



ENVIROTHON NB



Waste to Resources

Educational Resource Guide



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Waste to Resources

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1- Landfills and Hazardous Materials



Solid Waste in New Brunswick

During the late 1970's and early 1980's, many solid waste dumping sites in New Brunswick were reaching capacity. Over 300 dumps were scattered across the province, operated by the New Brunswick Department of Transportation, municipal government, or private owners. The 11 dumps in the Fundy Region were located in Spruce Lake, French Village, Chance Harbour, Maces Bay, Grand Bay, Browns Flat, St. Martins, Kingston Peninsula, Quispamsis, Welsford, and Hampton.

The search for new disposal sites was a lengthy and tedious process. Residents of areas adjacent to proposed sites attended public meetings in great numbers to express concerns about the preservation of environmental and aesthetic values in their communities. As a result of the public outcry, the province became committed to finding a new direction for solid waste management in New Brunswick.

On January 14, 1986, Honourable Robert C. Jackson, the Minister of Municipal Affairs and Environment, announced that a major public consultation effort would commence. 'The importance of input from the public in the development of waste management programs cannot be overly stressed,' said Mr. Jackson. 'Experience has shown that New Brunswickers are becoming more environmentally conscious all the time, and are demanding that waste disposal practices meet a very high standard.'

A five-member task force for the Environment Council conducted seven public consultation programs throughout the province and received a number of opinion letters and written submissions. As a result, a report offered 18 recommendations to the Minister of the Environment concerning the future direction of waste management in New Brunswick.

Recommendations Set by the New Brunswick Residents

During the Environmental Council's Public Consultation Program, the residents of New Brunswick expressed a clear desire that the 18 principles be adhered to in every commission's waste management program and projects. From these principles, three broader principles were offered as overriding concerns, which were intended to guide the future development of all components within New Brunswick's comprehensive waste management program.

Three Statements of Principle

- Public safety and environmental protection must be the primary considerations, at all times, in the planning and operation of all waste management programs.
- Effective public consultation and involvement in planning and implementation of new waste management systems in the Province are absolute prerequisites for success. To secure confidence, the public must have an opportunity to play a meaningful role in decision-making and overseeing the future operation of the system to ensure that public health and environment concerns receive maximum consideration.
- All governmental agencies in the Province must comply, and be seen to comply, with the New Brunswick Government's Environmental Acts and Regulations. If a specific statute is found to be unenforceable, it should be either repealed, or amended to ensure that it can be successfully enforced.

The strong and clear recommendations that were stated in the report served as high but attainable standards for each of the commissions to comply with.

The residents of New Brunswick expressed the need to promote the establishment of environmentally acceptable and cost effective waste management systems, concentrating available resources in several large-scale regional projects rather than smaller sites. Under the Province's new approach, regional commissions were established and given direct responsibility for all aspects of solid waste management in their respective areas.

The division resulted in thirteen regions, each guided by a Solid Waste Commission. All Solid Waste Commissions include representatives from each municipality, unincorporated area, and Indian band within its region. Each of the Commissions is charged with the responsibility of developing and implementing a regional solid waste program.

As a result of the sweeping changes to solid waste management in New Brunswick, residents were given the responsibility for their actions in their region. The user pay approach gave each of the Commissions the financial means for both the planning and operation of a solid waste strategy.

The Province produced a guide titled *Regional Solid Waste, Public Information/Consultation, Stage 1 - Developing a Strategy*. The document outlines the necessary steps for the Commissions to follow while devising their solid waste management plan.

The first requirement of each Commission was to conduct a technical and financial analysis of various waste management options for their region.

The second requirement was to establish a two-way communications channel for the people in the region on all matters relating to solid waste management planning.

Executing a Solid Waste Management Plan

The next step in the process was a site identification study followed by an Environmental Impact Assessment. The EIA process took place in all the regions except those with a Transfer Station. In those regions, the waste was collected and then sent to another Region's Landfill.

The principle objective of the Environmental Impact Assessment (EIA) study was to predict impacts which may be expected should the project proceed. The study, conducted in consultation with the residents from the area of potential impact, was also expected to identify methods of enhancing positive impacts and minimizing negative impacts resulting from the project.

Upon completion of the final draft of the EIA report, public meetings were held near the area where the project was proposed. At the public meetings, interested parties were encouraged to make comments, raise concerns, and ask questions pertaining to the EIA study. A summary of the public comments was presented to the Minister of Environment, and decisions were made by the Provincial Cabinet to deny or approve each site.

The Fundy Region

In 1989, the Fundy Solid Waste Action Team (Fundy SWAT) was formed with a mandate to develop a strategy for managing solid waste generated in the Fundy Region. Fundy SWAT consisted of representatives from the City of Saint John, the Towns of Grand Bay-Westfield, Saint John, Hampton, Rothesay, and Quispamsis, Village of St. Martins, and the parishes of Hampton, Rothesay, Kingston, Greenwich, Westfield, Petersville, Clarendon, Musquash, Saint Martins, and Simonds.

With direction from the region's residents, Fundy SWAT undertook the challenge, by means of a democratic process, to resolve how to manage the Fundy Region's solid waste.

Following the guidelines set by the Province, an extensive public communications process began. The goal was to gather residents' opinions regarding proper requirements for waste handling. Fundy SWAT became a household name. The search for a local solution to a local problem became everyone's concern.

The Fundy Region was the last region in New Brunswick to complete the challenge of orchestrating the closing of the dumps and opening of the new landfill. Notification that the 11 small dumps were subject to closure came from the Minister of the Environment, Vaughan Blaney. Upon the Minister's announcement, plans to commence the opening of a landfill in the Fundy Region began. The Fundy Region was in search of a local solution to a local problem.

The aim of the public information and consultation program was to be proactive in addressing the solid waste management concerns of the residents. A newsletter called *SWAT Talk* was published in order to capture the concerns of the residents and groups over the two year period of gathering options.

Two-way dialogue with the public through written surveys, phone surveys, public workshops, and open public hearings was also an integral part of the decision making process. Everyone was welcome to speak at the meetings as either an individual or a representative of a group.

After two years of research and public consultation, many concerns were recognized and in a cumulative fashion, recorded, and evaluated. A collaborative effort by many produced a set of Guiding Principles for the Environmental Impact Assessment. At the end of the public information and consultation phase, the following statements were adopted as the guiding principles for solid waste management in the Fundy Region:

Hierarchy

We are committed to a hierarchy of waste management options. The order of priorities for waste management shall be reduction, reuse, recycle, and recovery. Wastes that presently cannot practically be dealt with in these ways should be disposed of in landfills, incinerators, or other technology, whichever is most appropriate for the particular waste stream in question.

Waste Reduction

Our most important waste management measures are those that reduce the volume of waste we generate.

Reuse

We should strive to make products and packaging reusable and to encourage their reuse.

Recycle and Compost

We should strive to recycle or compost all wastes.

Recovery

We should attempt to recover energy, gases, fibres, or other products from the waste generated, and from the waste contained in closed out disposal facilities.

Implementation

A firm commitment to the ongoing progress of waste management options should be reflected in policies, goals, planning, budgets, and staff involved in waste management.

Waste Monitoring

We must continually monitor the composition, volumes, and sources of our waste and the products of their disposition in order to evaluate existing programs.

Public Involvement

All residents, businesses, and institutions in our region are waste generators and should be involved in waste reduction efforts.

Facility Siting

There must be full public discussion of potential sites, and of short and long term effects of each waste management facility.

Siting the Fundy Region's Landfill

With the Guiding Principles adopted, the groundwork began to determine where the landfill would be sited. Through a careful process of site selection, the Department of Environment in conjunction with the Commission reduced 157 possible sites to six.

The results of the next stage in the evaluation revealed two sites tied for first, and a third scored much lower in the evaluation. The two top sites were at Crane Mountain and Paddy's Hill. An extensive Environmental Assessment was conducted on both the Crane Mountain and Paddy's Hill sites. When attempts to purchase the land at Crane Mountain were unsuccessful, the other site (Paddy's Hill), which is adjacent to the City's then active Spruce Lake dump, was put forward for Cabinet approval.

With Environmental Impact Assessment hearings completed in February 1995, the local community of Lorneville put forth emotional arguments against the Paddy's Hill site.

Consequently, there was little support from both the municipal and provincial governments for the Paddy's Hill site. It appeared that both top sites had been eliminated, and a local solution could not be generated. The waste would have to be exported to Westmorland-Albert near Moncton. This was recommended publicly, without any financial consideration. At the same time, closure of the 11 dump sites in the region was taking place, and unbudgeted disposal costs to the municipalities began to build. In addition, the Spruce Lake Dump was given a deadline for closure.

The Commission, now realizing the lack of municipal and provincial governmental support, prepared a factual and sobering financial report, detailing the true cost to export the region's solid waste. The true cost totalled in excess of \$200 million over the 25-year term. The largest Commission of the 13 Commissions in New Brunswick would face a loss of economic benefits of \$200 million if a landfill was not sited in the region.

The closure of the Spruce Lake Dump and the Commission's financial report exploring the true cost to export the region's waste provided the incentive for the Cabinet to approve the Crane Mountain site.

In 1997, the Commission put together an aggressive schedule to open a new containment landfill. Within one year, the landfill at Crane Mountain was open and receiving waste. This eliminated the extreme costs associated with shipping waste out of the region. Local infrastructure was planned to allow for waste diversion programs. The combination of the new state-of-the-art landfill and the waste diversion programs will provide an answer to the Fundy Region's waste disposal for many years to come.

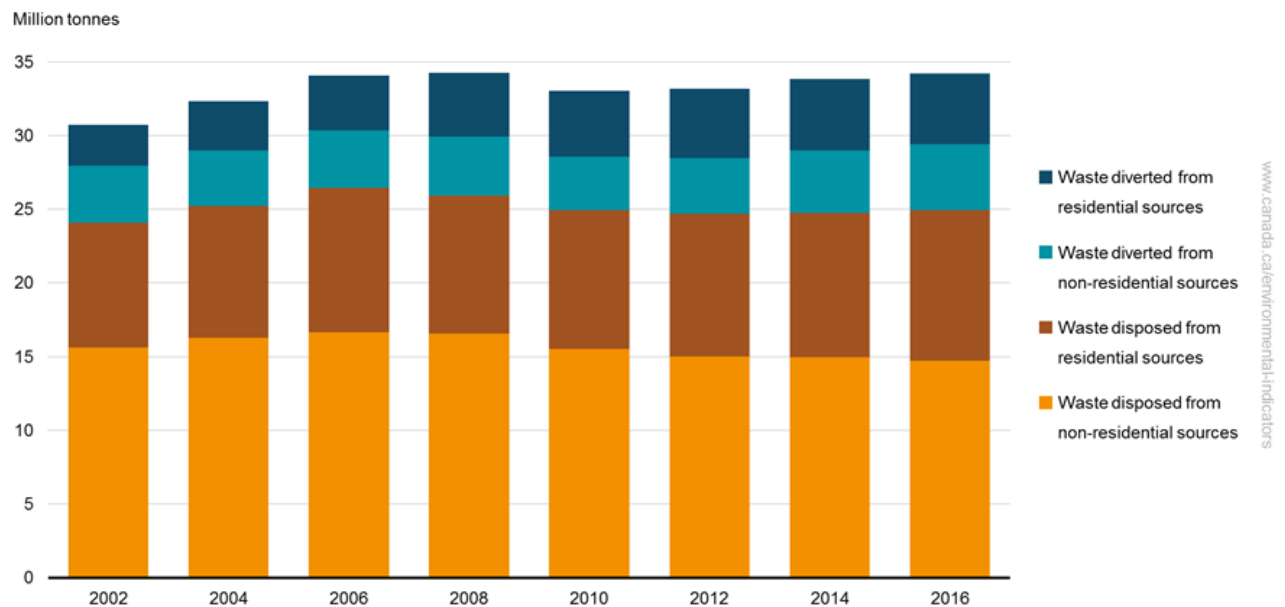
Solid waste diversion and disposal

Most garbage collected for disposal ends up in landfills and a small amount is incinerated. This can lead to air emissions, land disturbance or water pollution. The extraction and processing of new resources needed to replace those discarded as waste leads to more pollution. Diverting waste by recycling and composting can help reduce the impact of solid waste on the environment.¹

Key results

- From 2002 to 2016, the total amount of solid waste² collected in Canada increased by 3.5 million tonnes (or 11%)
 - The amount of waste disposed in landfills or incinerated increased by 0.9 million tonnes (or 4%) to reach 24.9 million tonnes in 2016
 - The amount of waste diverted grew by 2.6 million tonnes (or 39%) to reach 9.3 million tonnes in 2016
- In 2016, the non-residential sector was responsible for 59% of disposed waste and 48% of diverted waste

Figure 1. Solid waste diversion and disposal, Canada, 2002 to 2016



[Data for Figure 1](#)

Source: Statistics Canada (2018) [Table 38-10-0032-01. Disposal of waste, by source](#). Statistics Canada (2018) [Table 38-10-0033-01. Materials diverted, by source](#).

¹ For more information see [Municipal solid waste management](#).

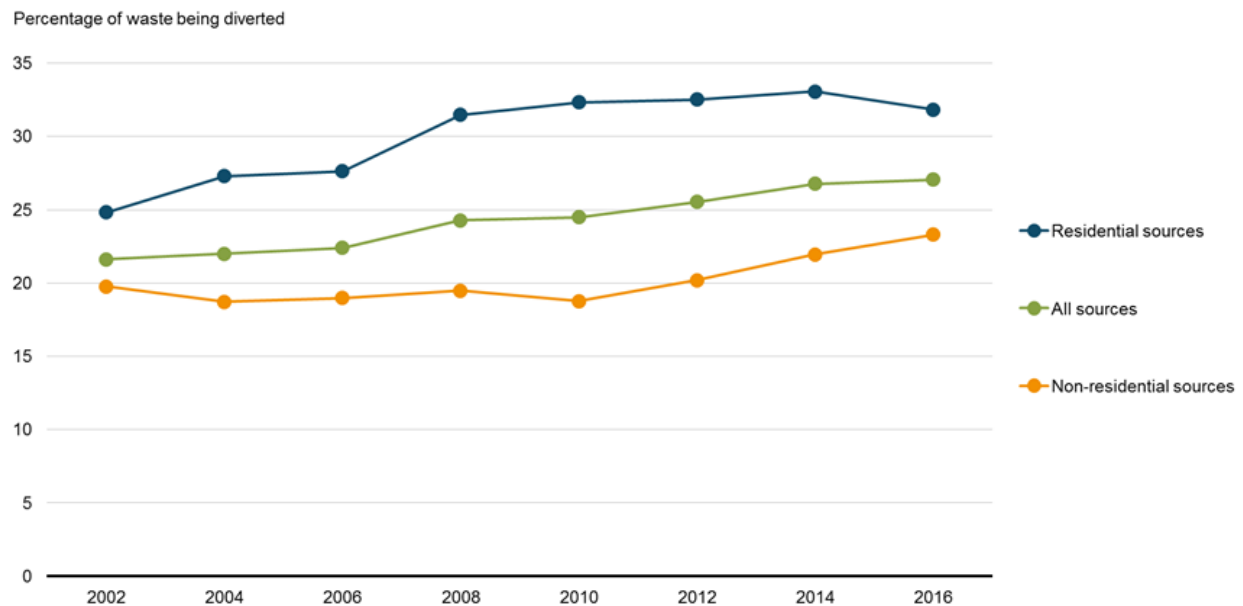
² For more details about what constitutes solid waste in the context of this indicator, please refer to the [Data sources and methods](#).

Solid waste refers to recyclables, organic materials and garbage generated by homes, businesses and institutions.

In 2016, 27% of solid waste was diverted from disposal, up from 22% in 2002.

- The share of waste being diverted from residential sources increased from 25% to 32%
- The share of waste being diverted from non-residential sources increased from 20% to 23%

Figure 2. Solid waste diversion rate by source, Canada, 2002 to 2016



[Data for Figure 2](#)

Source: Statistics Canada (2018) [Table 38-10-0032-01. Disposal of waste, by source](#). Statistics Canada (2018) [Table 38-10-0033-01. Materials diverted, by source](#).

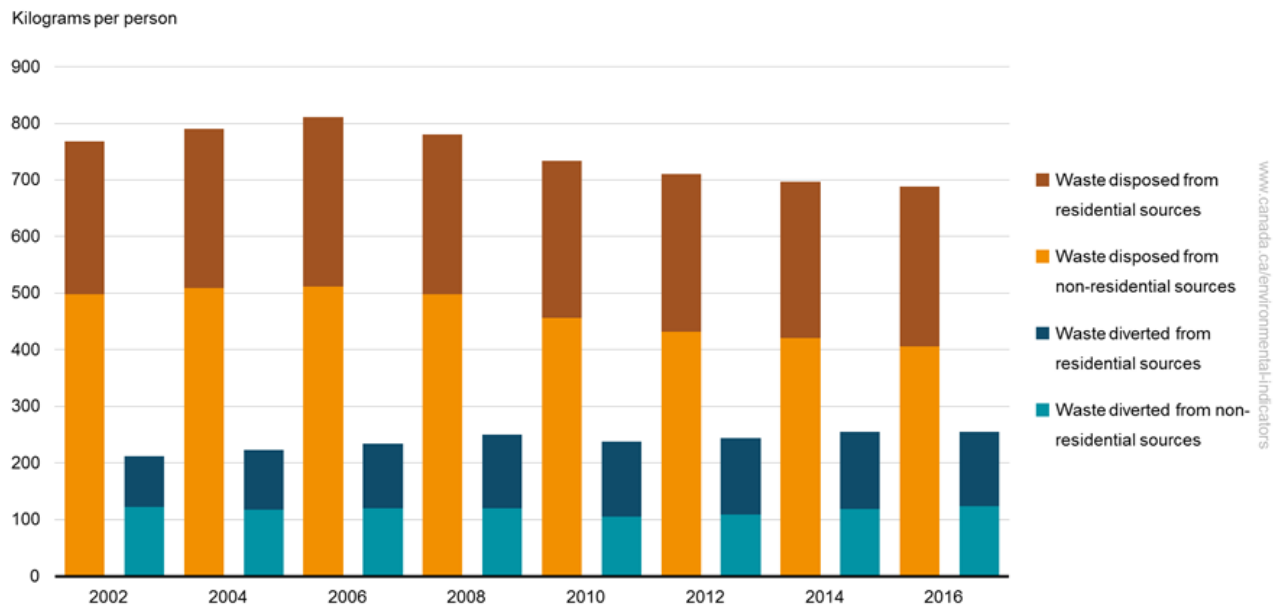
Between 2002 and 2016, solid waste disposal from residential sources grew by 1.8 million tonnes, while the waste diverted increased by 2 million tonnes. Disposal from non-residential sources shrank by 0.9 million tonnes over the same period, while diversion increased by 0.6 million tonnes.

Solid waste per person

Key results

- Total solid waste disposal per person has decreased from 768 to 688 kilograms between 2002 and 2016
- Diversion of waste per person has increased over the same period from 212 to 255 kilograms, an increase of about 20%

Figure 3. Solid waste diversion and disposal per person, Canada, 2002 to 2016



[Data for Figure 3](#)

Source: Statistics Canada (2018) [Table 38-10-0032-01. Disposal of waste, by source](#). Statistics Canada (2018) [Table 38-10-0033-01. Materials diverted, by source](#).

From 2002 to 2016, waste disposal per person from residential sources increased from 269 to 282 kilograms while disposal per person from non-residential sources declined from 499 to 406 kilograms.

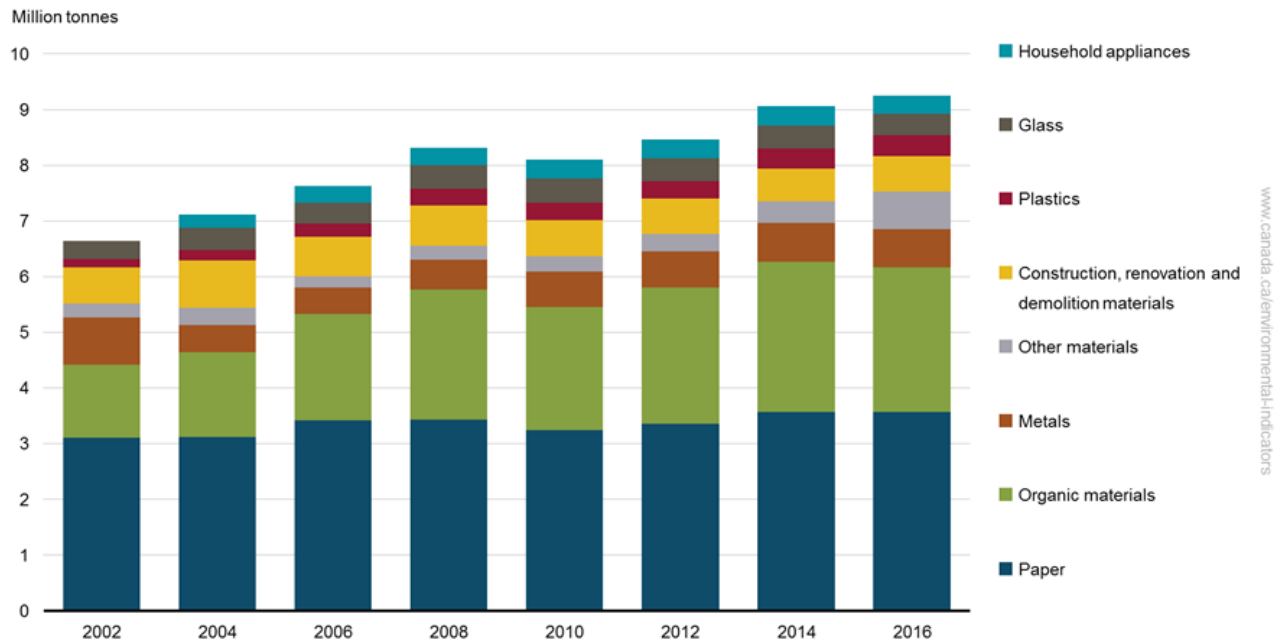
Waste diversion per person from residential sources increased steadily between 2002 and 2014, but dropped in 2016. Waste diversion per person from non-residential sources went up and down over the period.

Solid waste diversion by type of material

Key results

- Between 2002 and 2016, solid waste diversion increased by 39% to 9.3 million tonnes
- In 2016, paper and organic materials accounted for 67% of total solid waste diverted (3.6 and 2.6 million tonnes, respectively)

Figure 4. Solid waste diversion by type of material, Canada, 2002 to 2016



[Data for Figure 4](#)

Note: Other materials include electronics, tires and other unclassified materials.

Source: Statistics Canada (2018) [Table 38-10-0034-01. Materials diverted, by type.](#)

Diversion of plastics almost tripled between 2002 and 2016 but remains extremely small at less than 5% of all solid waste diversion. Organic materials diversion doubled to reach 28% of diverted material, second to paper.

Diversion of metals and construction, renovation and demolition materials are the only types of materials that saw a decline during this period.

The *Canadian Environmental Protection Act, 1999* (CEPA 1999)

October 2005

CEPA 1999: Focus on Issues

Key environmental issues managed under CEPA 1999

The health of Canadians and our economic and social progress are fundamentally linked to the quality of our environment. Recognizing this, the Government of Canada's environmental policies, under the banner of Project Green, are linked with economic and market realities so that Canadians have a cleaner, healthier environment and continued economic growth. The *Canadian Environmental Protection Act, 1999* is one of the Government of Canada's primary tools for achieving sustainable development and pollution prevention – the goals set out through Project Green.

This info-sheet is part of a series of three that provides an overview of CEPA 1999. *CEPA 1999: Focus on Issues* provides an introduction to the main issues addressed by the Act. The others in the series provide a brief introduction to the Act — *CEPA 1999 at a Glance*, and the key processes employed — *CEPA 1999: The Management Process*.



CEPA 1999 — a tool to help protect the environment and human health

CEPA 1999 enables the Government of Canada to provide sound management in eight major and distinct areas. The Act is intended to protect the environment and human health from the risks posed by harmful pollutants and to prevent new ones from entering the Canadian environment. The following snapshots show how CEPA 1999 works:

■ *New and existing substances*

CEPA 1999 aims to protect the environment and human health from risks posed by substances, including those new to Canada since 1987 (*new substances*), as well as the chemicals in use before 1987 (*existing substances*). Assessment of both new and existing substances is the joint responsibility of Environment Canada and Health Canada.

Most of the 23,000 existing substances were put into use without being subjected to a full health and environmental risk assessment. In order to begin to set priorities among these substances for assessing the risks they pose, CEPA 1999 requires that they be categorized in terms of whether they are (a) inherently toxic and either bioaccumulate in living organisms (meaning they collect in living organisms and end up in the food chain), or persist in the environment (meaning they take a long time to break down), or (b) present the greatest potential for human exposure in Canada. Substances which meet either (a) or (b) must undergo a risk assessment. If, through the assessment, they are found to pose risks to the environment or human health, action to deal with the substance is planned. A variety of

risk management instruments are available for use under CEPA 1999, including guidelines, codes of practice, pollution prevention plans, environmental emergency plans and regulations, allowing the Government of Canada to use the right tool or set of tools to address the risk at hand.

New substances are assessed, and if they have the potential to pose unacceptable risks to the environment and to human health, control measures are put in place before they are introduced into the Canadian marketplace. If the risks are severe enough, they may not be permitted to be used commercially in Canada.

■ *Living products of biotechnology*

CEPA 1999 also deals with new living organisms that are the products of biotechnology, and takes into account the special characteristics of living organisms that separate them from other new substances (such as chemicals and polymers). For example, since living organisms are capable of reproduction, quantity limitations are not useful approaches to managing them. CEPA 1999 provides the federal benchmark



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for the process for notification and assessment of new chemical substances and products of biotechnology. The notification and assessment provisions of CEPA 1999 actually serve as a safety net for these substances and products, and do not apply if requirements for notification and assessment are met by another federal act, such as the *Pest Control Products Act*, the *Fertilizers Act*, the *Feeds Act*, the *Seeds Act* or the *Health of Animals Act*.

About Schedule 1

Under CEPA 1999, a substance is considered to pose unacceptable risks if it:

- has or may have an immediate or a long term harmful effect on the environment, or
- poses or may pose a danger to the environment on which life depends, or
- is or may be a danger in Canada to human life or health.

Substances that meet any of these criteria may be added to Schedule 1 of the Act; if a substance is added to Schedule 1, CEPA 1999 requires specific action for managing the risks within strict timelines.

Tools available under CEPA 1999 for managing risks associated with substances range from guidelines or codes of practice through to requiring the preparation and implementation of pollution prevention plans, environmental emergency plans and regulations, including economic instruments. Public consultation is an important part of the process.

■ Disposal at sea and protection of the marine environment

CEPA 1999 prohibits the disposal of any material at sea without a permit issued under the Act. Reflecting Canada's international obligations to control the disposal of wastes at sea, CEPA 1999 allows permits for only a few classes of substances. CEPA 1999 also allows for the development of objectives, guidelines and codes of practice for protecting the marine environment from land-based sources of marine pollution, such as run off of harmful substances from an industrial site.

