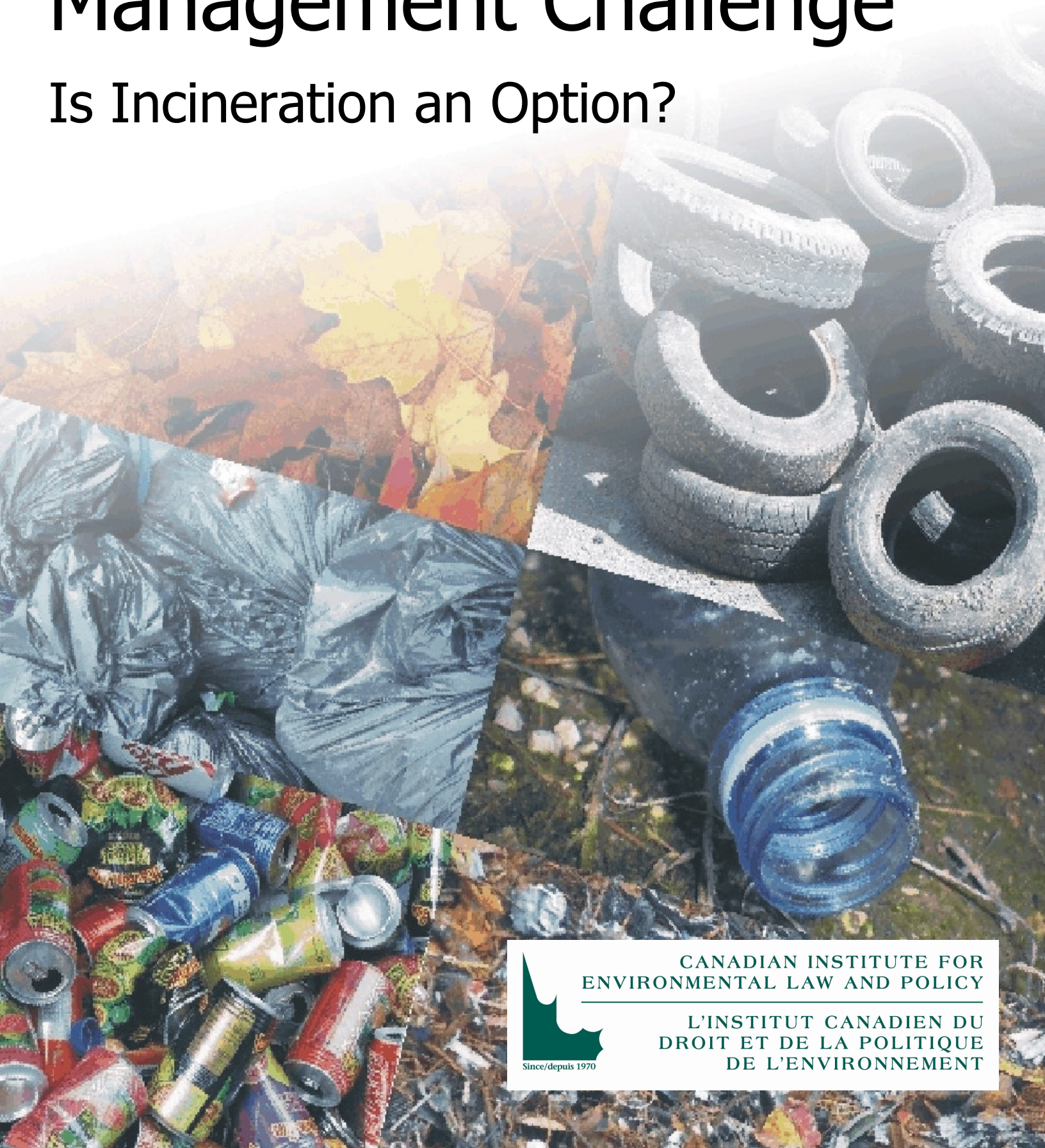
Ontario's Waste Management Challenge

Is Incineration an Option?



CANADIAN INSTITUTE FOR ENVIRONMENTAL LAW AND POLICY

L'INSTITUT CANADIEN DU DROIT ET DE LA POLITIQUE DE L'ENVIRONNEMENT

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Ontario's Waste Management Challenge – Is Incineration an Option?

by Maureen Carter-Whitney
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March 2007

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Executive Summary

In 2006 the State of Michigan, a major receiver of Ontario waste, threatened to ban the disposal of Canadian waste in Michigan landfills. As a result of the mounting pressure to find a viable alternative to shipping municipal solid waste to Michigan, and given the difficulty in finding acceptable sites for landfilling, Ontario municipalities have been exploring other waste management options including the use of incineration. This has led to a vigorous and polarized debate in Ontario regarding the safety and appropriateness of incineration for managing municipal solid waste.

This paper provides background and context for the incineration debate in Ontario in Parts 1 and 2. Part 3 sets out advantages and disadvantages of incineration technologies, and Part 4 reviews current and proposed regulations relating to municipal solid and hazardous waste. Part 5 of the paper discusses the place of incineration within the context of a waste management hierarchy and Part 6 considers the experience with incineration in Europe. The paper concludes in Part 7 with a policy perspective on incineration and 11 recommendations for Ontario.

Proponents of new incineration technologies have recently put forward the arguments that new incineration technologies are cleaner and safer than incineration technologies from the 1980s and that these facilities can produce much-needed energy. Incineration technologies continue to receive significant opposition from many environmental and citizens' groups, however, in part due to environmental and health concerns that remain despite the promise of technological improvements.

