Municipal Solid Waste (MSW) In Canada

Issues Paper

Report to

National Round Table on the Environment and the Economy

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Glossary of Terms and Abbreviations

Anaerobic digestion (AD)	Biological decomposition of organic material by micro-organisms in an oxygen free environment to produce biogas and stable organic humus
Biodegradable	Material which can be decomposted by natural processes
Biogas	Gas produced by anaerobic decomposition of organic material, consisting of 60% methane and the remainder is mostly carbon dioxide
Biological treatment	Processing of organic materials by micro-organisms and natural processes
Bottom ash	Non-hazardous combustion residue produced by MSW incinerators
Commercial waste	Waste generated by commercial facilities. The composition varies depending on the type of business involved (shopping malls, restaurants, etc)
Composting	A process whereby organic materials are broken down by micro-organisms in an oxygen rich-environment. The finished compost from the process is used to enrich soils
C&D waste	Construction and demolition waste
Disposal facilities	Landfills and incinerators where waste is disposed
Diversion	Directing waste to recycling and composting facilities, rather than to disposal facilities such as incinerators and landfills
Diversion Rate	Measured by the Canadian national GAP (Generally Accepted Principles) process, diversion refers to the ratio of diverted waste to generated waste as a percentage. See www.csr.org for additional details on GAP
Energy From Waste (EFW)	Incineration of non-hazardous waste is destroyed by controlled burning at high temperatures to produce steam, heat and/or electricity
Extended Producer Responsibility (EPR)	Policy where producers of products are responsible for their management at the end of their lifecycle

Fly ash	Light ash material produced by air cleaning equipment in EFW facilities. Classified as hazardous material because of high metal content. It is managed in a hazardous waste facility
Greenhouse gases (GHG)	Gases such as carbon dioxide (CO2) and methane (CH4) which contribute to the greenhouse effect and climate change
IC&I (Industrial, commercial and institutional) waste	Wastes generated by the industrial, commercial and institutional sectors. Most of this waste is managed by private sector waste management companies under contract with the waste generator. Small amounts are sometimes picked up curbside by the municipality, or can be dropped off at municipal landfills and depots.
Industrial waste	Waste generated by industrial facilities. The composition varies depending on the industry involved (manufacturing, pulp and paper, automotive, etc)
Institutional waste	Waste generated by institutional facilities. The composition varies depending on the type of institution involved (school, hospital, prison, municipal building, etc)
Landfill	A sanitary landfill is a facility which is designed for the disposal of non-hazardous waste. Design elements include a leachate collection and treatment system, gas collection systems, interim and final cover, as well as long term monitoring systems to collect data on the landfill performance.
Landfill gas	Mixture of methane and carbon dioxide which is produced at landfills as material decomposes. If not managed properly, landfill gas can migrate to adjoining properties and cause explosions. All modern landfills have effective landfill gas collection and management systems
Landfill leachate	Liquid which is created through the decomposition of waste in a landfill. This liquid is acidic and is collected for treatment prior to discharge.
Leachate collection system	A system which collects leachate through a series of pipes installed at the base of the landfill and pumps the leachate to a location where it is treated

MRF (Materials Recovery Facility)	A facility where dry recyclables are separated, processed (contaminants removed, materials are baled, etc) so that they are suitable for sale to end markets. Materials typically handled include newspapers, cardboard and other papers, glass, plastic and metal containers.
MSW (Municipal Solid Waste)	Non-hazardous waste such as paper, food, metals, glass, plastic, clothes and various durable goods which are produced by households and businesses. The residential portion of MSW is managed by municipalities through their own forces or contractors.
NRTEE	National Roundtable on the Environment and the Economy
Organic waste	Refers to food and garden waste, and other biodegradable waste produced by households and businesses
Residential waste	Waste produced by households
Source separated organics (SSO)	Organic materials separated from other wastes by the household or business before the waste is set out for collection
Stakeholder	An organization, government entity or individual that has a stake in or may by impacted by a given approach or issue
Tipping Fee	A fee charged at waste management facilities (landfill, MRF, composting facility or EFW)
Yard Waste	Garden waste produced by a household, which includes leaves, grass clippings and other garden refuse (weeds, etc.)

Executive Summary

We continue to produce too much waste in Canada. The way in which we manage waste is an indicator of our inefficiency. Our current practices are not sustainable, and waste needs some serious attention as part of our sustainable development, sustainable communities and sustainable production policies and objectives.

Most of the materials which are currently discarded could be recycled if the right policies and technologies were in place. We throw out millions of tonnes of paper in our garbage, because we have voluntary approaches to recycling in most of Canada. Our pulp and paper mills must import over 2 million tonnes of paper to provide sufficient feedstock for our production needs, because we do not recycle sufficient paper domestically. With the right policies in place, paper and other materials would be recovered from the waste stream, rather than discarded in landfills.

Landfill siting is becoming increasingly difficult and contentious, and even though Canada has significant amounts of available land, communities are resistant to new landfills. As old landfills close, in many cases they are not replaced, and some areas of Canada are facing a landfill shortage. We dispose of 24[1] million tonnes of waste per year, and currently export 3 million tonnes (12% of the total) to US landfills. This is not sustainable in the long term; we need to produce less waste.

Incineration meets significant public resistance because of a concern about dioxin and furan emissions. Canada landfills 79% of all the waste we produce, compared to an average rate of 58% of waste to landfill for other OECD countries

MSW management in Canada is a provincial responsibility. No government body has responsibility for coordinating MSW management issues and policies across Canada at a national level. This is a significant gap, which impedes our ability to manage our waste sustainably, and develop policies and instruments which will reduce our waste generation over time.

Canada needs to develop a comprehensive strategy on how it can reduce waste as part of a comprehensive sustainability agenda, but this need is not being addressed at this time, as it not currently within the mandate of any government body. The current governance structure has created a policy vacuum at the national level which needs to be addressed for Canada to move forward with policies which manage our waste sustainably and lead to lower waste disposal rates.

The legislated mandate of the National Round Table on the Environment and the Economy (NRTEE) is “to play the role of catalyst in identifying, explaining and promoting, in all sectors of Canadian society and in all regions of Canada, principles and practices of sustainable development.”

[1] Statistics Canada Waste Management Industry Survey, Business and Government Sectors, 2002

Two different types of roles should be considered by NRTEE:

Address a National 50% Waste Reduction Strategy
A Canadian National MSW Strategy is needed to identify how we could reduce our waste by 50% over the next ten years. This strategy needs to address:

- Technologies which could be used to enhance diversion;
- Policies which can enhance diversion;
- Tax policies which can reduce waste and increase waste diversion
- The infrastructure needed to achieve more diversion
- The costs of setting up a Canadian infrastructure for increased diversion
- Linkages between effective waste policy and energy policy
- Improvements which could be made to governance of MSW management, and how more coordination between provinces could improve our performance
- The most appropriate role of the federal government

NRTEE could form a multi-stakeholder committee or process to work on the elements of a strategy to reach a 50% reduction goal over ten years.

Targeted Role To Focus On Several Individual MSW Related Issues Which Are Not Currently Being Addressed
Alternatively, NRTEE could focus on one or more specific areas which need targeted attention. Nine options are offered, four of which are considered the most critical and in urgent need of attention, two additional actions are market related, and the remaining three are considered "nice to have".

Address Tax Policy, Economic Incentives, EPR and Governance
Tax policy, economic instruments, ERP and governance are the four most critical issues which NRTEE should address and are considered the highest priority in the short to medium term. These issues are not addressed at the national level by any coordinating body at this time. They represent significant gaps and barriers to sustainable MSW management in Canada. Potential roles for NRTEE in each of these specific issues are described below.

1. Evaluate Economic Instruments Which Could Be Used To Reduce Waste:
A multi-stakeholder group could be established to examine the role of economic instruments in helping Canada to become a more sustainable society. The group would assess mechanisms which would reduce the amount of waste we produce over time, and assess the extent to which existing tax policy is an impediment to sustainable consumption practices.

2. Examine Existing Tax Policy For Barriers to Resource Conservation and Waste Minimization: As in many countries, existing tax policies in Canada do not encourage resource conservation; an assessment needs to be undertaken on how tax

policy could be modified to support secondary industries, and also how it could provide incentives to waste minimization.

3. Establish a "Think Tank" On the Effectiveness and Impacts of EPR Policies: EPR has been embraced by the international community as a solution to non-sustainable waste management. There is no comprehensive evidence on the impacts of EPR policies, and the extent to which they have been able to influence Design for Environment and improve industrial process efficiency. A multi-stakeholder committee should examine this issue and make recommendations to the government on the role of EPR in our national sustainable economy agenda.

4. Governance Structures: The Federal Government is not currently engaged in the MSW issue, as most responsibility for MSW and the powers to implement MSW related policies are with the provinces and territories. The National Roundtable should examine whether the federal government should play a more active and central role in MSW related issues as part of Canada's sustainable development and clean production agenda, and make recommendations on what that role should be.

Market Related Issues

There are two market related issues which are considered important, and no entity is addressing them in any substantive way at this time. Potential roles for NRTEE are:

5. Assess How to Foster Innovation in Product Design for Environment and in Clean Production: To make Canada competitive, it needs to be a leader and an innovator in industrial processes and it must produce goods in a more resource efficient way. Design for environment is a key element of all policies aimed at reducing waste. NRTEE could establish a Green Ribbon Committee of large industry representatives who would assess mechanisms to move more Canadian companies to sustainable and clean production approaches. To imbed sustainable thinking in our industy leaders long term, Design for Environment needs to be incorporated into the curricula of business, engineering, design and law programs in Canadian educational institutions.