■ Fuels and engine emissions

CEPA 1999 provides for an integrated approach to reducing harmful emissions from on-road and off-road vehicles and equipment. Risks are reduced by controlling the quality of fuels used in Canada and by controlling emission performance standards of vehicles and equipment sold in or imported into Canada. In fact, as emissions controls for cars become stronger, the focus has shifted to reducing emissions from other transportation modes, including off-road vehicles and small marine engines, as well as various types of hand-held equipment.

Motor Vehicles and Smog

Transportation is the largest source of smog in Canada. CEPA 1999 enables effective management of smog-causing pollutants from vehicles that have a major negative impact on both the environment and human health.

■ Hazardous waste

Each year, about six million tonnes of hazardous waste are produced in Canada — including industrial, manufacturing and processing waste, as well as such common household waste as old car batteries and oil-based paints. Moreover, Canada imports and exports many tonnes of hazardous waste each year, with most of it destined for recycling.

An important role of CEPA 1999 is establishing the conditions and procedures for transboundary movement of hazardous wastes — including the use of permits and notification of transfers. This management role protects the environment and human health in Canada, as well as fulfilling Canada's obligations under international agreements.

Hazardous Waste

Until ways can be found to avoid creating hazardous waste, it must be managed in a way that minimizes risks to the environment and human health.



■ *Canadian sources of international air and water pollution*

Substances released from Canadian sources that pollute air or water beyond our borders — even those that are not listed in Schedule 1 (see sidebar on page 2) can be addressed under CEPA 1999. If the government of the province or territory in which the source of the pollutant is located is not willing or able to act, the federal government may step in to take action to reduce or prevent the pollution.

■ *Environmental emergencies*

Uncontrolled, unplanned or accidental releases of substances that could reasonably be expected to harm the environment or human health are deemed to be environmental emergencies. Where no other federal or provincial regulations exist that adequately address various aspects of environmental emergencies, CEPA 1999 can be used to fill these gaps. The government can make regulations or take other measures to prevent, prepare for, respond to and recover from environmental emergencies. To reduce the risks associated with emergencies, the preparation of environmental emergency plans are required for many substances.

■ *Environmental protection on federal and Aboriginal lands*

Under Canada's Constitution, provincial environmental laws do not generally apply to activities of the federal Crown, nor do they apply on federal and Aboriginal lands. CEPA 1999 provides the authority to develop regulations and other measures to manage many, but not all, of the environmental risks on federal and Aboriginal lands or from federal operations.

CEPA 1999 includes many ingredients for successful and sound protection of the environment and human health — including tools for assessing and managing risks.

For further information:

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Want more information? Visit:



***The Canadian Environmental Protection Act, 1999* and Hazardous Waste and Hazardous Recyclable Materials**

Each year, millions of tonnes of waste are generated in Canada as by-products of industrial activity. This waste contains chemicals such as acids, phenols, arsenic, lead, and mercury, and is considered hazardous to human health and/or the environment if improperly handled.

Protecting the environment is everyone's responsibility. We can all help to protect the environment and human health by reducing the amount of hazardous wastes and hazardous recyclable materials generated, as well as by controlling and recovering more of it.

What is hazardous waste and hazardous recyclable materials?

In Canada, hazardous wastes and hazardous recyclable materials are defined as those with properties such as flammability, corrosiveness, or inherent toxicity. These wastes and materials can pose a variety of risks, from skin damage on contact to the contamination of ground water, surface water, and soil as a result of leaching into the environment.

Hazardous wastes and recyclables come from many sources, including material left over from industrial activities such as oil refining, chemical manufacturing and metal processing. Even some everyday household products such as used batteries, computers and other electronic equipment, cleansers, paints, and pesticides may be hazardous when improperly discarded or recycled.

Drivers for change

A number of international and domestic factors are driving changes in the way Canada handles its hazardous waste and recyclables. One factor is that Canada has ratified the United Nations' Basel Convention (<http://www.basel.int/index.html>), which requires the environmentally sound management of hazardous wastes and recyclables and reductions in exports for final disposal. Canada has also implemented the Organisation for Economic Co-operation and Development (OECD) Council Decision on the control of transboundary movements of waste destined for recycling, and has signed a separate bilateral agreement with the United States to control the transboundary movement of hazardous waste and recyclables, including municipal solid waste.

How CEPA 1999 affects hazardous waste and hazardous recyclable materials

CEPA 1999 builds on the federal government's authority to enact regulations that govern the export and import of hazardous wastes and hazardous recyclable materials, including transits through Canada and transits through other countries for shipments to and from Canada. By including separate definitions of hazardous wastes and hazardous recyclable material, it gives regulators the flexibility to manage recyclables differently than waste, if the proposed management method is considered environmentally sound. The Act also includes the authority to:

- set criteria to assess the environmentally sound management of wastes and hazardous recyclable materials and to refuse to permit import or export if the criteria are not met;
- require exporters of hazardous wastes destined for final disposal to submit export-reduction plans;
- regulate the export and import of prescribed non-hazardous wastes for final disposal; and
- control inter-provincial movements of hazardous wastes and hazardous recyclable materials.

CEPA 1999 contains provisions that require the Minister of the Environment to publish notification information (e.g., type of waste, company name, and country of origin or destination) for exports, imports, and transits of hazardous wastes and hazardous recyclable materials. The Minister also has the authority to issue permits, on a case-by-case basis, for the equivalent level of environmental safety, thereby allowing for variances with the regulations under specific conditions.

Regulations under CEPA 1999

Several regulations are currently in place to implement the authorities and conditions set out in CEPA 1999.

The *Export and Import of Hazardous Wastes Regulations* have been revised and replaced by the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, which came into force in November 2005. The revised regulations further contribute to the protection of the environment by improving controls on transboundary movements of hazardous waste and hazardous recyclable material, strengthening Canada's compliance with evolving international obligations, incorporating authorities under CEPA 1999, and modernizing the control regime.

The *PCB Waste Export Regulations* prohibit the export of wastes containing PCB in concentrations of 50 milligrams of PCBs per kilogram of waste or more destined for disposal to any country other than the United States.

In addition, Environment Canada is working on the following regulatory initiatives:

- developing new PCB regulations that will strengthen existing controls and propose deadlines for ending the use and storage of PCBs; and
- revising the *Interprovincial Movement of Hazardous Waste Regulations* to align the definitions of hazardous waste and hazardous recyclable material and the new movement document with those under the Export and Import of Hazardous Wastes Regulations.

The Government of Canada continues to work towards modernizing the management of hazardous wastes and recyclables by diverting waste toward environmentally sound recycling, minimizing hazardous waste generation, and promoting the use of greener technologies. All regulatory proposals and amendments are subject to the public consultation provisions contained in CEPA 1999.

Further information

Waste Reduction and Management Division

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Additional information on CEPA 1999 is available on Environment Canada's Web Site at www.ec.gc.ca/ceparegistry.

Additional information on waste-related initiatives is also available on Environment Canada's Green Lane at www.ec.gc.ca/wmd-dgd/

Inquiry Centre:

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2- Reuse, Recycling and Waste Diversion





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[Canada.ca](#) > [Environment and natural resources](#) > [Pollution and waste management](#)
> [Managing and reducing waste](#) > [Municipal solid waste management](#)

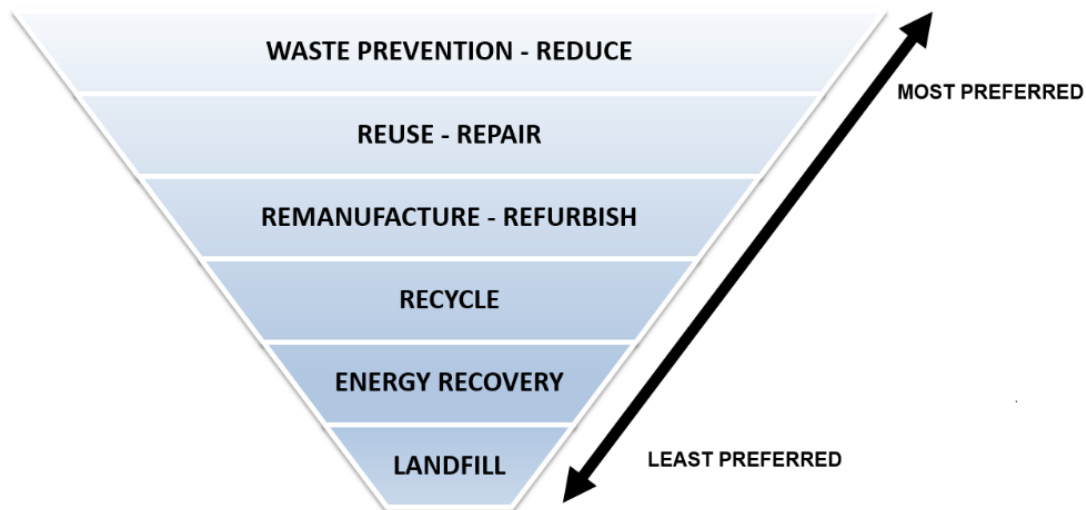
Reducing municipal solid waste

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- [Waste prevention and the circular economy](#)
- [Municipal solid waste: non-hazardous and hazardous](#)
- [How to recycle or dispose of specific items or wastes](#)
- [Additional resources for managing specific wastes](#)

The waste hierarchy - rethinking to recovery

We need to rethink how we purchase, use and throw out used items to reduce the costs and environmental impacts of waste management. This waste hierarchy ranks the preferred approaches to waste reduction and management to maximize the recovery and value of used materials. Value recovery processes, such as metal recycling, can be effective in industrial settings but can also be part of our daily routine.



► Long Description

Waste prevention: Preventing the generation of waste in the first place at the manufacturing, consumer and institutional level

Reduce: Reducing and preventing the amount of material entering the recycling and solid waste stream

Reuse: Reusing materials and/or products as much as possible through repairing and refurbishing before entering the recycling or solid waste stream

Recycle: Recycling by collecting, sorting and using materials as a resource input or selling them to secondary markets

Recovery: Using materials or waste that cannot be reused or recycled to produce fuel or energy using technologies such as Waste-to-Energy and Anaerobic Digestion

Canadians can also support the recycling effort by purchasing products that can be and are able to be recycled, or have been manufactured using recycled content. This helps to provide a market for recyclable materials.

- [Waste Reduction Week in Canada](#)

- [UL Certification \(Formerly Eco Logo\)](#)

Waste prevention and the circular economy

The first priority should be waste prevention, both at the manufacturing level and by consumers and institutions. The second priority is waste diversion to keep it out of landfills. Waste should be seen as valuable resource to increase the economic benefit from recycling and diversion.

A transition from the linear “take, make, waste” model to the circular economy would help efforts to implement the waste hierarchy. The circular economy keeps materials and products in use as long as possible by extending the lifespan, recirculating them back into the economy through recycling, refurbishing or repurposing, and by moving away from ownership of products to services and the sharing economy.

- [What is the Circular Economy?](#)



Preliminary Resource Recovery Report Card and Gaps Assessment for Canada

Final Report

Prepared for:
Natural Resources Canada
Land and Mines Sector and Canadian
Forest Service

Date: March 21st, 2020

Submitted by:
Marie Kelleher
Principal, Kelleher Environmental
in association with Millette Environmental



[Preliminary Resource Recovery Report Card
and Gaps Assessment for Canada](#)
[\[PDF \(Portable Document Format\) - 3.49 MB](#)
[\(Megabyte\)\]](#)

Municipal solid waste: non-hazardous and hazardous

Municipal solid waste (MSW) includes waste generated by the residential and industrial, commercial and institutional (ICI) sources. The ICI sources can include wastes from office buildings, shopping malls, schools or hospitals. MSW can include:

- **Recyclables** - such as plastics, metals, paper and cardboard
- **Organic waste** - biodegradable and compostable wastes such as food scraps, yard waste as well as used paper products and boxboard
- **Construction, renovation and demolition (CRD)** - such as wood (clean, engineered, treated and painted), asphalt roofing and drywall
- **Residual materials** - wastes that cannot be recycled or composted

MSW is primarily non-hazardous, however it includes small quantities of residential and ICI hazardous and other wastes that require specialized collection, treatment and disposal. Household hazardous waste and special wastes typically include wastes that are toxic, flammable, corrosive, environmentally hazardous or explosive. This can include wastes such as used batteries, mercury-containing products (lamps or batteries), pharmaceuticals and sharps, cleaners, paints, pesticides/herbicides and propane tanks.

How to recycle or dispose of specific items or wastes

In Canada, it's important to remember that waste is managed locally. The collection, diversion and disposal of compost, recyclables, household hazardous waste and non-hazardous waste are the responsibility of municipal governments.

Provinces and territories may have Extended Producer Responsibility (EPR) programs in place for certain types of wastes. EPR programs help to recycle or dispose of a variety of products such as: used agricultural and automotive products, beverage containers, electronic and electric equipment (EEE), household hazardous waste, mercury-containing products (e.g. fluorescent light bulbs), packaging and printed materials, pharmaceuticals, plastic bags and refrigerants.

Product manufacturers and retail stores can also be a source of information on how to dispose or recycle a product in environmentally safe manner or often provide collection of these items. For an overview of EPR in Canada and an inventory of recycling programs, by product category and jurisdiction, please see:

- [Overview of extended producer responsibility in Canada](#)
- [Inventory of recycling programs in Canada](#)

EPR programs vary between each province and territory. If you have an item to recycle or household hazardous waste to dispose of not listed in the EPR programs above - please contact your local municipality and provincial or territorial government:

- [Other Canadian jurisdictions](#)

Additional resources for managing specific wastes

Electronic and electrical equipment

End-of-life electronic and electrical equipment (EEE) is a growing domestic and global waste concern as electronic waste (e-waste) may contain toxic and hazardous substances, such as mercury or lead that could pose risks to human health and the environment if disposed of improperly.

The disposal of e-waste is managed by the provinces and territories. Most Canadian jurisdictions have introduced EPR regulations to promote and improve the collection of e-waste for environmentally sound management. Other useful links include:

- [Recycle My Electronics](#)
- [Electronic Products Recycling Association](#)
- [Electronics Product Stewardship Canada](#)

Pharmaceutical wastes

Pharmaceuticals and personal care products (PPCPs) include expired or unused prescription or over-the-counter drugs and natural health care products. PPCPs have been detected in the environment and in drinking water. PPCPs should not be disposed of in regular garbage or flushed down the toilet or sink. Proper disposal is an important step to reduce PPCPs in the environment and to protect the health and safety of Canadians.

The disposal of PPCP waste is managed by the provinces and territories that have introduced product stewardship programs to collect unwanted or expired medications and used sharps for environmentally sound management. Your local pharmacy may also be a good source of information in regards to proper disposal of PPCPs. Other useful links include:

- [Health Product Stewardship Association \(HPSA\)](#)
- [Prescription Drug Return Initiatives in Canada](#)
- [Disposal and use of pharmaceuticals \(Health Canada\)](#)

Light bulbs containing mercury

Every year mercury is released into the environment from millions of light bulbs such as compact fluorescent lamps and fluorescent tubes that end up in landfills. Be sure to check your bulbs for the letters: Hg. This indicates that the product contains mercury.

Some provinces and territories offer programs where you can drop off your lights at collection sites or arrange to have free pick-up services. There are also companies that offer disposal services for a fee and retailer take back programs, to keep mercury out of landfills.

- [Canada's national strategy for lamps containing mercury](#).

Construction, renovation and demolition waste

Construction, renovation and demolition (CRD) waste represents a significant portion (4 million tonnes or 12%) of the solid waste stream generated in Canada. CRD waste also contains chemicals that may pose risks to human health and the environment if improperly managed.

Many Canadian municipalities are developing legislation or programs to encourage the reuse and recycling of CRD waste. Larger CRD waste processing facilities in Canada are located in or near large cities. Provinces and territories have committed to developing EPR programs for CRD through the Canadian Council of Ministers of the Environment (CCME) Canada-wide Action Plan for Extended Producer Responsibility (Phase 2). Other useful links include:

- [Progress Report on the Canadian-Wide Action Plan for Extended Producer Responsibility \(CCME\)](#).
- [Guide for Identifying, Evaluating and Selecting Policies for Influencing Construction, Renovation and Demolition Waste Management \(CCME\)](#).

Date modified:

CHALLENGES AND OPPORTUNITIES

Staying on TRACC for the Future

Stephen Richardson, TRACC President

As Christmas 2019 approached we had no idea what was about to happen. Operations at the TRACC facility in Minto came to an abrupt halt as we dealt with a news-making fire.

As an industrial operation, we do think about, and plan for different scenarios, but despite planning you hope that “something” will never happen. And when it does, it can knock the wind from your sails. As a family-run business, it was probably more of a hit for us. We live in the community, so we knew this was bigger than just us. Yes, it impacted our family, but it also impacted our staff and our neighbours.

Perhaps it is because we are in New Brunswick, but the ‘community’ truly came together and rallied to support us. Community is a big word. Community means your family, your employees, their families, your neighbours, government, other businesspeople and more. We truly felt a

sense of this bigger community. It is because of community that we were able to not only survive but thrive.

Less than a year later, we were in a new building, our recycling operations have not only been streamlined but significantly improved. Tire storage, processing and new product packaging and shipping have all changed - for the better! That is not to say we didn't have additional challenges along the way. Like everyone else, the pandemic complicated things - from closed borders to sourcing materials, everything was more challenging - but again our community - the people - made success possible.

They say overcoming tragedy and adversity makes you stronger and it does. However, if the last year has taught us anything, it reminded us about the power of community! As we look to



the future, we are in the research and development stage of what new product lines we can introduce to the TRACC business. It's all about staying on TRACC for the future!



The Pandemic

Like every other organization and business in New Brunswick, our greatest challenge in 2020 was operating during a pandemic, the likes of which the world has not seen since 1918. Pandemic planning was part of our risk plan, but the COVID-19 crisis challenged us to be innovative and flexible.

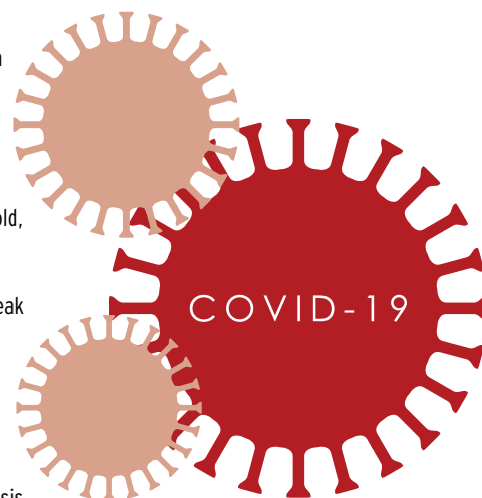
Our priority was the safety and well-being of our staff. In this time of uncertainty we wanted to reduce their stress and help them feel informed and supported. In addition to their safety, we had to maintain the continuity of work, which meant ensuring that they had resources and support to cope with rapid change and working remotely. Staff worked from home from March until the middle of May. In preparation for reopening the office, we created an operational plan that took precautions such as masks, signage, plexiglass dividers and sanitizing.

During the early months of the pandemic, some of the recycling locations for paint and electronic products were either closed or operating at reduced hours. This created an inconvenience for New Brunswickers who had to store their recyclables until they reopened in May. Even after locations reopened, people were reluctant to drop off materials for fear that they could increase their risk of getting the virus. As a result, collection of these products is down slightly.

The collection of tires and oil products continued as tire collectors, garages and oil collectors are essential services workers. However, we saw impacts on both programs. People were not driving their cars as much

so collection numbers for the oil program dropped and did not pick up until the end of the year. In addition to a decline in the number of tires collected, the Tire Program, which is funded from the tire recycling fee charged on each new tire sold, suffered a drop in revenue.

As we move from mitigation of the outbreak to recovery, we will review our response strategies, assess the programs and financial implications of the pandemic, communicate with our partners and the citizens of New Brunswick about how we can minimize the effects of any future crisis.



TIRE STEWARDSHIP PROGRAM (TSP)

Historic perspective

The *Designated Materials Regulation* (New Brunswick Regulation 2008-54) under the *Clean Environment Act* came into effect on May 1, 2008. The Regulation created Recycle NB and transferred the rights and obligations of the existing New Brunswick Tire Stewardship Board to the new corporate body.

Through the Tire Stewardship Program, Recycle NB provides a system that allows tire retailers in New Brunswick to comply with the *Designated Materials Regulation*. The regulation applies to anyone selling new tires within the province.

Tire Sales in 2020

There are about 700 registered tire retailers in New Brunswick. Each retailer handles collecting tire recycling fees at the point-of-sale for each new tire sold. Retailers remit the fees to Recycle NB, which in turn, funds the scrap tire collection, transportation and recycling operations. The program is self-supporting, receiving its funding from new tire sales in New Brunswick.

Tires Sold (Passenger Tire Equivalent):
1,334,389 PTEs 2020
(1,353,788 PTEs in 2019)

Tire Collections in 2020

Every scrap tire collected from tire retail locations throughout New Brunswick goes to the TRACC recycling plant in Minto. Recycle NB carefully monitors collection rates to ensure a level playing field for all tire retailers across the province.

Tires collected (Passenger Tire Equivalent):
1,185,521 PTEs in 2020 (1,248,461 in 2019)

Tire recovery rate: 88.8% (92.2% in 2019)



Tire Processing System

Under the tipping fee-based system, developed between TRACC and the Province of New Brunswick, the processing costs for scrap tires are paid once the collected scrap tires enter the TRACC inventory. The advantages of this system include a reduction in administrative costs and an end to frequent inventory audits. In addition, the agreement is a positive first step towards an Extended Producer Responsibility (EPR) program for tires.



YEAR	2016	2017	2018	2019	2020
Tires Sold *	1,347,000	1,434,000	1,487,366	1,353,788	1,334,389
Tires Collected *	1,140,000	1,078,000	1,221,754	1,248,461	1,185,521
Recovery Rate	84.7%	75.1%	82.1%	92.2%	88.8%

* Refers to passenger tire equivalents *(PTEs) where one PTE is equal to approximately 10 KGs

Quality Assurance

Recycle NB ensures that the quality of services provided by the program meets the needs of New Brunswickers. In 2020, we completed 10

audits on randomly selected retailers. All 10 were compliant. Recycle NB continues to focus its efforts and resources more effectively by collaborating with other provinces on the

delivery of tire retailer audits through its membership in the Canadian Association of Tire Recycling Agencies (CATRA).



PAINT STEWARDSHIP PROGRAM (PSP)

Historical Perspective

The *Designated Materials Regulation - Clean Environment Act* came into effect on May 1, 2008. The Regulation gave Recycle NB responsibility for the Paint Stewardship Program, the first Extended Producer Responsibility (EPR) program in New Brunswick.

In June 2008, Recycle NB accepted Product Care Association as the paint agent for brand owners registered under the program. Product Care Association developed the New Brunswick Paint Recycling Program to comply with the New Brunswick Designated Materials Regulation. Product Care Association, currently known as Product Care Recycling, continues to offer

waste diversion solutions for its brand owners' products in New Brunswick.

Achievements

Even in these trying times, Lauretide Re-Source Atlantic moved forward with plans to make its Richibucto plant the centre of its sorting operation in Atlantic Canada. The facility was sorting post-consumer paint products collected from New Brunswick, Newfoundland, and Prince Edward Island. This year, the Company completed its consolidation. Paint products, collected through the Product Care Recycling program in Nova Scotia, now go to the Richibucto plant for sorting.



The New Brunswick Paint Program is New Brunswick's most mature program and well used by residents to recycle their leftover paint products.



Paint Sales

Program members reported the sale of an estimated liquid volume of 5,410,127 litres of program product in 2020. The corresponding sales in the 2019 reporting period were 4,660,038 litres.



ESTIMATED LIQUID VOLUME SOLD (LITRES)

2020	5,410,127
2019	4,660,038
2018	4,533,254
2017	4,799,118
2016	4,654,046

Paint Collections

The Paint Stewardship Program offers homeowners and businesses collection depots across the province where they can drop off their leftover paint and various stains, varnishes, and aerosols for recycling. As of December 31, 2020, there were 64 collection depots in the province. They include retailers,

Solid Waste Commissions (including events) and Redemption Centres (bottle return depots).

The program collected 322,021 litres of paint during the year. The volume of leftover paint processed in the year and the method of disposal follows.

Percentage of Leftover Paint by Disposal Method 2020

METHOD	VOLUME (LITRES)	PERCENTAGE
Reuse (through paint exchange program)	491	0.2%
Recycle	245,383	76.7%
Energy Recovery	20,115	6.3%
Landfill	54,120	17.0%
Total	320,109	100%

* Total volume includes only paint materials processed during the year.

* Total does not add up to 100% due to rounding.

Metal and plastic containers collected

The following table shows the amount of metal and plastic containers Product Care recycled during the year.

CONTAINERS COLLECTED AND RECYCLED (TONNES)

Year	Metal	Plastic pails (HDPE 2)	Plastic paint cans (polypropylene)	Total (tonnes)
2020	53.3	4.7	12.8	70.8
2019	45.2	4.8	18.8	68.8
2018	62.7	4.3	16.1	83.1
2017	67.5	4.7	19.5	91.7
2016	72.3	4.2	13.6	90.1

OIL AND GLYCOL STEWARDSHIP PROGRAM

Historical perspective

Used oil and glycol are major sources of liquid waste in New Brunswick.

One litre of oil could pollute one million litres of water. However, when recycled, these products become a resource. By properly recycling and reusing these products, we help protect our environment for future generations.

The provincial government introduced a recycling program for used oil and glycol on October 24, 2012. *The Designated Materials Regulation-Clean Environment Act* designates oil, oil filters, oil containers, glycol and glycol containers as materials to be managed.

The Recycle NB Board approved the New Brunswick Oil and Glycol Product Stewardship Plan for 2014-2017 on November 6, 2013. An industry-led and financed oil and glycol-recycling program began on January 1, 2014.

The Board approved a new plan on December 8, 2017 that covers the period 2018-2022. UOMA Atlantic (Used Oil Management Association Atlantic) runs the program on behalf of its members.

Achievements

In its efforts to continuously improve its program, UOMA hired Luc Gagnon as Operations Program Manager. Based in New Brunswick, Mr. Gagnon will be overseeing the operations of UOMA's programs in all four Atlantic Provinces. A former Biologist with the New Brunswick Department of Natural Resources, Mr. Gagnon brings a scientific background to his new role. We look forward to collaborating with him to make the New Brunswick program as effective and efficient as possible.



SALES AND COLLECTIONS

Oil Sales

In 2020, UOMA reported a total of 14,317,109 litres of oil were sold in New Brunswick.

Oil Collections

UOMA has 198 oil and glycol collection depots across the Province and contracts with five companies to collect used oil products from its collection depots.