A number of developments have recently taken place in Ontario that signal that incineration technologies are increasingly being considered as potential options for waste management by both provincial and local governments. York Region, Durham Region, and Halton Region are all moving forward with waste plans that include incineration as their preferred option; Niagara Region and the City of Hamilton have also considered incineration. The Ontario Ministry of the Environment has been facilitating pilot projects to test new incineration technologies through regulatory changes.

These recent decisions have been made in the absence of strong policy leadership from the provincial government regarding how best to manage waste throughout the province. Without the province's leadership, waste management decisions may be made reactively and on a patchwork basis, without an overall, long term, sustainable vision.

Although a number of laws, regulations and policies currently regulate aspects of municipal solid and hazardous waste management, there has been no action on the part of the province to the development of a waste management strategy at a broad policy level that would ensure maximum diversion throughout Ontario.

Life cycle analysis has shown that waste diversion consumes much less energy and causes a smaller environmental burden than incineration, landfilling, or other disposal methods. The lack of a strategy to ensure that waste diversion efforts are prioritized over disposal methods underlies

one of the significant concerns expressed by those who are wary of incineration technologies: that authorities will have little incentive to reduce waste, or divert it from landfill or incineration once these disposal methods provide sufficient capacity to manage the waste, and an immediate crisis of capacity is averted. In fact, the use of incineration could seriously undermine Ontario's waste diversion efforts because in order to maintain optimal combustion, incinerators need a guaranteed constant supply of waste. The provincial government must quickly take measures to ensure that incineration does not become a technical fix that ultimately leaves Ontario without a commitment to diversion and in worse shape over the long run.

Various European examples, which are often pointed to as models for incineration use, can be used to understand how diversion efforts can be emphasized within a larger policy strategy in an attempt to ensure that landfilling or incineration are only used for waste that is truly residual. These countries have created strong frameworks that consider incineration within the context of a waste hierarchy that gives clear priority to waste prevention and reduction. The European Community has also put in place policies and regulations that include extended producer responsibility and packaging regulations.

Even if incineration is found to be safe enough for expanded use in Ontario, it should only be contemplated for truly residual waste, within a waste hierarchy framework that primarily seeks to prevent and reduce the generation of waste, and then seeks to achieve the highest possible rate of diversion. Incineration may or may not turn out to be an appropriate technology for Ontario, but this determination should only be made once an overarching waste management policy for the province is put in place. Waste management must be led by policy, not technology. Municipalities deserve provincial direction and should demand, along with other key stakeholders, a strong and comprehensive waste management strategy and regulatory framework, with funding to support the strategy.

Recommendations

1. The Ontario government should fund an independent, fair and impartial study of the true costs of incineration and a scientific assessment of the risks and benefits of incineration technologies currently available in order to raise public awareness and inform decision-making.

2. The Ontario government should evaluate incineration technology primarily on the basis of whether or not it is an appropriate means of waste disposal rather than as a means to provide energy.

3. The Ontario government should establish a strong, effective and comprehensive provincial waste management policy that includes enforceable reduction targets and timetables, and develops provincial regulations and coordinated regional approaches to using the best available technology for dealing with residuals.

4. The Ontario government should make use of life cycle analysis methods to consider all of the environmental, economic and social costs implicit in the various options for managing waste.

5 The Ontario government should strive for as near 'zero waste' as possible, by establishing short and long term reduction targets for waste generation to guide policy decisions and creating strong policies and regulations that provide policy certainty, work towards the prevention of waste creation, improve recycling rates and challenge consumer choices.

6 The Ontario government should introduce strong policies and regulations on extended producer responsibility requiring industry to take responsibility for managing consumer-generated waste itself, and should strengthen the powers of Waste Diversion Ontario through amendments to the *Waste Diversion Act* to increase the role of industry stewardship in reducing and recycling waste.

7 The Ontario government should develop and implement strict packaging regulations to prevent and reduce consumer goods packaging.

8 The Ontario government should consider introducing a regulatory requirement for municipalities to use economic and other tools to promote waste reduction in Ontario, including garbage bag fees and limits on the number of garbage bags collected.

9 The Ontario government should ensure the development of progressively higher regulatory standards, monitoring and enforcement, regardless of the disposal options pursued, to address environmental and human health impact concerns and pursue a goal of virtual elimination of dioxins and furans and toxic pollutants. In connection with this, the government should review Guidelines A-7 and A-8 in light of current regulatory standards in the US and EU.

10 The Ontario government should ensure that the public is meaningfully informed about and engaged in the development of provincial waste management policies and regulations. Public consultation should be designed to encourage public commitment to the waste policies adopted, improve public awareness and knowledge of waste management issues, be open to all for real participation and build trust and understanding.

11 The Ontario government should provide to the public an annual summary of the volumes and weights of municipal and industrial wastes, household hazardous wastes and hazardous industrial wastes. The summary should include information about the end disposition of the wastes by different methods, whether by reuse, recycling, landfilling or incineration.

1. Ontario and its Current Waste Management Problems

In 2005, Ontario's municipalities and Industrial, Commercial & Industrial (IC&I) sector produced approximately 13.3 million tonnes of waste, of which about 3.3 million tonnes were diverted through the province's 3Rs program, 6 million tones were landfilled or incinerated within Ontario and 4 million tonnes were exported to the United States for landfilling or incineration. Approximately 90% of the waste exported to the United States went into landfills in Michigan[1]. It is difficult to find accurate figures on amounts of hazardous waste, but one estimate suggests that about 2.8 million tonnes of hazardous waste was produced in Ontario in 2004.