6. Appropriate Role of Federal Government and Businesses in Developing Sustainable Markets for Secondary Materials: Examine a range of options which would create stable markets for recyclable materials, including a leadership role by the federal government in green procurement, to lead by example as part of the House in Order program. Assess the viability of establishing a National "Buy Recycled Alliance"; existing procurement specifications at all levels of government, and how these could be altered to mandate high recycled content. Assess how design for environment and clean production policies could be incorporated into purchasing specifications for all vendors who do business with the federal government. Through an evaluation process, NRTEE could make recommendations on how federal government purchasing practices in particular could be improved.

Other Potential Targetted NRTEE Roles

Three actions described below are considered less critical, but may fit more clearly into other policy and measurement areas being explored

7. Develop a MSW Specific Indicator:

A specific waste or MSW related indicator is needed which measures how Canada is performing with respect to sustainable consumption, clean production, and environmental impacts of waste management activities.

8. Linkages between MSW Management and Energy/Climate Change Policy:

Waste management practices impact on greenhouse gas (GHG) emissions, and higher diversion strategies save considerable energy in industrial processes, and also through reduced raw material extraction energy requirements. Preferential pricing of green energy can improve the economics of technologies such as anaerobic digestion and landfill gas recovery, which are not economically viable in many locations in Canada at this time. A comprehensive assessment of possible beneficial linkages between climate change policy, energy policy and waste management policy is needed.

9. Better Data Collection On IC&I Waste Management:

We currently do not have a detailed understanding of how MSW produced by businesses and industries (IC&I waste) is managed in Canada. This hampers efforts to develop diversion plans and strategies. Data collected by Statistics Canada is aggregated for confidentiality reasons, and is not available in a sufficiently disaggregated format which would be useful for detailed analysis. The National Roundtable could examine, as part of a larger plan, methods to collect more comprehensive data on IC&I waste production and management practices to assist industries to manage their processes more sustainably and reduce the amount of waste produced.

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1. Introduction

Municipal solid waste is defined as any material for which the generator has no further use, and which is managed at waste disposal, recycling or composting (or other organics processing) sites. MSW generally includes solid, non-hazardous wastes generated by households, businesses and construction and demolition activities.

In Canada, waste generation continues to increase. We generate about 31 million tonnes of waste, recycle and compost about 20% of the waste generated, and dispose of 24 million tonnes of waste per year. Our waste generation per capita has actually increased in the last 12 years, when ideally it should reduce over time due to efficiencies in product design and consumer awareness of waste generation. We need to delink economic growth and environmental degradation; we need to innovate and produce less waste in the future.

Waste is a significant urban issue. As urban areas grow, the amount of waste to be managed increases, and even though Canada has large tracts of land, there is strong public resistance to siting of new landfills. This is already evident in Southern Ontario, which exports one third of its waste to Michigan landfills. The 400 additional garbage trailers crossing the border each day cause local air quality degradation. The increased congestion affects the speed at which parts and materials needed for industries in Southern Ontario can be delivered to these manufacturing facilities. This particularly affects the auto industry which depends on significant cross-border just-in-time delivery of goods and materials to maintain its competitive position.

Waste affects the quality of our lives. Improper management of waste leads to water and air pollution and can be a public health hazard. The management of waste within the urban context affects land use, water quality and clean air, greenhouse gas production and air quality. Waste disposal requires the use of large amounts of land for landfills. Even though we have an abundance of land in Canada, local communities are very resistant to landfill development, resulting in a critical shortage of landfill capacity in Ontario in particular.

Waste production is a sign of inefficiency in industrial processes. Whereas the actual cost of waste disposal is low ($50 to $100/tonne), the original purchased cost of the material being thrown out is significant, and the fact that expensive material is discarded is a sign of inefficient design of industrial processes using these materials. While the ideal is to produce no waste at all, it is recognized that for the foreseeable future, some waste will be produced. In the past, the term “waste” has been associated with low value, unwanted material. However, with proper planning and policies in place, discarded materials from one system can be a resource for another system. Viewing waste as a potentially valuable resource can help to drive changes in waste management systems, improve product design for material recovery and lead to efficient resource use strategies.

For Canada in particular, there are a number of reasons why we have been slower than other countries to reduce the waste we produce.

- Landfill costs have been traditionally low in Canada and the costs of recycling and composting and other organic processing have been higher than landfill; this has slowed our move to waste diversion on economic grounds
- Our taxation system supports resource based rather than secondary industries;
- There are not sufficient tax policies and incentives in place yet to initiate and sustain the innovation we need to develop efficient production processes which produce less waste, and for us to remain at the forefront of the global economy;
- There are no incentives in place at this time that make it more attractive to conserve materials rather than to produce waste;
- Many of our industrial processes are older and not as efficient as state-of-the-art production processes which use all material inputs efficiently and produce little or no waste; waste production is one sign of Canada's industrial process inefficiency;
- We have traditionally been a resource based economy; material has always been plentiful, therefore until now, we have not had to accomplish "more with less", and develop production processes which use materials efficiently;
- Increased global competitiveness is now forcing us to become more resource efficient.

While it is not yet obvious that Canada's wastefulness has impacted on our competitiveness, it will become more obvious over time, unless we start to innovate now. There was a time when Canada was an international leader in developing new and novel approaches to waste management, and was a recognized leader globally in environmental innovation. The Blue Box recycling system has been adopted by communities throughout North America and world wide, and is a Canadian environmental innovation success story. However, in recent years, we have lost our leadership position.

Lifestyles have changed significantly in the last few years, in part because of the dramatic changes in all forms of communication. These changes lead to the design of new products; each of these new products must be managed at the end of their life to minimize their impact on the environment, and recover what we can for use elsewhere to reduce the size of our environmental footprint.

Waste is associated with a range of direct and indirect environmental, health and economic problems from toxic emissions to loss of property value. Apart from waste experts, the benefits of reducing waste and recovering materials often are not fully appreciated by the general public. These benefits include increased efficiency, cleaner air and water, conservation of resources, land and natural habitats. As a significant contributor to emissions of greenhouse gases, the reduction of waste and increased resource recovery should be part of our climate change strategy.

Equally important, resource recovery tends to support sustained jobs in rural and urban communities and to increase competitiveness in the industries involved.

Many actions can be taken to reduce waste. Policies such as EPR (extended producer

responsibility) promote Design for Environment as one element of reducing our impact on the environment. One of the challenges for manufacturers is to meet consumer demands and needs in more efficient, less wasteful ways, through innovation and more efficient product design. World leaders recognize that this challenge must be met; hence various commitments have been made to sustainable consumption and sustainable production. Leaders recognize that business-as-usual can not continue and that change must occur. The challenge is to find the most effective ways to make change happen.

Zero Waste is an ideal; there may always be some material that cannot be recovered or can no longer be reused or recycled. The goal is to start on the path to zero waste with a policy of continuous improvement. Solid waste policies and programs in Canada and around the world that have achieved 50-70 per cent reduction in waste can serve as a base to build from.

The trend to increasing waste generation can be reversed through a combination of good public policies, economic instruments, tax policy reform to support secondary industries, new infrastructure development, technical innovation and behaviour change.

The federal government, provinces/territories, municipalities and businesses have all been working on waste diversion since the late 1980's. In the last 15 years, we have achieved major successes in technical areas related to recycling and composting, and in policies such as variable rate pricing and EPR. These efforts have lead to 20% waste diversion in 2002. We now need to make a quantum leap to identify what is required to reach 50% diversion for all of Canada by 2015. The questions which need to be answered are numerous, and include:

- Which policies are needed; and which combination of policies will work best;
- Which governance structure would work best;
- Which economic instruments should be used and
- What technological changes are needed.

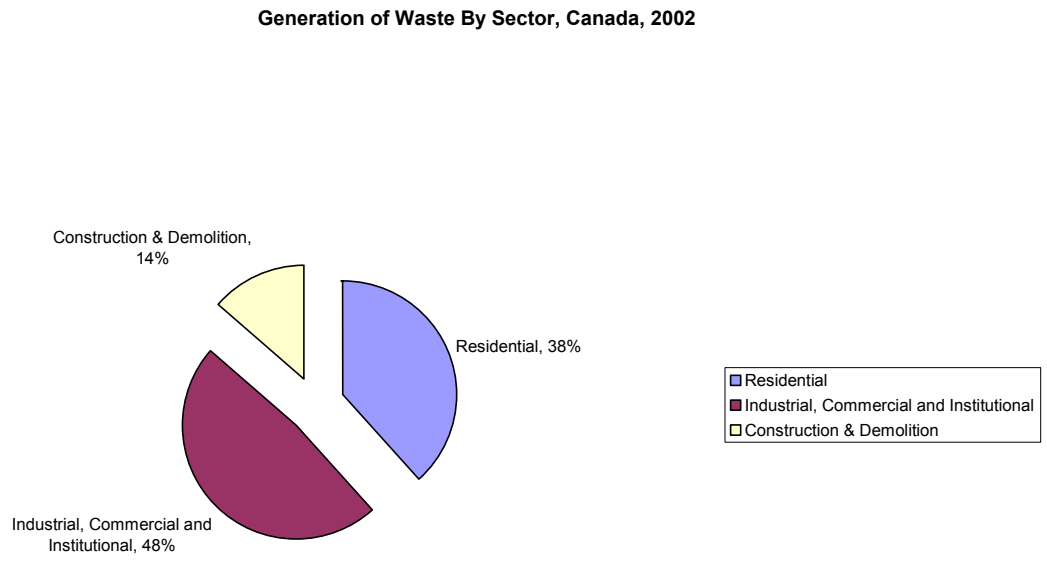
A plan is needed to get Canada from where it is today to where it needs to be.