In 2020, 9,907,439 litres of used oil were available for recovery. The program collected 2,651,177 litres. This is 26.8 % of oil available for collection. A study revealed that 55% of used oil available for recovery in New Brunswick is burned in small, approved used oil furnaces. In 2020 that amounted to 5,394,601 litres of oil available for collection. Therefore, the total recovery rate for 2020 was 81.2%. The goal set for the program in 2020 was a 75% recovery rate.



YEAR	OIL COLLECTED (LITRES)*
2020	2,651,177
2019	3,057,400
2018	3,612,077
2017	3,728,890
2016	3,690,751

*55% of the used oil generated in New Brunswick is burned in small, approved furnaces.

Oil Filter Sales and Collection

The number of units of oil filters sold in New Brunswick in 2020 was 1,272,597 units (382,059kg). UOMA collected 278,104 kilograms. The recuperation rate of 72.8 % is just short of the program goal of 75% recovery.

YEAR	OIL FILTERS COLLECTED (KILOGRAMS)
2020	278,104
2019	295,537
2018	339,699
2017	317,694
2016	296,820



Oil Containers Collected

In 2020, 451,274 kilograms of oil containers were sold in New Brunswick. Of that total 428,711 kilograms were available for recovery. UOMA collected 244,502 kilograms of containers. This is a recovery rate of 57% that continues to be below the program goal of 75%. As part of its continuous improvement program, Recycle NB will work with UOMA, as it did with the collection of oil, to increase the recovery rate for containers.

YEAR	OIL CONTAINERS COLLECTED (KILOGRAMS)
2020	244,502
2019	240,374
2018	258,354
2017	261,149
2016	244,722

* Oil Containers: 95% of the collectable rate for oil containers is based on a 2008 study made by Recyc-Québec and SOGHU stating that 5% of containers are reused and are, therefore, not available for collection.

Glycol (antifreeze) Sales and Collections

Sales of glycol in the Province amounted to 2,056,562 litres in 2020. Of the amount sold, 883,293 litres were available for recovery. Recovery of this product at 121,299 litres, along with 230,651 litres of glycol found in waste oil amounts to a 39.8% recovery rate. This is below the 75% goal for recovery.

Glycol collection is low across the country. UOMA completed a national study on the recycling of glycol and, while it helped identify

more areas where glycol was being used, it still did not account for enough to ensure their target was met. Recycle NB is working with other provinces to understand what happens to the uncollected amount.

YEAR	GLYCOL COLLECTED (LITRES)
2020	121,299
2019	116,217
2018	114,682
2017	107,482
2016	120,860

*Waste oil contains 1.3% glycol.

Glycol (antifreeze) Containers Collected

In 2020, 49,225 kilograms of recoverable glycol containers were sold in New Brunswick. Of those containers, UOMA collected 14,760 kilograms. This is a recovery rate of 30% which is below the 75% target set by the program. Understanding the situation with recycling glycol itself in New Brunswick may offer some understanding about the after-sale use and practices of containers but Recycle NB will continue to emphasize the need for improvement in this area.

YEAR	GLYCOL CONTAINERS COLLECTED (KILOGRAMS)
2020	14,760
2019	14,561
2018	15,099
2017	11,770
2016	7,729

ELECTRONIC PRODUCTS STEWARDSHIP PROGRAM

Historical perspective

Every year thousands of tonnes of electronic devices ended up in landfills. Items such as televisions, computers, digital cameras, and audiovisual systems contain hazardous materials like lead and cadmium that are harmful to the environment. They also have materials like gold and copper that can be recycled and used to make new products.

The provincial government established the electronics waste management program under the *Designated Materials Regulation-Clean Environment Act* to ensure the safe recycling of these products.

The program began operation on March 30, 2017.

Electronic Products Recycling Association (EPRA) manages and operates the electronics recycling program in New Brunswick.

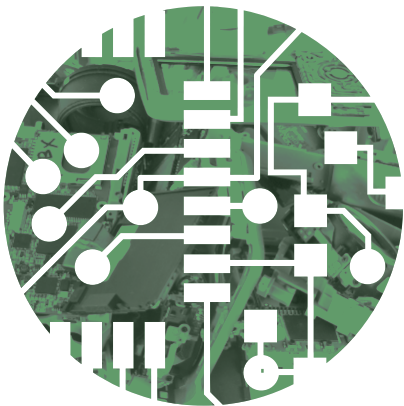
Achievements

Now in its third year of operation, the electronics program has matured and is offering New Brunswickers safe and easy recycling for their unwanted electronic devices at 78 collection depots throughout the province.

In spring 2020, EPRA/Recycle My Electronics updated its free, bilingual, online Learning Hub designed for school-aged kids. The site offers interactive games, quizzes, videos and downloadable worksheets to help parents and educators teach the students about the importance of recycling and the process of recycling electronics.

Materials collected

The total weight of end-of-life electronics collected from January 1, 2020 to December 31, 2020 was 971 metric tonnes.



YEAR	METRIC TONNES
2020	971
2019	1,056
2018	875
2017	799

Materials management by method

The program offers the safe and secure recycling of all materials at the end-of-life and encourages reuse of electronics. The following describes the management of products collected in 2020.

Material Recovery	97.35%
Energy Recovery	0.88%
Disposed	1.77%

Materials Processed

Electronic devices and equipment are made with valuable materials that can be reused. EPRA ensures that as many materials as possible are recovered and reused.





Waste Management, Reduction, and Diversion Phase 1

- A Sound Investment -

Years ago, and for generations, the face of waste in New Brunswick was an unpleasant one. Hundreds of dumps were scattered throughout the Province, operated by municipalities, by the provincial Department of Transportation, or by private individuals. No single body had responsibility for the safe disposal of our waste.

At these dumpsites, odour and vermin problems were “solved” by regular open burning of the refuse, which in turn created air pollution and related health hazards. Dumping was largely uncontrolled, and a variety of hazardous wastes were dropped off along with household garbage to be buried or burned. Liquid running off from the refuse was not contained on site, and this leachate was free to enter nearby lakes and streams, threatening drinking water supplies of neighbouring homes.

In response to the growing public concerns about our health and environment, the Province began to apply stricter environmental standards. By the mid-1980s, it had become very clear that our traditional ‘dump-and-burn’ method of garbage disposal could not be sustained; we needed a long-range plan.

A Regional Approach

After considerable background work, New Brunswick’s Solid Waste Management Plan was adopted in 1987. This new plan proposed to establish a series of Regional Solid Waste Commissions, each with direct responsibility for all aspects of solid waste management in its own area. Commission members would be local decision-makers, drawn from Municipal officials, Local Service District Advisory

Committees, and First Nations band councils where applicable.

Volunteer-based “Provisional Committees” were formed to study the waste management options, to consult with local residents, and to develop a long-term waste management strategy for their respective regions. As specific plans for construction of new waste-handling facilities were finalized for each region, its Provisional Committee was replaced by a Solid Waste Commission, empowered by the *Clean Environment Act* to manage that region’s household, commercial, and industrial wastes.

This regional approach allows for the differences in population, infrastructure, and other characteristics between various areas of New Brunswick. Decisions are made on a local basis by representatives of the people most directly affected by those decisions, within the comprehensive waste management strategy that guides the Province as a whole.

Environmental Protection

The Solid Waste Management Plan represented a new approach to waste management, placing a priority on environmental protection. Region by region, a total of six sanitary landfill sites were opened, replacing the hundreds of old, unsafe dumpsites. These modern landfills are designed and operated to prevent seepage into surface and ground water supplies, odours and health hazards from open burning, and long-term soil contamination. In addition to the landfill facilities, five transfer stations completed the Province-wide waste management network.



The roadside collection of solid waste, provided by municipalities to their residents for years, was expanded to include unincorporated areas as the old, local dumps were gradually closed. Under the new plan, Municipalities continued to oversee household waste collection in their respective communities, while the Province, through its provision of services to Local Service Districts, contracted with local haulers for waste collection in rural areas.

After more than a decade of intense effort and extensive public consultation, and with the investment of over \$75 million, New Brunswick now has one of the most environmentally sound waste disposal systems in Canada.

Moving Toward Reduction & Diversion

In 1989, the Canadian Council of Ministers of the Environment (CCME), including New Brunswick, agreed on a national goal to reduce the waste sent for disposal by 50% per capita, by the year 2000. During the ensuing decade, New Brunswick continued to place its primary focus on building safeguards for environmental protection. Even so, effort was made to initiate and support localized and provincial reduction measures, so that as of 2000, we have achieved a 40% per capita reduction in our generated waste — through private sector and voluntary efforts in communities across the Province, and through some ground-breaking environmental legislation.

Beverage Containers

The *Beverage Containers Act* (1992) established a deposit/refund system for soft drink, beer, and liquor containers, to discourage littering and to divert recyclable or refillable containers from our solid waste stream and our landfills. Juice containers were added to the list of returnables in 1993.

Under this program half of the deposit on beverage containers is refunded when consumers return them to a redemption centre. The balance goes to industry to help offset the costs of collecting and recycling the containers, and to the New Brunswick Environmental Trust Fund.

Over 100 distributors of beverages, and over 3,000 brands and types of containers are now covered by the legislation. To date, over one billion recyclable containers have been returned, and redemption centres and processing facilities around the Province employ over 250 people in full and part-time jobs.

Scrap Tires

In New Brunswick, we buy about 700,000 new tires each year. Improper storage and disposal of our many discarded tires can create real environmental hazards in the event of fire, including air pollution and groundwater contamination.

In 1995, the government partnered with tire manufacturers, distributors, and retailers to explore a new way of handling scrap tires. The result was the NB Tire Stewardship Board, set up under the *New Brunswick Tire Stewardship Regulation* (1996) with representatives from both industry and government.

The Board uses an “environmental levy” on tire sales to subsidize a private processing facility that grinds used tires into “rubber crumb” then manufactures new products. To date, over 2.5 million tires have been diverted from our landfills under this stewardship program.

Composting

Composting of organic matter not only produces a valuable soil additive; it can divert up to 1/3 of household wastes from landfills. Yard wastes and grass clippings, food wastes, and wood products can be successfully composted.



Two Solid Waste Commissions in New Brunswick have fully-implemented large scale composting to date, and other commissions are moving in this direction, and voluntary home-based composting is quickly gaining in popularity. As well, a number of municipalities hold backyard composting workshops and/or supply low-cost compost bins for their residents. Some communities also sponsor Christmas and other tree mulching programs, utilizing the mulch on public green spaces.

A number of municipalities produce organic bio-solids from their respective wastewater treatment plants, producing compost which can benefit soil structure and enhance crop performance. Bio-solids also provide restorative cover for land reclamation projects, and reduce the need to deplete valuable topsoil.

Other Examples of Recycling

- There are a variety of locales where “do-it-yourself-ers” can take their used oil. It is then collected and transported to companies that can process and “clean” it, to be used again for fuel or other purposes.
- Salvage yards have traditionally bought and sold scrap metal for recycling into new metal products; and used auto parts in good condition are often sold to consumers and garages for repairing other vehicles.
- Since 1997, the Canadian Household Battery Association has voluntarily operated a national program to collect and recycle used Nickel-Cadmium (Ni-Cad) rechargeable batteries. A number of New Brunswick retailers accept these and other household batteries, or automotive batteries, for recycling.
- Some large manufacturers of wood products now make saleable products, such as fuel for wood-pellet stoves, from their own wood waste.
- There is a growing re-sale market in New Brunswick, as elsewhere, for used dimensional lumber, mouldings, fixtures, and other building materials saved from demolition or left over from construction. Construction waste offers considerable potential for recycling: for example, scraps of drywall or plasterboard can be crushed, screened, and recycled into new gypsum products.
- Plastics, glass and paper wastes of various types are widely collected for recycling, by commercial recycling companies or through community-based programs under each Regional Solid Waste Commission.

Our opportunities for recycling do vary considerably from one region to the next, and change from time to time. Much depends on each region’s population and how it is distributed, as well as on such factors as transportation costs and changes in the marketplace.



Where Do We Go From Here?

We can look back on two decades of considerable accomplishment. New Brunswick's old, environmentally unacceptable dumps have been closed; and a sophisticated new system of sanitary landfills protects our environment from further harm. And we've made a good start in the area of recycling.

With our landfill infrastructure in place, New Brunswick can now focus strongly on waste reduction and diversion — on initiatives to divert waste from our landfills by *reducing* the amount of waste generated, *reusing* materials which would otherwise become waste, and by *recycling*.

It is inevitable that waste reduction efforts will have an impact on all New Brunswickers through changes in lifestyle and workplace habits, as well as the investments required to achieve province-wide waste reduction goals. As a result, we will continue the regional approach to waste management, where decisions that impact each region will continue to be made locally, within the broader provincial legislative and regulatory framework, and in conjunction with the delivery of this Action Plan.

The cornerstone for waste reduction already exists in organizational and physical infrastructure across the province. There is greater private sector activity in waste handling than ever before. Business and industry are moving toward the stewardship initiatives that mark them as good corporate citizens, and residents throughout the province are calling for increased opportunities to minimize waste. With these variables in place, and a strong commitment to realizing the initiatives outlined in this document, New Brunswick can be a leader in waste reduction and diversion.



Waste Management, Reduction, and Diversion - Phase 2

- Looking to the Future -

New Brunswick has made important strides in managing solid waste. Now we look to the future with an emphasis on reducing and diverting waste, not only to prolong the life of the sanitary landfills, but also to create new opportunities both provincially, and locally. The development and delivery of this Action Plan will require focussed effort and commitment at all levels of government, by regional and community interests, and by the private sector. And individual New Brunswickers, who are empowered as consumers, taxpayers, waste generators, and participants in waste reduction programs, will help determine its success.

Listening to New Brunswickers

In December of 1999, a Discussion Paper, featuring 16 key discussion points was made publicly available on the Internet and through the Department of Environment's regional offices and Service New Brunswick Centres. The Paper, based on a review of solid waste management practices in New Brunswick and other North American jurisdictions, was also distributed directly to over 300 key stakeholders throughout the province. A period of three months was provided for the submission of public comments, and the paper formed the basis of more detailed discussions with representatives of the 12 Regional Solid Waste Commissions, Municipalities and Local Service Districts, private sector interests, and environmental groups (see below). Stemming from the Discussion Paper, the department received 88 written submissions from across the province for consideration in developing the Action Plan.

Simultaneous to the release of the Discussion Paper, a Household Reply Card was distributed randomly to residents in each of the province's 12 solid waste regions. The card was designed to gather information about New Brunswickers' attitudes toward, and commitment to expanded waste reduction and diversion initiatives. A very positive return rate of over 10% (2,590 cards) provided the department with a clear sense of public views.

In conjunction with the New Brunswick Solid Waste Association, the department conducted a series of discussion sessions with stakeholders in each of the 12 Solid Waste Regions of the province. One hundred and thirty four attendees, representing a broad range of perspectives and interests, participated in these sessions. The resulting 100-page summary of their input created a valuable tool in the development of the Action Plan.

Organization and Accountability

The first step toward implementation of the Waste Reduction and Diversion Action Plan would be the development by the Department of the Environment and Local Government, of a work plan to aid all parties in achieving positive results within the targeted time frames. This work plan would guide both the legislative and operational aspects of the Provincial Government's role, as well as setting clear objectives for Regional Solid Waste Commissions. It would serve not only as an organizing tool, but also as a means of measuring and reporting to New Brunswickers on progress in implementing the Action Plan.



A Continuing Commitment to Involvement

Throughout the development of this Action Plan, there has been an ongoing commitment to involve the key players in the province's waste management sectors as initiatives are introduced. In keeping with this commitment, Regional Solid Waste Commissions, Municipalities and Local Service Districts, Business and Industry would be made aware of any major initiatives which are likely to have an impact on their respective areas of interest, and provided respective opportunities for input when an initiative places direct responsibility on any one of these sectors.

The adoption of this Action Plan would have definite implications for the key players involved, both in financial terms as well as in increased or evolving management responsibilities. The Plan also heralds new opportunities, with a potential for the development of new resources and markets and in accompanying job creation. With a commitment to continued dialogue between the Province and key stakeholders, aided by an effective liaison role within the Department of the Environment and Local Government, the signature of a new era in waste reduction and diversion should be one of respectful collaboration.



An Action Plan for New Brunswick:

Summary of the Initiatives under the 10 Point Plan

1. Ensuring Province-wide Consistency

- Legislated Waste Diversion Standards

Local decision-making has guided solid waste management in New Brunswick for more than a decade, an approach that has allowed for the differing needs and objectives of diverse regions. And while it is recognized that local decision-making has been important to actions such as siting and maintaining sanitary landfills, a regional approach can also create inconsistencies in the broader waste management and reduction spectrum. It doesn't mean that decisions shouldn't continue to be made locally and activities carried out in the respective solid waste regions, but simply that there should be some consistency across the province so that our collective efforts to reduce waste will have greater impact provincially.

Some regions of the province have developed comprehensive waste diversion and recycling programs for municipal and industrial, commercial, and institutional waste while other regions lag considerably behind. The result is that New Brunswickers in some areas do not have access to the waste reduction programs their fellow citizens enjoy elsewhere. Similarly, there are fewer business opportunities related to waste management and reduction in some locales.

Most people who live and conduct business in the province recognize the importance of environmental protection. They also know that the longer a landfill lasts, the less money and effort will have to be spent locally to create a new one, and that by investing in reduction

and diversion instead, New Brunswick will be better off environmentally as well as economically in the future.

Initiatives under Point 1

In response to the need for province-wide consistency on waste diversion, the Province would establish regulated standards to ensure certain recycling services for all residents of New Brunswick, as follows:

- **Each Regional Solid Waste Commission would be required to implement region-wide recycling programs for:**
 - **Corrugated cardboard, newsprint, box board, and office paper by December 31, 2003**
 - **Polyethylene terephthalate (PET) and high density polyethylene (HDPE) plastics, (#1&2) by December 31, 2004**
 - **Composting of all organic waste by December 31, 2006.**
- **All Regional Solid Waste Commissions would be required to establish region-wide solid waste recycling programs for these specific wastes within their respective regions. The particular recycling program to be adopted by each region would be determined as part of a regional solid waste reduction and diversion plan (see Point 5).**
- **Each Commission would also be required to report annually, on a form provided by the department, to the Minis-**



ter of the Environment and Local Government on the amount of material diverted from their respective regional landfills.

The waste reduction and diversion standards outlined above allow for the implementation of the regional waste diversion initiatives in phases. That is, the standards allow for an incremental development of appropriate legislative support, regional planning and infrastructure over the five-year implementation period. It should also be noted, that these standards are a benchmark, and do not preclude continuing or additional activity toward waste reduction and diversion in solid waste regions.

2. Leading by Example

- A Green Procurement Policy for Government

The business of running government and delivering services to New Brunswickers makes demands on a wide variety of resources, both in terms of purchase and utilization. Concerted efforts to reduce waste are not only desirable in environmental terms, but can also mean more effective use of public funds.

Among other positive outcomes, implementing sound environmental practices among government employees can have far-reaching behavioural impacts in communities across the province, and by changing our business practices, an additional gain can be made in the likely increase in market volume of particular recyclable commodities.

In all of these respects, the provincial government has an opportunity to lead by example, by setting and achieving reduction targets for its own operations.

The government also acts as the central purchasing body on behalf of New Brunswickers,

which means it sets certain standards for purchasing activities. By including environmental considerations in its purchasing policies, the government can not only help reduce waste, but also influence the practices of the business community from which it makes those purchases.

The Province recognizes that demands will be made of virtually every sector in the province, including individual citizens, if this Action Plan is to see positive results over the next five years. Accordingly, the government is prepared to not only guide the implementation of the overall initiatives in the Action Plan, but to be an active participant in achieving waste reduction and diversion in New Brunswick.

Initiatives under Point 2

In a commitment to lead by example, the Province would:

- 1. Conduct a government wide waste audit to measure current waste reduction and diversion practices, identify areas where waste reduction and diversion can be applied, and to set a benchmark for measuring reduction and diversion performance over time.**
- 2. Develop and adopt waste reduction guidelines for use by departments in conducting their everyday operations.**
- 3. Undertake the development of an environmentally responsible and economically sound procurement and tendering policy. All government departments, agencies and boards would be required to adhere to the policy.**
- 4. This process would include the establishment of an interdepartmental committee to review procurement and tendering options, including those asso-**



ciated with construction and demolition activities.

5. As part of its mandate, the Interdepartmental Committee would be asked to consider whether an environmentally responsible procurement policy should be adopted as regulation.
6. Examine the links between any provincial waste reduction and procurement policies and those of municipalities.
7. Encourage those municipalities which produce municipal bio-solids to give preference, in suitable applications, to the use of manufactured topsoil using composted bio-solids in place of topsoil from agricultural land.

It should be noted that a strategy for waste reduction through gains in energy efficiency has been outlined in the Province's Energy Policy, and includes:

- directing provincial government departments to include energy efficiency in all relevant decisions and policies, including procurement.
- expanding the Energy Accounting System (which sets measurable standards of energy use for building managers) to include oil and natural gas.
- extending the scope of the Provincial Buildings Initiative to include indirectly funded buildings such as hospitals, nursing homes and buildings owned or operated by crown corporations.

3. Encouraging Personal and Community Action

- Enhanced Public Education and Awareness

The success of community, regional, and provincial waste programs, hinges to a great extent on the acceptance and active participation of individual New Brunswickers. Public education and awareness plays an important role in fostering this acceptance and promoting personal action. An informed public can engender a more environmentally-responsible public, as people come to understand and act on their individual and inter-dependent roles.

There has been considerable waste-related educational activity across the province over the past several years. Several municipalities as well as community and environmental groups have created demonstration projects and staged events to call attention to particular waste related issues. Regional Solid Waste Commissions have led the way in explaining local waste management and reduction services to residents. The Province, in turn, has supported both individual and community awareness through departmental activities and educational materials, as well as through sponsorship under the Environmental Trust Fund.

In the area of waste reduction, perhaps the single most active contingent of the population has been New Brunswick's school children, and particularly those in elementary and middle schools. These youngsters, with support from teachers and parents, have established a broad roster of recycling and conservation programs that serve as a constant reminder of what collective effort can accomplish.



With the implementation of the Waste Reduction and Diversion Action Plan, the development of focussed, New Brunswick-specific education initiatives would become a priority across all sectors.

Initiatives under Point 3

With the aim of encouraging personal and community action, the Province would:

- **Develop and disseminate educational materials via the Department of the Environment and Local Government which**
 - **explain the public's role under waste reduction legislation or policies;**
 - **promote changes in overall consumer and user behaviour regarding waste generation and management;**
 - **provide practical information to guide New Brunswickers in making sound waste reduction related decisions.**

Areas for particular consideration would include a) the benefits of the three R's (reduction, re-use, recycling), b) household hazardous waste, and c) illegal dumping.

- **Support regional and community-based waste reduction awareness efforts through**
 - **recommendations for funding under the Environmental Trust Fund as appropriate;**

- **in-kind support stemming from the delivery of Provincial waste reduction programs (e.g. technical knowledge of waste systems)**
- **and continued provision of Provincial education materials for local use.**

- **Promote, via the Department of Education, the comprehensive adoption of recycling and other conservation programs in New Brunswick schools.**

4. Enabling Our Local Partners

- Support for Local and Regional Waste Reduction Initiatives

The Phase 1 development of a province-wide waste management system would not have been realized had there not been financial investments from both the provincial as well as local governments and the people they represent. Of equal importance, this undertaking required organizational support during the respective planning, development and construction activities. This support continues today through the ongoing management, funding and regulation of those waste systems.

The move toward increased waste reduction opportunities will also require money and other resources. The experience of communities or regional waste commissions where waste reduction and recycling activities are already well underway, tells us that such investments are required to achieve future improvements. And just as authorities have had to devise ways of operating regional landfill facilities and transfer stations, or local blue box programs with economic viability in mind, so the implementation of expanded waste reduction measures will require sound



economic decisions.

To enable local and regional action both financial and organizational investments will have to be made from a spectrum of sources. Apart from the elements of support referenced above (Point 3), and the potential funding opportunities which can be identified at federal and provincial levels, individual communities and Regional Solid Waste Commissions will be encouraged to seek innovative means of delivering waste reduction programs as economically as possible. This could include reducing collection costs through householder waste reduction (see Point 9), or seeking private sector partnerships. Whatever the approach, the most immediate dividends will be for an improved environment.

Initiatives under Point 4

To facilitate support for local and regional waste reduction initiatives, the Province would:

- **Ensure that all municipalities are aware of funding opportunities under the Canada-New Brunswick Infrastructure Program, and carefully consider applications for funding in light of Provincial waste reduction objectives.**

It should be noted that the present funding criteria includes a Provincial commitment to dedicating a minimum of 70 % of the total funding to Green Local Government infrastructure, including that associated with waste management.

- **Encourage applications to the Environmental Trust Fund which demonstrate achievable results under this Action Plan and which identify, wherever possible, alternative and/or complementary sources of funding.**

- **Establish an inter-departmental committee to examine the potential for creating economic opportunities associated with waste reduction and diversion, including the development of end-use or product markets for New Brunswick and Atlantic Canada.**

5. Bringing the Solid Waste Regions into Focus

- Waste Reduction and Diversion Plans

New Brunswick's Regional Solid Waste Commissions have all achieved the original threshold of managing solid waste disposal. A number of commissions have gone beyond that initial stage to develop recycling and waste reduction programs. As envisioned at the outset of the established solid waste management in New Brunswick, the development of disposal facilities was to be the cornerstone in a broader spectrum of waste management options. To achieve that goal, and do so consistently across the province requires concerted planning.

Developing comprehensive plans on a regional basis will facilitate the development of concrete targets for waste reduction. It is also widely regarded as a way to ensure that all sectors within a particular region are actively involved in waste diversion and reduction programs for that region. With established Provincial standards in place (see Point 1), regional commissions will have a benchmark that either complements their existing operations, or forms a foundation on which to build new services. As the standards are for specific materials and target dates, individual commissions will continue to be able to develop region-specific plans for these recycling initiatives.



Initiatives under Point 5

As a means of enabling Regional Solid Waste Commissions to meet the requirements of Provincial waste reduction and diversion standards, and to encourage consistency in waste reduction planning throughout New Brunswick, the Province would:

- **Require that each Regional Solid Waste Commission develop a Waste Reduction and Diversion Plan to be submitted to the Minister of the Environment and Local Government for review and approval, by December 31, 2002. The plan would have to:**
 - **Respond to the province-wide waste reduction standards for commissions, and include an implementation schedule to meet those standards.**
 - **Be developed with the full involvement of the Municipalities and Local Service Districts, (including Local Service District Advisory Committees), as well as First Nations Councils, where applicable within a specific region.**
 - **Be region-wide in scope.**
 - **Have provision for disposal of household hazardous wastes.**
 - **Include projected diversions rates.**
 - **Include a public awareness and education strategy.**
 - **Consider all alternatives for delivery, including partnering with the private sector.**

- **Provide a complete cost-analysis for all proposals included in the Plan.**

Where more than one commission is serviced by a sanitary landfill, the commissions would be encouraged to pool their resources to develop a joint plan.