This arrangement meant that around 150 truckloads of waste were driven each day from the Greater Toronto Area (GTA) to Michigan through southwestern Ontario.[2] Michigan residents raised many concerns including: environmental contamination from the landfills; traffic congestion; damaged roads from truck traffic; and border security issues.[3] In March 2006, the State of Michigan passed legislation banning the disposal of Canadian waste in Michigan landfills. The Carleton Farms landfill in Michigan then gave two months' notice in June 2006 that it had decided to ban sewage sludge from Toronto.[4] The legislation banning the disposal of Canadian waste, however, could not take effect without enabling legislation by the U.S. federal government.[5] The Ontario government stepped in and negotiated an agreement with Michigan Senators Debbie Stabenow and Carl Levin[6]. Based on Ontario's commitment to reduce and

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[1] Municipalities in the GTA exported approximately 1.15 million tonnes of municipal waste to Michigan in 2005, excluding biosolids. Michigan received waste from Toronto, the Region of Peel, the Region of York and the Region of Durham in the GTA, as well as waste from Owen Sound, Orangeville and Meaford: MOE Fact Sheet, *How Ontario Manages Its Waste: The Basic Facts and Figures*, August 31, 2006: http://www.ene.gov.on.ca/envision/news/2006/083101.htm.

[2] *Ibid*.

[3] Correspondence from Senators Debbie Stabenow and Carl Levin, United States Senate to Honourable Laurel C. Broten, Minister of the Environment, August 30, 2006: http://www.ene.gov.on.ca/envision/news/2006/083101ltr2.pdf.

[4] "Michigan landfill bars city sludge," *Toronto Star*, June 1, 2006: http://www.thestar.com/NASApp/cs/ContentServer?pagename=thestar/Layout/Article_Type1&c=Article&cid=1149112211060&call_pageid=970599119419. This was in response to a class action lawsuit launched by neighbouring residents over the odour.

[5] As of August 2006, a bill was before the U.S. House of Representatives that would, if passed, allow states to make laws restricting the receipt and disposal of foreign municipal solid waste until such time as the Environmental Protection Agency Administrator implemented regulations to enforce the U.S.-Canada Agreement Concerning Transboundary Movement of Hazardous Waste, that had been amended in 1992 to cover MSW. This bill would also have required approval by the U.S. Senate. Had the federal bill been passed, the Michigan state legislation would have prohibited Canadian waste from entering Michigan after 90 days: MOE Backgrounder, *The Ontario/Michigan Waste Issue*, August 31, 2006: http://www.ene.gov.on.ca/envision/news/2006/083101mb.htm.

[6] On August 30, 2006, Ontario's Minister of the Environment announced a commitment by key Ontario municipalities to move towards the goal of eliminating cross-border shipment of MSW: "Collectively, the

ultimately stop shipments of municipal solid waste (MSW) to Michigan by 2010, the U.S. Senators agreed in writing that they would not pursue the passage of legislation or legislative amendments, or other similar measures, to prevent the shipment of waste from Ontario to Michigan.[7]

As a result of the mounting pressure to find a viable alternative to shipping MSW to Michigan and given the difficulty in finding acceptable sites for landfilling, Ontario municipalities have been exploring other waste management options.

This has led to a heated public debate. In the lead-up to the municipal elections in November 2006 a flurry of media articles raised the pressing question of whether or not municipalities in Ontario should introduce incineration technologies to deal with their waste. Most of these articles and opinion pieces discussed how new technologies are purported to be cleaner and safer than incineration technologies from the 1980s. Such articles also focused on the potential for these facilities to produce much-needed energy through waste incineration.[8] Media coverage also noted the significant opposition that many environmental groups have expressed to moving towards new incineration technologies.[9]

Despite the significant media interest in the potential use of incineration, a number of questions remain unanswered. Civil society and government decision-makers alike continue to ask:

- Have incineration technologies improved enough to be considered as appropriate forms of waste management in Ontario?
- Could energy from waste technologies provide a means of generating energy that would be efficient and cost effective?

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municipalities in Ontario that ship waste to sites in Michigan have committed to reduce these shipments by 20 percent [*sic*] by the end of 2007, by 40 per cent by the end of 2008 and eliminate them altogether by the end of 2010, using the 2005 baseline of 1.34 million tonnes of municipal waste shipped. This means an elimination of about 2.78 million tonnes of waste over tehe four year period that would otherwise have been shipped from municipalities in Ontario to landfill sites in Michigan.": Correspondence from Honourable Laurel C. Broten, Minister of the Environment to Senators Debbie Stabenow and Carl Levin, United States Senate, August 30, 2006: http://www.ene.gov.on.ca/envision/news/2006/083101ltr1.pdf.

[7] Correspondence from Senators Debbie Stabenow and Carl Levin, United States Senate to Honourable Laurel C. Broten, Minister of the Environment, August 30, 2006: http://www.ene.gov.on.ca/envision/news/2006/083101ltr2.pdf.

