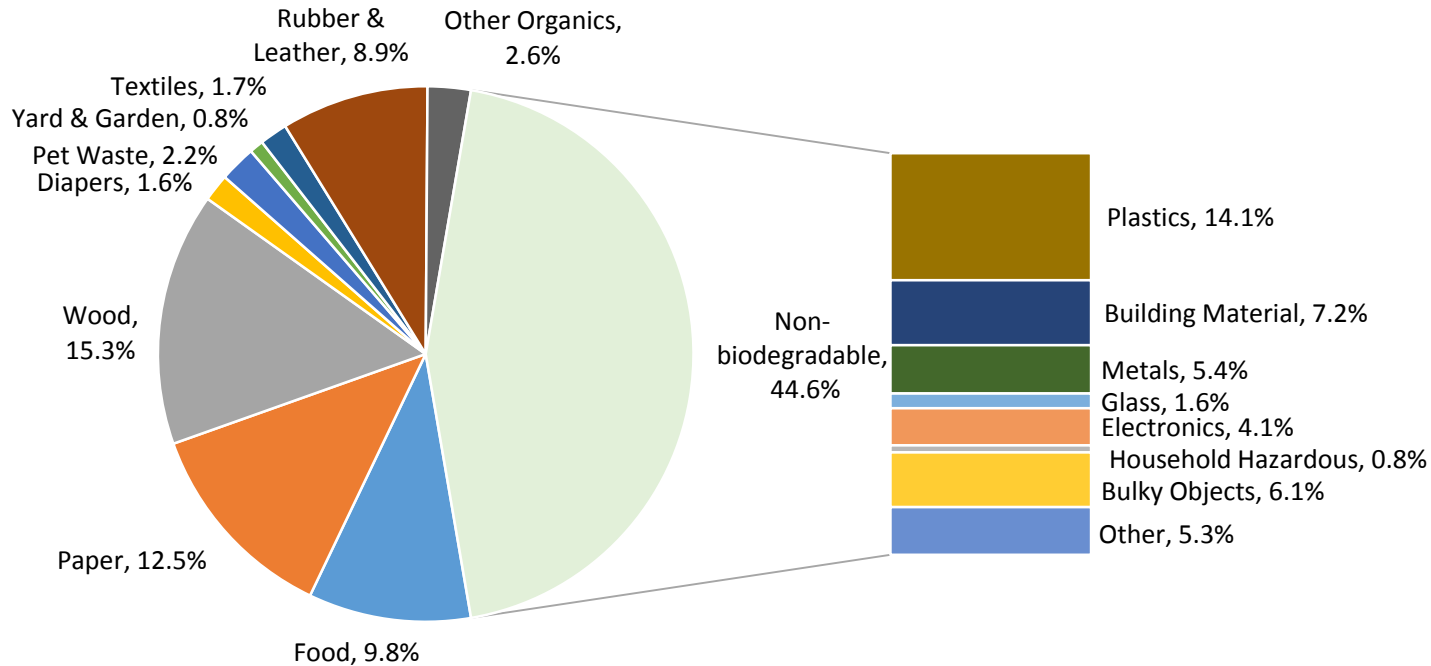
## NS Total Residual Municipal Solid Waste – Draft 2018