The Department of the Environment and Local Government would act as a liaison with commissions during the development of the waste reduction and diversion plans.

6. Promoting Environmental Compliance

- Prevention of Illegal Dumping

Illegal dumping has been an unfortunate part of New Brunswick's societal and physical landscape for many years. Its effects can be a detriment to the environment and can pose a threat to human health and to wildlife. The very visual aspect of this practice can also have an impact on the recreational enjoyment of the province's residents and visitors.

Even with the advent of sanitary landfills and transfer stations, a system which provides virtually every New Brunswick with access to curb-side garbage collection on a weekly basis, there are still instances of illegal dumping.

There have been a variety of approaches taken over the years to reduce the impacts of illegal dumping, including derelict vehicle removal and unsightly premises action programs, which have removed thousands of eyesores from our landscape. And there have been measures to pursue cases of illegal dumping, although it is very difficult to patrol all corners of the province. The inspection



and enforcement approach carries a substantial investment of time and tax dollars and doesn't always guarantee a change in the behaviour of those who dump illegally. And so, while enforcement efforts continue, the primary emphasis must be placed on preventing this behaviour in the first place.

The province supports the premise that there will be greater long-term success in diminishing illegal dumping through public awareness (see Point 3) and the greater availability of disposal alternatives.

Apart from roadside pick up for household garbage, New Brunswick's Solid Waste Commissions also co-ordinate bi-annual collections of over-sized items, such as furniture and appliances. In some areas, this collection schedule has been enhanced to provide additional opportunities for householders to dispose of these items. There are also inspected and approved sites for construction and demolition waste which offer a reduced tipping fee to individuals and companies.

While these options are a good starting place, there is a need to increase waste diversion alternatives and with it, to strengthen the prevention of illegal dumping.

Initiatives under Point 6

In an effort to address illegal dumping, the Province would:

- **Seek to formalize the implementation of a policy for expanded waste collection in Local Service Districts as current waste collection contracts expire. This entails:**
 - **including a provision in all Local Service District waste collection service contracts, to allow residents to put out garbage and refuse ordi-**

narily associated with special waste collection days (i.e., small furniture pieces, building material, etc.)

- **allowing for this collection on a weekly basis**

The policy may not be applicable to all Local Service Districts. In regions where there are established recycling programs that require specially modified waste collection vehicles, it may not be possible to accommodate bulky wastes. Similarly, restrictions may be placed on white goods (appliances – refrigerators, stoves, etc.) and large items (i.e. sofas, arm-chairs) as many waste haulers operate one-person enterprises and the pick up of larger items would be too difficult for an individual to manage. Large items could be disposed of through special waste days generally held by waste commissions 2-3 times per year.

- **Work with the Department of Justice to develop legislative or regulatory measures which could be adopted to enhance compliance and enforcement efforts, including the potential for on-site ticketing by Department of the Environment and Local Government Inspection staff in instances of illegal dumping.**

While the permanent long-term improvement in the management and control of illegal dumping is expected to come about as a result of improved rural waste pick-up, the additional impact of issuing tickets would add to the Province's enforcement capabilities.

7. Weighing in Nationally

- Advocating Mandatory Recycled Content

Instituting mandatory recycled content means requiring that manufacturers and packaging companies adhere to established percent-



ages of recycled materials when producing their products. Given that most manufacturers produce for a broad, often national or even larger market, individual provincial requirements for content would be both inefficient, which can lead to other forms of environmental waste (e.g. energy, water consumption) as well as so cost-prohibitive as to deter compliance. In order to have maximum impact, a recycled content requirement should be national in scope, or as a minimum, involve several neighbouring jurisdictions.

Another waste management concept which is generating considerable interest is 'extended producer responsibility' (EPR). Under this model, a producer takes back a product once it has expended its useful life for the consumer, and the costs of managing this waste are incorporated into the price of the product.

The concepts of mandatory recycled content and extended producer responsibility have been in circulation for some time. In order to move them off the drafting board and onto consumer shelves, New Brunswick must join forces with its provincial, territorial, and federal colleagues to mobilize the move toward waste reduction at this level.

Initiatives under Point 7

In order to effect national change, which will have positive implications for New Brunswick, the Province will:

- **encourage other provincial and territorial jurisdictions to consider the adoption of compatible mandatory recycled content regulations, either as a complement to federal legislation or as a pre-cursor to its development.**
 - **advocate for the study of Extended Producer Responsibility and its applicability to Canada through the CCME.**
-
- ## **8. Calling for Life-cycle Product Management**
- ### ***- Industry Stewardship***
-
- 'Industry stewardship' is a term used to describe the management by industry of waste associated with a depleted consumer good or service, originally provided by that industry. Historically, this stewardship has come under one of two headings: regulated or voluntary.
- Regulated stewardship follows legally required management provisions and may provide an economic incentive for individuals to participate, or place an environmental levy on a product to off-set recycling costs. In New Brunswick regulated stewardship has been adopted to manage beverage containers and scrap tires. In a voluntary stewardship program, an industry voluntarily takes back its products (i.e. nickel cadmium (Ni-Cad) batteries, Brita water filters, plastic bags). The costs associated with managing waste under this model are often built into the price of the product or service.
- The call for more active industry stewardship to divert waste from landfills has wide-spread support in the province among the public and waste management stakeholders. Regulated stewardship is seen as the preferred approach, including among potentially affected industries, which see it as a means to ensure



all competitors in the industry concerned are placed 'on a level playing field'.

In an era when individuals are seeing themselves as having some responsibility for environmental sustainability, industry stewardship is an obvious next-level ownership of waste reduction and diversion solutions.

Initiatives under Point 8

In recognition of the significant contribution industry can make to waste reduction and diversion, through the lifecycle management of its products and services, the Province will:

- **finalize a milk container stewardship program with the New Brunswick Dairy Industry during 2002,**
- **develop a model for Paint Stewardship during 2002, and**
- **finalize a Used Oil Regulation for implementation by Spring 2002.**

9. Devising Waste Management Alternatives

- Municipal and Regional Options

Presently in New Brunswick, municipalities are responsible for waste collection within their boundaries. In turn, the respective Regional Solid Waste Commissions manage the disposal of this waste. For both entities, the cost of collecting and managing waste is a growing issue.

Municipalities are conscious of the pressure placed on their budgets by waste collection, and interested in finding alternative means of funding this service other than to increase municipal taxes. In this regard, attention is

being given to reducing the volume of waste that goes to the landfills. Commissions, meanwhile, are dependent to some extent on the tipping fees associated with the tonnage of waste sent for disposal, which creates both an environmental and economic conundrum.

Some Municipalities and Commissions favour a collection and disposal fee (sometimes referred to as a user-pay system), in which residents pay for waste collection based on the volume of waste generated. This provides an economic incentive to reduce the amount of waste each household generates. For the municipality, a decreased volume of municipal waste can potentially stabilize or slow the increasing costs of waste collection. From a legal perspective, the *Municipalities Act* does not presently allow for a collection and disposal fee approach, although this is currently under exploration. Additionally, there are concerns that collection and disposal fees will prompt an increase in illegal dumping.

There are alternative means of reducing household waste which, if adopted in a comprehensive manner, could alleviate the strain on municipal collection costs as well as the processing costs associated with recycling by Commissions. Additionally, there may be opportunities for creating new waste streams as a source of regional revenue. Source separation is the most familiar of these avenues. By sorting waste where it is generated (in households or commercial settings), the costs of disposal are reduced, and the quality of the materials collected (whether organics for large scale composting, or high grade plastics for recycling), combined with less time spent sorting by the Commissions can mean considerable savings.



The success of a source separation program relies to some extent on the volume of sorted waste which can be collected, and therefore a high participation rate by residents and other users. Whatever options municipal and regional interests pursue, New Brunswickers have indicated that waste reduction should be the primary consideration.

Initiatives under Point 9

In promoting the exploration of alternative municipal and regional waste management options, the Province would:

- **undertake a review of applicable legislation to determine what instruments might be put in place for use by Municipal and other bodies in managing waste volumes locally.**
- **Encourage an examination by Waste Commissions of a tiered tipping fee approach for managing waste from the ICI (Institutional, Commercial, Industrial) sector.**

10. New Directions for Diversion

- Consideration of Landfill Bans

A landfill ban is a regulatory measure that prohibits the disposal of a solid waste that can be recycled or is not appropriate for disposal in a sanitary landfill. Proponents of landfill bans point to the potential for diversion of recyclable materials from disposal facilities, and the requirement it places on industrial, commercial and institutional sectors to source-separate their waste. Those who oppose landfill bans cite a likely increase in illegal dumping or the creation of a glut in materials for which there may be fluctuating markets. Some Regional Solid Waste Commissions

see landfill bans as a potential loss of revenue to private sector recycling and waste management enterprises.

There can be both environmental and economic benefits to landfill bans, as long as equitable arrangements are made between parties and a fully developed system is in place to ensure both the environmental and economic viability of associated programs.

Initiatives under Point 10

Recognizing that landfill bans may be a beneficial option in achieving waste reduction in New Brunswick, the province will:

- **consider proposals to the Department of the Environment and Local Government for landfill bans, per the following:**
 - **Such a ban is requested by one or more Solid Waste Commission(s) and would be region or province-wide.**
 - **There are viable alternatives to disposal for the banned material (e.g. recycling and reuse programs).**
 - **There is an appropriate collection mechanism (e.g. source separation) in place for use by the public and industry.**

A Note about other initiatives

The initiatives under this 10-point plan encompass many of the proposals originally put forward in the Waste Reduction and Diversion Discussion paper. The remaining concepts should be considered as potential future directions, which can be re-visited at any time during the five-year period covered by this



Action Plan or as the foundation for waste reduction and diversion once it is better established across the province.

For example, initiatives such as the establishment of a marketing cooperative for recyclables may be a natural next step in the management of New Brunswick's waste resources, but can be better evaluated once individual regional plans for recycling are in place.

We can also anticipate potential modifications to future waste reduction and diversion planning, based on the experience gained from implementing this Action Plan.

Too Good to Waste!

What is waste?

Historically, the definition of waste according to Webster's 1913 Dictionary was: "lying unused; unproductive; worthless; valueless; refuse; rejected".

Today, the Oxford English Dictionary defines waste as: "eliminated or discarded as no longer useful or required".

A waste not want not proverb:

"If you use a commodity or resource carefully and without extravagance you will never be in need".

This proverb reiterates the theme for WRW in Canada, "Too Good to Waste". So let's start thinking of items that we would otherwise discard as: "resources that we conserve, reuse or recycle to protect our environment".



What can I do?

Start practicing the 3Rs in everyday life. Whether you are at home, at school or at work, think about how you can reduce, reuse or recycle your waste to turn it into a resource. All of us have an important role to play in reducing waste.

Why waste reduction?

If we can reduce the amount of waste that is produced in the first instance, we are conserving resources and limiting the need to reuse or recycle. Canadians produce more than 31 million tonnes of waste annually¹, that's 2.7kgs per person per day. In perspective, that's the same volume of waste being generated as piling up 31 million average family cars. Nearly 40% of this waste is generated at home with the remainder coming from commercial, industrial, construction and demolition sources. Of the waste we are generating, we are diverting less than 25%.

Most of our waste is buried in landfills. For waste to decompose in a healthy environment, such as your compost pile, it requires air and water. These are not present deep in the landfill, and as the waste slowly decomposes and reacts with what is around it, it can produce a leachate which may end up in our groundwater system, not to mention creating greenhouse gases such as methane and carbon dioxide. In properly managed landfills, leachate is collected and treated along with greenhouse gases. According to Environment Canada², landfill sites account for 38% of Canada's total methane emissions. It is up to each of us as individuals, communities, schools or businesses to consider what we are throwing away and the environmental impact this is causing. We need to look for alternatives that will promote waste reduction and help to protect our environment.

1. Statistics Canada, Environment Accounts and Statistics Division

2. Environment Canada www.ns.ec.gc.ca

Too Good to Waste!

Reducing

Reducing the amount of waste produced in the first place, is by far the most efficient way of conserving resources and protecting our environment. We are all responsible for the waste we produce, so think: what do you throw away each day? When you avoid making waste in the first place, you don't have to worry about reusing it or recycling it later.

At work or school:

- Reduce paper use by using both sides
- Pack your lunch in reusable containers
- Rent items that are not used very often
- Purchase products with recycled content

When shopping:

- Reduce waste by avoiding over packaged or unnecessary disposable items
- Avoid food packaged in individual servings—where feasible and safe, buy in bulk
- Buy drinks in refillable containers where available
- Use your own cloth bags

As a community encourage your neighbors and friends to do the same. As a business reduce the amount of packaging you require for your products or the amount of materials used to make your product.

Reusing

Reusing items give the resources they were originally made from another life, while reducing pollution and conserving the energy that comes with the manufacturing process or recycling the items.

- Purchase durable products that can be repaired and reused.
- Donate things to or purchase household items and clothing from charity shops or have a yard sale. You will be amazed - one person's trash is another's treasure!

- Reuse jars and containers for storage.
- Donate reusable equipment to schools, churches or other charity organizations.
- When shopping consider buying used items. There are many "used" stores that offer refurbished items that work as good as new.

Recycling

Recycling and purchasing products made with recycled materials is the next way we can conserve resources. If we can't reduce waste by avoiding it, and it can't be reused, can we recycle it? 17 million Canadians (nearly 2/3 of us) have access to recycling.³

- Recycle in the garden by composting organics such as food scraps, leaves and yard trimmings.
- At work, separate items for recycling - this can save your business money in disposal costs.
- At school, consider setting up a recycling program.
- At home, use the recycling services provided by your municipality or take end-of-life items back to where they were purchased or other take-back centers.
- When shopping consider the material that the item is made from and packaged in. Have the resources already had a previous life? Are these resources renewable? How much of it is made up of recycled content? And only purchase materials which can be recycled again.

Register

Register your community, business, organization and school activities and events for WRW in Canada on the website at www.wrwcanada.com, view resources, download a kit and get more ideas on what else you can do to contribute to the success of Waste Reduction Week in Canada.

Municipal Waste Reduction in Canada

Municipalities all across Canada are affected by waste management issues every day. Reducing the amount of waste produced in a municipality is beneficial for a number of reasons:

- It reduces the need for landfill space
- Saves valuable natural resources
- Cuts down on greenhouse gas production
- Saves the community money by reducing disposal costs

Your municipality probably already has some form of waste reduction program in place. However, you may not be aware of all of the options that are available to you. Here is an overview of various waste reduction programs that are happening throughout the country and examples of where they have been a success.

Drop-Off Systems

In a drop-off system, residents deliver their recyclables to a central location or depot. Drop-off systems offer convenience and low operating costs. In most cases, the depots are located at frequently visited locations. Some of the materials collected through this system include mixed paper, cardboard, plastic bags, and metal cans.

Deposit/Refund

A deposit/refund system charges a fee on a container at the time of purchase. This fee is partially or fully refunded when the item is returned to a collection facility. An example of this system is the beverage container recycling system that is common in most regions in Canada. During the 2003-2004 fiscal year, Saskatchewan's beverage container recycling program collected 237 million designated beverage containers. That's a recovery rate of approximately 87%.



User Pay

User pay systems involve the application of a fee or tax. These systems support the “polluter pays principle” and are meant to encourage environmentally responsible behaviour. A user pay system has been implemented in several municipalities in BC such as Burnaby and Surrey, where residents are limited to one or two containers of garbage per week. Residents who need to dispose of more than the weekly garbage limit must purchase an over-limit ticket for \$2-\$3 per bag.

Special Collection Days

It is important to keep hazardous products, such as cleaners, paints, pesticides and electronics out of our landfills. In some provinces some of these items are not permitted in regular waste and are collected through stewardship programs or via special round-up days. For example, successful electronic waste round-ups have been held in a number of municipalities, including Whitehorse, Calgary and Winnipeg. Other municipalities and regional districts, in Nova Scotia and Alberta for instance, have permanent and mobile collection facilities for hazardous wastes.

Municipal Waste Reduction in Canada

Curbside Systems

Curbside systems collect recyclables at curbside through the use of various sorting methods, including multi-coloured containers, and take them to a central processing facility. Markham, Ontario has recently implemented a “3-Stream” curbside program to reach its diversion goal of 70%. This means that each household sorts its waste into three streams: recyclables are put into a blue box, organic materials go into a green bin and leftover garbage is placed in garbage bags.

Organics Collection

Many municipalities have a program for diverting organic waste from landfills. In some cases, there are drop-off sites for leaves and yard waste and in others curbside pick-up of organic material is available. Some municipalities rely on backyard composting programs and supply households with composters. Residents in Halifax and other municipalities in Nova Scotia are supplied with green carts for collecting organics. These are picked up once every two weeks and once a week in July and August.



Christmas Tree Recycling

Once Christmas is over each year, many municipalities provide temporary depots to collect Christmas trees for recycling. Through the “Lets Chip In Program” in Winnipeg, Manitoba residents can drop off their trees to be recycled and then return later for free wood chips. Aside from these programs, there are lots of things your municipality can do to participate in Waste Reduction Week. Following are a series of suggestions, tips and specific tools for conducting a waste aware activity or holding your next community event.

Proclaim Waste Reduction Week!

Issue a proclamation of Waste Reduction Week and your municipality's participation in it. See the sample proclamation form in the next page.



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> [Managing and reducing waste](#) > [Waste management in Canada](#)

> [Plastic waste and pollution reduction](#)

Zero plastic waste: the need for action

Plastic is a valuable material and resource because of its unrivalled functionality, durability and low cost. We use plastics in almost all aspects of our lives. In Canada, plastic production is a \$35 billion industry employing close to 100,000 people in nearly 2,000 businesses that make and recycle plastic products.

Yet every year Canadians throw away over 3 million tonnes of plastic waste from our homes and businesses. Almost half of that is packaging. The rest comes from sectors like construction, textiles, agriculture, automotive and electronics.

The way we currently use and manage plastics affects our ecosystems and wildlife, and burdens our economy. It is time to shift towards a more resource efficient and circular economy for plastics.

Protecting our environment from marine litter

Marine litter is solid waste that has been discarded, disposed of or littered into the environment, including our freshwater and marine ecosystems. Most of it - about 80% to 90% - is plastic. It comes in all shapes and sizes including microplastics – small plastic particles less than or equal to 5mm in size - and consists of items like fishing gear and packaging.

In 2016, about 29,000 tonnes of plastic waste was littered into our environment in Canada – that is as heavy as almost 300 Blue Whales! Close to 10,000 tonnes of plastics enter the Great Lakes every year from Canada and the United States. Litter that you see on the sidewalk can be blown into a river or lake, or go down the storm drain and end up in the ocean.

Marine litter can have many affects. It can transfer contaminants, damage habitats, impact fisheries or seriously harm wildlife if it is ingested or they become entangled in it.

Over the last 25 years, nearly 800,000 volunteers have removed over 1.3 million kilograms of trash from across Canada's shorelines through the Great Canadian Shoreline Cleanup. The most commonly littered items on our shorelines are single-use or short-lived products, many containing plastics such as:

- cigarette butts
- tiny plastic or foam
- food wrappers
- bottle caps
- paper materials
- plastic bags
- beverage cans
- plastic bottles
- straws
- other packaging
- foam
- coffee cups

Building a circular economy

Currently the way we manage plastics is based on a “take-make-waste” model - we extract resources, we make products and then we throw them away. If current trends continue, the plastics thrown away in Canada will be worth \$11 billion by 2030.

In a circular economy, the lifecycle of materials and products is extended as long as possible. It follows a “make-use-return” model so that materials and products are reused, repaired, re-manufactured or recycled. By creating a circular economy for plastics, we could:

- reduce plastic and carbon pollution
- generate billions of dollars in revenue
- create as many as 42,000 jobs by 2030.

Our vision is a zero plastic waste future where plastics stay in the economy and out of landfills and the environment.

Related links

[Economic study of the Canadian plastic industry, markets and waste](#)

[Great Canadian Shoreline Cleanup](#)

[Toward zero plastic waste](#)

[Canada's actions on plastic waste](#)

[Get involved and find resources](#)

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ENVIROTHON NB

Waste to Resources

3- Composting and Food Waste



Backyard Magic

Is there a compost pile in your past? For most New Brunswickers, the answer is yes. Our grandparents' generation knew the value of composting their yard and kitchen wastes. Giving back some of the nourishment they took from the earth made good common sense, and it still does!

In today's New Brunswick, composting is a traditional idea with a broad new appeal. It's making a strong comeback in all parts of the Province, as people look for positive things they can do themselves to benefit the environment. With just a little effort, the results can be very satisfying.

Composting uses nature's own recycling system. Weeds and leaves, grass clippings, vegetable peels, and various other organic wastes are turned into humus. That's an essential soil conditioner richer than anything we can buy.



Why throw away the raw material which generates something so valuable? Especially when composting has other benefits as well.

Reducing Garbage

Up to 30% of the garbage we throw out each week can go in the compost pile. Cutting domestic waste generation means a longer life for landfill sites and better environmental management for the entire community.

Helping Plants Grow

Your lawn, garden and house plants can never get too much compost. It gradually releases a variety of nutrients just when they're required by the growing plants. Insects and diseases don't seem to do as much damage where the soil is enriched with plenty of decayed organic matter. And there's another bonus: dark compost draws the sun's heat to warm the garden soil, making our short growing season a few days longer.

Building Up the Soil

Plenty of compost added to the soil will also act like a sponge, soaking up water when it rains and releasing it in dry spells. It improves the structure of both sand and clay soils, protecting them against drought and erosion.

How A Compost Pile Works

When leaves drop from a tree, they decay into soft black humus over time, without any help from people. When an animal dies, its remains slowly return to the earth. Anything that once lived will eventually decompose.

Composting is based on this natural process and begins with the thousands of microorganisms which live naturally in soil. They feed on a moist heap of organic waste materials, generating considerable heat in the process. Other groups of “decomposer” organisms go to work as the temperature rises, an ever-changing workforce of bacteria, fungi, and insects.

When the temperature drops, turning or stirring the pile gives the decomposers more oxygen and the heat builds again, helping to kill harmful bacteria. When all the easily decomposed material has been consumed, the temperature drops for the last time and earthworms and ants may move in, signalling that the compost is ready to feed new plants with its “recycled” nutrients.

Finished compost has the distinctive fresh smell of newly-turned soil or a forest floor in spring, and won't heat up again no matter how often you turn air into the pile. The ideal result of the composting process is crumbly, dark, soil-like humus where none of the original material can be identified. The nutrients stored in compost depend on the richness and variety of its ingredients, and on its exposure to harsh weather. But experienced gardeners know there is no such thing as bad compost!

Using the Compost You Produce

Finished compost adds nutrients and organic matter to the soil, improving its texture and increasing its ability to hold air and water. Because it doesn't burn plant roots, large quantities of compost can be applied to the soil at any time.

Soil Improvement

Try digging several centimeters (one inch) of finished compost into a flower bed or vegetable garden before planting. How much you use will depend on how much you have available: the soil can use it all.

You can also give trees, shrubs, and nursery seedlings a good start by planting them in half-and-half soil and compost. New lawns will develop healthy roots to keep them green, if compost is dug into the soil before the grass seed is applied. When an established lawn suffers winter-kill, working some compost into the bald spots before seeding again is another good idea.

Top Dressing

Treating lawns with just over a centimeter (half-inch) of compost serves as a very effective feeding when the ground has dried in the spring. By sifting the compost first, you can remove any unattractive large pieces or materials that may not be fully decomposed. These large pieces can be returned to the compost for further breakdown.

Side Dressing

You can also apply compost as a spot fertilizer. Scratch it lightly into the top layers of soil around the plant that needs a boost, and water deeply.



Compost “Tea”

Here’s a tidy way to supply compost nutrients to house plants or to spot-fertilize seedlings. Soak a burlap bag or old pillowcase of compost in a pail of water until the liquid is tea-coloured. Or stir one part compost into three parts water and pour off the “tea.” Using this liquid to water plants makes a difference, particularly in the middle of the warm growing season.

Mulch

Mulching should be done late in the spring when the ground is thoroughly warmed, but before summer’s heat, to conserve moisture. Spread approximately 8 cm (3 inches) of compost on top of the soil around trees and shrubs, from near the base of the trunk out to the dripline. You can also mulch around vegetables and flowers as soon as the plants are approximately 8 cm (3 inches) high, to keep roots cool and discourage weeds.

Potting Soil

House plants, window boxes and hanging baskets will all benefit from a potting soil mixed with sifted compost. Compost alone can be used for growing vegetables in containers, and for starting plants from seed. For indoor use, you may want to sterilize compost in the oven for an hour at 95°C (200°F), but don’t be alarmed by the (temporary) strong smell.

The Compost Recipe

Composting is a very basic process. You can simply toss grass clippings and leaves in a heap and let nature do the rest in its own good time, or you can help it along, by providing a balanced diet for the micro-organisms who'll do most of the work, as well as a home that meets their needs.

Just like us, these decomposer organisms have three basic requirements: air, water, and food.

Air provides oxygen and enables bacteria to carry out "aerobic" decomposition. Without oxygen, "anaerobic" decomposition of the waste may take place instead. This is something we normally want to avoid, since anaerobic bacteria produce the rotten-egg smell often associated with decay.

There are two methods of aerobic composting, depending on whether or not the pile heats up. A "cold" compost pile will decompose as surely as a "hot" one, but it'll take much longer.

Cold composting is slow but it's easy. Someone with more space for compost than physical energy and time to devote to it may opt for the "cold" approach. This could also be the method to choose if your primary concern is reducing waste, rather than making quantities of compost.

In contrast, hot composting is a fairly fast method of creating compost and makes efficient use of smaller spaces. It does take more physical effort than cold composting, but gardeners who want as much compost as possible will usually choose this method.

There are many variations of approach, as individual as the people who compost. You might pick one method to start with and adapt it, as you gain experience over time. Above all, keep your system simple, convenient, and suited to your lifestyle.



Air

Air penetrates only the top layers of the pile, so it needs help to reach the centre. A vile smell around the compost tells you that anaerobic bacteria are moving in, and the pile may simply need to breathe. In hot composting, plenty of air is essential to develop the high temperatures that kill pathogens and speed the process of decomposition.

Turning

The most effective method of introducing air is to turn the pile with a garden fork. Lift the material from the top and sides, toss it into the more active centre of the new pile, then add the partially decomposed centre to the outside.

Stirring

If you would rather not do the work of turning a pile, try stirring it with a stick instead; this won't distribute the air as evenly, however, so the composting process will be somewhat slower.

Aerator Tools

You can buy an aerator, a rod with flaps on one end and a handle on the other, at a garden centre. You jab the tool into the compost pile, and the flaps unfold to loosen the materials as you pull it back out. The result is easier than turning and produces more air than stirring.

Air Stacks

Another approach is to build your compost pile around a perforated pipe, a bundle of long twigs, or a tube of wire mesh standing on end. This carries air to the centre between turnings. With air stacks, you can skip the turning, although the pile won't heat up as efficiently.