[8] For example, see: "Burning Desire," *Toronto Star*, February 12, 2006 at A16; Rethinking incineration: How long can Toronto keep exporting its trash?," CBC On-line News, March 17, 2006, http://www.cbc.ca/news/background/realitycheck/20060317sheppard.html; "So, why don't we just burn our garbage?," *Toronto Star*, March 18, 2006 at F1; "Incinerating trash now a burning issue; Touted as solution to garbage crisis Ontario refuses to wade into mire," *Toronto Star*, May 8, 2006 at A1; "Incineration: a twin solution: Energy, garbage problems can be felled at once," *National Post*, May 10, 2006 at A14; "Incinerate the trash," *Globe and Mail*, May 15, 2006 at A12; "GTA must halt Michigan garbage shipments by 2010: minister," CBC On-line News, May 16, 2006, http://www.cbc.ca/toronto/story/tor-gta-garbage060516.html; "Politicians in denial over Toronto garbage," *Toronto Star*, June 11, 2006; "York, Durham add fuel to incineration debate," *Globe and Mail*, June 24, 2006 at A16

[9] For example, see: "Incineration not so safe," *Globe and Mail*, May 16, 2006 at A18; and "Getting burned," *Eye Weekly*, June 8, 2006.

- Should the provincial government encourage and facilitate the use of these technologies or not?
- Should municipal governments plan and construct incineration facilities to manage their municipal solid waste?

This paper is an attempt to articulate and discuss these questions in order to help the government of Ontario and municipalities move forward on this difficult and polarized issue. The paper concludes that decisions on proceeding with waste management options, such as incineration, should not be made until the provincial government has put in place a strong, effective and comprehensive waste management policy. Any framework for waste management must include waste prevention and reduction, as well as strong diversion targets and programs. Only after policy mandates and prioritizes waste diversion will stakeholders be in a position to seriously entertain, and perhaps support, the use of incineration and similar technologies.

It should be noted that the term "incineration" is used most commonly in this paper to refer broadly to thermal treatment of waste. It has become increasingly common for proponents to refer to Energy from Waste (or EFW) facilities. While the term EFW is referred to at times in this paper, it is important that it not be used to suggest that these facilities provide a major energy solution. The focus should first be on the appropriateness of incineration technology as a way to manage waste and only secondly as a means to provide energy. This is because incineration tends to be an expensive[10] and fairly inefficient way to produce energy.[11]

It is also important to note that this paper considers incineration in the context of municipal solid waste and hazardous waste but does not attempt to address specifically its use in relation to management of industrial, commercial and institutional (IC&I) waste or hospital waste. However, recommendations in the paper concerning the need for a comprehensive provincial waste management would also apply to the management of IC&I and biomedical wastes.

[10] See Elbert Dijkgraaf and Herman R.J. Vollebergh, "Burn or bury? A social cost comparison of final waste disposal methods," *Ecological Economics* 50(2004) 233-247.

[11] Andrew Knox, *An Overview of Incineration and EFW Technology as Applied to the Management of Municipal Solid Waste (MSW)*, prepared for ONEIA Energy Subcommittee, February 2005, at 51, 63: http://www.oneia.ca/files/EFW%20-%20Knox.pdf.

2. The Incineration Debate in Ontario

The Recent History of Incineration in Ontario

A vigorous and polarized debate is currently taking place in Ontario regarding the safety and appropriateness of incineration for managing MSW. This debate is certainly not new; it stems from a history of wide-ranging shifts in government policy in the 1990s and long and difficult battles by citizens and the environmental and health communities to shut down incinerators that they saw as being hazardous. As regulators once again consider the potential role for incinerators in the early twenty-first century and public debate surges we must understand the history of what has led us to our current situation.

In 1991 the Ontario Ministry of the Environment, then under the New Democratic Party, took a strong position in favour of waste reduction by announcing a decision to ban new incinerators for municipal solid waste (MSW)[12] in combination with the development of a Waste Reduction Action Plan (WRAP).[13] This ban on new incinerators was made legally binding by the New Democratic Party government in 1992 through a regulation that prohibited the construction of new incinerators for MSW.[14] The motivation for this ban came, in part, from the concern that incinerators and their need for a steady stream of fuel waste would impede progress on waste reduction.[15] Environmental groups responded with strong support for the Ministry's approach.[16]

In 1995 a newly elected Progressive Conservative government, in fulfilling an election promise,[17] quickly proposed a regulation to remove the ban on new incinerators for MSW in Ontario.[18] After a period of public consultation, the regulation was made and the ban removed.[19]

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[12] Session: 35:1, Date: 19911210 http://hansardindex.ontla.on.ca/hansardeissue/35-1/l096a.htm

[13] Under WRAP, 3Rs regulations were put in place that required major industrial, commercial and institutional generators of MSW to conduct waste audits, to develop waste reduction work plans, and to implement source separation of specified materials: Environmental Commissioner of Ontario, *The Ontario Regulation And Policy-Making Process In A Comparative Context: Exploring The Possibilities For Reform: A Report Prepared For The Environmental Commissioner of Ontario*, October 1996 at 10.

[14] O. Reg. 555/92 amending Reg. 347 made under the *Environmental Protection Act*, R.R.O. 1990; see Estrin & Swaigen, *Environment on Trial: A Guide to Ontario Environmental Law and Policy* (Toronto: Emond Montgomery Publications Limited and Canadian Institute for Environmental Law and Policy, 1993) at 783.