Source: Report under development by Environment and Climate Change Canada

# New Brunswick Waste Characterization

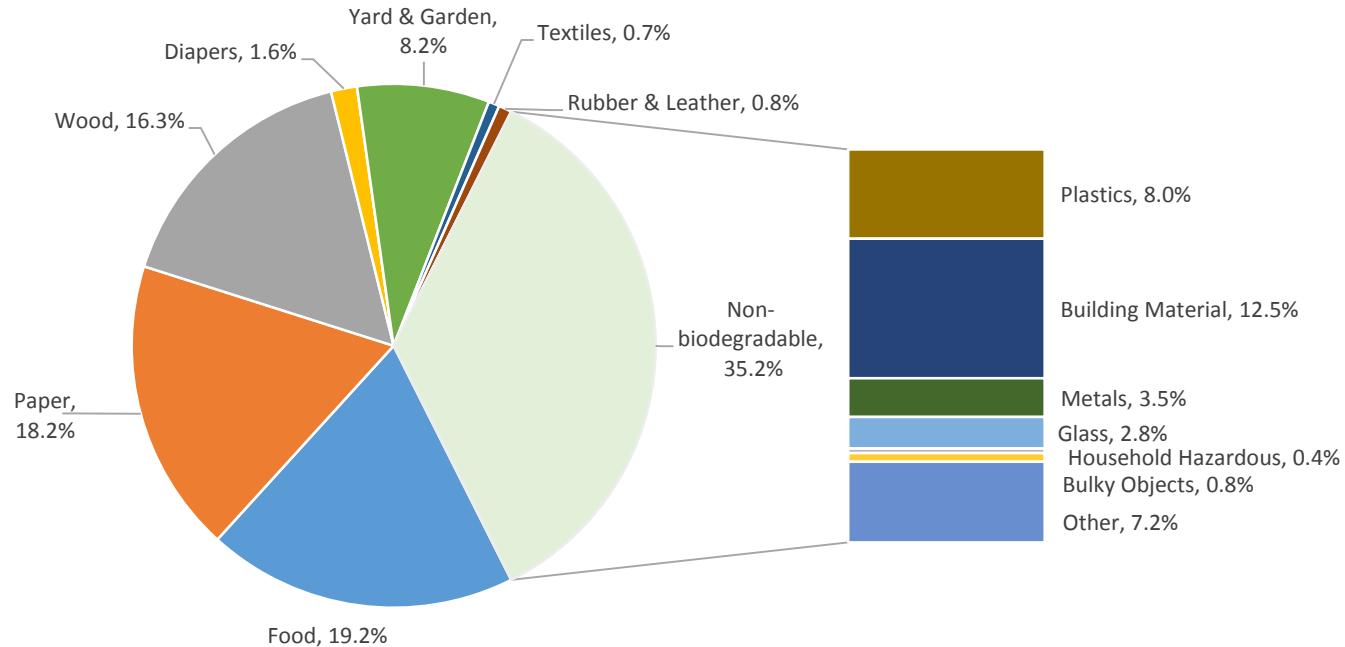
## NB Total Residual Municipal Solid Waste – Draft 2018