Elevated Compost

Most compost piles rest on bare ground, but you can build the pile on a raised platform of loosely spaced boards, allowing air to be drawn up from the bottom. If you elevate your compost, however, be sure to sprinkle garden soil through the compost to introduce those essential soil bacteria.



Water

Your compost pile should be as damp as a wrung-out sponge, moist to the touch, but no water should come out when you squeeze a handful.

Too dry?

You can poke holes in the pile and water it from the top with a trickling hose. Better yet, pull the pile apart and rebuild it, wetting each layer as it goes on. Very fibrous materials such as dead leaves may need to be soaked in a bucket for an hour or two.

Too wet?

A soggy pile should be turned so that clumps of material are broken up, letting air in and water out. If the compost is absolutely soaked, you can spread the materials to dry in the sun, or scatter peat moss through the pile as you rebuild it with the drier materials in the centre.

Food

Decomposer organisms work best with as varied a diet as you can feed them. The ingredients are all around us, almost anything that once lived is a candidate for the compost, so try for lots of variety to get a good mix of textures and plant nutrients.

In composting jargon, woody materials that are high in carbon (autumn leaves, paper, peat moss, sawdust, cornstalks, hay and straw, etc.) are called “brown” ingredients. Materials like garden refuse, manure, tea and coffee grounds, feathers, hair, and food scraps are high in nitrogen, or “green.” Some materials can actually be both: fresh grass clippings are “green,” for example, but dried grass is “brown.”



For successful results, you can use the simple rule that compost needs to be about half “brown” and half “green” by weight. Don’t bother to weigh your ingredients, though: an estimate is fine. Composting soon becomes a matter of instinct, like the cook who bakes without a recipe. If the pile doesn’t heat up, you know there’s not enough “green” in the mix, while a smell of ammonia means it needs more “brown.”

Materials To Use

Green (Nitrogen Rich)

- Algae
- Bone meal
- Coffee grounds
- Eggshells
- Feathers
- Flowers
- Fruit and fruit peels
- Grass clippings (fresh)
- Hair
- Manure
- Seaweed
- Tea Leaves
- Vegetables and peelings
- Weeds

Brown (Carbon Rich)

- Buckwheat hulls
- Coffee filters
- Corn cobs
- Cotton/wool/silk scraps
- Grass clippings (dried)
- Hay
- Leaves (dead)
- Paper
- Peat moss
- Pine needles
- Sawdust
- Straw
- Tea bags
- Wood chips
- Wood ash

This list is far from complete. Anything organic can, in theory, be composted -- some more easily than others. But common sense suggests a few exceptions. The following materials may cause problems in a backyard compost pile.

Materials To Avoid

- pet wastes can contain extremely harmful bacteria;
- meat, fish, fats and dairy products are likely to smell as they rot and may attract four-footed visitors;
- insect-infested or diseased plants may persist in the compost;
- materials contaminated by synthetic chemicals or treated with herbicides or insecticides should never be used;
- weeds with mature seeds, and plants with a persistent root system (like crabgrass, ground ivy, or daylilies), may not be killed by the heat of the compost;
- leaves of rhubarb and walnut contain substances toxic to insects or other plants so most people choose not to compost them.

Building A Hot Compost Pile

Directions

1. Gather both “green” and “brown” ingredients, enough to make a compost pile measuring at least 1 meter (3 feet) in each direction (high, wide and long).

A smaller pile won't generate or retain enough heat to effectively kill any harmful bacteria present. If you choose healthy ingredients to compost, and keep pets and pests out, there's no reason for concern.

A much larger pile is more likely to compact, shutting out air, and is more difficult to work with.

2. Chop or shred into small pieces as much of the material as possible. Dry materials like leaves can be run through a shredder or under a lawn mower. A whipper-snipper in a garbage can works well too, like a big blender.

Shredded materials make a better home for decomposer organisms, with more surface area for them to work on. A shredded pile is also better insulated, has more pockets for air and retains moisture more easily. The finer the pieces, the faster your compost will be finished.

3. Layer 15 cm (6 inches) of well-watered “browns” and 15 cm of “greens,” mixing the two layers together.
4. Alternate and mix layers of each type of material, adding water as needed, until the pile is at least one meter (3 feet) high.

Adding the material in layers simply helps you judge the right proportions of “brown” and “green.” But everything should then be thoroughly combined to compost efficiently.

5. Cover the pile to protect it from heavy rain, and wait. The compost should begin to heat up within hours.

To witness decomposition in action, you can stick a metal rod into the centre of the pile for a few minutes, then check if it has warmed up. Compost thermometers are available at garden centres, or you can mount a meat thermometer at the end of a stick, if you want precise temperature readings.

Vapour emerging from aeration holes, and a fine grey fungus just under the surface, are other good signs of an active hot compost.

What if it doesn't heat up?

When a compost pile won't heat up, the problem is almost certainly one of three things: a) the pile is too small; b) it's too dry; c) it needs more "greens" or, especially in cold weather, a "starter" to give it more nitrogen.

Compost Activators

Garden suppliers sell compost starters or "activators," often composed of high-nitrogen fertilizers. In some cases, "inoculants" of dehydrated bacteria are also described as compost activators.

While high-nitrogen fertilizers may be helpful, the benefits of adding more bacteria from a package have yet to be proven. All the bacteria you need should already be present in the soil under the compost pile or the food and garden waste you add. You could try soaking ordinary garden soil in water for an hour and douse the heap with the teacoloured liquid. But giving a boost of nitrogen to the bacteria you already have is the best solution.

Fresh stable manure is the ideal compost starter, though it may be hard for some of us to find; harder yet to explain to your next-door neighbours. While the commercial activators based on high-nitrogen fertilizers do heat up the compost quickly, it's hard to control the amount of nitrogen added this way and the excess may leach out or escape as ammonia into the air.

There are several effective organic alternatives: bloodmeal, finished compost, or well-composted manure, for example. Or, you can simply rebuild the compost pile with additional grass clippings or other "green" materials.

The Hot Composting Timetable

The temperature of the pile should rise steadily, peaking between 50°C to 65°C (120°F to 150°F), 24 hours to one week later. When the temperature begins to drop, the compost is ready for turning. Break up any clumps of material, and move the outside parts to the base and centre. If the pile is too dry, this is the time to wet it. Cover the pile again, and wait.

The temperature should peak again in about a week, in a pile made of well-shredded materials. Remember, the smaller the pieces, the faster the compost. As soon as it begins to cool, turn the pile once more. In another week or two, the compost should be finished; that is, dark and crumbly, fresh-smelling, with very little of the original material identifiable. When compost is ready for use, the temperature of the pile won't rise above 43°C (110°F) no matter how often you turn it.

Key Points to Remember

- Use equal amounts of “greens” and “browns.”
- Mix together a variety of ingredients.
- Shred or chop all ingredients, if possible.
- Build the pile large enough to retain heat.
- Turn or aerate the heap regularly to let in the air.
- Keep the pile as moist as a damp sponge.

The Compost Container

Anyone who has come back home after a long holiday knows that, given enough time, organic matter can decompose even in the back of the fridge. Out in the backyard, nature certainly doesn't care whether the compost is heaped out in the open or enclosed in a bin.

However, a container of some sort does help to keep the yard neat and the neighbours happy. A covered container also means the pile can retain both heat and nutrients, while keeping out rodents, raccoons and pets.



Hot compost piles need regular turning, and you'll want to harvest finished compost from time to time. So, above all, the container should make it easy to do this work. Beyond that consideration, you're safe in choosing a container for its appearance, convenience, cost, size, or other qualities.

All sorts of composting units are available commercially. Some are simply “digesters,” such as a cone covering a collecting basket in a pit. Others, with solid bases, have doors or chutes to let you harvest the compost from the bottom and put it to use.

Your own system may be as simple as a circle of chicken wire, or a bottomless barrel with air holes in its sides. Just lift it away from the pile, set it up again nearby, and put the newer layers back in, leaving behind the finished compost.



Pens

One of the simplest structures is a circle of snow fencing or wire mesh supported by posts or stakes. At turning time, you unwrap and remove the fencing, set it up in a new location nearby, and fork the compost back into the pen. This requires a little more space and some lifting effort, and it leaves the compost in full view; but it is inexpensive, strong enough, and very easy to construct.

Bins

Bins are sturdier and more discreet than pens. They may require a little more skill to build but are still inexpensive. The four sides can be made of almost anything: wire screen stretched on wooden frames or old pallets standing on end. Three walls are normally fixed permanently together, but may be hinged, hooked or tied. One design has three walls of concrete blocks, stacked without mortar, and a fourth wall of removable boards.

To turn the pile, the front of the bin is removed and the compost forked out onto the ground. Then the pile is rebuilt in the bin. You do need the extra ground space in front of the bin for turning, but you don't have to lift the compost over a wall to get it back in. One variation calls for the bin to be set over a pit, to provide extra insulation. Although this encourages the presence of helpful earthworms, it does mean reaching down below ground level to turn the compost.

Drums

A rotating barrel composter can be made from a large drum with aeration holes punched in it, and fins inside to lift and mix the compost materials. A hinged loading door in the side allows wastes to be added gradually. Some are rolled on the ground to mix the contents; others are mounted horizontally on stands with crank attachments. Various commercial models are available.

If bacteria is introduced with a good amount of garden soil and the barrel is turned every few days, compost can be made in a few weeks this way with little physical effort.



Boxes

Perhaps the best small-scale system for the relatively energetic composter is a design known as the New Zealand box. A bottomless wooden box with ventilation spaces between the wall boards, its face is easily removable to facilitate turning. Since the compost rests directly on the ground, a lid is normally added to prevent nutrients leaching from the pile during heavy rains.



A New Zealand box or something similar can be made at home with a minimum of skill. It can be moved to a new location fairly easily, if required, and it keeps the compost neatly out of sight.

A popular variation has two or three compartments in a row: compost is turned from one box into another; the emptied box then accumulates the makings for another batch. It is ideal for people who use kitchen and yard wastes as they accumulate and can't save up enough materials to make a really big pile.

Other Ways to Compost

Cold Composting

If you aren't interested in the physical task of turning a compost pile, or if you have plenty of space and don't need the compost in a hurry, cold composting is the answer. Small households may accumulate organic waste too slowly to build a hot compost pile all at once, but you don't need much to start a cold compost. The pile builds gradually as materials come to hand.

Although the feeding process is less demanding, the results take a long time. You can wait from 6 months to a year for a batch of compost to be produced by this method. It depends on what goes into the pile: soft "greens" like grass clippings and kitchen wastes break down much faster than woody "browns" or unshredded pieces. On the plus side, absolutely no turning is required! But it's a good idea to build the pile around an air stack, or to poke it with an aerator tool occasionally, to help it along.

As with a hot compost, cold piles should be kept moist, and need a variety of foods for the decomposer organisms to prosper. The lower layers decompose first, because new material is constantly being added to the top. A compost container isn't necessary, but it may help you to get at the finished stuff on the bottom.

Whatever you choose, a fancy container or a pile in the corner of the yard, compost produced slowly will need to be covered or a lot of its nutrients will be “weathered away” over time. This means the resulting material will still be valuable as a soil conditioner, but not very effective as a fertilizer.

Soil Incorporation

Soil incorporation is probably the simplest method of composting. Food and yard wastes are finely chopped, mixed with soil, and buried 20 cm (8 inches) or deeper in the earth. Depending on soil temperature, bacterial activity, and the carbon content of the wastes, decomposition will take from one month to a year.

One word of caution, however! High-carbon materials (like raw autumn leaves) are not appropriate for this method, because they’ll steal their nitrogen from the surrounding soil. Leaves may also acidify the soil or inhibit the growth of plants if they are dug into the ground without first being at least partially composted.

Even high-nitrogen materials should be given ample time to decompose underground before the area is used for planting, because the decomposer organisms will take nitrogen wherever they can find it while they’re working. Some people get around the problem of nitrogen loss by adding bloodmeal to the soil before they bury the compost materials.

Postholing

A posthole digger is a handy tool for soil incorporation, although a spade will do. The idea is to dig a series of holes around the drip line of trees and shrubs, or in a fallow area of the garden (to avoid stealing nitrogen from growing plants), and bury organic wastes there. The compost is made right where it is most needed. You can use what space you have, then start over where the first load has composted. If the holes are dug before the ground freezes, you can continue to dispose of wastes in this way all through the winter.

Rotation Trenching

Trenching involves digging a long pit instead of separate holes, usually between rows in a garden. It is capped with a layer of soil as the wastes are gradually added.

This method is often used by British gardeners in a simple three-year rotation of 1) soil incorporation, 2) crops, and 3) pathways. In the first year a trench is dug, filled with nitrogen-rich wastes, and covered with soil. The row next to it is used to grow crops and a third row is used as a path.

In each successive year, the fertile soil of the previous year's trench is used to grow the crops, and the former path is the composting trench. Thus the garden's soil is continuously renewed. Although this method demands far less space than a conventional composting system, it does require three rows to grow one row of crops. Each garden will suggest its own variations. Trenches can be dug under the pathways in use, one section at a time, as the space is needed. In a garden too small for paths, a two-year rotation of crops and trench is fine.

Mulching

Mulching copies nature's way of composting on the surface of the soil and gardeners have been doing it for centuries. Woody, "brown" organic materials are spread in a layer on the ground, over a garden, or around shrubs and trees. Because they are not dug into the soil but decompose on the surface, they don't disturb the pH balance of the soil or rob it of nitrogen.

Although it is perhaps the slowest method of composting, mulching offers other benefits. It discourages weeds, protects soil from compacting or eroding, and keeps the roots of plants cool and moist in hot weather, insulated in the winter.



Introduction

The North American Initiative on Food Loss and Waste Reduction and Recovery is a project led by the Commission for Environmental Cooperation (CEC) with support from the federal governments of Canada, Mexico and the United States. The goal of this initiative is to enhance North American capacity for reducing food loss and waste (FLW) within relevant North American industrial, commercial, and institutional (ICI) sectors across the food supply chain throughout Canada, Mexico and the United States. The scope of the current research focused on source reduction, and on food rescue and recovery, during post-harvest to pre-consumer stages of the food supply chain (i.e., post-harvest food production, processing, distribution, retail and foodservice stages). The pre-harvest food production stage and the consumer stage of the food supply chain are beyond the scope of this study.

This project is part of the climate change and green growth portfolios under the CEC's 2015–2016 Operational Plan, and supports international and domestic commitments in Canada, Mexico and the United States. It was carried out simultaneously and in conjunction with a companion CEC project entitled North American Initiative on Organic Waste Diversion and Processing, which examines composting, anaerobic digestion, and other industrial processes (e.g., rendering, biofuel) for FLW and other organic waste. Together, these two initiatives provide an overview of FLW reduction, recovery and recycling in North America.

The purpose of this white paper is to highlight the current state, causes and impacts of FLW in North America, and to identify opportunities for the ICI sector, governments and nongovernmental organizations (NGOs) to take action.

The issues and opportunities identified in this paper should be considered when developing policies, strategies and initiatives to address FLW in North America. Opportunities identified in this paper should be explored more deeply in collaboration with relevant stakeholder organizations. More details on the information and approaches presented in this paper are available in the companion foundational report, entitled *Characterization and Management of Food Loss and Waste in North America* (CEC 2017). Future work may also warrant examining FLW in pre-harvest food production and consumer stages of the food supply chain.

The content of this white paper reflects information compiled from primary and secondary sources in Canada, Mexico, the United States and various countries outside of North America. Primary sources included interviews and emails with stakeholders throughout the food supply chain, with representation distributed across location and type of stakeholder, size of organization, and stage of the food supply chain. A total of 167 interviews were conducted for this research. The interviewees' countries of origin were as follows: 46 from Canada, 78 from Mexico, 41 from the United States, and two from countries outside of North America. Secondary sources included reports, white papers, academic papers, news articles, media recordings and government databases. The literature review also included a scan of on-the-ground programs and projects implemented by the ICI sector, governments and NGOs in North America and beyond.

What is Food Loss and Waste?

Food loss refers to food that is intended for human consumption but, through poor functioning of the food production and supply system, is reduced in quantity or quality.

- Food loss is primarily due to inefficiencies in the food supply chain. Examples include food that rots in the field or in storage because of inadequate management, technology or refrigeration, or food that cannot make it to market because of poor infrastructure and thus goes unconsumed.

Food waste refers to food for human consumption that is discarded (both edible and inedible parts) due to intentional behaviors. “Food waste” often refers to what occurs along the food chain from the retail store through to the point of intended consumption.

- Food waste often occurs by choice, through poor stock management, or through neglect, and includes food that has spoiled, expired, or been left uneaten after preparation.

For the purposes of this paper, the term “food loss and waste”—or FLW—is commonly applied. Although the definitions of food loss and food waste vary, significant overlap exists between the two terms. The primary difference is that food loss tends to focus on the upstream stages of the food supply chain (i.e., food production and processing), while efforts to address food waste tend to focus on downstream stages of the food supply chain (i.e., distribution, retail, food services and consumers).

FLW can be addressed at all stages of the food supply chain through measures to enhance reduction (e.g., FLW prevention), recovery (e.g., rescuing surplus food to feed people and animals), and recycling (i.e., reducing disposal in landfills via rendering, anaerobic digestion, enhanced composting, or other means).

This paper differentiates edible and inedible parts of food as follows:

Food (edible): Any substance—whether processed, semi-processed or raw—that is intended for human consumption. “Food” includes drink, and any edible substance used in the manufacture, preparation or treatment of food. “Food” also includes the above material when it has spoiled and is therefore no longer fit for human consumption. It does not include cosmetics, tobacco or substances used only as drugs. It does not include processing agents used along the food supply chain—for example, water to clean or cook raw materials in factories or at home (WRI 2016, 15).

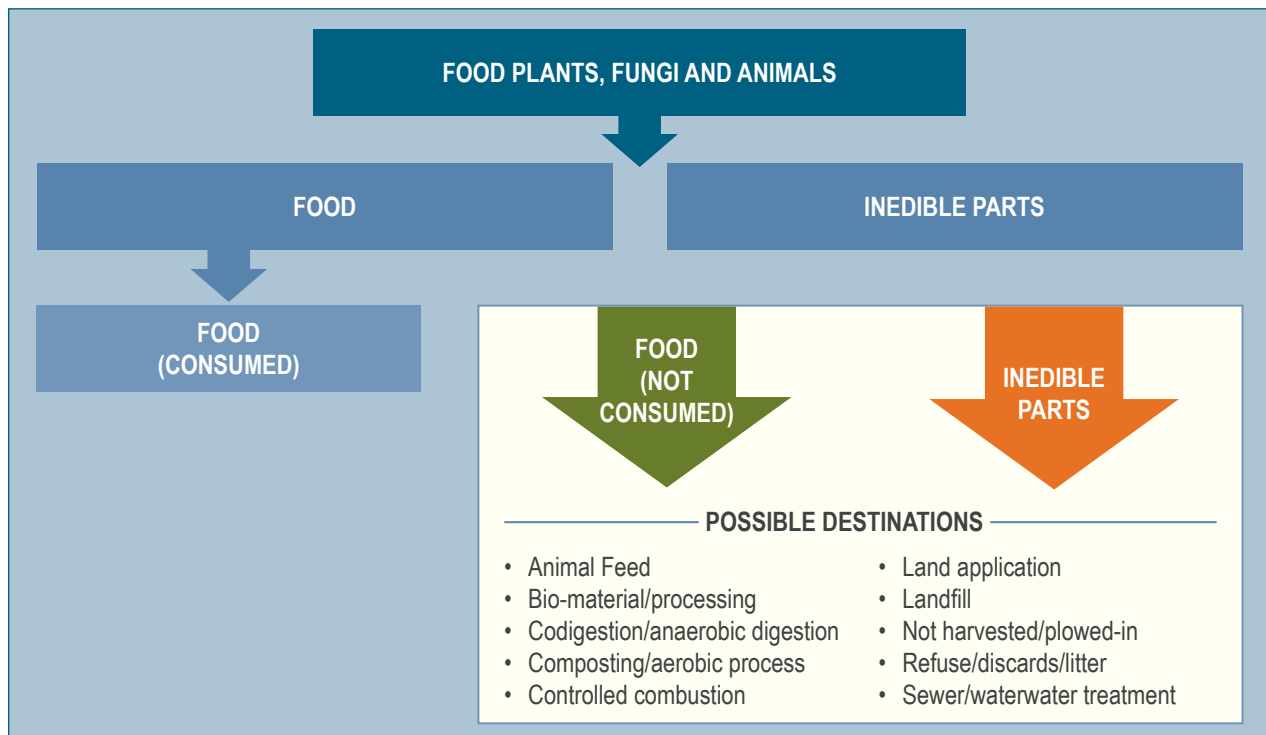




Inedible Parts (of food): Components associated with food that are not intended for human consumption in a particular food supply chain. Examples of inedible parts of food could include bones, rinds and pits/stones. “Inedible parts” does not include packaging. What is considered inedible varies among users (e.g., chicken feet are consumed in some food supply chains but not others). It also changes over time and is influenced by a range of variables, including culture, socio-economic factors, availability, price, technological advances, international trade, and geography (WRI 2016, 15).

Figure 1 demonstrates the possible destinations for unconsumed food and the inedible parts of food.

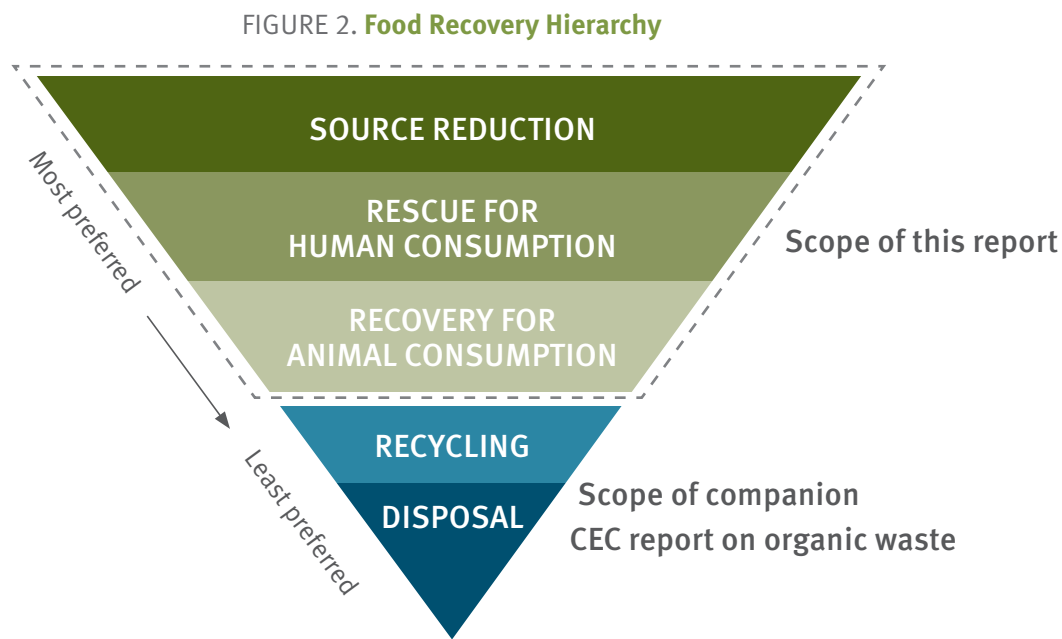
FIGURE 1. **Possible Destinations for Food and Inedible Parts**



Source: Adapted from WRI 2016.

Food Recovery Hierarchy

The **food recovery hierarchy** (Figure 2) prioritizes the reduction, rescue and recovery of food over recycling and disposal. The scope of this study includes source reduction, rescue for human consumption and recovery for animal consumption.



Source: Adapted from US EPA 2016a; MacRae et al. 2016; Papargyropoulou et al. 2014; Kelly 2014; WRAP 2013.

Food Recovery Hierarchy – Definitions of Terms

Source Reduction: Actions to minimize generation of surplus food and prevent avoidable generation of FLW.

Rescue for Human Consumption: Actions to rescue safe and nutritious surplus food for human consumption—receiving, storing, or processing food (with or without payment) that would otherwise be discarded or wasted. The term used in this paper to describe food that cannot be used for its originally intended purpose (e.g., sold to primary markets) but is suitable for human consumption is surplus food. Food rescued for human consumption is referred to as rescued food.

Recovery for Animal Consumption: Actions to recover safe and nutritious surplus food for animal feed—receiving, storing, or processing food (with or without payment) which would otherwise be wasted.

Recycling: Actions to recycle food for non-food-related uses—processes such as industrial processing of compounds, including fats and oils; anaerobic digestion; and composting.

Disposal: Actions to dispose of food through controlled and uncontrolled means—primarily landfilling, but also incineration, sewage, open dumping and open burning. The food recovery hierarchy does not recommend the use of uncontrolled disposal options (e.g., open dumping and open burning).

Sources: Adapted from US EPA 2016a, MacRae et al. 2016, Papargyropoulou et al. 2014, Kelly 2014, WRAP 2013.

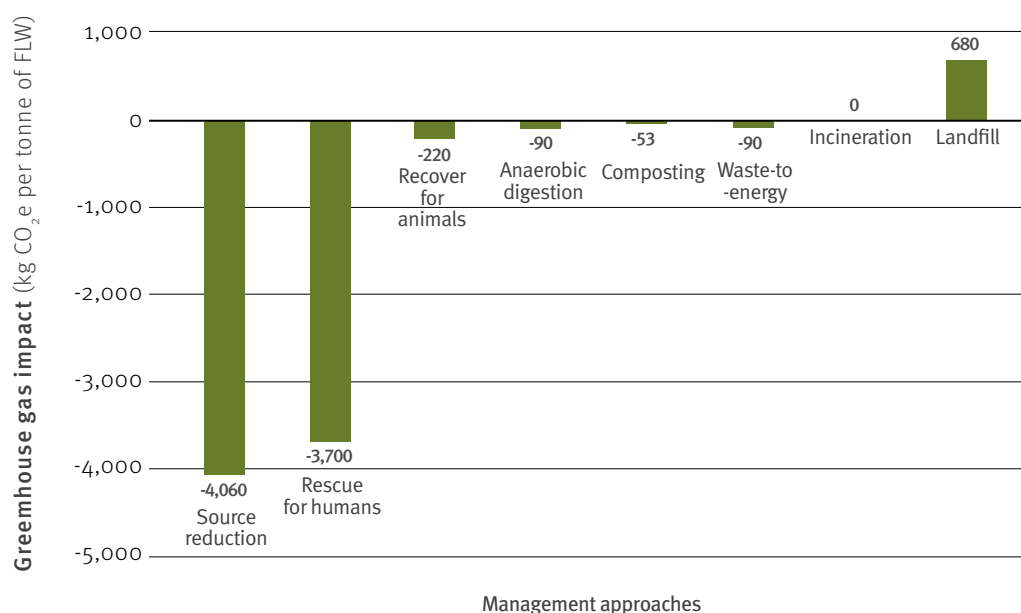
While the food recovery hierarchy provides a clarifying model for managing FLW, approaches at different tiers of the hierarchy can compete with one another, resulting in loss of benefits (Mourad 2016). For example, investing in food recycling solutions such as compost collection may disincentivize source reduction. One study found that the availability of composting programs reduced the effect of consumer education on source reduction because residents felt less guilty once food waste was composted instead of landfilled (Crane 2017).