[15] Ruth Grier, then Minister of the Environment, later described this as "a decision taken in the best interest of protecting the health and well-being of our communities. It also rules out a waste disposal option whose voracious appetite for fuel is a counter-productive competitor to waste reduction.": Winfield, *Looking Back and Looking Ahead: Municipal Solid Waste Management in Ontario from the 1983Blueprint to 50% Diversion in 2000 – Conference Background Paper and Report* (Toronto: Canadian Institute for Environmental Law and Policy, March 1993).

[16] National general news, Canadian Press wire service, April 26, 1991, 18:55 E.D.T.

[17] *Opening the Doors to Better Environmental Decision Making: Annual Report 1994-1995*, Environmental Commissioner of Ontario at 35.

[18] Environmental Registry Notice #RA5E0018, www.ebr.gov.on.ca.

[19] O. Reg. 512/95 amending Reg. 347 made under the *Environmental Protection Act*, R.R.O. 1990.

Environmental groups, members of the public, and other stakeholders who opposed the reversal of the ban expressed concern for health and the environment.[20]

As the political debate over the development of new MSW incinerators took place many citizens were also taking action in their communities to demand the closure of neighbourhood facilities. An example of such a struggle was over the Solid Waste Reduction Unit (SWARU) in Hamilton. Starting in the late 1980s, Hamilton residents in the area of the SWARU incinerator expressed concerns that its significant emissions, particularly of dioxins, furans and other toxins posed significant health risks for those living in the community.[21] After opening in 1972, the SWARU incinerator burned approximately 40 to 60 per cent of Hamilton's MSW. Each day, the incinerator produced as much as 30 tonnes of fly ash, or fine ash filtered from combustion flue gases and potentially containing high levels of heavy metals and other toxins.[22] The Ministry of Environment and Energy was permitting the facility to operate under an approval that had been issued in 1972 without any restrictive conditions included in it and that did not reflect current environmental standards.[23]

After years of using public processes, such as applications under the *Environmental Bill of Rights,* to persuade the municipal and provincial governments to respond to their concerns about SWARU local residents finally succeeded in having the facility permanently closed in 2002.[24] A key factor in this decision was the fact that the SWARU facility would not have been able to meet the Canada-Wide Standards for Dioxins and Furans, that came into effect in 2006, without major changes to its air pollution control systems.[25]

The example of this long and difficult battle to close down an outdated and dangerous incinerator explains much of the resistance of the environmental community and many members of the public to incineration as a method of waste management.

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[20] Environmental groups and members of the public who commented on the proposed regulation cited the following concerns: the impact of emissions on human health such as respiratory diseases, cancer, lowering of immune protection and lowering of reproductive capabilities; the impact of emissions on the environment from greenhouse gases, acid gases, heavy metals, organic compounds and fine particulates.

[21] The Environmental Commissioner of Ontario has noted: In the year 2000, the facility emitted approximately 5.5 grams of dioxins and furans, measured as Toxic Equivalent Quotient (TEQ). Municipal waste incineration, Canada-wide, emits a total of approximately 8.4 grams per year of dioxins and furans, according to an estimate by the Canadian Council of Ministers of the Environment. This suggests that SWARU's emissions contribute over 60 per cent of the total dioxin and furan emissions from municipal waste incinerators across Canada: *Developing Sustainability: Annual Report 2001-2002*, Environmental Commissioner of Ontario at 123-4.

[22] Environmental Commissioner of Ontario, *Thinking Beyond the Near and Now: Annual Report 2002-2003* at 143.

[23] Environmental Commissioner of Ontario, *Developing Sustainability: Annual Report 2001-2002* at 124-5.

[24] Environmental Commissioner of Ontario, *Thinking Beyond the Near and Now: Annual Report 2002-2003* at 144-6.

[25] Environmental Commissioner of Ontario, *Developing Sustainability: Annual Report 2001-2002* at 125.

The Current Context for Considering Incineration in Ontario

While other facilities exist in Canada,[26] only one incinerator currently processes MSW in Ontario, in the Region of Peel. The Algonquin Power Energy From Waste Inc. facility is a waste to energy facility located in Brampton, Ontario that has been in operation since 1992. It incinerates non-recyclable materials, including municipal solid waste, to produce steam used to drive a turbine generator that in turn produces electricity.[27] The facility currently processes approximately 50% of Peel Region's garbage, or 140,000 tonnes per year. It claims a strong environmental track record and a commitment to exceeding Ontario's air emission standards.[28]

The fact that only one incineration facility is still in operation in Ontario shows how hesitant municipalities have been to consider them as a management option and once again face such strong opposition. Persistent and increasing concerns about how to manage future generation of MSW, however, have led several Ontario municipalities, including the Niagara Region, the City of Hamilton, York Region, and Durham Region to once again consider the use of these technologies. The promise that incineration technologies have improved significantly over the past few decades has also provided grounds for their re-evaluation.

In 2003, Niagara Region and the City of Hamilton began working together to develop a joint plan for the future management of solid waste after determining that the two municipalities shared circumstances and goals, including limited landfill space, a target of 65% diversion of waste from landfill and a desire to manage their own wastes. The two communities decided to work together to pursue materials recycling, centralized composting and disposal options such as EFW.[29]

In December 2005, as a step in the Niagara-Hamilton WastePlan Environmental Assessment Study, the consultants to the study released the *Draft Report on Evaluation of "Alternatives To" and Selection of a Preferred Disposal System*. The report considered and evaluated eight alternative waste disposal systems[30]; the consultants identified the preferred option as thermal

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[26] One example is the Greater Vancouver Regional District Waste-to-Energy Facility that began operating in 1988 and has processed almost 5 million tonnes of municipal solid waste since that time. More information is available at Ken Carrusca and Ron Richter, *Waste Management in Greater Vancouver – Success with Waste-to-Energy*, Presentation to RCO Energy From Waste Forum, November 3, 2006: http://www.rco.on.ca/Greater%20Vancouver.pdf.