This paper describes current municipal waste management practices in Canada and elsewhere. Numerous issues need to be addressed to bring Canada back to a leadership position in waste management; this is essential as a fundamental part of our sustainable development strategy. The paper suggests a number of roles which the National Roundtable could consider to facilitate a coordinated national approach to waste reduction.

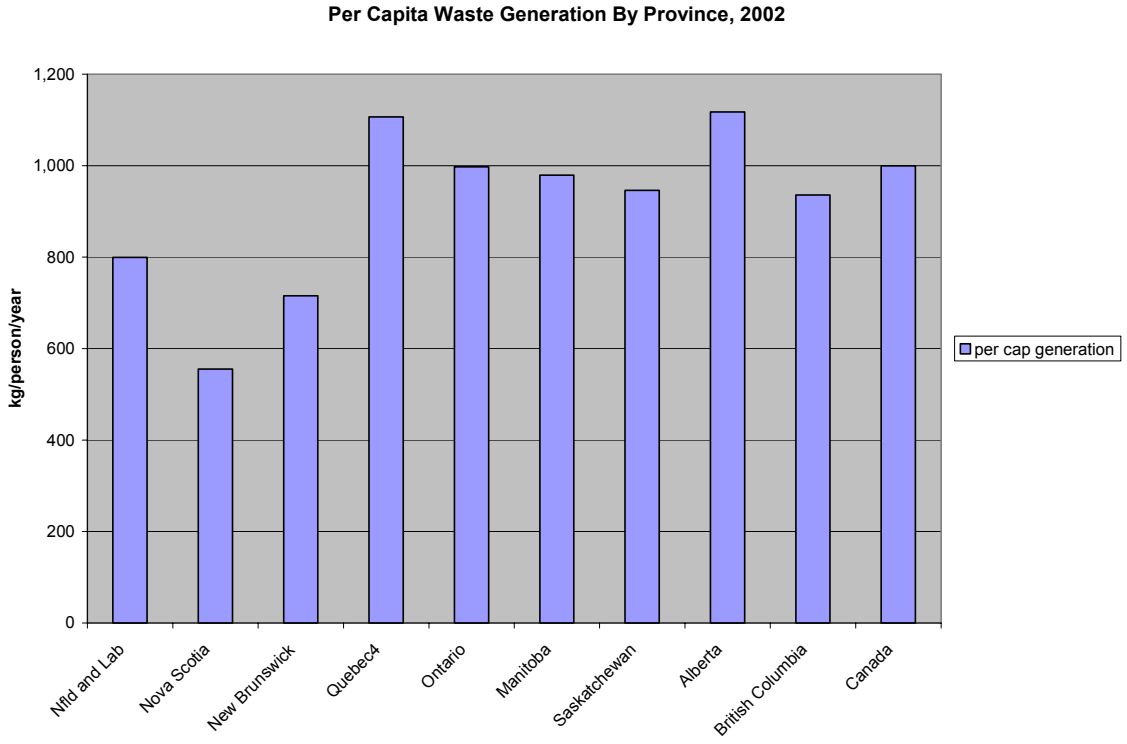
2. Municipal Solid Waste (MSW) Management in Canada

2.1 Solid Waste Generation

In 2002, over 31 million tonnes of non-hazardous solid waste was generated by Canadian households and businesses. The industrial/commercial/ institutional (IC&I) sector produced 48% of the total, households produced 38% of these waste materials, and construction and demolition activities (C&D) produced 14%.



Waste generated varies substantially across Canada for a variety of reasons, including population, household size and family size and age, demographics, urbanization, the local industrial base, economic activity and current lifestyles. Comparative waste generation for different provinces is shown in the chart below. Data are not available for PEI, Yukon and NWT for confidentiality reasons.



MSW in Canada is managed through diversion (reuse, recycling, composting and other organic processing) or disposal (landfill and incineration). The amounts of waste diverted and disposed in Canada by generating sector are shown in Table 2.1 below.

Table 2.1: Waste Generation, Diversion and Disposal By Source, Canada, 2002 (million tonnes per year)

	Residential Waste	IC&I Waste	C&D Waste	Total
Total Waste Generation (tonnes per year)	12	15	4.3	31.3
Total Waste Diverted (tonnes per year)	2.5	3.5	.5	6.5
Total Waste Disposed (tonnes per year)	9.5	11.5	3.8	24.8
Diversion Rate	21%	23%	12%	21%

2.2 Solid Waste Diversion

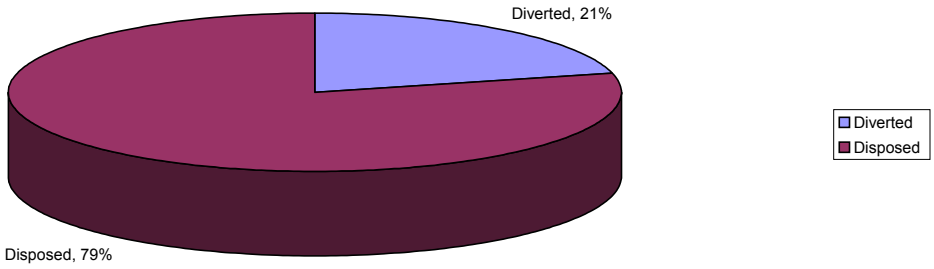
Waste diversion refers to activities which use waste through reuse, recycling, composting and other organics processing, so that disposal through landfill and incineration is not required. Just over one-fifth (21% or 6.5 million tonnes) of all waste materials produced in Canada in 2002 were diverted from disposal. Diversion activity varies by sector (residential, IC&I and C&D).

Residential waste is diverted through drop off and curbside service for recycling, reuse and composting of food and yard waste, and also through stewardship programs for a range of materials such as tires, electronics, etc. Businesses recycle various materials depending on the economics compared to disposal. The waste materials collected from homes and businesses are processed in recycling plants (MRFs - Material Recovery Facilities) and composting or other organics processing facilities to meet the specifications of various end markets.

Recovered paper materials are used by Canadian and US paper mills in the manufacture of new paper products. Metals are used by Canadian and US smelters; glass is used by the fibreglass and glass container industry and plastics are used by the plastics, textile and carpet manufacturing industries. Food and yard wastes are converted to compost and sold as soil products. Where organic materials are processed in anaerobic digestion (AD) plants, biogas is produced by breakdown of organic materials, and is a source of green energy.

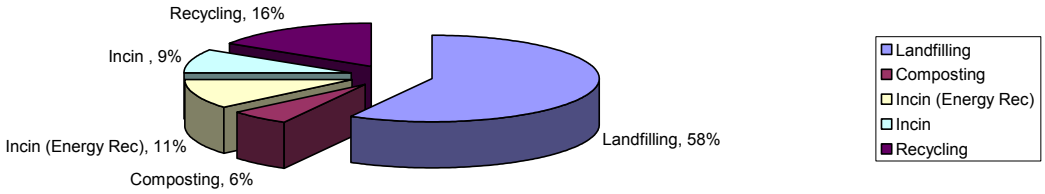
Paper products account for almost half (46%) of the recycling activity, followed by organics recycling (food and yard waste) at 18% and recycling of metals (ferrous, non-ferrous and other metals) at 15%.

Disposition of Waste In Canada, 2002



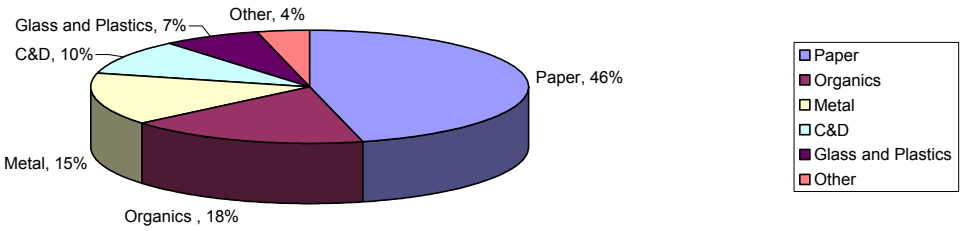
Canada landfills 79% of the waste we produce, compared to OECD countries, which on average landfill 58% of waste produced.

MSW Management in OECD Countries (2000)



The use of incineration and EFW in Canada is much lower than in other OECD countries for a number of reasons, discussed later in this paper.

Relative Contribution of Recycling of Different Materials in Canada, 2002

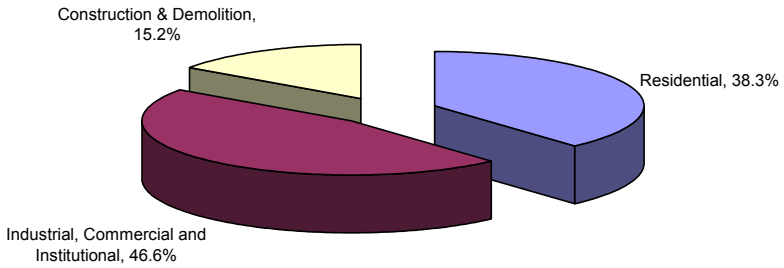


2.3 Solid Waste Disposal

In 2002, about 24 million tonnes of MSW generated in Canada was disposed, mostly in landfill, with a small amount incinerated. Of the total MSW disposed, 9 million tonnes was from residential sources, 12 million tonnes was from businesses and almost 4 million tonnes was from construction and demolition activities.

The MSW which is disposed in Canada contains large amounts of valuable materials such as paper and metals. Canada imports over 2 million tonnes of recycled paper per year from the US to feed our deinking mills. This material is needed because we have not recovered sufficient paper material from our own waste stream to meet domestic demand for recycled paper. We recycle about 2.8 million tonnes of paper each year, but actually need about 5.3 million tonnes for our paper mills. The deficit is actually contained in the mixed garbage we dispose in landfill. Policies and methods are needed to recover this resource, rather than to dispose of it.