Comparative Greenhouse Gas Savings for Food Loss and Waste

In the context of the food recovery hierarchy presented in Figure 2, source reduction and rescue for human consumption are prioritized over recovery for animal consumption, which is in turn preferable to recycling. Disposal is the least preferable option.

Source reduction has the greatest savings potential for greenhouse gas (GHG) emissions, as more than 80 percent of GHG emissions associated with FLW come from upstream sources (e.g., producing, processing, distributing food) (US EPA 2015). According to data from the Waste and Resources Action Programme (WRAP) in the United Kingdom (Figure 3), the environmental benefits of rescuing food for human consumption are far greater than those of recovering for animal consumption and therefore make rescue a higher priority. For example, WRAP (2017) estimates that the GHG emissions savings from rescuing food for human consumption are about 20 times more than those from recovering for animal consumption, and more than 40 times higher than those from recycling alternatives. In addition to the environmental benefits, rescuing food for human consumption can provide social benefits, such as support for food-insecure people in various communities.

FIGURE 3. Greenhouse Gas Impacts of Management Approaches to Food Loss and Waste



Note: Data collected by WRAP in 2016, for a tonne of average food waste in the United Kingdom. Includes embedded greenhouse gas emissions.
Source: Adapted from WRAP 2017.

The Food Supply Chain

This study contains a review of the food supply chain, including post-harvest stages, processing, distribution, retail and foodservice sectors, as well as secondary markets and animal feed. Figure 4 depicts a schematic of the food supply chain and highlights the sectors covered in the scope of this research, which are found within the grey, dashed outline of the rectangle. The figure simplifies the food supply chain and shows the general flow of food between the stages.

The Primary Food Supply Chain, shown in blue, tracks the typical path of food for human consumption. The stages included in the research for this paper are defined as follows:



Post-harvest Food Production covers the post-harvest activities at the farm level and those occurring outside the agricultural sector—activities that involve harvesting, handling, and storage of plants or their parts, or of animals (livestock, poultry, seafood) or their parts (adapted from Grolleaud 2001).



Food Processing is the transforming of raw foods into products suitable for consuming, cooking or storing (European Food Information Council 2016). The term “food processing” is interchangeable with “food manufacturing.”



Distribution encompasses the transportation and distribution of food products before reception by the consumer, and includes wholesaling and brokering (adapted from Perner 2008).



Retail is the sale of food in businesses that serve the consumer directly (e.g., in a store or market setting), to be used in households (not sales in restaurants or institutional settings) (adapted from Suttle n.d.).



Foodservice covers preparation and serving of meals, snacks and beverages for consumption outside of the home (or for take-out), in dining or fast-food establishments and within commercial and institutional settings; e.g., restaurants, event venues, hotels and cafeterias.

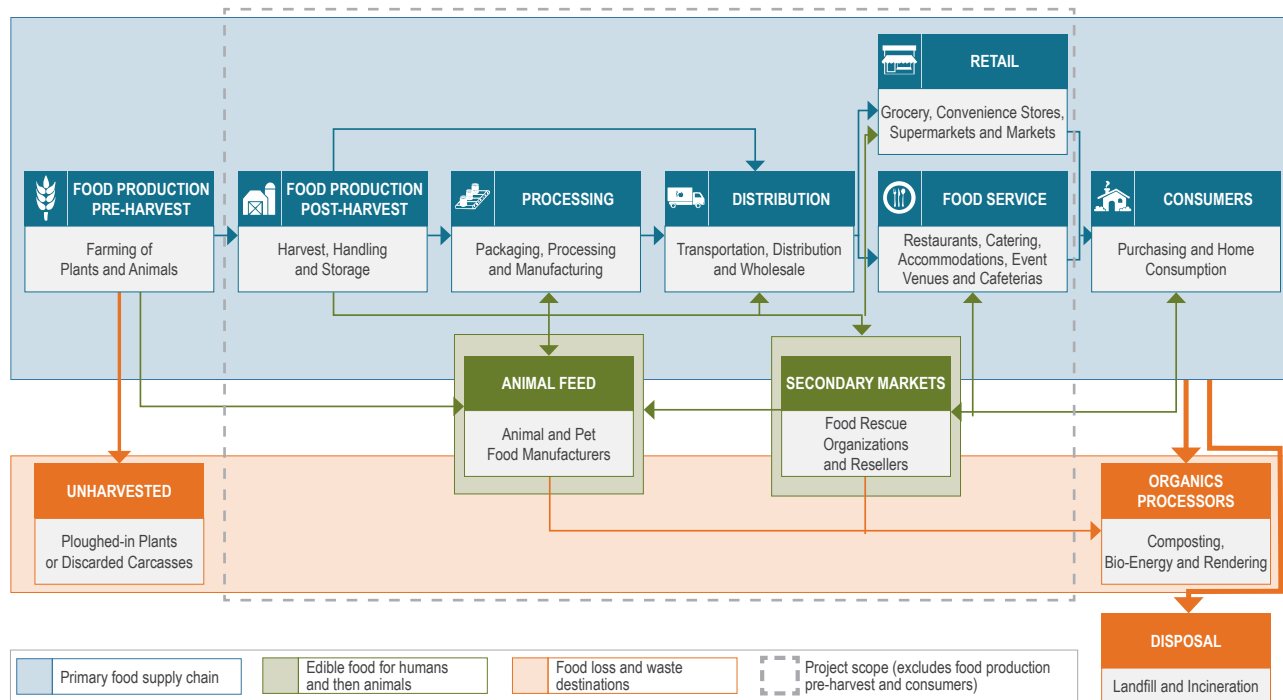
Secondary Uses covers what happens when surplus food that otherwise would go to waste is recovered for human consumption or for processing into animal feed. Secondary Uses is depicted in green.

Secondary Markets refers to customers other than those to whom the product was originally offered. The product can be a surplus of food that was generated for another market, or can be culls or byproducts of food from various points along the food supply chain. Producers, processors, and primary retailers normally sell these products at a discounted price (adapted from ReFED 2017b). Secondary markets include, but are not limited to, a range of enterprises and organizations that rescue food from the primary food supply chain and then either supply the food directly to consumers, or, more frequently, send the food to meal programs and food banks.

Animal Feed refers here to feed that has content derived from food recovered from surplus food; from wasted food that has undergone treatment and processing; and/or from animal, poultry and fish slaughterhouse discard. Such feed may be mixed with other feed or be fed directly (adapted from ReFED 2017a). It is not counted here as a part of the food supply chain for humans, but is an established end-product from the diversion of food loss and waste (FLW). Animal feed is lower in the food recovery hierarchy than food rescued for human consumption.

FLW (food loss and waste) Destination refers to an end-location where the food is no longer intended for consumption. Such food includes crop that did not get harvested (or was harvested and then abandoned), crop residuals, and foodstuff that ends up being processed as waste (e.g., recycled, or disposed of). Processing food as waste is broken into two categories: organics processing and disposal. Examples are provided in a separate, companion report by the CEC, entitled *Characterization and Management of Organic Waste in North America*. FLW Destination is depicted in orange.

FIGURE 4. **Food Supply Chain Overview**



Note: Pre-harvest food production and consumer stages of the food supply chain were included for the purpose of quantifying FLW in each of the three North American countries, and estimating some environmental and socio-economic impacts.

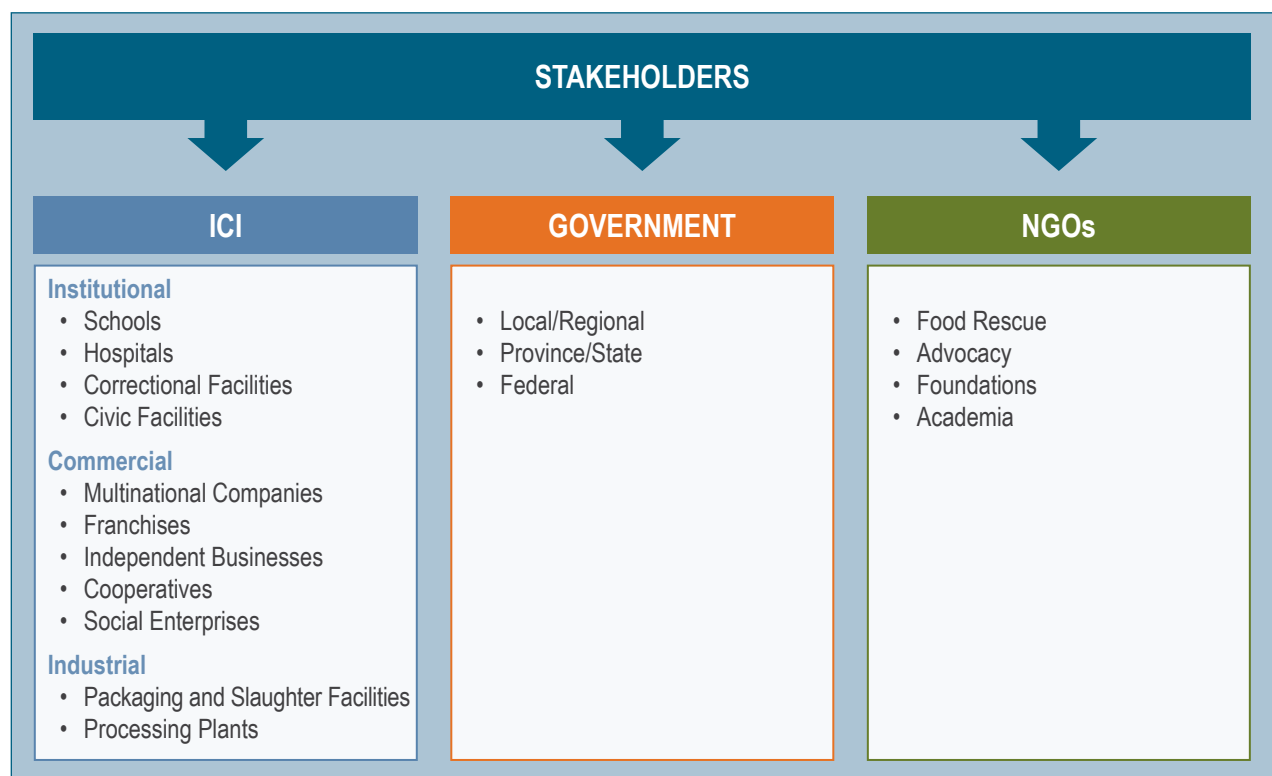
Stakeholders in the Food Supply Chain

Stakeholders are individuals or organizations that influence decisions or are affected by decisions. Associations typically represent aspects of each stakeholder group. The stakeholders in the food supply chain are defined, in the context of FLW, as follows:

- **Industrial, Commercial, and Institutional (ICI)** entities and associations are those involved in processing, preparing, preserving, distributing, and serving or selling foods and beverages. (Wiley Online Library 2016).
- **Government** includes the local, regional, state/provincial and federal departments and agencies with responsibilities related to food and FLW issues. FLW typically involves multiple government departments or agencies, such as those concerned with the environment, agriculture, public health and social development.
- **Nongovernmental Organizations (NGOs)** are typically nonprofit or voluntary groups of individuals or organizations, formed to provide services or to advocate public policy (Encyclopedia Britannica 2016). NGOs can operate on a local, regional, national or international level. NGOs include both those that work on food rescue and recovery, as well as charities that support FLW reduction initiatives; advocacy groups; and researchers, both within and outside of academia.

Figure 5 lists relevant stakeholders in the food supply chain, across the ICI, government and NGO sectors.

FIGURE 5. **Stakeholder Chart**



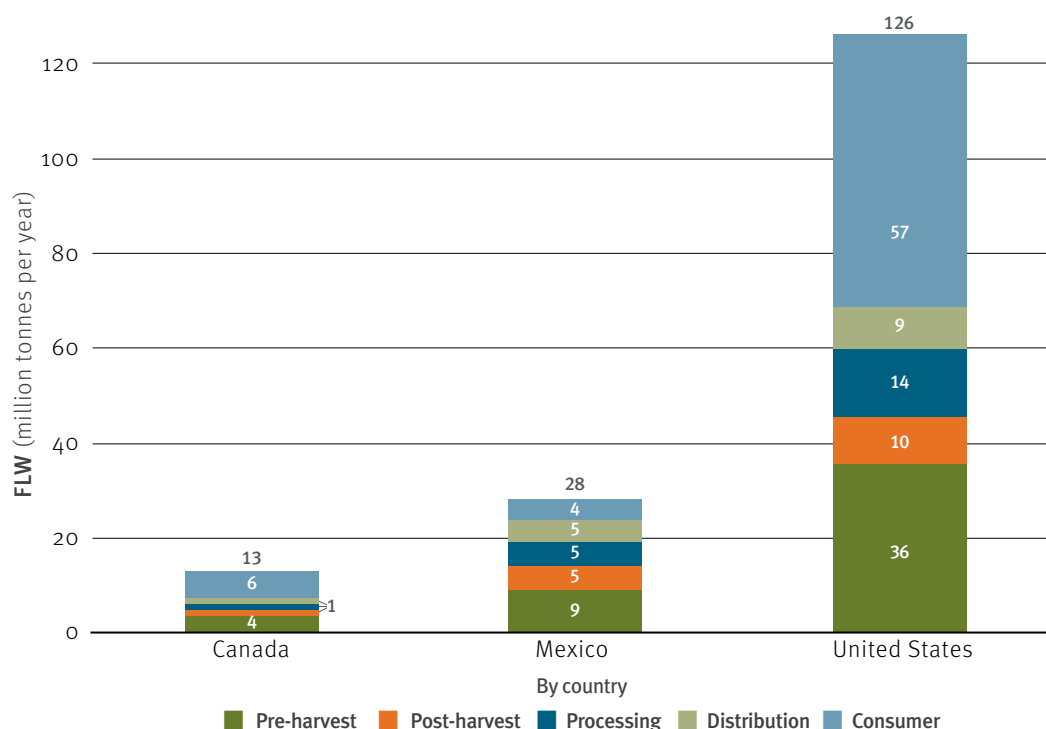
Food Loss and Waste in North America

A standard methodology for quantification of food loss and waste (FLW) in North America has not yet been developed. To present data in a consistent format for the three North American countries, the research team derived the FLW estimates below using a methodology adopted by the FAO (Gustavsson et al. 2013). In general, the scope of this research is limited to post-harvest through pre-consumer stages of the food supply chain (i.e., post-harvest food production, processing, distribution, retail and food service). Pre-harvest food production and consumer stages of the food supply chain were included for the purpose of quantifying FLW in each of the three North American countries and estimating some environmental and socio-economic impacts. Data sources are scarce and varied in this emerging area of study, so the numbers should be considered informed estimates.

Using the FAO methodology, approximately 168 million tonnes of FLW is generated in North America annually. This estimate encompasses all stages of the food supply chain, including the pre-harvest and consumer stages. By country, this equates to 13 million tonnes in Canada, 28 million tonnes in Mexico and 126 million tonnes in the United States, as presented in Figure 6. Estimates of FLW per capita across the food supply chain in North America are shown in Figure 7.

North American and Oceanic (e.g., Australia and New Zealand) countries have the highest estimated per-capita FLW globally (Gustavsson et al. 2013). Per capita, FLW in Canada (396 kg/person/year) is comparable to that in the United States (415 kg/person/year). The per-capita FLW generation in Mexico (249 kg/person/year) is much lower

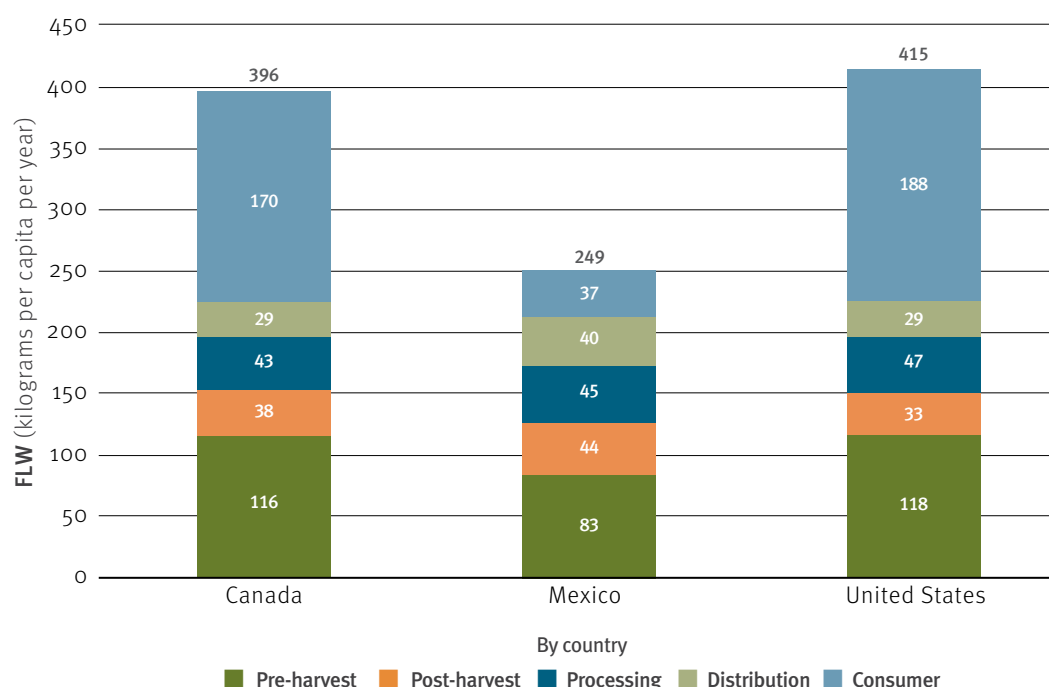
FIGURE 6. **Estimates of Food Loss and Waste across the Food Supply Chain in North America**



Note: Estimates presented in these graphs encompass all stages of the food supply chain, including the pre-harvest and consumer stages, which are otherwise excluded from the scope of this paper. FLW estimates include food (including milk) and inedible parts, based on estimates from FAO Food Balance Sheets and loss factors. FAO data include the market system in distribution (e.g., retail and foodservice).

Source: Summary of methodologies and estimates provided in the CEC foundational report *Characterization and Management of Food Loss and Waste in North America*, Section 2 and Appendix 3 (CEC 2017).

FIGURE 7. **Estimates of Food Loss and Waste Per Capita across the Food Supply Chain in North America**



Note: Estimates presented in these graphs encompass all stages of the food supply chain, including the pre-harvest and consumer stages, which are otherwise excluded from the scope of this paper. FLW estimates include food (including milk) and inedible parts, based on estimates from FAO Food Balance Sheets and loss factors. FAO data include the market system in distribution (e.g., retail and foodservice).

Source: Summary of methodologies and estimates provided in the CEC foundational report *Characterization and Management of Food Loss and Waste in North America*, Section 2 and Appendix 3 (CEC 2017).

than that in Canada or the United States. The estimates of lower FLW per capita in Mexico align with the global FAO data set, which showed that more food is generally wasted per person in medium/high-income countries (e.g., Canada and the United States) compared to low-income countries (e.g., Mexico).

There is a wide range of FLW estimates available due to variations in the scope of food supply chain stage, sector, food product type, and end-destination used in other studies of FLW in North American countries. Based on the research team's literature review and calculations reflecting population sizes (outlined in the CEC foundational report *Characterization and Management of Food Loss and Waste in North America*, Section 2 and Appendix 3), other existing estimates of FLW range from 6 to 13 million tonnes per year in Canada, 12 to 21 million tonnes per year in Mexico, and 35 to 60 million tonnes per year in the United States.¹ As stated above, these estimates of FLW quantities were derived using varying estimation parameters.

Causes of Food Loss and Waste

Table 1 presents the primary causes of FLW along different stages of the food supply chain—from post-harvest food production, to foodservice—along with the key players along the food supply chain.

1. Estimates are shown here to demonstrate that there is a range of FLW estimates available for each country. These figures may not be directly comparable. The range of estimates presented here includes the results of studies that used differing methodologies, encompassing different stages of the food supply chain. For example, the 6 million tonnes of FLW referred to for Canada is derived from a study on consumer and retail FLW, while the 13 million tonnes of FLW in Canada was derived using the FAO methodology and applies to the pre-harvest to consumer stages of the food supply chain. These studies used differing methodologies and the results are not directly comparable.

TABLE 1. Causes of Food Loss and Waste, and Key Players that Can Address Them

 Post-Harvest	 Processing	 Distribution	 Retail	 Foodservice
Causes of Food Loss and Waste				
<ul style="list-style-type: none"> Grading standards for size and quality Inaccurate supply-and-demand forecasting Order cancellations Employee behavior Low market prices and lack of markets (especially for second-grade products) Inadequate sorting Damage from handling Spillage and degradation Inappropriate transportation and storage conditions Cold-chain (refrigeration during transportation and storage) deficiencies Labor shortages 	<ul style="list-style-type: none"> Inadequate infrastructure, machinery Inefficient systems design Damage during production Inaccurate supply-and-demand forecasting Contamination Trimming and culling Supply/demand issues Inconsistent/confusing date labels Inconsistency in quality of ingredients Food safety issues Production line changes Cold-chain deficiencies Facility employee behavior 	<ul style="list-style-type: none"> Damage during transport Inaccurate supply-and-demand forecasting Cold-chain deficiencies Rejection of shipments Poor record keeping Inappropriate transportation and storage conditions Incorrect/ineffective packaging Delays during border inspections Road infrastructure challenges Excessive food distribution centralization 	<ul style="list-style-type: none"> Inaccurate supply-and-demand forecasting Overstocking Food safety concerns Inconsistent/confusing date labels Order minimums and fluctuations in delivery from suppliers Cold-chain deficiencies Rejection of shipments Increasing merchandising standards Product differentiation Market over-saturation Rigid management Marketing practices 	<ul style="list-style-type: none"> Plate composition Expansive menu options Over-serving Over-preparing Unexpected demand fluctuations Preparation mistakes Improper handling and storage Rigid management Facility employee behavior Food safety concerns Use of trays Marketing practices
Key Players That Can Address Causes				
<ul style="list-style-type: none"> Farm owners Farm workers Retailers Processors Distributors Food rescue organizations Service providers (storage, equipment) Government (various levels) 	<ul style="list-style-type: none"> Facility managers Facility employees Retailers Distributors Service providers (equipment, process engineers) Food rescue organizations Government (various levels) 	<ul style="list-style-type: none"> Facility managers Farm owners/workers Facility employees Service providers (equipment, transport, packaging) Processors Retailers and intermediaries Foodservice Food rescue organizations Government (various levels) 	<ul style="list-style-type: none"> Facility managers Facility employees Farm owners Processors Distributors Service providers (packaging, technology) Food rescue organizations Government (various levels) 	<ul style="list-style-type: none"> Facility owners and managers Facility employees Service providers (custodial, delivery, food service) Distributors Food rescue organizations Government (various levels)

Sources: Adapted from Provision Coalition 2014, Blair and Sobal 2006, ReFED 2016, Lipinski et al. 2013, Gunders 2012, Parfitt et al. 2010, and Gustavsson et al. 2011.

Environmental and Socio-Economic Impacts

Across the food supply chain, FLW contributes to significant environmental and socio-economic impacts associated with the following:

- greenhouse gas (GHG) emissions;
- water use;
- land use;
- fertilizer use;
- energy use;
- wasted landfill space and tipping fees;
- market value of FLW;
- loss of biodiversity; and
- wasted calories.

Table 2 presents estimates of the environmental and socio-economic impacts from FLW, per country, in North America. Figure 8 displays the total estimates for North America. Due to limited data on these impacts in each North American country, the research team used regional or global data when country-specific information was unavailable. Furthermore, detailed and accurate quantification of FLW is still in the early stages of development; thus, applying methodologies and tools to quantify environmental and socio-economic impacts includes significant levels of uncertainty.

TABLE 2. **Environmental and Socio-Economic Impacts of Food Loss and Waste**

Impact Category ¹	Unit	Canada	Mexico	United States	North America
Life-Cycle Greenhouse Gas Emissions for Landfilled FLW ^{2,a}	million tonnes CO ₂ e per year	21 ^a	49 ^b	123 ^b	193
Water Use ^{3,c}	billion m ³ per year	1.5	2.7	13.4	17.6
Wasted Cropland ^{3,c}	million ha per year	1.8	4.4	15.9	22.1
Fertilizer Use ^{3,c}	million tonnes per year	0.33	0.63	2.97	3.94
Biodiversity Loss ^{3,d}	loss equivalent to X million US\$ per year	26	64	229	319
Energy Use ^{3,e}	10 ¹⁸ Joules per year	1.0	3.4	8.9	13.3
Wasted Landfill Space ^{2,f}	million m ³ per year	4.2	8.6	25.9	38.6
FLW Tipping Fees ^{2,f}	million US\$ per year	326	249	1,293	1,867
Market Value of FLW ³	billion US\$ per year	24 ^g	36 ^h	218 ⁱ	278
Wasted Calories ^{3,j}	trillion kcal per year	20	20	177	217

1. Assumptions and parameters for quantifying environmental and socio-economic impacts are provided in the CEC foundational report *Characterization and Management of Food Loss and Waste in North America*, Section 6 and Appendices 4 and 6 (CEC 2017).