[27] Algonquin Power Energy From Waste Inc., Algonquin Power web site: http://www.algonquinpower.com/business/facility/alternative_peel.asp?choice=region.

[28] Andrew Pollock, *The Role of Energy From Waste in the Region of Peel*, Presentation to RCO Energy From Waste Forum, November 3, 2006: http://www.rco.on.ca/Peel%20Algonquin.pdf.

[29] Niagara-Hamilton Waste Plan web site, *Niagara-Hamilton Partnership*: http://www.wasteplan.ca/wasteplan_partnership.cfm.

[30] The report considered and evaluated: mechanical biological treatment and landfilling of stabilized residuals; mechanical biological treatment with biogas recovery and landfill; thermal treatment; thermal treatment with recovery of recyclables; thermal treatment of alternative fuel; thermal treatment of alternative fuel with biogas recovery; landfilling of mixed solid waste; and landfilling of mixed solid waste with recovery of landfill gas. More information concerning some of these waste disposal techniques is provided later in this paper: MacViro Consultants and Jacques Whitford Limited, Niagara-Hamilton WastePlan Joint Study on Waste Disposal, *Draft Report on Evaluation of "Alternatives To" and Selection of a Preferred Disposal System*, December 5, 2005 at 14-58: http://www.wasteplan.ca/library_wasteplanreports.cfm.

treatment of MSW and recovery of energy, followed by the removal of materials that may be sold to market from the ash/char residue, and finally the landfilling of all process residues.[31]

After its release, the report was made available for a 60-day public consultation period. Of the 106 comments received: about 50% supported the option recommended by the consultants; 25% were critical of the EA process, the evaluation criteria and the methodology used; and the other 25% were not directly relevant. Public input included concerns about: whether incineration might affect further waste diversion; what the total loading and emission discharges from a thermal facility would be; the fact that further research into stabilized landfilling was required; and how affordable the various options would be.[32]

In response to those who expressed opposition to incineration during the public consultation, the Niagara-Hamilton WastePlan Joint Working Group decided to request additional information about a stabilized landfill option that would involve pre-treating waste to allow it to be landfilled with minimal odour, toxic leachate or greenhouse gas emissions.[33] This issue is still under consideration in the region.

York Region and Durham Region, which both currently export most of their waste to Michigan, have also been collaborating to explore how they could jointly manage their wastes. The two municipalities decided to conduct a joint Residual Waste Planning Study in order to find an alternative way to manage solid waste that remains after diversion.[34] On May 30, 2006, the Durham/York Residual Waste Study received from their consultants a final report on *Evaluation of "Alternatives to" and Identification of the Preferred Residuals Processing System – Recommendations*. In this report, the consultants recommended thermal treatment of mixed solid waste and recovery of energy followed by recovery of materials from ash/char as the system that would offer the best balance of advantages and disadvantages in the context of the environmental priorities that were established by York and Durham Regions.[35]

In contrast to Niagara and Hamilton, approximately 80% of those who participated in the Durham and York consultation process agreed with the residuals processing system recommended by the consultants.[36] Some questioned how greenhouse gas emissions, air emissions and public health impacts would differ between an EFW facility as opposed to the present waste management

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[31] *Ibid*. at 59-64.

[32] Beth Goodger and Barry Friesen, Niagara-Hamilton WastePlan, *Selection of a Waste Disposal System*, RCO's Energy From Waste Forum, November 3, 2006 at 6-8: http://www.rco.on.ca/Niagara%20Region.pdf.

[33] *Ibid* at 6; Eric McGuinness, "Pre-treating landfill worth look: politicians," *The Hamilton Spectator*, February 10, 2006.

[34] Durham/York Residual Waste Study web site, Home Page: http://www.durhamyorkwaste.ca/index.php.

[35] *Ibid*. at 15-53. The alternatives considered in the Durham/York study included: mechanical and biological treatment with biogas recovery; thermal treatment of mixed waste with recovery of materials from the ash/char; thermal treatment of solid recovered fuel; and thermal treatment of solid recovered fuel with biogas recovery.

[36] MacViro Consultants and Jacques Whitford Limited, Durham/York Residual Waste Study, *Evaluation of "Alternatives to" and Identification of the Preferred Residuals Processing System – Recommendations*, May 30, 2006 at page 2 of the transmittal letter: http://www.durhamyorkwaste.ca/study_documents/pdfs/processing/Final-Report-May30-06-no-e-signatures.pdf.

option of shipping waste to landfills in Michigan. Some suggested that a larger EFW facility might be needed to serve all of the GTA. There were also concerns about the effect of EFW on waste diversion efforts, with strong support for additional diversion and the implementation of extended producer responsibility requiring industry to manage its waste itself.[37]

The EA process in the Durham/York study is now further along than that of Niagara-Hamilton, as Durham/York is now evaluating "alternative methods" of carrying out the undertaking, or siting.[38] Public information sessions on a short list of sites are planned for March 2007.[39]

In August 2006, Halton Region announced that it had received written confirmation of the Ontario Minister of the Environment's approval under the *Environmental Assessment Act* for implementation of an EFW facility when the Region determines it is necessary for waste management.[40]

A number of other developments have recently taken place in Ontario that signal that incineration technologies are being considered as potential options for waste management by both provincial and local governments.