Disposal of Waste By Sector in Canada, 2002



2.3.1 EFW (Energy From Waste) Incineration

In all cases, newer incinerators recover energy are referred to as EFW (energy from waste) facilities. EFW incineration reduces the requirement for landfill substantially. Where waste is incinerated, the volume is reduced by 90%, and the weight is reduced about 70%, leaving about 28% of the waste weight to be disposed as a bottom ash, and 2% of the weight to be managed as hazardous fly ash.

Canada only has five municipal incinerators (Vancouver, Peel, Charlottown, Quebec City and Sydney, NS), whereas some European countries have many more EFW MSW incinerators.

In general, densely populated countries such as Denmark and the Netherlands incinerate at least 50% of their waste, to reduce the volume by as much as 90%. EFW incinerators in these countries are often located in the middle of urban areas, and the energy generated by incineration of MSW is used as an energy source for district heating systems; waste management and energy policy are interlinked and interdependent in these countries. In Japan, where land is at a premium, 78% of their waste is incinerated, considerably reducing the need for landfill. Canada and the US have few EFW incinerators because of their relatively high cost, when compared to the cost landfilling, considerable public resistance to incineration, based on a concern about health impacts related to dioxin and furan emissions, and also the fact that there is more land available for landfills, resulting in low landfill costs relative to high technology incineration.

Where incinerators have been proposed in Canada or the US in recent years, there is strong resistance from environmental groups, who object to incinerators on the grounds that they provide a disincentive to recycling and other waste diversion. The argument is that once an incinerator is constructed, it has to be "fed" with waste each day, thus disincenting waste reduction and recycling efforts. This has proven not to be true in the Region of Peel, Ontario, which has an EFW incinerator, and also one of the most advanced recycling and composting programs in Canada. The successful integration of EFW into a comprehensive diversion system is achieved in Peel by sizing the EFW incinerator to process a small portion of the post-diversion MSW to be managed. In this way, EFW does not compete with recycling.

Environmental groups and pulp and paper companies object to incinerators on the grounds that the paper which is incinerated is needed at pulp and paper mills as a feedstock to make newsprint and other paper products. Some of the material needed at Canadian pulp and paper facilities is currently imported from the US because there is not a sufficient domestic supply available. NGOs also argue that incinerators destroy resources which could be directed to higher and better uses as recycled materials.

2.3.2 Landfill

MSW generally is landfilled at a facility where the most economical combination of transport costs and tipping fees is found; this sometimes means that waste will be hauled a number of hundreds of miles to a landfill site with low tipping fees. There are less than 50 large landfills in Canada, mostly owned and operated by private sector companies, but some are also owned and operated by municipalities. There are many hundred small and old landfills, mostly owned and operated by small municipalities. Provincial government policies encourage the closure of these small landfills over time, and there is a strong move to establishing regional landfills to serve a number of communities where practical.

Landfills consume large amounts of land, and impact on local communities through the daily traffic impacts to the site. Newer landfills meet stringent design and operation requirements for leachate and landfill gas collection, and do not have significant environmental impacts, aside from local land use and air quality related impacts of the truck traffic to and from the site.

In the past, a number of landfills which were not properly designed caused groundwater contamination and landfill gas migration problems. Considerable expense was required to correct contamination problems caused by these landfills. Stringent landfill design and performance regulations are now in place across Canada to protect groundwater and also properties located near landfill sites from any environmental impacts of these sites.

Where landfill capacity is in short supply, it puts significant pressure on waste managers to divert more waste, as siting of new landfills has proven difficult, and almost impossible in recent years.

Some communities ship waste large distances for disposal. About one third of all Ontario waste is shipped 800 km to Michigan for disposal. About 400 trucks per day of Ontario waste cross the border into Michigan and other US states, causing significant increased truck traffic and truck emissions for border communities. Vancouver ships its garbage to a landfill in Cache Creek, about 400 km inland.

2.4 MSW Management Industry

MSW at the local level is managed by both municipalities and the private sector. Municipalities are responsible for managing the residential component of MSW generated within their borders. They manage MSW through use of internal municipal waste management crews and equipment, or MSW management is contracted to private sector companies.

The municipal sector employed more than 8,100 people in waste management service activities, and more than 24,300 people were employed by waste management businesses across Canada in 2002.

Municipalities and other government bodies which provide waste management services expended $1.5 billion on waste management activities in 2002. About $800 million of this total represented payments by municipalities and/or municipal organizations to contracted waste management firms.

Operating revenues of businesses in the waste management industry totalled $4.1 billion in 2002, while operating expenditures reached $3.4 billion. In addition, these firms invested $342 million in capital expenditures in Canada in 2002.

2.5 Jurisdictional Roles and Responsibilities

The federal government has a limited role in management of non-hazardous solid waste, which is predominantly a provincial responsibility. Roles of various players are shown in the table below.

Jurisdiction	Role
Federal	Fulfil Canada's obligations under international treaties (Basel Convention, OECD Council Decision and the Canada-US Agreement) Responsible for managing transboundary movement of waste Coordination role only; try to facilitate harmonization of approaches between provinces
Provincial	Set waste management policy (e.g. landfill bans, diversion targets, mandatory recycling, etc) Issue permits and approvals for landfills, transfer stations,recycling facilities (MRF) and composting facilities
Municipal	Manage solid waste from residences, some apartments and some small businesses.

	Some municipalities own landfills, transfer stations, composting and recycling facilities and incinerators which manage both residential and IC&I waste. Private sector companies can use some municipal facilities if they pay a tipping fee
Private Sector Waste Management Companies	Provide for-fee service to IC&I and C&D waste generators. Own and operate recycling and composting operations, transfer stations and landfills Manage residential waste for some municipalities under contract
Non-Governmental Organizations	Provide information to public Advocate for increased recycling and composting Advocate against incineration and landfill Promote policy positions which reduce waste and support sustainable communities

2.6 MSW Management Practices By Municipalities

Municipalities across Canada vary in their approach to waste diversion. Practices depend on provincial and municipal policies in place, and often on the local landfill situation. The most typical policies include landfill bans (e.g. the organics ban in Nova Scotia), and also various forms of container limits and user pay systems.

Examples:

- Greater Vancouver has both an EFW incinerator and a landfill, located about 300 miles from the urban area, in Cache Creek. This site has 3 years remaining capacity. The Province required each regional district in BC to develop a plan on how to achieve 50% "reduction in per capita waste disposed" by year 2000, measured against a 1989 baseline. The plan will be revisited in the near future.

- The Province of Quebec has set high recycling and organics recovery targets, and is requiring all regional municipalities to submit plans on how these high recovery targets will be achieved. Quebec has over 500 landfills of different design and capacity. Five-year expansion certificates are typically granted.

- Manitoba and Saskatchewan have numerous landfills and sufficient landfill capacity for at least 25 to 40 years of waste production. Winnipeg has sufficient MSW landfill capacity for about the next 70 years. Municipalities provide recycling and waste diversion service based on public demand and what can be practically provided at reasonable cost. The low cost of landfill makes many waste diversion options uneconomical.

- All municipalities in Nova Scotia and PEI source separate organic waste, which is typically 40% of the residential waste stream. This material is collected separately and composted. In Nova Scotia, establishment of systems for food and yard waste were prompted by the provincial policy of banning organics from landfill, which was

announced in 1995, and came into effect in 1999. This policy has resulted in Halifax being the city with the highest diversion rate (56%) for municipal waste in Canada. The policy also had a strong social focus, and resulted in creation of 1,500 new jobs, showing that waste diversion creates more jobs than waste disposal.

  - In Nova Scotia, many old landfills were closed as part of a provincial coordinated strategy initiated in the 1990's. The province will shortly have 4 regional landfills which will provide 20 to 25 years of landfill capacity. A similar regional approach has been implemented in New Brunswick, PEI, and Newfoundland.

- The City of Calgary provides recycling service to residents through a series of 44 drop-off depots, mostly located in shopping malls. Calgary is currently looking at expanding diversion to include leaf and yard waste, based on public demand. The City also provides waste collection service to a number of businesses, and has sufficient landfill capacity for about 70 years of waste production.

- The City of Edmonton composts all of the residual waste after curbside source separation of recyclables. It chose this system based on public feedback.

- In Ontario, curbside recycling and convenient leaf and yard waste pick-up is mandated in provincial regulations. Funding of "blue box" recycling has been secured through the establishment of Stewardship Ontario to collect fees from packaging and printed paper stewards, and disburse these fees to Ontario municipalities. Industry will contribute over $50 million to Ontario municipalities in the 2004-2005 fiscal year.

- Large municipalities in the Greater Toronto Area and Southern Ontario will implement full scale curbside collection of food waste, in an effort to increase waste diversion and decrease their dependence on landfill. This effort is also prompted by impending landfill shortages throughout Southern Ontario. This landfill situation is caused mostly by significant public resistance to landfill siting.

- Greater Toronto Area municipalities contract with the private sector to ship over 1 million tonnes of municipal waste from Greater Toronto Area to Michigan landfills each year. This has caused significant resistance in Michigan, and Toronto has guaranteed that they will no longer depend on Michigan landfills by 2010.

There are currently no restrictions on the movement of MSW across provincial and international borders. Environment Canada are currently drafting regulations on the movement of Prescribed Non-Hazardous Waste (PNHW) to meet our obligations under the Basel Convention. These regulations are expected in 2005.

2.7 MSW Management Practices By Industrial, Commercial and Institutional(IC&I) Businesses and at Construction and Demolition (C&D) Projects

IC&I and C&D waste management is contracted to private sector waste management companies by private sector business and industrial waste generators.