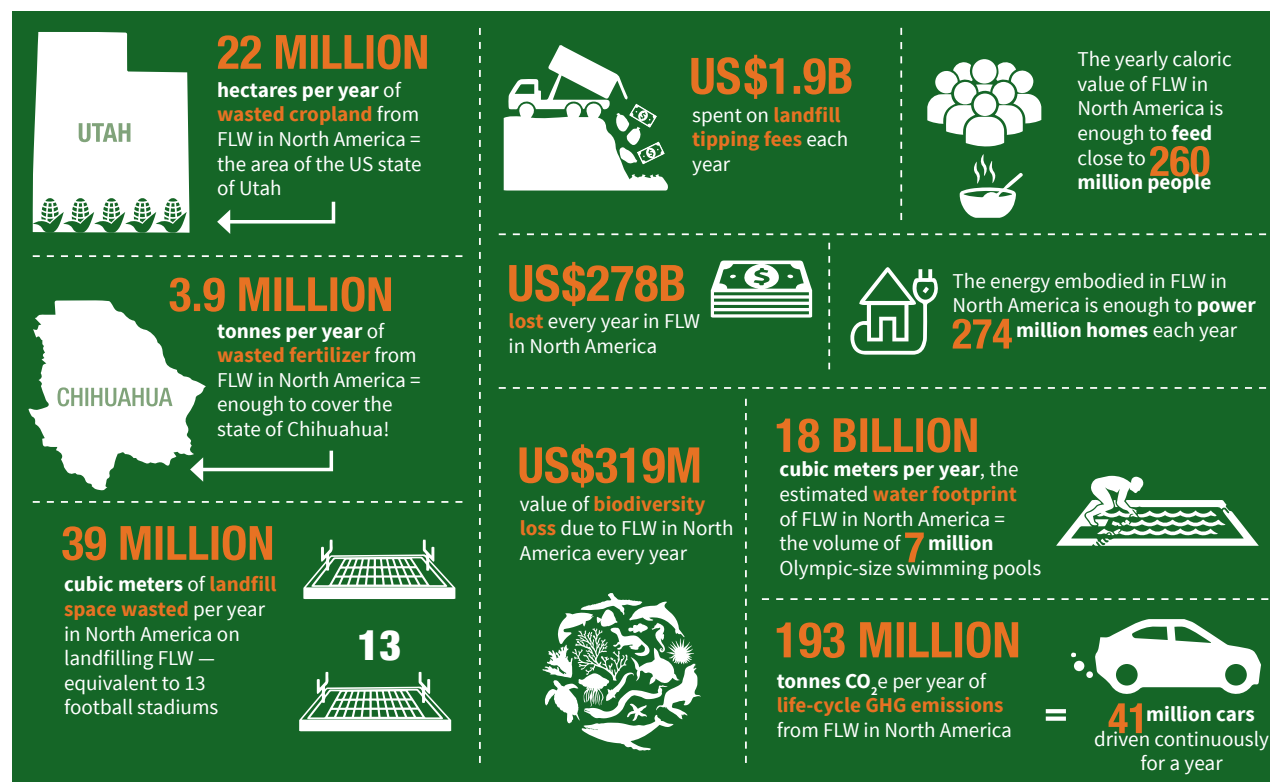
2. Life-cycle greenhouse gas emissions, wasted landfill space and wasted tipping fees were only calculated for landfilled FLW; the estimates exclude FLW disposed of, unharvested, or lost by other means.

3. While not explicitly stated in each methodology, estimates assume FLW from all stages of the food supply chain are included. Estimates shown only include the direct cost (market value) of FLW. Indirect costs such as labor, transportation, storage and wasted resources are not included.

Note: CO₂e = carbon dioxide equivalent; m³ = cubic meters; ha = hectare; kcal = kilocalories.

Sources: a. ICF Consulting 2005, US EPA 2015; b. US EPA 2015; c. Kummu et al. 2012; d. FAO 2014; e. Cuellar and Webber 2010; f. Green Power Inc. 2014, EPA Victoria 2016; g. Gooch et al. 2014; h. Gutiérrez Aguilar 2016; i. ReFED 2016; j. Lipinski et al. 2013.

FIGURE 8. **Environmental and Socio-Economic Impacts in North America**



Note: Due to limited data on the environmental and socio-economic impacts of FLW in each North American country, regional or global data were used when country-specific information was unavailable. The estimates represent totals for the three North American countries combined.

Government Programs and Commitments on Food Loss and Waste in North America

One of the specific targets of the United Nations' Agenda 2030 on Sustainable Development is to: "halve per capita global food waste at the retail and consumer level, and reduce food losses along production and supply chains by 2030" (UN 2015). North America has implemented regional programs and commitments addressing FLW across all three countries; Canada, Mexico and the US have implemented similar initiatives on a national scale. These programs and commitments—presented in Table 3—are cross-cutting between FLW source reduction; food rescue and recovery; and measuring, tracking and reporting.

TABLE 3. **Government Programs and Commitments to Address Food Loss and Waste in North America**

Country/Region	Programs and Commitments
North America	<ul style="list-style-type: none"> North American Climate, Clean Energy, and Environment Partnership Action Plan North American Initiative on Food Loss and Waste Reduction and Recovery
Canada	<ul style="list-style-type: none"> Strategy on Short-lived Climate Pollutants
Mexico	<ul style="list-style-type: none"> National Strategy and Program of Sustainable Production and Consumption National Crusade Against Hunger Champions 12.3 Initiative
United States	<ul style="list-style-type: none"> FLW Target (reduce by 50% by 2030) Food Recovery Challenge FLW 2030 Champions

Approaches to Addressing Food Loss and Waste

The following sub-sections provide an overview of stakeholder approaches across North America for FLW source reduction; food rescue and recovery; and measuring, tracking and reporting; in addition to a description of the resulting benefits. These approaches can help fulfill the commitments made by the North American governments and organizations listed in Table 3. The approaches are based on CEC research conducted for the foundational report *Characterization and Management of Food Loss and Waste in North America*, which includes a detailed overview of trends, challenges and examples for each North American country (CEC 2017).

Potential Stakeholder Benefits from Reducing Food Loss and Waste

Investing in and implementing approaches for FLW source reduction; food rescue and recovery; and measuring, tracking and reporting has the potential to produce a range of benefits for stakeholders across the food supply chain. These benefits are summarized in Table 4.

TABLE 4. **Potential Benefits from Addressing Food Loss and Waste**

Stakeholder	Type of Approach		
	Reduction	Rescue and Recovery	Measuring, Tracking and Reporting
ICI	<ul style="list-style-type: none"> ▪ Increase sales and revenue from untapped markets ▪ Operational efficiencies and savings ▪ Positive brand recognition ▪ Corporate social responsibility ▪ Potential job creation ▪ Reduce pollution and greenhouse gas emissions 	<ul style="list-style-type: none"> ▪ Mitigate costs of disposal ▪ Positive brand recognition ▪ Increase employee morale ▪ Corporate social responsibility ▪ Reduce pollution and greenhouse gas emissions 	<ul style="list-style-type: none"> ▪ Identify root causes of FLW ▪ Use data to drive change and develop FLW solutions ▪ Track employee and operational performance ▪ Employee engagement
Government	<ul style="list-style-type: none"> ▪ Conserve natural resources ▪ Mitigate habitat loss ▪ Reduce pollution and greenhouse gas emissions ▪ Mitigate disposal costs ▪ Optimize infrastructure/utilities to support food production, processing and distribution 	<ul style="list-style-type: none"> ▪ Conserve natural resources ▪ Mitigate habitat loss ▪ Reduce pollution and greenhouse gas emissions ▪ Lower costs for waste management ▪ Augment social programs for food assistance and ensure food security 	<ul style="list-style-type: none"> ▪ Measure, track and evaluate progress on FLW targets or goals ▪ Use data to develop FLW policies ▪ Increase accountability on meeting FLW commitments
NGO	<ul style="list-style-type: none"> ▪ Achieve organizational mandates for environmental and/or social impacts 	<ul style="list-style-type: none"> ▪ Achieve organizational mandates for environmental and/or social impacts ▪ Reduce food procurement costs (for food rescue only) ▪ Increase quality of food ▪ Improve supply management 	<ul style="list-style-type: none"> ▪ Provide evidence base for advocacy efforts on FLW ▪ Evaluate effectiveness of solutions

Source Reduction of Food Loss and Waste

Table 5 presents approaches to FLW source reduction. Each approach includes a description, causes of FLW addressed, and stages of the food supply chain involved. Stages that are more directly involved are indicated in bold. These initiatives were identified across multiple literature sources, as well as by key stakeholders (e.g., academia, different levels of government, ICI associations, foodservice, NGOs) throughout the food supply chain, as promising solutions.

TABLE 5. Approaches to Source Reduction of Food Loss and Waste

Approach	Description	Causes of FLW Addressed by Approach	Stages of Food Supply Chain Involved*
1 Reducing Portion Sizes	In foodservice settings, reducing portion sizes as a way to reduce plate waste, either through serving smaller portions or making operational changes that encourage customers to take less food.	<ul style="list-style-type: none"> Over-preparing Over-serving Plate composition Use of trays 	<ul style="list-style-type: none"> Foodservice
2 Increasing Marketability of Produce	Accepting and integrating second-grade produce into retail settings, typically sold at a discounted rate.	<ul style="list-style-type: none"> Grading requirements for size and quality as set by retail and/or government Inaccurate forecasting of supply and demand Increasing merchandising standards Rejection of shipments 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
3 Standardizing Date Labels	Collaborating among stakeholders to standardize date labels so they are clear and consistent, to reduce confusion at all stages of the food supply chain.	<ul style="list-style-type: none"> Inaccurate forecasting of supply and demand Inconsistent/confusing date labels Food safety concerns 	<ul style="list-style-type: none"> Processing Distribution Retail Foodservice
4 Implementing Packaging Adjustments	Collaborating among processors, packagers, retail and foodservice to improve shelf-life, using both packaging and sizing (e.g., flexible pack sizes to meet customer demands) and technology (e.g., intelligent packaging).	<ul style="list-style-type: none"> Damage during transport Inconsistent/confusing date labels Cold-chain deficiencies Food safety concerns Over-purchasing 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
5 Improving Cold-Chain Management	Improving or upgrading infrastructure such as trucks, cold rooms and warehouses to maintain appropriate food temperatures during transportation.	<ul style="list-style-type: none"> Rejection of shipments due to spoilage Cold-chain deficiencies Inappropriate storage conditions (e.g., temperature not regulated or does not meet sanitary standards) 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
6 Expanding Value-Added Processing	Extending the usable life of food through processing into shelf-stable products, including processing byproducts into food products through innovative technologies.	<ul style="list-style-type: none"> Low market prices and lack of markets for second-grade products Damage from handling Inaccurate forecasting of supply and demand Cold-chain deficiencies Trimming and culling 	<ul style="list-style-type: none"> Post-Harvest Processing

* Stages that are more directly involved are in bold.

Food Rescue and Recovery

Table 6 presents approaches to food rescue and recovery. Each approach includes a description, causes of FLW that the approach helps to overcome, and the stages of the food supply chain involved. Stages that are more directly involved are indicated in **bold**. These initiatives were identified across multiple literature sources, as well as by key stakeholders (e.g., academia, different levels of government, ICI associations, foodservice, NGOs) throughout the food supply chain, as promising solutions.

Table 6. Approaches to Food Rescue and Recovery

Approach	Description	Causes of FLW Addressed by Approach	Stages of Food Supply Chain Involved*
1 Increasing Rescue of Healthy Food	Supporting food banks, gleaning-organizations (they harvest remaining crops in the field), food-rescuing hubs, and meal programs rescuing surplus food: to increase access to nutritious food for food-insecure people.	<ul style="list-style-type: none"> Grading standards for size and quality Inaccurate forecasting of supply and demand Unexpected fluctuations in demand Overstocking 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
2 Implementing Storage and Transportation Improvements	Expanding temperature-controlled food distribution and storage infrastructure for donated food.	<ul style="list-style-type: none"> Cold-chain deficiencies Improper handling and storage 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
3 Exploring Financial Incentives for Food Donation	Exploring federal tax incentives for corporations to make food donations, to encourage such donations and educate potential donors on policies.	<ul style="list-style-type: none"> Low market prices and lack of markets for second-grade and surplus food products 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
4 Developing Liability Protection for Food Donors	Enacting regulations that protect donors from liability for donated food; educating potential donors on existing regulations.	<ul style="list-style-type: none"> Food safety concerns 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
5 Supporting Online Food Rescue Platforms	Developing online platforms/organizations that support matching of generators of surplus foods to buyers or organizations willing to take donations.	<ul style="list-style-type: none"> Low market prices and lack of markets for second-grade products Inaccurate supply and demand forecasting 	<ul style="list-style-type: none"> Post-Harvest Processing Distribution Retail Foodservice
6 Feeding Animals	Processing surplus food or food byproducts into animal feed or pet food, or feeding it to animals directly.	<ul style="list-style-type: none"> Inaccurate supply and demand forecasting Low market prices and lack of markets for second-grade products Damage from handling Trimming and culling 	<ul style="list-style-type: none"> Post-Harvest Processing Retail Foodservice

* Stages that are more directly involved are in bold.

2.1.1 Approach 1 – Reducing Portion Sizes

Case Study 1. Canada: Adapting Food-Ordering to Customer Needs / Neighbourhood Group of Companies

Food Supply Chain Stage: Foodservice – Restaurant

The Neighbourhood Group of Companies operates four sit-down restaurants in the City of Guelph, Ontario, that promote sustainable and locally grown and crafted foods and beverages. With 150 full-time and part-time employees, the restaurant chain is an active member of the community. The owner has undertaken a number of initiatives to understand how and where food loss and waste (FLW) is generated, and how to reduce FLW.

To understand how much waste was being generated, all kitchen and plated waste was measured over a three-month period. The results showed on average 0.6 kilograms of waste per guest, about 80 percent of which was FLW; the remaining 20 percent was recyclable materials or garbage. Of the FLW generated, 45 percent was kitchen FLW (e.g., vegetable cuttings, meat cuttings, eggshells) and the remaining was FLW from plated food.



Source: Neighbourhood Group of Companies 2016.

The owner started to examine which dishes typically created FLW and how they were being prepared. The investigations revealed that the most common FLW in the kitchen was potato peelings from making mashed potatoes and the most common FLW on the plate was French fries. The owner responded to observations by eliminating potato peeling (i.e., by leaving the skins on the potatoes for mashed potatoes, potato salad and French fries), and by reducing French fry portions (see photo). In addition, the restaurants do not offer bread, since 40 percent is thrown out. Bread is provided to customers by request but it is not advertised.

After the success of the first FLW monitoring study, the owner initiated a follow-up project with the University of Guelph. The study showed that on average, 10 to 15 percent of plated food was coming back as waste; this was again dependent on the particular dish. For example, the item that generated the most FLW was the signature pulled pork served with side orders of mashed potatoes, bread, and coleslaw. This finding resulted in the owner's reducing the portion sizes of side orders, and now the dish produces negligible FLW. Condiments (e.g., ketchup) provided another example of observed FLW. Now staff ask customers if they want condiments and provide them in small bowls, which has reduced ketchup consumption by one third. Dessert portions were also identified as being too large and have now been halved in size, with the price reduced to reflect the change. This has resulted in a significant reduction in waste and a significant increase in the sales of desserts.

Positive Impacts: The owner has noticed overall savings in operating costs, both from reduced labor associated with food preparation (e.g., not having to peel potatoes) but also in food costs, making the restaurants more profitable now than before. Furthermore, the decision to support local foods and sustainable activities has resulted in greater growth in business and customer support.

Key Insights: There is a need to educate customers about FLW and to promote smaller portions and other waste-reduction initiatives in restaurants. Restaurants need to measure FLW in order to be able to identify opportunities to create less FLW and thereby increase overall savings for the business, by reducing portions.

Source: Interview C17.

Case Study 2. Canada: Trayless Dining and Smaller Plates / Dalhousie University

Food Supply Chain Stage: Foodservice – Institutional

In 2007, Dalhousie University conducted an audit to investigate generation rates of food loss and waste (FLW) and discovered that at the university's largest cafeteria an average of 227 kilogram of FLW was generated per day. Of the FLW generated, just over half of it came from plate waste and the rest from the kitchen. At the time of the waste audit, the cafeteria used trays.



Source: Dalhousie University n.d.

The waste audit results also showed that the greatest amount of post-consumer FLW was generated at dinner, and the least at lunch. On average, each student generated approximately 0.3 kilograms of FLW over the three meals.

When a survey was administered to the students who ate at the dining hall, 55 percent admitted to regularly leaving one quarter of the food on the tray as waste and 69 percent of respondents were aware of the fact that they were discarding uneaten food. Furthermore, 47 percent of students attributed poor food quality/taste to the main reason for the FLW and 33 percent admitted that their waste resulted from taking too much food. Almost all students surveyed (97 percent) were on a meal plan. When asked what could be done to reduce the amount of FLW generated, the most popular responses included increasing food quality and taste (38 percent responses), introducing controlled portion sizes and changing the type of meal plan provided.

Positive Impacts: In March 2008, almost one year after the waste audit, the university introduced trayless dining in all four of the residence dining halls. According to Aramark's Foodservice Director at Dalhousie, "Getting rid of trays is one of several environmentally friendly initiatives Aramark, the university's foodservice provider, is making these days. The move will also cut back on water and detergents used to clean and sterilize the 3,000 to 4,000 trays in circulation at Dalhousie each day." Aramark found that when it went trayless in universities and colleges, the amount of FLW was reduced by 25 to 30 percent. In addition to introducing trayless dining, the use of smaller dining plates has also now become standard practice. Aramark has replaced the larger 33-cm dinner plates with 23-cm plates, to further reduce plated FLW.

Key Insights: There are many opportunities to reduce FLW in the eating areas of campus dining halls and other large cafeterias, by implementing simple procedures such as trayless dining and use of smaller plates. Monitoring FLW in front and back of house is key to collecting the data to support change.

Sources: Wright 2007; Smulders 2008.

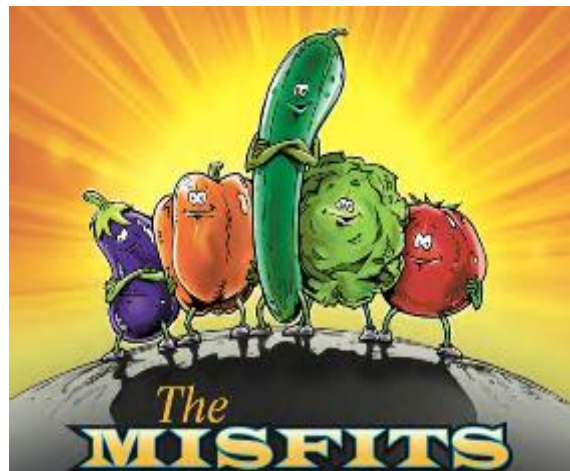
2.1.2 Approach 2 – Increasing Marketability of Produce

Case Study 3. Canada: The Misfits Campaign / RedHat Co-operative

Food Supply Chain Stage: Food Production Post-Harvest

RedHat Co-operative is a farmer co-operative in Southern Alberta that specializes in greenhouse-grown vegetables. It has more than 50 growers who produce approximately 36,000 tonnes of vegetables per year. Of these vegetables, 3–5 percent are second-grade. Since the vegetables are grown in greenhouses, they need to be picked and cannot be tilled back into the soil. Without markets for these vegetables, they are typically disposed of.

In 2014, RedHat Co-operative launched The Misfits, a produce line which is based on the Inglorious Fruits and Vegetables program created by Intermarché, a major grocery store chain in France. Instead of culling its second-grade produce, RedHat packed the produce and sold it at a discounted price to wholesalers and grocery stores. The program began as a pilot in Calgary, Alberta, with two grocery chains (Safeway and Co-op) and one wholesaler (Freestone Produce) participating. A pilot is currently running with Save-on-Foods, in Regina, Saskatchewan. Save-on-Foods is planning to expand this program to 35 stores in Alberta. RedHat is also selling The Misfits to wholesalers and distributors, which includes providing vegetables to Loblaw's Naturally Imperfect produce line.



Source: Meinhardt 2015.

Positive Impacts: In the initial pilots alone, approximately 23 tonnes of vegetables were sold as The Misfits. Customers were excited about the products and most stores sold out. Farmers benefit from The Misfits as they are able to increase their income from vegetables that they would have otherwise not been able to sell. Farmer morale has also increased, as there is often a feeling of guilt associated with disposing of edible vegetables. Due to demand for The Misfits, RedHat Co-operative has expanded and started brokering second-grade produce from the US and Mexico, to supplement supply from its growers, especially of vegetables that cannot be grown in colder climates or during the off-season. One distributor from the United States, Robinson Fresh, has purchased a license for The Misfits brand and is scaling the program up to 400 grocery stores.

Key Insights: There is demand and interest for The Misfits from farmers, wholesalers and consumers; however, retailers are still slow to scale up and expand the program beyond running pilots.

Source: Meinhardt 2015.

2.1.6 Approach 6 – Value-Added Processing

Case Study 8. Canada: Broken Ladder Cider / British Columbia Tree Fruits

Stage of Food Supply Chain: Post-Harvest, Processing

BC Tree Fruits is one of the largest fruit-growing farm cooperatives in Canada, with more than 500 member growers and 13 packing facilities. Their growers are based in the Okanagan region of British Columbia. The primary crops grown by their members include apples, cherries, peaches, and pears. The average annual gross production is approximately 77 million kilograms of fruit.

Of the fruit produced, approximately 80 percent is sold as fresh fruit. The remaining 20 percent is culled. Although there are markets for culled fruit, of which the majority is destined for juicing and animal feed, the prices for fruit that go to these end-uses are very low. To find a better use for culled fruits, BC Tree Fruits pursued the cider industry. BC Tree Fruits partnered with Lonetree Cider Company to produce a cider from culled fruit, called Broken Ladder. There are three recipes under this product line: Authentic Dry, Ginger Apple and Cranberry Apple Cider. This cider is marketed as a minimally processed, 100 percent BC fruit product, which appeals to a growing consumer demand for more locally made craft beverages.

Positive Impacts: In its initial rounds of production, BC Tree Fruits has repurposed 5 percent of its culls for cider and is planning to increase this to 25 percent (approximately 5 percent of gross production) as production ramps up. Since the cider is produced under BC Tree Fruits, the profits go not just to the processor but also to the cooperative's member growers, which gives them a higher-value market for their fruit.

Sources: Interview C7; McLeod 2015.



Source: BC Tree Fruits Cider Co. n.d.

2.2.2 Approach 2 – Storage and Transportation Improvements

Case Study 14. Canada: Grocery Meat and Food Terminal Rescue Programs / Moisson Montréal

Stage of Food Supply Chain: Secondary Market

Moisson Montréal is a food bank that specializes in rescuing perishable food products, such as meats, vegetables and fruits. Most of the food rescued (85%) needs to be kept cold or frozen; this contrasts with the situation at most food banks, which rely on rescuing mostly dry goods. Since most food banks cannot afford the investment in trucks that have freezer capabilities and in large cold/freezer storage units, Moisson Montréal has assumed the role of a central collection, storage, and distribution hub for perishable food products. Due to its large size, Moisson Montréal uses a software-based inventory tracking system, which allows the organization to track incoming and outgoing donations. Moisson Montréal redistributes the perishable food to food banks located throughout the Province of Quebec; however, it requires the food banks to come to the distribution center to collect the food. When organizations pick up the food, they go through a grocery check-out type of system linked to the software, so that Moisson Montréal can track exactly how much food is distributed.



Source: Moisson Montréal 2015b.

In 2015, Moisson Montréal worked with 293 agri-food suppliers (including food manufacturers, distributors and grocery stores) to collect perishable foods, which are distributed to over 250 community-based organizations on a regular basis. The food helps feed over 146,000 people each month.

Meat and fish are the food items most in demand from community organizations. To help accommodate this need, in 2013 Moisson Montréal implemented a pilot project with ten grocery stores (Loblaws), to rescue meat that was near the best-before date and would have been thrown out. The success of the pilot resulted in the project's being expanded to stores located throughout the Montreal area. Today about 110 grocery stores participate in the meat rescue project.

Meat that is no longer wanted by the supermarket is placed into plastic containers and put in the freezer until it can be collected by the organization. Moisson Montréal has three freezer trucks dedicated to the grocery store and meat program and manages between 200 to 220 pick-ups per week from the participating stores, or about 40 pallets per day. At the same time, Moisson Montréal will pick up other food products (e.g., bakery, fruits, and vegetables) from the stores but most of the emphasis is on meat.

Moisson Montréal emphasizes quality control at every step, with every plastic bin identified by number and tracked manually. Upon reaching the distribution center, the meat is repackaged and categorized and the information is entered into a computerized program for warehouse management. This approach was developed in response to brand-risk concerns identified by some donors.

The meat is stored in a freezer at Moisson Montréal until it is ready to be collected by the agencies, at which time the frozen meat is placed in polystyrene coolers to keep it frozen while being transported. All meat is tracked and the information is sent back to each store on a monthly basis.

The meat is re-distributed only to agencies involved in food transformation (e.g., community kitchens, meals providers, such as The Salvation Army, Meals-on-Wheels, etc.) that have staff that are trained for safe handling and cooking of meat. It is not donated for food baskets, due to health and safety

concerns. There are approximately 90 agencies in the program and the meat donations cover 100 percent of the meat needs of these agencies.

During the pilot, Moisson Montréal did not receive as much meat as anticipated and found out that many of the grocery store staff did not understand the nature of the project and who would be benefitting from the donations. In response, Moisson Montréal developed a training program for employees of grocery stores, to explain the program, who benefits and how to participate. A seven-minute animated video was developed, along with an interactive training program for the employees. The training resulted in a doubling of the meat donations.

In addition to grocery stores, Moisson Montréal started working with vendors at the Montreal Food Terminal located at Marché Central, to collect fruits and vegetables that were not sold at the end of the day. The Montreal Food Terminal generates an estimated 50 tonnes of wasted food per day. Moisson Montréal has a dedicated truck that collects 20–25 pallets of perishables every day, which is equivalent to 8–10 tonnes of food. Of the food rescued, about 85% is considered edible, with the remaining 15% being inedible. Drivers must evaluate the quality of the produce to ensure that the vendors are not trying to offload inedible food. If this happens, then Moisson Montréal will send a representative to talk with the donor and try to work out a solution. If the problem persists, then Moisson Montréal will remove the vendor from its donor list for a period of time. The Food Terminal supplies 70% of the fruits and vegetables collected by the organization.

Positive Impacts: About 60,000 to 65,000 kilograms of meat per month are rescued by participating grocery stores. The remaining food is donations from the Montreal Food Terminal (35%) and other suppliers (55%). With the success of the meat rescue project, Moisson Montréal has been working to expand the project to other grocery stores in the Montreal area. The organization is also working to help other organizations outside Quebec, e.g., Second Harvest, establish similar programs in their area. Moisson Montréal has a major project in the works for determining a way to rescue 100% of the unsold fruits and vegetables at the Montreal Food Terminal, thus ensuring the rescue of 50 tonnes of fresh produce now wasted every day.

Key Insights: The Quebec government has announced that within the next five years it will introduce a provincial law banning organic material from disposal throughout the province. Staff at Moisson Montréal see huge obstacles that will need to be addressed prior to the implementation of the law, including the need to de-package all food before it can be sent for processing into animal feed or for composting. The process to set up de-packaging will be very expensive, as the infrastructure to accommodate it will need to be developed. By-laws may need to be re-examined, to ensure that the pre-packaged food can be transported, stored and re-purposed.

Sources: Interview C32; Moisson Montréal 2015a; Moisson Montréal 2015b.

2.2.5 Approach 5 – Feeding Animals

Case Study 17. Canada: Fish Feed from Insect Larvae Raised on Wasted Food / Enterra

Stage of Food Supply Chain: Secondary Market

Conventional fish feed is produced by harvesting small wild marine fish and mixing them with soy into pellet-shaped products. The production of soy for fish feed uses up scarce land and water resources. Born out of these



concerns, Enterra has a mission “to secure the future of the world’s food supply by solving two global problems: wasted food

Source: Enterra Feed Corporation 2016.

and nutrient shortage.” Its business is to make dried larvae feed for fish meal and poultry meal, as well as organic fertilizers to be used on local farms. Enterra upcycles nutrients from pre-consumer wasted food collected from generators such as farms, supermarkets, greenhouses and bakeries, and feeds it to larvae of the black soldier fly. The larvae are then harvested and turned into feed products. The larvae themselves are also edible by humans, making them a potentially effective source of protein, should consumers be more open to consuming insects, but in Canada they are not currently approved for human consumption. The company is currently producing more than 110 million soldier fly larvae per day.