One of these developments has been the construction and operation of pilot projects to test new incineration technologies. In June 2006, for example, the Ontario Cabinet approved two regulations that allowed the Plasco Energy Group to undertake a plasma gasification demonstration project that would gasify up to 85 tonnes of municipal waste per day in order to generate 5.2 megawatts (MW) of electricity. The Plasco facility is a joint project with the City of Ottawa with the goal of trying to reduce the amount of MSW entering the Trail Landfill.[41] The demonstration project is set for one year and extensive independent testing will be conducted during this time to assess the environmental performance of the facility.[42] Plasco states that the

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[37] Kelly Spitzig, York Region, *The Durham-York Residual Waste Study*, RCO's Energy From Waste Forum, November 3, 2006 at 10-11: http://www.rco.on.ca/Durham%20York.pdf.

[38] Durham/York Residual Waste Study web site, *Study Schedule*: http://www.durhamyorkwaste.ca/schedule.php.

[39] Durham/York Residual Waste Study web site, *Opportunities for Public Involvement*: http://www.durhamyorkwaste.ca/involvement.php.

[40] The Regional Municipality of Halton, Media Release, *Solutions for Solid Waste Management in Halton*, August 2, 2006: http://www.halton.ca/News/MediaShow.cfm?MediaID=2006-08-02-12-13-18.

[41] Of the 85 tonnes, Plasco is permitted to process up to 10 tonnes of municipal waste that otherwise would have been landfilled within or just outside of the Ottawa area. According to Plasco, the 10 tonnes of municipal waste is intended to be municipal waste that has a high energy value and may include plastic bags, non-recyclable plastics and shredded tires, as well as other things. The remaining 75 tonnes of municipal waste will be obtained from municipal waste that would have been destined specifically for the Trail Road Landfill site: Environmental Registry Notice # RA05E0021: www.ebr.gov.on.ca.

[42] After waste diversion efforts, Ottawa is still left with more than 200,000 tonnes of MSW each year. It is expected that the gasification of 85 tonnes of municipal solid waste each day at the demonstration facility will generate about 5 MW of power. Because 1MW will be used to power the gasification process, a net 4 MW of electricity will be provided to Hydro Ottawa, which Plasco claims is enough electricity to power 4600 homes: Plasco Energy Group web site, *Ottawa, Canada – Partnership for a Zero-Waste Ottawa*: http://www.plascoenergygroup.com/content.php?cat=projects&subcat=project33.

disposal technology has zero impact on the environment, claiming that there are no harmful air emissions or leachate from the process.[43]

In November 2006, the Ministry of the Environment initiated a public consultation on proposals by Dongara Pellet Factory Inc. and Arbour Power in Durham Region to cooperate in the processing of non-recyclable municipal waste by turning it into pellets that could then be used as an alternative fuel source. To facilitate these proposals, the ministry would need to make regulations exempting proponents who want to use the Dongara's Enerpax waste pellets from the mandatory hearing requirements under section 30 of the *Environmental Protection Act*, and exempting Arbour Power's proposed Ajax gasification facility from the requirements of the *Environmental Assessment Act*.[44] The proposals were posted on the Environmental Registry for a 45-day comment period.[45] In a news release, the Ontario government welcomed these proposals as "innovative solutions for managing waste" and encouraged "the public to learn more about new waste technologies and to comment on the proposals."[46] As of the release of this paper no decision on this proposal has been posted on the Environmental Registry.

Yet another significant development affecting the current context of renewed interest in incineration took place in September 2006 with the City of Toronto's approval of the purchase of a landfill in southwestern Ontario. On September 19, 2006, Toronto City Council approved a letter of intent to purchase the Green Lane Landfill, and city officials were given a mere 90 days to negotiate the final terms of the sale. The agreement took place very quickly and without public consultation prior to the announcement of the landfill purchase. The landfill, which has operated since 1978, recently received approval from the provincial government for an expansion. It has also passed the environmental assessment required for the expansion.[47] In December 2006, the City of Toronto purchased the landfill for $220 million. The City is scheduled to take possession of it in March 2007. Toronto is planning that, with a strong waste diversion plan, the landfill will give the city a disposal capacity of 13 million tonnes.[48] It has been suggested that Toronto is purchasing the landfill in order to avoid the use of incineration, of which Mayor David Miller is known to be a staunch opponent.

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[43] Plasco Energy Group web site, *Questions and Answers: How clean is it?*: http://www.zerowasteottawa.com/qa.php?id=80&l=en.

[44] Instead of the current requirement for Arbour Power to conduct an individual EA as required by O. Reg. 116/01 for Electricity Projects, Arbour Power would be subject to a screening process similar to the one outlined in O. Reg. 116/01.except that the public would not have an opportunity to request that a project be subject to an individual EA.

[45] Environmental Registry # RA06E0016: www.ebr.gov.on.ca.

[46] MOE News Release, *Province Seeks Public Input on Innovative New "Energy From Waste" Proposals*, November 30, 2006: www.ene.gov.on.ca/envision/news/2006/113001.htm.

[47] City of Toronto news release, *Toronto approves landfill purchase as part of solid waste management plan*, September 19, 2006: http://wx.toronto.ca/inter/it/newsrel.nsf/7017df2f20edbe2885256619004e428e/ac349ca5b0663c42852571ef004be55f?OpenDocument.