Industrial, commercial and institutional generators divert waste depending on the value of the material diverted. For some materials, in particular office paper, cardboard and metals, there is always a ready market if the materials are source separated by the waste generator at the site. Bins are often provided by waste management companies and material brokers for generators to keep metals and cardboard separate. These bins are serviced by separate vehicles which take the material to a processor or end market which pay the current market value, or a pre-agreed contract value per tonne recovered. Metals and paper are processed by recyclers and are used by paper mills and metal smelters in Canada. There materials are exported to the US, Asia and Europe depending on the prices paid by paper brokers, mills and metal smelters.

For construction projects, the ability to divert waste depends on the space available at the site and the extent to which pre-planning can impact on the design of the project to minimize waste production. Renovation and demolition projects generate significant amounts of waste materials, particularly brick, concrete metals and wood. Some valuable materials, such as metals, are generally recovered from the waste, as long as sufficient space and time are available.

Waste which is not diverted is disposed, mostly in landfills. The private sector in Ontario ships 2 million tonnes per year of IC&I waste to Michigan and other US states because of a lack of permitted capacity in Ontario.

In general, there is very little understanding of how IC&I and C&D waste generators and waste companies manage non-residential waste, which makes up 62% of the total generated in Canada each year. A better understanding of this waste stream, and the factors that influence how it is managed is needed.

3. Environmental and Economic Impacts of MSW Management in Canada

3.1 Environmental Impacts

Waste generation has a significant environmental impact which is felt through the produce lifecycle from production through to consumption and disposal. Impacts are caused by different players (businesses and consumers) and through many different activities; when material are discarded, it indicates an inefficency in production processes, and discarded materials increase the demand to produce new materials. This in turn tracks back through the production process to cause increased emissions to water and air, all related to the extraction of raw material and the energy required to make new products. Life cycle assessments (LCAs) try to quantify the environmental impacts of manufacturing different materials.

The waste management system itself consists of:

- Collection trucks;
- Processing of recovered materials
- Disposal of discarded materials.

Collection System Impacts

Trucks used to collect waste produce GHG and other air emissions through the burning of diesel fuel. While new diesel standards in 2007 will reduce the impacts, some will still remain. Collection trucks cause local air quality impacts due to diesel use, and also cause noise pollution and local traffic congestion.

Analysis has shown that collection system impacts are minor compared to the significant benefits of using recycled materials rather than virgin materials in production processes.

Processing System Impacts

Processing of recovered materials has minimal environmental impacts. Recyclable materials processing is carried out in enclosed buildings with low energy requirements. Composting operations can occur indoors or outdoors. In either case energy needs are low. Composting systems sometimes generate odours; properly managed facilities do not have significant environmental impacts. Runoff water from the compost pile is generally reused on site.

The net impacts of collection and processing are far outweighed by the benefits of using recycled rather than virgin stock in production processes. Table 3.1 shows some comparative numbers for illustration.

Table 3.1
Reduction in Manufacturing Energy Requirements For Paper, Metal and Glass Using Recycled Materials (%)

Material	Reduction in Energy Requirements Using Recycled Rather Than Virgin Inputs (%)
Unbleached boxboard	43%
Linerboard	44%
Corrugated Medium	27%
Aluminium	96%
Glass	27%

Disposal Impacts
Environmental impacts of waste management facilities have been reduced significantly in recent years through environmental regulation and development of more efficient technologies to collect landfill gas, treat landfill leachate and control the quality of incinerator ash, etc.

New regulations for landfills ensure that leachate is collected, and does not contaminate groundwater, and also that landfill gas is collected, and does not cause odour problems or explosions in adjoining properties. Landfills do not have significant environmental impacts if properly designed and operated; however, they consume large amounts of land, and this is an inefficient use of this land. Landfills also cause local nuisance impacts related to truck traffic (noise, local air pollution, dust); these are controlled through operating permits which limit the tonnes which can be received at each landfill site per day.

Incinerators now operate to stringent air quality standards, and ash from incinerators is handled in a safe manner which minimizes impacts on the environment.

A number of analytical tools are now available to quantify the environmental impacts of different waste management facilities.

3.1.1 Greenhouse Gas Impacts of MSW Management in Canada

Waste management activities (mostly landfill related) are estimated to contribute 3% (18 million tonnes) of Canada's annual greenhouse gas emission total of 610 million tonnes of eCO_2 (equivalent CO_2) per year.[2]

Waste management activities have the following energy and GHG impacts:

[2] Government of Canada. 1997. Canada's Second National Report on Climate Change.

- Trucks used to collect and transport garbage, recyclables and organics use diesel fuel and generate CO_2 emissions;
- Landfills produce methane (CH_4) emissions from the decomposition of organic material in an anaerobic environment. Methane is 21 times more powerful as a greenhouse gas than carbon dioxide, therefore controlling the release of methane into the atmosphere has a significant effect on greenhouse gas emissions, which are measured as CO_2 equivalent;
- Recycling of materials has a significant positive effect on the energy required to produce new materials, as it takes considerably less energy to produce materials from recycled rather than from virgin stock.

3.2 Economic Impacts

The waste management sector employs 31,000 people in Canada. More significantly, the recycling of 6.5 million tonnes of paper, metals and other materials provided raw materials needed by our industries. Using recycled rather than virgin stock reduces energy needs, energy costs and environmental impacts related to energy production and generation and raw material extraction.

We currently import over 2 million tonnes of paper per year, mostly from the US, because we can not recycle sufficient quantities in Canada to meet the needs of our paper mills.

Disposal of 24 million tonnes of waste per year at an average disposal rate of $50/tonne costs $1.2 billion per year to Canadian taxpayers and private industry.

The current export of waste to the US has significant consequences for the Southern Ontario economy in particular, related to the impact of truck traffic on other delivery systems to manufacturing facilities. The 400 trucks of garbage per day crossing the US border clog traffic at the border, and result in increasing GHG emissions from diesel burning vehicles. They also cause slow-downs for trucks moving other materials to manufacturing facilities in Ontario. Just-in-time delivery systems require materials to be delivered on-time, and the border delays, caused in part by increased security concerns in the US, but also to a small extent by extra truck traffic due to waste export, impact on Ontario businesses.

4 Current Policies and Instruments Which Reduce Waste

4.1 Introduction

Waste reduction can be most effectively achieved through policies, economic instruments and legislation coupled with appropriate technical approaches. The policies chosen and implemented have a significant impact on the amount and type of waste produced. Economic instruments can be used to influence consumers and markets to achieve waste reduction objectives

All levels of government can introduce policies and regulations that prevent the creation of waste through product design, mandatory waste reduction in production and use and promoting the recovery of discarded materials. These policies and regulations transform waste into a resource and encourage individual and community responsibility for creating a sustainable society.

Waste management policies and economic instruments are discussed under the following headings in this section:

- Waste Management Policies
- Economic Instruments
- Extended Producer Responsibility
- Zero Waste

Each section describes the current situation in Canada, and also identifies approaches in other countries.

4.2 Waste Management Policies

Waste management policies in place in Canada and elsewhere targeting various elements of the waste stream and include:

- Setting waste reduction targets or goals;
- Landfill bans on recyclable or compostable materials,
- Banning the collection of certain materials as part of the municipal waste stream
- Mandatory source separation legislation.

4.2.1 Examples in Canada

Setting Waste Reduction Goals - Setting goals helps to identify the policy and legislative supports needed for successful design of the integrated resource and waste management strategy. Experience with waste diversion goals in Canada and elsewhere is that rates above 35% are challenging to meet without significant system changes. In the late 1980's and early 1990's, various provinces across Canada set 50% diversion goals which have not been reached, except for the Province of Nova Scotia. In Nova Scotia, an innovative and aggressive waste management plan set high waste reduction goals which resulted in the creation of new waste management businesses in the province, and the creation of 1,500 new jobs. Provinces are currently revisiting goals, and Ontario is in the process of identifying the economic and environmental implications of meeting a 60% diversion goal by 2008.

Disposal Bans On Specific Materials – Disposal bans prohibit designated materials such as recyclable or compostable material from the landfill. For example:

- Nova Scotia's Solid Waste-Resource Management Regulation bans leaf & yard and other compostable organic material as well as 13 other materials from landfill and incinerators. This policy helped to create a province-wide recycling and composting infrastructure;
- Before the closure of its landfill, the Region of Peel, Ontario imposed landfill disposal bans on paper fibres, container glass, ferrous and non-ferrous metals, tires, wood and gypsum board. These bans applied to the residential, IC&I and C&D sectors.

Curbside Material Bans – Municipalities can introduce bans on materials at the curbside. Collection crews then refuse to collect any of the designated material set out at the curb. Some examples include:

- In the City of Calgary, computer/monitor waste will not be picked up at the curb. Twice a year, the city provides computer drop-off events where the material is collected by a local recycler. Some is refurbished for resale and some is dismantled and recycled;
- Numerous Ontario municipalities including Kitchener, Waterloo, Windsor, Toronto, Markham, Halton and others ban grass clippings at the curb.

Mandatory Recycling By-laws – The by-laws compel waste generators to separate particular materials from the waste stream; for example:

- Halifax, Nova Scotia, has implemented mandatory recycling and composting by-laws on a wide range of materials for which recycling programs are available;
- The City of Guelph, Ontario required residents to separate wet and dry materials into see-through blue (dry recyclables) or green (organics) bags, and garbage into a third bag. If the level of contamination in the blue and green bags is unacceptable, both bags are left at the curb

- IC&I waste generators in regulated categories in Ontario carry out waste audits and develop waste reduction plans; specific materials must be source separated by designated generators (e.g. large manufacturing and shopping malls, etc.)