Source: Report under development by Environment and Climate Change Canada

# Newfoundland & Labrador Waste Characterization

## NL Total Residual Municipal Solid Waste – Draft 2018

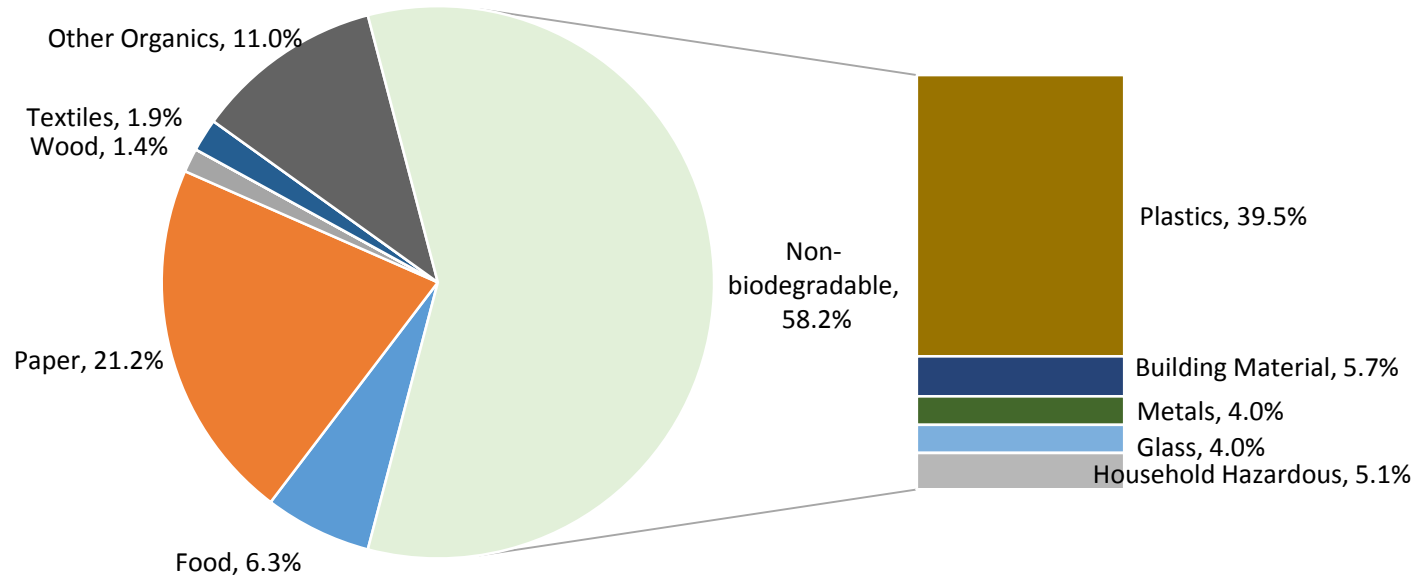


Source: Report under development by Environment and Climate Change Canada



# Prince Edward Island Waste Characterization

## PE Total Residual Municipal Solid Waste – Draft 2018



Source: Report under development by Environment and Climate Change Canada

# Large Thermal Treatment Facilities in Canada

Name	Type of Facility	Waste Type	Capacity (tonnes/year)	Energy Recovery		Location	Comments
<b>L'incinérateur de la Ville de Québec</b>	Incinerator with Energy Recovery	Post-recycled MSW; wastewater sludge	312000	Steam		Québec, QC	Heat used to dry wastewater sludge prior to incineration
<b>Covanta Burnaby Renewable Energy</b>	Incinerator with Energy Recovery	Post-recycled MSW	285,000	Electricity	28 MW	Burnaby, BC	25% of Metro Vancouver's waste
<b>Durham York Energy Centre</b>	Incinerator with Energy Recovery	Post-recycled MSW	140,000	Electricity	17.5 MW	Durham Region, ON	
<b>PEI Energy Systems EFW</b>	Incinerator with Energy Recovery	Post-recycled MSW	30,000	Steam, Electricity, Hot Water		Charlottetown, PEI	District heating and hot water system
<b>L'incinérateur municipal de Lévis</b>	Incinerator	Post-recycled MSW; hospital waste	26,800		None	Lévis, QC	
<b>Emerald Energy From Waste</b>	Gasification with Energy Recovery	MSW	187,000	Steam, Electricity	9.3 MW	Mississauga, ON	Excess steam sold to neighboring paper mill

# Cement Industry

- Industry is a major energy consumer and seeks alternative fuels to reduce costs
- **Unrecyclable plastics** – Numerous facilities either using or seeking approval, including: Lafarge (Delta, BC; Brookfield, NS; Bath, ON; Exshaw, AB); St. Mary's Cement (2 facilities in ON); and Holcim Cement (Joliette, QC)
- **Tire Derived Fuel (TDF)**
  - TDF offsets the use of coal, petroleum coke and other fuels, reducing greenhouse gas and NOx emissions
  - More than half of Canada's cement plants have a permit to use TDF as a part of their fuel mix; less than 5% of overall fuel mix
  - Some provinces prohibit; others, such as Quebec, encourage the cement industry to use TDF in order to divert the scrap tires from landfills

# When one might consider thermal treatment?

**Can be an environmentally sound option and may be most preferred when:**

- Waste reduction measures have been implemented and are yielding results (e.g. prevention, reuse)
- High recycling and diversion rates have been achieved, including hazardous wastes (e.g. lamps containing mercury)
- Energy and/or chemical recovery are viable
- Recovery of additional metals or other materials is viable
- Appropriate air pollutant emissions controls are included
- Skilled operators are available, properly trained & supervised
- Protocols for operation, maintenance and monitoring are clearly defined and adhered to