Positive Impacts: The upcycling and recovery of pre-consumer wasted food is a key component of this business and allows it to solve numerous problems, including overfishing, land degradation and water scarcity. Enterra plays an important role in food recovery by closing the food system loop and tying waste management back to food production. Another positive side effect of feeding wasted food to larvae is that this process also produces a manure-type product, which can be used as a natural fertilizer. In terms of organic processing methods, Enterra’s is high value in comparison to windrow composting or anaerobic digestion and is climate-change friendly, producing no methane and minimal carbon dioxide.

Key Insights: Enterra has been able to close the loop on wasted food through a process of upcycling the nutrients from wasted food back into the food chain. It provides a sustainable protein source for fish and poultry and a great source of fertilizer for agriculture. The company is expanding internationally and sales are growing, especially in the United States. Enterra has become the first manufacturer of an insect protein product to have completed the registration process for it as a feed ingredient in Canada. This product is currently approved for use in poultry feeds, and the company submission for use in fish feed is pending.

Sources: Enterra Feed Corporation 2016; Tamminga 2015; Cook 2014.



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Waste to Resources

4- Combustion with Energy Recovery



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Enerkem achieves a major breakthrough by producing sustainable aviation fuel from local forest biomass

Français

NEWS PROVIDED BY

Enerkem Inc. →

Nov 12, 2021, 06:30 ET

MONTREAL, Nov. 12, 2021 /CNW Telbec/ - Enerkem, a world leader in the production of biofuels from waste materials, is proud to have achieved a major breakthrough in converting carbon from forest biomass into sustainable aviation fuel (SAF) using its proprietary thermochemical process. This important milestone was achieved at Enerkem's Innovation Centre in Westbury, Quebec. It will be followed by the demonstration phase, which will lead to commercialization in the near future. This research is part of The Sky's the Limit Challenge organized by Natural Resources Canada and for which Enerkem was selected as a finalist.

The aviation sector alone accounts for 3% of total global GHG emissions and its carbon footprint appears difficult to reduce. With the favorable support provided by the Renewable Transportation Fuels Regulation, the production of sustainable aviation fuel from end-of-life materials has emerged as a future solution that will be the cornerstone of aviation's efforts to reduce its GHG emissions and eliminate them completely by 2050.

Currently, sustainable aviation fuel can be produced from a number of sources, including waste materials, corn grain and CO₂. Enerkem is already working with Shell on the use of waste materials for its Rotterdam project, and as part of The Sky's the Limit Challenge, Enerkem has chosen a fourth source: forest biomass.

"Our diligent and innovative approach in developing our forest biomass conversion technology has enabled us to produce a sustainable aviation fuel that will reduce the full life cycle carbon emissions of the aviation industry by over 90% compared to conventional fuel. This breakthrough will allow travelers to take flights that emit significantly less GHGs," says Michel Chornet, Enerkem's Executive Vice President, Engineering, Innovation and Operations.

Enerkem's aviation fuel is already in the process of being certified by Canadian, American and European authorities. Enerkem already has the infrastructure in place to move to the commercialization stage (plant in Edmonton and innovation center in Westbury) and will be able to proceed as soon as the market conditions are met.

Agroforestry for sustainable aviation

Agroforestry captures atmospheric CO₂ and, through photosynthesis, water and nutrients, converts the carbon in the CO₂ into biomass molecules. The transformation of biomass into biofuels and marketable bioproducts represents a unique opportunity for innovation. It is this eco-friendly approach that inspired Enerkem to take part in the The Sky's the Limit Challenge and convert Canadian forest biomass residues into sustainable aviation fuel.

The benefits of this approach are numerous: creation of partnerships with regional communities, sustainable economic development, job and wealth creation in the region, diversion of urban biomass from landfill and valorization of residual forest biomass.

Strong commercialization potential

"Our technology is proven. We already have a commercial-scale biofuel plant in Edmonton, Alberta. It converts residual municipal waste into biofuels. A second plant is currently under construction in Varennes, Quebec, in partnership with Shell, Suncor, Proman, the Quebec government and with support from Infrastructure Canada. This plant will process forest biomass in addition to non-recyclable and non-compostable waste. In addition, last June, due to the substantial demand for sustainable aviation fuel, we decided, with our partners Shell and the Port of Rotterdam, to transform the proposed Rotterdam plant in the Netherlands.

The planned production at this plant will now focus on converting waste materials into aviation fuels rather than renewable chemicals. The commercialization potential is there and we believe in it," adds Dominique Boies, Enerkem's Chief Executive Officer and Chief Financial Officer.



About Enerkem

Enerkem has developed and commercializes a disruptive technology producing advanced biofuels and renewable chemicals from non-recyclable waste. Headquartered in Montréal, Québec, Canada, Enerkem operates a full-scale commercial demonstration facility in Edmonton, Alberta, Canada as well as an innovation centre in Québec. A full-scale commercial facility in Varennes, Quebec, Canada is currently under construction and commissioning is scheduled for 2023. Enerkem's technology is a prime example of how carbon in agroforestry residues and in urban residues can be recycled into new products, diversifying the energy mix and making everyday products greener while offering a smart, sustainable alternative to landfilling and incineration. For more information, visit www.enerkem.com, follow us on [Twitter@Enerkem](#) or consult our [LinkedIn](#) or [Facebook](#) pages.

SOURCE Enerkem Inc.

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www.enerkem.com

New Brunswick's Greatest Resource

13 July 2020/

The lush green forests of New Brunswick are the envy of many who are surrounded by concrete walls in population-dense cities. However, a lot of our own residents may not even know exactly how rich of a commodity the abundance of woods in their own backyards produce. Enter forest biomass – the wood waste left as a result of strategic forest management and local sawmill processing. In being resourceful and taking that “waste” and turning it into value-added product, the wood pellet can be produced and thus, a source of clean energy is created. It is arguably New Brunswick’s greatest underutilized resource.

Wood pellets have become a highly sought-after product and are being used more and more for industrial heating purposes, replacing the outdated use of fossil fuels. Hundreds of thousands of pellets are exported out of the Port of Belledune annually, destined for overseas heating facilities. The UK understands this resource and has effectively reduced the use of fossil fuel drastically; as a result, also cutting carbon emissions. The Belledune Port Authority (BPA) has worked to become the top biomass exporter in Eastern Canada since beginning to export wood pellets over a decade ago. The amount of laydown space available at the Port of Belledune and the excellent storage facilities directly on the terminals as well as top notch operations have clients increasing their supply of these products. In 2019, JD Irving Ltd. constructed a storage facility adjacent to Terminal 3 in collaboration with the Port’s stevedoring partner and terminal operator, QSL Canada Inc. Wood pellets are sensitive to the elements and this new facility is the third warehouse on the Port of Belledune’s terminals dedicated to storing the commodity. As growth continues necessary discussions are taking place to identify how to best support the local economy while meeting global demands.

The wood pellets in the new storage facility at the Port of Belledune are created from bi-products and leftover sawmill biomass materials at the JD Irving Sawmill located in Saint Leonard, New Brunswick. This facility is just one location that makes up the product supply exported overseas through the Port of Belledune. In being environmentally responsible, JD Irving Ltd. is taking the by-product of their operations, what would otherwise be thrown out, and capitalizing on other uses. Customers in Europe and other continents overseas continue to increase their purchasing, recognizing the environmental benefits of using wood pellets as fuel for energy production.

There continues to be growing interest locally around wood pellets and their ability to be a clean energy solution for the domestic market as well. The question is whether it is possible to utilize the provinces’ own supply of biomass while continuing to be profitable and successful in supplying customers overseas. In 2016, the provincial government of New Brunswick released their Climate Action Plan (CAP), including the lofty goal of eventually transitioning to a drastically carbon-reduced economy. An important part of CAP that will directly influence businesses around the region is the eventual phasing out of coal being used to produce energy. According to an article published in Canadian Biomass Magazine, the wood pellet sector in New

Brunswick is “well positioned to help the government meet its climate commitments, to improve the provincial economy, and to create more jobs.” (Canadian Biomass Magazine, 2017). Benefits to adding wood pellets to heating methods include:

- growing employment and job creation;
- growing an industry based on using waste that is already being generated by the sawmill industry;
- using a cost-effective, reliable, and clean way to reduce pollution and meet CAP standards;
- ultimately reduced heating costs; and,
- reducing dependence on imports of oil and coal, which would keep money circulating in the province.

Although it remains to be seen how exactly the use of industrial wood pellets could benefit local industries and the environment, it is with certainty we know that wood pellets will continue to be needed internationally and demand will likely grow. To remain a top supplier of this renewable energy source, the key will always be to have smart, strategic, and sustainable forest management. As the BPA focuses on clean environmentally friendly projects, there is also a commitment to partner with organizations that have similar values. The BPA is proud to partner with JD Irving Ltd. because of their exemplary efforts to responsibly replace the wood supply used in its operations. Since beginning the tree planting program in 1957, over one billion trees of various species have been planted! They proudly hold the national record in Canada and continue with their commitment to always replace what is used. The trees planted act as natural air filters and absorb up to one tonne of carbon in a lifetime.

It is not something always at the forefront, but it is important to recognize the impact New Brunswick has overseas by making the most of its greatest natural resource. New Brunswick has significantly played a helping role in the world’s quest for cleaner energy and reducing worldwide carbon emission output. Even more, the province is poised to contribute even more through escalating wood pellet exports from the Port of Belledune and their suppliers. It is clear the greatest resource at the province’s disposal is one that resides in all our own backyards. What was once viewed as unusable trash has become a natural commodity which is in demand. Our supply to the world positions us as a leader in creating a less-polluted, healthier, and safer world.



ENVIROTHON NB

Waste to Resources

5- Human and Animal Waste Treatment



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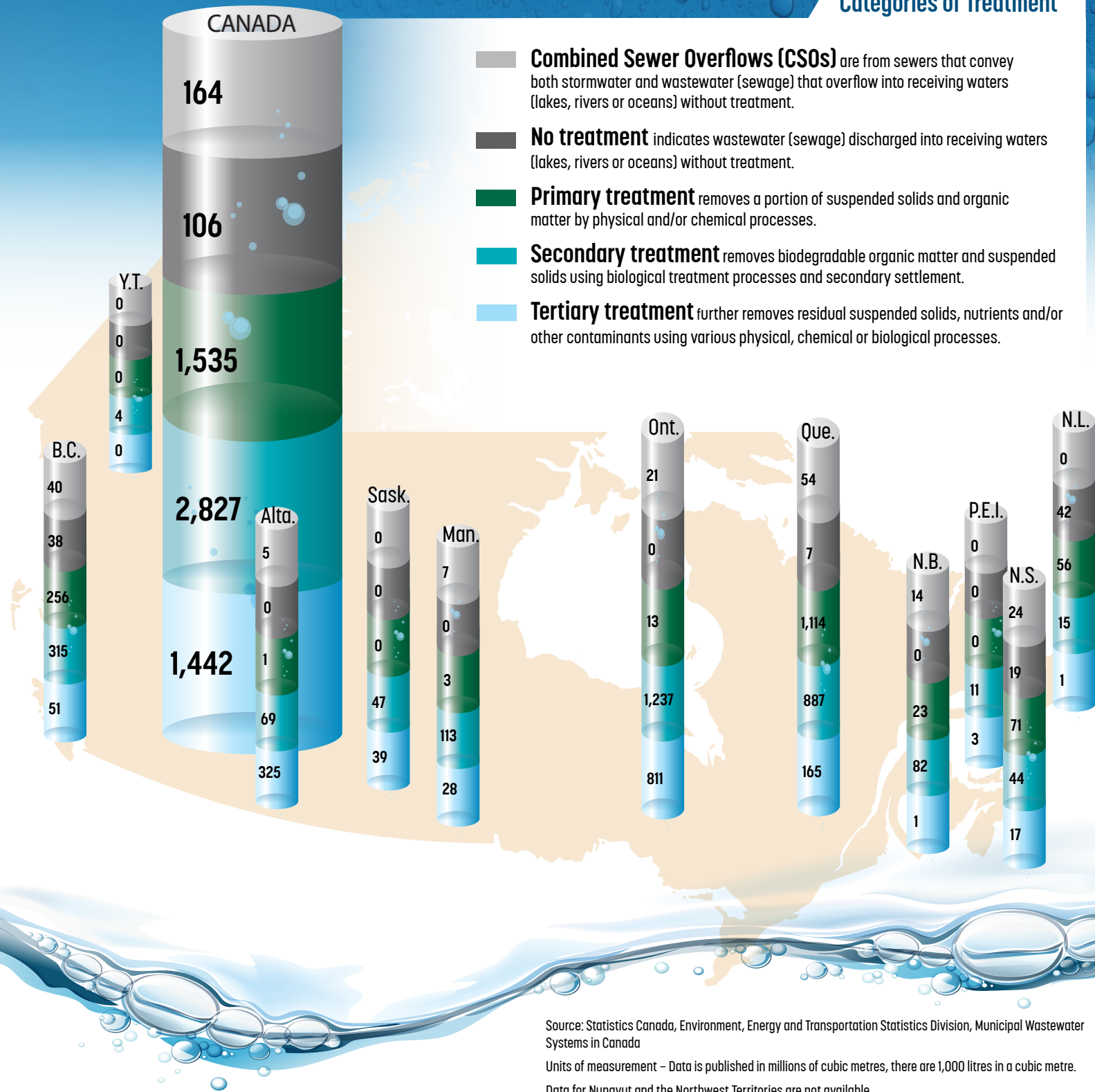
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MUNICIPAL WASTEWATER SYSTEMS IN CANADA

Volumes of provincial wastewater (sewage) discharged by treatment category, 2017 (millions of cubic metres)

Categories of Treatment

- Combined Sewer Overflows (CSOs)** are from sewers that convey both stormwater and wastewater (sewage) that overflow into receiving waters (lakes, rivers or oceans) without treatment.
- No treatment** indicates wastewater (sewage) discharged into receiving waters (lakes, rivers or oceans) without treatment.
- Primary treatment** removes a portion of suspended solids and organic matter by physical and/or chemical processes.
- Secondary treatment** removes biodegradable organic matter and suspended solids using biological treatment processes and secondary settlement.
- Tertiary treatment** further removes residual suspended solids, nutrients and/or other contaminants using various physical, chemical or biological processes.



Source: Statistics Canada, Environment, Energy and Transportation Statistics Division, Municipal Wastewater Systems in Canada

Units of measurement – Data is published in millions of cubic metres, there are 1,000 litres in a cubic metre.

Data for Nunavut and the Northwest Territories are not available.

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ENVIROTHON NB

Waste to Resources

6- Brownfields and Restoration of Degraded Lands





Introduction

The national strategy on brownfield redevelopment is guided by the following vision: The transformation of Canada's brownfields into economically productive, environmentally healthy and socially vibrant centres of community life, through the coordinated efforts of all levels of government, the private sector and community organizations.

Canada's Brownfields: Legacy and Opportunity

Brownfields shape the landscapes of communities in every region across Canada.

Brownfields stand as a legacy of a century of industrialization in Canada. They can be found in cities and towns across the country: abandoned, vacant, derelict or underutilized commercial and industrial properties where past actions have resulted in actual or perceived contamination. But brownfields differ from other contaminated sites in one important way—they hold excellent potential for being cleaned up and redeveloped for productive uses.

Brownfields exist in a variety of sites: decommissioned refineries, former railway yards, old industrial waterfronts and riverbanks, crumbling warehouses, abandoned gas stations, former drycleaners—any properties where toxic substances may have been used or stored. They may be publicly or privately owned, held under trusteeship or be “orphan” sites, without ownership.

The City of Brantford, Ontario, was left with a brownfield property owned by a bankrupt company. No one was in control of the property, and when squatters subsequently occupied the vacant building, the City had no authority to evict them. The building eventually burned to the ground in a spectacular blaze that nearly forced the emergency evacuation of the nearby Brantford General Hospital.

There may be as many as 30,000 such sites in Canada. Left idle and unmanaged, brownfields represent a significant loss of economic opportunity. They adversely affect a neighbourhood's image and quality of life, and in some cases they pose risks to human health and the environment.

Brownfields represent an untapped opportunity to revitalize older neighbourhoods and generate wealth for communities.

There is a growing recognition in Canada and other countries that brownfields represent an untapped opportunity to revitalize some of the oldest and most neglected neighbourhoods of many communities—to restore environmental quality and to bring new life to these properties in the form of housing, small businesses and recreational opportunities. Over the past few years, experience in the United States, Europe and several Canadian cities has demonstrated that, with the right kind of incentives and partnerships, brownfields can have a bright future.

Already, several thousand contaminated sites have been cleaned up in Canada, creating tens of thousands of jobs, millions of dollars in additional property taxes and thousands of new housing units. With the package of supportive measures outlined in this national strategy, Canada's nascent brownfield redevelopment industry could evolve rapidly into a business generating many billions of dollars a year.

Transforming brownfields into vibrant centres of community life will not be a simple task. Brownfields present a complex array of challenges for communities in every part of Canada. Long-standing legal, financial and community concerns must be acknowledged and addressed. The interests of all parties involved in community development—governments at all levels, the private sector, community groups—must be engaged around a shared commitment. Above all, public leadership must lend credibility, support and momentum to the task.

The Benefits of Brownfield Redevelopment: Helping Build Sustainable Communities

Note: Italicized terms marked with an asterisk () are defined in Annex 1.*

The case for redeveloping brownfields is strong. Cleaning up and revitalizing a brownfield site can transform the quality of life in an older neighbourhood or district, generating a wide range of economic, environmental and social benefits. And the benefits are seen not only in the neighbourhood, but also at the city, provincial and even national levels: brownfield redevelopment can be a key tool for building sustainable communities in Canada. By restoring environmental quality and revitalizing once-abandoned properties, brownfield redevelopment represents an excellent example of putting into practice the principles of sustainable development—development that seeks to integrate economic, environmental and social goals so that the needs of today's generation can be met without compromising the ability of future generations to meet their needs.

Annex 2 provides examples of economic, social and environmental benefits from brownfield redevelopment projects in several Canadian cities. Experience with brownfield redevelopment in Canada, the United States and Europe suggests that, while specific circumstances may vary, significant benefits are consistently seen in the following areas:

1. Creation and retention of employment opportunities

Brownfield redevelopment creates employment opportunities both in the specialized areas of cleanup technology and development, and in the new enterprises

Quebec's Revi-Sols program, established to promote brownfield redevelopment, has created an estimated 1,075 person-years of employment over the last five years in the areas of assessment and cleanup.¹

The redevelopment of a small brownfield property in the West Harbourfront area of Hamilton, Ontario, involving the construction of 27 new housing units on land formerly used for rail yards and a gasoline station, generated personal income of \$720,000 from on-site remediation and construction jobs, and created 10 permanent jobs.²

—small businesses and services—that find a home in the rejuvenated brownfield site.

At the national level, an enhanced capacity for brownfield redevelopment can also mean increased export potential for Canadian cleanup technologies.

2. Increased tax revenues

Brownfield redevelopment increases the tax base for all three levels of government, through the creation of new economic bases to sustain property, income and capital taxes. At the municipal level, a redeveloped site increases property tax revenues and the funding available to local governments to provide public services. Experience in the United States has also demonstrated that as brownfields are redeveloped, the value of surrounding properties within a radius of up to 2.5 kilometres may rise by an average of 10 percent, with associated increases in property tax revenues.³

Once completed, the Spencer Creek Village project in Dundas, Ontario, involving nearly 500 new housing units and 40,000 square feet of commercial space on the former site of a steel foundry, will generate an estimated:

- \$1.76 million a year in new property tax revenue for the municipality
- \$7.55 million in additional provincial sales tax
- \$6.6 million in additional GST revenues.⁴

At the provincial and federal levels, brownfield redevelopment brings increases in sales tax and goods and services tax (GST) revenues, as well as an increase in income tax revenues. Indirectly, all three levels of government can benefit through reduced funding requirements for new roads and infrastructure, as brownfields tend to be located in areas with services already in place.

3. Revitalized neighbourhoods and communities

Brownfield redevelopment can be an engine for urban renewal and economic growth, particularly where there are large tracts of brownfields in the central business district or in heavily industrialized suburbs.

A redeveloped brownfield returns idle lands to productive uses. It can mean greater access to affordable housing. It can improve the quality of life in a neighbourhood, enabling residents to live closer to work and recreational facilities. It can directly create new busi-

Redevelopment of the old CN Rail repair shops in Moncton, New Brunswick, created 110 acres of new sports facilities in an accessible downtown location. These facilities include 10 baseball diamonds, four soccer fields, two football fields and a sportsplex containing four NHL-sized hockey rinks.⁵

The redevelopment of the False Creek south shore in downtown Vancouver, launched in the 1970s on 80 acres of decaying industrial lands, stands as a landmark example of how brownfield redevelopment can support community social goals. For example, the city's development plan explicitly called for a housing mix that accommodated households of all income levels and age groups. As a result, the redevelopment project was opened to all types of developers, market and non-market, co-op and condominium, rental and ownership, so that all segments of Vancouver society could be included.⁶

nesses in the area, which in turn attract additional businesses and services.

In smaller and rural communities—where the impact of even a single large brownfield can overwhelm a community's resources and blight the landscape—brownfield redevelopment can be a source of rebirth.

4. Reduced urban sprawl

Brownfield redevelopment reduces development pressures on *greenfields** in the community's outlying areas, resulting in both infrastructure and transportation savings.

Every hectare of a brownfield redeveloped for residential purposes can save as much as \$66,000 a year in transportation costs (relative to equivalent greenfield redevelopment).⁷

Redeveloped brownfields usually make effective use of existing municipal infrastructure and are strategically located along existing transportation corridors. Development of greenfields, on the other hand, often consumes otherwise productive agricultural land and requires the installation of costly municipal infrastructure and services. Typically, greenfield development also consumes much more land than a brownfield project and is less compatible with pedestrian and public transit uses.

Every hectare developed in a brownfield project can save an estimated minimum of 4.5 hectares of greenfield land from being developed in an outlying area.⁸

5. Increased competitiveness for cities

The effects of increased private sector productivity—through compact land use, a reduced tax burden to support infrastructure, and an improved business climate from better neighbourhoods and reduced congestion—all combine to increase the competitiveness of Canadian cities seeking to attract foreign investment.

6. Enhanced environmental quality, health and safety

Many brownfield sites are contaminated with industrial or other toxic wastes that pose a health and safety risk to nearby residents and workers. Cleaning up these sites can help restore environmental quality in the community and remove the threats to health and safety.

A shopping mall was built in Shawinigan, Quebec, on the site of a former chlor-alkali and solvent manufacturing plant that had been located beside a residential area, protecting the health of neighbourhood residents and redeveloping a property that had been derelict for more than 25 years.⁹

Channelling growth into brownfields instead of greenfields can also contribute to improved air quality and reduced greenhouse gas emissions in urban areas. The redevelopment of older downtown sites provides an alternative to urban sprawl that promotes more compact urban forms and reduces the commuting and transportation requirements of residents, workers and businesses.

For example, it has been estimated that, on average, a suburban resident in the Greater Toronto Area travels more than two and a half times further by car on an annual basis than an urban resident living in a former brownfield site, due to the latter's shorter commuting distances and greater use of public transit. (The latter's average annual savings in fuel-based emissions is actually greater than this ratio, because reduced car travel results in less congestion and increased fuel efficiency for other travellers, especially at peak commuter time periods.)¹⁰

Brownfield Redevelopment's Impact on the Canadian Economy

In addition to providing important economic, environmental and social benefits at the community level, brownfield redevelopment can generate substantial economic benefits to the overall Canadian economy, according to a preliminary economic study commissioned by the NRTEE in 2002.¹¹

The study sought to identify the goods and services associated with the brownfield redevelopment sector of the Canadian economy, and model the sector's income multiplier effects on the economy—how one dollar spent on an activity is re-spent (through several rounds) on further activities and commodities.

The study concluded that brownfield redevelopment has an extremely high multiplier effect, reflecting the high service content of the brownfield redevelopment cluster and the large number of interfirm linkages that typify brownfield redevelopment activity (e.g. the high degree to which the brownfield sector purchases goods and services from other sectors of the Canadian economy).

(For more information on the study, see Annex 3.)



False Creek, Vancouver, B.C., before redevelopment, 1950s



False Creek, Vancouver, B.C., 2002

1. Moncton Shops Project, Moncton, New Brunswick

Developer: Canada Lands Company (CLC)

Location: Downtown, Moncton, New Brunswick

Site Area: 285 acres

Proposed Use

Mixed use development with:

- 60 acres (500,000 square feet) for the Emmerson Business and Technology Park
- 110 acres for Moncton Common recreational area (includes 10 baseball diamonds, two football fields and four soccer fields)
- a sportsplex (four NHL-sized hockey rinks)
- 64 acres for (450 to 550) residential units

Site History

- Used as an industrial site for 85 years; former Canadian National Railway repair shops for Eastern Canada

Site Condition

- Numerous industrial contaminants in soils

Cleanup

- CLC undertook comprehensive remediation, which has been completed, and has launched an extensive redevelopment program
- University of Moncton Chemistry Department conducted the bulk of the site assessment, using innovative site assessment and remediation methodology (CLC invested \$100,000 in laboratory facilities at the University of Moncton)
- Site assessment results indicated areas where contamination could be managed on site (by modifying land uses) and areas where soils required remediation

Costs

- Initial estimates of cleanup: \$50 million to \$100 million
- Actual cleanup: \$12 million to \$15 million

Progress to Date

- Moncton Commons recreational area and sportsplex are complete
- Construction began in September 2002 on the first commercial building in Emmerson Business and Technology Park; the park will take 10 years to complete

Economic Benefits

- More than \$200 million from remediation and potential future development
- Approximately 300 person-years of employment during remediation (1996 to 2001)
- Approximately 1,500 person-years of employment during construction of the Emmerson Business and Technology Park
- Potentially 5,000 permanent jobs after completion of Emmerson Business and Technology Park
- Approximately 250 person-years of employment during construction of the Franklin Heights residential area
- Approximately 30 person-years of employment during construction of the open recreational area
- Potential investment of \$175 million for future building development in Emmerson Business and Technology Park; \$20 million for future development of Franklin Heights; \$5 million for the construction of the open recreational area
- The potential total property tax base at full development is almost \$9 million (the present property tax base is \$214,000): \$8 million from Emmerson Business and Technology Park, \$550,000 from Franklin Heights

Other Benefits

- The open recreational park will benefit current and future generations of Moncton residents
- The potential for 5,000 permanent jobs in Emmerson Business Park will significantly benefit the quality of life in Moncton and surrounding area by supporting local businesses, increasing home sales and increasing social amenities
- Citizens participated in site planning via a citizen environmental committee



ENVIROTHON NB

Waste to Resources

7- Additional Resources



- [Canadian Council of Ministers of the Environment](#)
- [The Afterlife of wastes](#)
- [Tire Recycling Atlantic Canada Corp](#)