Promoting Waste Reduction Activities in the Home –Effective communication regarding waste reduction can reduce the waste set out for disposal by 5 to 7% (especially if coupled with a user pay program)[3]. For example, the Greater Vancouver Regional District suggests reducing waste by "buying only what we need and avoiding excess packaging" and offers a brochure with 40 reduction tips for the home.

Reuse Centres - Reuse can encompass a variety of activities including repairing broken items, purchasing durable and refillable goods and purchasing "second-hand" or "gently used" items. Reuse centers deal with the exchange of "second hand" items. Examples include:

- The Habitat Re-store is located in Winnipeg, Manitoba and is operated by the non-profit organization, Habitat for Humanity. The organization collects and sells used residential building materials (some IC&I materials accepted);
- The City of Montreal has established 5 eco-centres, which enable citizens to take used items (e.g. furniture, computers, used clothing) to the centres for reuse or recovery.

Green Procurement – One of the most viable means of generating demand for recyclable materials involves purchasing products that contain recycled content. Regulations enacted in the State of California require 40% recycled content in newspapers and have created a steady market for newsprint in British Columbia, leading to the building of a large newspaper deinking and recycling facility in the province[4].

Various levels of government and private sector companies can adopt purchasing policies that help to create market demand for recycled products, or products with recycled content, and in this way, make recycling and waste diversion sustainable. Examples of such purchasing policies include:

- The City of Richmond, British Columbia established an environmental purchasing policy and guide;
- The Regional District of Kootenay Boundary in British Columbia permits a 10% price preference for green products;
- The provincial governments of Alberta, Quebec and Nova Scotia assign a price preference for green products.
- The Federal Government encourages green purchasing through various Sustainable Development Strategies; these could likely be expanded, but an assessment of current performance is needed to identify the best opportunities.

4.2.2 International Examples of Waste Management Policies

[3] Lisa Skumatz. " Source Reduction Can be Measured" in Resource Recycling, August 2000.
[4] Ibid.

- The European Union introduced the EU Landfill Directive in 1999, requiring all EU countries to phase out the landfilling of biodegradable materials over time
- Florida and a number of US states have banned computer monitors and TVs from landfill disposal, because of a concern about lead content
- A ban on leaf and yard waste from landfill in many US states in the late 1980's was very effective in preserving landfill space, and turning leaf and yard waste to productive use as a compost material
- A mandatory requirement for 35% recycled content in newspapers sold from paper boxes in Chicago in the late 1980's revolutionized how newsprint is now manufactured across North America; many paper mills use recycled newsprint as feedstock, and hence harvest the "urban forest" rather than the natural forest;
- A mandatory requirement for recycled content in garbage bags sold in California, with a population of 30 million, created a permanent, sustainable market for recycled high density polyethylene

4.3 Economic Instruments for Waste Reduction

Various economic instruments can be used to influence the amount and type of waste produced and how it is managed at end of life, including:

- User pay (variable rate pricing) systems for waste management;
- Landfill levies and taxes dedicated to waste reduction;
- "Nuisance material" taxes or levies which are dedicated to management of particular materials
- Special taxes
- Product charges
- Advance disposal fees
- Deposit/refund schemes
- Subsidies and tax credits for the production and use of environmentally preferable products

Some, but not all, of these instruments are currently used in Canada. There are some very interesting and effective examples of the use of economic instruments to achieve waste reduction goals in other countries. A thorough assessment of the potential value of these instruments in reducing waste in Canada would be a worthwhile exercise.

User Pay, Variable Rate Pricing, Full Cost Accounting and Full Cost Pricing Systems- In a variable rate pricing or user pay system[5], waste generators pay for waste collection (and other waste management services) on the basis of the amount of waste generated. Residential user pay programs charge the householder for waste placed at the curb for disposal; these systems can be designed as variable rate pricing systems, where the price paid varies depending on the amount of waste set out. This policy sends pricing

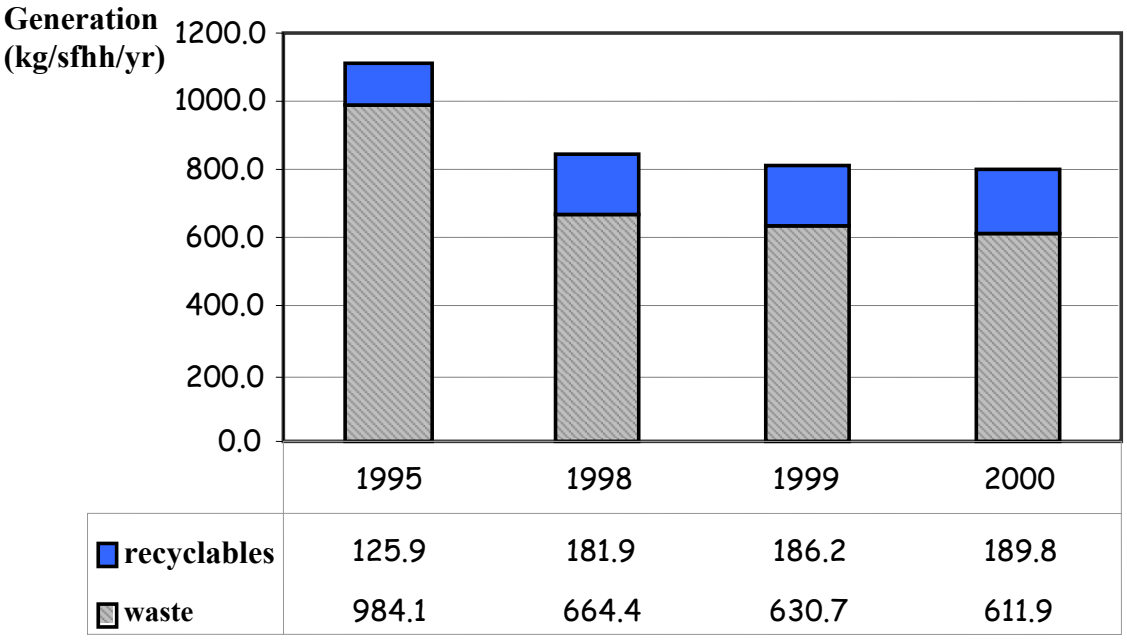
[5] Depending on the jurisdiction, user pay also is referred to as variable rate pricing, fee-for-service and pay-as-you-throw (PAYT).

signals to the consumer to reduce waste, and increase recycling and composting. It is consistent with the Polluter Pays Principle. Table 4.1 shows the impacts of variable rate pricing and bag limits on waste disposed in seven Canadian municipalities. Figure 4.1 shows the dramatic impact of a user pay system on waste diversion and disposal in St Albert, Alberta.

Table 4.1 Impacts of Variable Rate Pricing for Garbage Pick-Up on Recycling in Selected Canadian Communities

Community	Reduction in Waste Disposed Following Introduction of Bag Limits and User Pay	Increase In Recycling Following Introduction of Bag Limits and User Pay
Peel	-4%	+12%
Peterborough	-21%	49%
Markham	-8%	6%
Georgina	-38%	46%
Barrie	-16%	22%
Orillia	-23%	31%
St Albert, Alta	-38%	51%

Figure 4.1:
St. Albert - Impacts of User Pay On Waste Disposal and Recycling



Currently, an estimated 200+ municipalities operate user pay and variable rate pricing programs in Canada.

These policies are most popular in British Columbia and Ontario; however, there are some programs in place in Alberta, Yukon Territory, Northwest Territories, Saskatchewan, Manitoba, and the Maritimes.

Tipping Fee Surcharges –Tipping fee surcharges are sometimes applied to garbage disposed at the landfill at a price which reflects the full cost of disposal plus an additional charge to support the municipality's objectives (raise funds to provide residential and IC&I waste diversion programs, disintentive to disposal, preserve landfill capacity, etc). Indirectly, tipping fee surcharges can encourage recycling or composting activities and reduce the amount of waste requiring disposal. However, they are only effective if other disposal routes are not available. Raising tip fees above a "willingness to pay" threshold will result in IC&I waste being disposed elsewhere if options exist. The City of Toronto increased its tipping fees from $50/tonne to $150/tonne in 1991. This resulted in a 90% loss of IC&I waste (and revenues) as waste went to other landfills in Ontario and the US. Soon after, Toronto dropped its tip fee to $50/tonne to bring back the IC&I waste and revenues.

Economic Disincentives – Differential Tipping Fees –Landfill owners and operators can encourage recycling by establishing economic disincentives incur a higher tipping fee at the landfill on loads containing designated recyclables. For example, in an effort to divert commercial cardboard generated by the IC&I sector, the City of Grand Prairie, Alberta established a recycling program supported by double tipping fees for loads containing cardboard. Some landfill owners will charge a lower tip fee for loads of wood and/or contaminated soil which can be used as landfill cover or for other construction needs within the landfill.

Product Charges and Advanced Disposal Fees: There are a number of examples of product charges in Canada, described in the EPR section below. Typically, these involve paying a fee at point of purchase to collect sufficient funds to manage products at the end of their lives. Product charges are in place for paint, tires and batteries in a few provinces. In February, 2005, Alberta will be the first province in Canada to introduce the charges on electronics.

Deposit Return Systems: There are many deposit-return systems in place in Canada on products such as lead acid batteries and beverage containers. A deposit is paid when the product or container is purchased, and is returned when the container is returned to a variety of redemption centres. Deposit-return systems are effective for recovering the element of the waste stream on which they are placed. These systems have very high administrative costs, compared to the amount of materials they divert from the waste stream.

4.3.1 International Examples of Economic Instruments

Landfill levies and taxes dedicated to waste reduction; Ireland and the UK have both implemented landfill levies of $20-$40/tonne on top of the price of landfill tipping fees, in an effort to increase the cost of disposal and thereby make diversion more attractive, and at the same time generate funds to finance waste diversion activities.