# Potential **Benefits** of Thermal Treatment

- Significantly reduces the volume of waste requiring final disposal
- Energy and/or chemical recovery may be viable, particularly for larger scale facilities
- Can have lower GHG emissions than landfills, when the waste disposed includes biodegradable materials
- Lower GHG and NOx emissions for cement plants when combusting used tires and unrecyclable plastics, as compared to fuels like coal and petroleum coke

# Potential **Benefits** of Thermal Treatment

- Air pollutant emissions from modern systems are/can be lower than regulatory requirements
- Additional recovery of metals is possible, even when processing post-recycled waste (e.g. Covanta Burnaby incinerator recovers about 7000 tonnes of metal per year)

# Potential **Drawbacks** of Thermal Treatment

- Significant financial investment
- Energy and/or chemical recovery may be limited at small scale
- Can become undesirable competition for recycling and diversion
- Requires highly skilled operators, extensive maintenance and monitoring
- Waste streams with high energy and low moisture are (generally) preferred

# Potential **Drawbacks** of Thermal Treatment

- For incinerators, in cases where the waste stream has low energy content, a supplementary fuel may be required to ensure complete combustion
- When not properly designed and operated, can be a significant source of air pollutant emissions such as particulate matter, dioxins, furans, and mercury
- A second disposal system (typically a landfill) may be required for ash or other residues (some of which may hazardous waste)



# Federal Requirements and Guidance

- **National Pollutant Release Inventory**
  - Must report if incinerating:  $\geq 26$  tonnes non-hazardous solid waste;  $\geq 26$  tonnes biomedical or hospital waste; hazardous waste; sewage sludge
  - Excludes industrial processes where fuel derived from waste is fired as an energy source (e.g. bark and other clean wood waste used to fire a boiler)
- **ECDC's *Technical Document on Batch Waste Incineration (2010)***
  - Guidance on selecting, operating and maintaining small batch MSW incinerators, with the aim of minimizing dioxin, furan and mercury emissions
- **ECDC's *Solid Waste Management in Northern and Remote Communities: Planning and Technical Guidance Document (2017)***

# Green Municipal Fund (FCM)

- Provides grants for municipalities and their partners to do studies for initiatives that could help divert at least 60% of MSW from landfills
  - If 60% target already achieved, project must demonstrate potential to surpass
  - For remote communities, diversion projects must target a diversion rate of 15% over their current baseline
- **Thermal treatment projects are only eligible for funding if the municipality has already achieved a total diversion rate of at least 60% with reduction, reuse, recycling or biological processes**
  - This limitation does not apply to remote communities

# Federal Support for Infrastructure & Innovation

- **Clean Growth Hub** (<http://www.ic.gc.ca/eic/site/099.nsf/eng/home>)
  - Whole-of-government focal point for clean technology focused on supporting companies and projects, coordinating programs and tracking results
  - Get advice from a team of experts from across government who can help you find and understand what programs and services may be right for you
  - Services are available to firms of all sizes in the clean technology space and across all sectors of the economy
- **ECCC's Low Carbon Economy Fund**
  - Enwave Energy Corporation will receive up to \$3.5M to upgrade and expand an existing waste-to-energy system for district heating in Charlottetown, PEI  
<https://www.canada.ca/en/environment-climate-change/news/2019/03/government-of-canada-supports-climate-action-by-enwave-energy-corporation.html>

# Federal Support for Infrastructure & Innovation

- **Natural Resources Canada funded projects**
  - Enerkem Inc. received \$729K toward its “Biomass-rich Waste Conversion into Drop-in Fuels” project (completed 2016)
  - Enerkem Inc. also received \$2.9M toward its “Modular Compact Combined Heat and Power (CHP) Using Heterogeneous Biomass Wastes” project (completed 2018), which focused on serving remote communities
  - Both projects determined that the production of biofuels would be more cost effective when done on a larger scale, at central conversion hubs
  - <https://www.nrcan.gc.ca/energy/funding/21146>

# Thank You!

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