Levies on Particular Items In The Waste Stream: When Ireland implemented a 15 cent charge on each plastic bag used to bring groceries home from the store, use of plastic bags, which were a big litter problem in Ireland, dropped by 90%. Plastic bags went from being 5% of all litter to well below 1%. The measure has over 90% approval rating in Ireland, and is being considered by a number of other countries.

Nuisance Taxes and Levies: Various Asian countries (Korea, China, Taiwan) have imposed "nuisance taxes" on difficult to manage materials found in visible litter, such as cigarettes, chewing gum, fast food packaging, etc. The money collected is used for environmental projects

4.4 Product Stewardship and Extended Producer Responsibility Programs

Extended Producer Responsibility (EPR) is an environmental policy approach in which a producer's responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product's life cycle. Key features of EPR policy:

- Concern about environmental impacts of a product throughout its lifecycle;
- the shifting of responsibility (physically and/or economically, fully or partially) upstream to the producer and away from municipalities, and
- to provide incentives to producers to take the environmental impacts of products throughout their lifecycle (including when they need to be recycled or disposed) into the design of the product.

The concept of stewardship was initially promoted by the OECD in the late 1980's and early 1990's. This developed to product stewardship, then producer responsibility to the current concept of extended producer responsibility (EPR)

4.4.1 EPR in Canada

Extended Producer Responsibility, or EPR, has existed as a formal policy approach to MSW management in Canada since the Province of British Columbia implemented its paint stewardship program in 1994. To date, Canada has over 54 EPR programs, mostly operating at the provincial level. There are also a few EPR programs operated nationally on a voluntary basis for refrigerants and rechargeable batteries. Current Canadian EPR programs address more than a dozen separate products and materials, including:

- Batteries
- Beverage containers
- Blue Box Materials (printed papers and plastic, glass, metal and paper packaging) in Ontario
- Electronics (Computers and TVs) in Alberta, with regulations expected in Ontario by December, 2004
- Flourescent Tubes
- Oil & Oil-related Products
- Paint

- Pesticides
- Pharmaceuticals
- Refrigerants, and
- Tires

The approach to stewardship of specific materials varies considerably by province across Canada. Existing EPR programs have developed across Canada as a mosaic of different approaches to different materials, and generally reflect cultural and policy differences among the provinces. This increases the compliance and administration burden to industry and also to governments.

Examples of EPR programs in Canada:

- Paint stewardship has been in place in BC since 1994. A levy of 50 cents is charged on most cans of paint sold in the Provice. This money is used to manage a used paint recovery program. Consumers can bring paint cans or old paint to a number of depots located throughout the province;
- The Province of Alberta will impose fees on a selected list of electronics (personal computers and televisions) sold in the Province in February, 2005. The fees will be managed by the electronics division of the Alberta Recycling Management Authority to finance end of life management of electronics in the Province
- Stewardship Ontario was established as a result of the Waste Diversion Act in Ontario, to collect fees from stewards of packaging and printed paper, and disburse these fees to municipalities to help pay the cost of Blue Box recycling. In its first year, Stewardship Ontario will collect almost $60 million from Ontario industry and will distributed this money to municipalities.
- Refrigerants – Refrigerants Management Canada was established on a voluntary basis by the refrigerant industry in Canada and imposes a voluntary levy on the sale of refrigerants to finance various aspects of refrigerant recovery in Canada.

4.4.2 EPR Internationally

EPR has been discussed in policy circles for many years internationally as a method to encourage manufacturers to produce more sustainably, and in the long term reduce the amount of waste produced.

EPR programs have been in place in some European countries for a number of years for packaging materials in particular. The German Packaging Ordinance was the first comprehensive EPR program for packaging, and was followed by similar legislation in most other European countries, eventually under a European Union Packaging Directive. This legislation requires packaging "stewards" to establish and fund programs for packaging (paper, glass, plastic and metal containers) recovery, and also to meet high recovery targets, which vary by material.

There are also examples of EPR for specific materials in particular countries. In Sweden, for instance, a deposit is paid upon the purchase of an automobile, which ensures that it is managed at end of life, and also that vehicles are not abandoned.

The current focus of EPR in Europe is on electronics. The European Parliament and European Ministers finally reached an agreement in October 2002 on the proposals for two directives addressing the long term management of electronic waste within the EU:

- The Waste from Electrical and Electronic Equipment (WEEE) Directive stipulates high recovery targets for a wide range of electronic equipment (4 kg/capita) , and requires manufacturers to set up recovery systems and guarantee that recovered material is recycled. The final wording clearly specifies that the producers finance the management of WEEE, and that, in the future, individual producer responsibility (IPR) - whereby each individual producer is clearly responsible for the waste from his own products - will be the basis of this financing.

- The ROHS (Restriction in the use Of certain Hazardous Substances in electrical and electronic equipment) Directive[6] calls for the obligatory phase-out of heavy metals [lead, cadmium, mercury, hexavalent chromium], and of two groups of brominated flame retardants [polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE)] in electronics production by January 1st 2007.

In the US, the NEPSI (National Electronic Product Stewardship Initiative) process recognized that EPR for electronics was likely to be established in the US longer term. It was supported by the USEPA and was a voluntary effort by electronic industries and government over four years to reach harmonized approaches to the regulation of electronic materials recovery among different states.

The Home Appliance Recycling Law in Japan makes manufacturers responsible for dismantling and recycling appliances such as washing machines, television sets, air-conditioners, computers and microwave ovens. The law stipulates that 80% of the recovered materials must be sold. About 1 million televisions were recovered the first year of the program. The material from these televisions, and on a go-forward basis from the other products collected, will have a significant impact on local Asian markets for recycled materials.

4.5 Sustainable Consumption and Zero Waste

At the World Summit on Sustainable Development in Johannesburg in 2002, world leaders committed themselves to:

[6] The European Environmental Bureau - Press Release, 11 October 2002

> Encourage and promote the development of a 10-year framework of programmes in support of regional and national initiatives to accelerate the shift towards **sustainable consumption and production** to promote social and economic development within the carrying capacity of ecosystems by addressing and where appropriate delinking economic growth and environmental degradation through improving efficiency and sustainability in the use of resources and production processes and reduce resource degradation, pollution and waste.

The UK government has defined sustainable consumption and production (SCP) as:

> continuous economic and social progress that respects the limits of the Earth's ecosystems, and meets the needs and aspirations of everyone for a better quality of life, now and for future generations to come.

The "Zero Waste" philosophy, which is espoused by many organizations in Canada, the US, Australia and New Zealand, combines waste reduction policies and actions into a coherent framework which has three fundamental components:

1. It asks consumers, taxpayers and local governments to stop thinking of resources as garbage for which they have to pay to landfill or incinerate, but to maximize reuse, repair, recycling and composting instead;
2. It asks business to seek out materials efficiencies; redesign products and packaging the community cannot reuse, repair, recycle or compost so that they can be easily recycled, reused or composted; and extend their responsibility for the product and its packaging by establishing take-back, reuse and remanufacturing systems, and
3. It asks senior levels of government to shift economic incentives from virgin resources to renewable resources and to facilitate the growth of Zero Waste.

In particular, the "Zero Waste" philosophy supports the following strategies:

- Extended Producer Responsibility:
- Design For Environment:
- Resource Recovery Facilities:
- Legislation and Economic Instruments

The City of Canberra, Australia has designed their landfill as a "Resource Recovery Park". Industries are located within the landfill property who can use various materials contained in the waste stream as a feedstock. Canberra refer to their landfill as a Zero Waste Facility. They recognize that the landfill will be used for waste disposal in the short and medium term, but over time, it is hoped that the amount of waste being landfilled will go down as other uses will be found for the materials in the waste stream. There are a few Eco-Industrial Parks in North America which are based on the same

concept. These facilities receive varying amounts of support from different levels of government.

4.6 Summary

In 2000, Paul Martin, the Minister of Finance at the time, and now the Prime Minister, made the following statement:

> We need to abandon the very concept of waste. This will require a fundamental shift in our thinking – away from linear models of production and closer to the example that nature sets for us. The traditional model takes in virgin materials at one end, created waste and emissions during production, and throws away potentially valuable materials after consumer use. But nature long ago came up with a superior design. One where all waste is reused as food or energy elsewhere…. We would do well to expand our powers of imitation[7]

Policies in Canada and elsewhere are trying to provide incentives to use our resources more sustainably for a number of reasons:

- The lack of appetite for new landfills,
- to improve our competitiveness through more efficient use of materials and resources.

Some, but not all, of the available policy instruments which could set Canada on a waste reduction path are currently used in Canada. A thorough assessment is needed of the potential value of these instruments in reducing waste in Canada as part of a plan to make Canada a more sustainable society.

[7] Sustainability Within a Generation – A New Vision for Canada; David Suzuki Foundation, 2004

5 MSW Issues Identification and Potential NRTEE Role(s)

A recent evaluation of waste issues by the OECD[8] concluded that waste management and development of waste policy was:

- A very complex situation;
- Full of contradictions;
- Full of shadowy areas and
- In which a uniform approach may well be prejudicial to environmental and economic efficiency.

The OECD concluded that environmental effectiveness is beginning to take second place to economic efficiency, and that many EU countries were recycling and composting materials for environmental reasons, even though this was more expensive than disposal.

5.1 The Current MSW Situation - Key Problems or Challenges

The amount of MSW produced and landfilled continues to grow in Canada, even accounting for population growth. We landfill 79% of the waste we produce. The material we landfill contains significant amounts of paper which could be used by our paper mills, and reduce the amount of paper we import from other countries. The waste we landfill also contains large amounts of metal, which our smelters could use, and reduce the need to mine and process raw materials at high energy and environmental cost.

Waste is a significant issue for urban areas in Canada, some Canadian urban areas have a significant waste problem now, and others will face this problem in the future when landfills are full and no new landfills can be established.

Waste management also contributes 3% of Canada's GHG emissions, mostly through the uncontrolled release of landfill gas. We can create GHG offsets through the use of more recycled materials in our production processes, because of the significant energy benefits involved.

Increasing waste quantities indicate of inefficiency in our economy and our production processes. Producing large amounts of waste is non-sustainable; we need to learn to use our resources more effectively and efficiently to remain competitive in the global economy. The benefit of increased recycling and lower MSW generation will result in a stronger industry here at home. We are currently exporting, burning and burying our resources and with this inefficiency, we are missing many opportunities.

Canada needs to develop clean production processes, and there is an opportunity to become a leader in design for environment.

[8] Workshop on the Economics of Waste, October, 2003. OECD ENCV/EPOC/WGWPR (2003)12

We need to decouple waste generation from economic growth and our GDP through design for environment and other mechanisms. Economic instruments are seen as a powerful mechanism to push markets in the direction which favours design for environment and reduces resource consumption.

We need an indicator that measures the inefficiency in our economy that is specifically related and linked to waste generation.

Canada does not currently have the right incentives in place to encourage more waste diversion. Our tax policies were developed a long time ago and are designed for a resource based economy which was in place at that time; our tax policies need to be evaluated to encourage and support secondary industries. We need a tax policy which internalizes waste related environmental externalities and sends the correct pricing signals to consumers, businesses, government and industries to support environmental and economic efficiency. There are many successful examples to draw on from both within Canada and other countries.

Our current cost structure for waste management in Canada encourages disposal in landfill rather than recycling and composting, because landfill costs are currently low. This is likely to change over time as landfills close and new landfills become increasingly difficult to site.

5.2 What is Needed

Canada needs to reduce the waste generated, and recover more materials from the waste stream before it is disposed. Most of the materials which are currently discarded could be recycled if the right policies and technologies were in place. Landfill siting is becoming increasingly difficult and contentious, therefore in the long term Canada needs to produce less waste and reduce its reliance on landfill. This is consistent with our policies and international commitments on sustainable consumption and our domestic commitment to sustainable communities and the urban agenda.

A policy, technical and economic framework to reduce the waste disposed in Canada to 50% of its current levels over the next 10 years (by 2014) is needed. Achievement of this goal would require significant effort through all levels of government. Recycling and composting are worthwhile for the materials remaining in the waste stream, but the ideal situation is not to produce these materials in the first place. We can reduce waste through innovation in design processes. The innovation, new policies, new technologies and new taxation system design that would be required to achieve this goal is likely to have numerous positive spin-offs for Canadian industry. The impact of such an objective for Canada should be assessed in detail over the next 12 to 18 months. Specific elements of the assessment could include:

Economic Instruments: We need to identify how to achieve our waste reduction goals through economic instruments, and also identify and evaluate which instruments would be the most effective and practical;

Policies: We need to identify what policy instruments and economic instruments are needed to encourage innovation and use our resources more efficiently;

Indicators: We need to develop an indicator that reflects how our waste generation and management practices fit into the broader economic and sustainability context for Canada.

Infrastructure: We need to identify the infrastructure needed to divert more waste in Canada (diversion facilities and landfill gas recovery). We need to identify how much the infrastructure will cost, how to finance it, and who should or will pay for development of the infrastructure

Innovation: Canada has become a leader world wide in some specific industries such as telecommunications. We innovate in some industries ahead of other countries, and then export our expertise and leading edge technologies world-wide. We need to take a leadership role in design for environment, which is a cornerstone of successful EPR, and is now codified as a requirement of the EU Waste Electronics and Electrical Equipment (WEEE) Directive and the Restriction of Hazardous Substances (ROHS) Directive. A strategy on making Canada a leader is needed.

Thermal technologies: Canada can not get beyond 60% diversion of waste from landfill without substantial use of thermal technologies, which include incineration, gasification, etc. There is significant public resistance to incineration and other thermal technologies in Canada. These technologies are expensive, and their role within a national strategy needs to be identified, and barriers to their adoption (technical and public perception) need to be addressed.

Governance: We need to identify the role which the federal government should and could play in reducing waste in Canada. The current role is limited to meeting our international obligations.

Linkage between MSW Management and Energy/Climate Change Policy: There are co-benefits and overlaps between waste management and climate change which should be explored to optimize how we set policies in both areas.

5.3 Potential NRTEE Role or Roles

The legislated mandate of the National Round Table on the Environment and the Economy (NRTEE) is "to play the role of catalyst in identifying, explaining and promoting, in all sectors of Canadian society and in all regions of Canada, principles and practices of sustainable development."

The way in which we manage waste is an indicator of our efficiency. Our current practices are not sustainable, and waste needs some serious attention as part of our sustainable development, sustainable communities and sustainable production policies and objectives.

The previous section identified what needs to happen in a broad context, and identified actions which need to be taken, and analyses which need to be completed. This section identifies specific areas where NRTEE involvement would be valuable, and where NRTEE is in a unique position to influence this important issue through its role as a neutral third party facilitator.

Broad, Comprehensive Role In 50% Reduction Strategy Development

Canada needs to develop a comprehensive strategy on how it can reduce waste as part of a comprehensive sustainability agenda. The strategy is not being addressed at this time. The comprehensive strategy needs to incorporate:

- Technologies which could be used to enhance diversion;
- Policies which can enhance diversion;
- Tax policies which can reduce waste and increase waste diversion
- The infrastructure needed to achieve more diversion
- The costs of setting up a Canadian infrastructure for increased diversion
- Linkages between effective waste policy and energy policy
- Improvements which could be made to governance of MSW management, and how more coordination between provinces could improve our performance
- The most appropriate role of the federal government

NRTEE could become involved in a very broad and comprehensive process, and take on the package of activities (policies, technical innovation, economic instruments, actions, costs) to help Canada reach a 50% reduction goal over 10 years, or NRTEE could focus on specific areas which need targeted attention (discussed below)

Targeted Role On Key MSW Related Issues Which Are Not Currently Being Addressed

NRTEE could also take on a more targeted role, and address one or more of the following more focused issues:

Governance Structures: The Federal Government is not currently engaged in the MSW issue, as most responsibility for MSW and the powers to implement MSW related policies are with the provinces and territories. The National Roundtable should examine whether the federal government should play a more active and central role in MSW related issues as part of Canada's sustainable development and clean production agenda, and make recommendations on what that role should be.

Evaluate Economic Instruments Which Could Be Used To Reduce Waste: A multi-stakeholder group could be established to examine the role of economic instruments in helping Canada to become a more sustainable society. The group would assess mechanisms which would reduce the amount of waste we produce over time, and assess the extent to which existing tax policy is an impediment to sustainable consumption practices.

Establish a "Think Tank" On the Effectiveness and Impacts of EPR Policies: EPR has been embraced by the international community as a solution to non-sustainable waste management. There is no comprehensive evidence on the impacts of EPR policies, and the extent to which they have been able to influence Design for Environment and improve industrial process efficiency. A multi-stakeholder committee should examine this issue and make recommendations to the government on the role of EPR in our national sustainable economy agenda.

Examine Existing Tax Policy For Barriers to Resource Conservation and Waste Minimization: As in many countries, existing tax policies in Canada do not encourage resource conservation; an assessment needs to be undertaken on how tax policy could be modified to support secondary industries, and also how it could provide incentives to waste minimization

Innovation in Product Design for Environment and Clean Production: To make Canada competitive, it needs to be a leader and an innovator in industrial process design and it must produce goods in a more resource efficient way. Design for environment is a key element of all policies aimed at reducing waste. NRTEE could establish a Green Ribbon Committee of large industry representatives who would assess mechanisms to move more Canadian companies to sustainable and clean production approaches. To imbed sustainable thinking in our industy leaders long term, Design for Environment needs to be incorporated into the curricula of business, engineering, design and law programs in Canadian educational institutions.

Linkages between MSW Management and Energy/Climate Change Policy: Waste management practices impact on greenhouse gas (GHG) emissions, and higher diversion strategies save considerable energy in industrial processes, and also through reduced raw material extraction energy requirements. Preferential pricing of green energy can improve the economics of technologies such as anaerobic digestion and landfill gas recovery, which are not economically viable in many locations in Canada at this time. A comprehensive assessment of possible beneficial linkages between climate change policy, energy policy and waste management policy is needed.

Appropriate Role of Federal Government and Businesses in Developing Sustainable Markets for Secondary Materials: Examine a range of options which would create stable markets for recyclable materials, including a leadership role by the federal government in green procurement, to lead by example as part of the House in Order program. Assess the viability of establishing a National "Buy Recycled Alliance";

existing procurement specifications at all levels of government, and how these could be altered to mandate high recycled content. Assess how design for environment and clean production policies could be incorporated into purchasing specifications for all vendors who do business with the federal government. Through an evaluation process, NRTEE could make recommendations on how federal government purchasing practices in particular could be improved

Indicator: A specific waste or MSW related indicator is needed which measures how Canada is performing with respect to sustainable consumption, clean production, and environmental impacts of waste management activities.

Better Data Collection On IC&I Waste Management: We currently do not have a detailed understanding of how MSW produced by businesses and industries (IC&I waste) is managed in Canada. This hampers efforts to develop diversion plans and strategies. Data collected by Statistics Canada is aggregated for confidentiality reasons, and is not available in a sufficiently disaggregated format which would be useful for detailed analysis. The National Roundtable could examine, as part of a larger plan, methods to collect more comprehensive data on IC&I waste production and management practices to assist industries to manage their processes more sustainably and reduce the amount of waste produced.

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