[48] City of Toronto news release, *City of Toronto purchases Green Lane Landfill: Possession set for March 2007*, December 20, 2006: http://wx.toronto.ca/inter/it/newsrel.nsf/af1ffa833dc5afb485256dde005a4471/83f8f0457330c9ff8525724a00532dfd?OpenDocument.

In addition to the Green Lane Landfill expansion, the Ontario government has also recently approved an environmental assessment for the proposed expansion of a landfill in the Township of Warwick landfill,[49] and an environmental assessment for the proposed Niagara Waste Systems landfill expansion in Niagara Region.[50]

The events taking place in Ontario – the development of plans for incineration in the Niagara, Hamilton, Durham, and York Regions; the promotion of pilot projects to test new incineration technologies by the Ontario Ministry of the Environment; and the City of Toronto's rapid purchase of a landfill in reaction to pressure from EFW proponents – suggest that incineration technologies are quickly re-entering the debate as waste management alternatives. These events, however, are taking place in an environment where the positions of stakeholders continue to be highly polarized. Decisions are being made without strong leadership from the provincial government regarding how waste management should move forward within the province. Without the province's leadership in this area waste management decisions are unfolding reactively and in ways that do not lend themselves to the movement towards a sustainable vision.

Within the context of this issue one of the questions that all stakeholders, including the media, decision-makers, and civil society, have asked throughout this series of events is how the health and environmental implications of incineration technologies have improved over the past couple of decades and how effective they are as alternatives to landfilling. The next section will attempt to clarify answers to these questions, although there remains a great deal of uncertainty.

[49] MOE News Release, *Warwick Landfill to Expand Under Strict Environmental Conditions*, January 16, 2007: http://www.ene.gov.on.ca/envision/news/2007/011601.htm.

[50] MOE News Release, *Niagara Waste Systems Landfill Expansion Receives Environmental Approval*, November 16, 2006: http://www.ene.gov.on.ca/envision/news/2006/111601.htm.

3. An Overview of Incineration Technologies – Advantages and Disadvantages

Proponents of new incineration technologies claim that these technologies have significantly improved over the past decades and are asking decision-makers, in light of these advancements, to re-consider using these technologies in municipal solid waste management. For instance it has been suggested that a number of new technologies are capable of removing many of the pollutant emissions that result from the incineration of different streams of waste. For example, a 2005 German government document made the claim of a drastic reduction in toxic contaminant emissions from waste incineration since 1990. The German government stated that "[t]otal dioxin emissions from all 66 waste incineration plants in Germany has dropped to approx. one thousandth as a consequence of the installation of filter units stipulated by statutory law: from 400 grams…to less than 0.5 grams.[51]

These claims are now being called upon by many decision-makers to support moving forward with the development of facilities to incinerate municipal solid waste. Many stakeholders continue to question these technologies, however, and are asking whether these they have really improved and what the improvements mean for human and environmental health.

This section presents a broad overview of incineration and other thermal processes, such as gasification and pyrolosis, which are capable of producing energy from waste.[52] It then attempts to assess their comparative advantages and disadvantages in relation to other forms of waste management. To get a broader view of what other current and emerging waste management technologies are available please see Appendix A. Readers should note that this is not a scientific analysis of these technologies. In order for the Ontario public to fully understand the potential risks and benefits of incineration as a method of waste management, a fair and impartial scientific assessment of these technologies must first take place.

It also is important to keep in mind that, while EFW technologies may produce an added public benefit in the form of some energy production, the environmental impacts of the technologies will be similar to those of incineration without EFW.

Incineration

Incineration is the thermal oxidation of waste resulting in heat, water vapour, particulate matter, products of incomplete combustion, nitrogen, carbon dioxide and oxygen. Incinerators are typically fed mixed waste containing low levels of hazardous substances such as heavy metals and chlorinated organic chemicals. These substances can be transformed by incineration into

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[51] German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, *Waste Incineration – A Potential Danger?*, September 2005. See also Elena Ares and Paul Bolton, *Waste Incineration*, Research Paper 02/34,UK Parliament House of Commons Library, May 9, 2002 at 16: http://www.parliament.uk/commons/lib/research/rp2002/rp02-034.pdf.

[52] Please see *Appendix A – Other Current and Emerging Waste Management Technologies* for a brief technical explanation of other non-incineration techniques for waste management that are currently available.

forms that are likely to be more toxic.[53] Depending on the nature of the waste being incinerated, various other compounds may be produced, including hydrogen chloride, hydrogen fluoride, nitrogen oxides, sulphur dioxide, volatile organic carbons, dioxins and furans, polychlorinated biphenyls, heavy metals, etc.[54] Mercury may also be released in emissions from waste incineration when consumer goods containing mercury, such as alkaline batteries and fluorescent lightbulbs, are present in the waste stream.[55] Many of these chemicals are know to be persistent, bioaccumulative, carcinogenic and/or endocrine disruptors.[56] These byproducts of combustion must be removed and properly managed if incineration is to be considered as a technology to manage MSW.

Over the last three decades, MSW incineration technology has greatly improved. These pollutant emissions from the flue gas can be removed to a large extent by expensive gas and particulate treatment systems. There has been improved air pollution control of the flue gas, partially due to improvements in the efficiency of separation technologies.[57] Also, a better understanding of the temperature and residence time requirements, the use of activated carbon, and the use of high performance gas scrubbers have helped to improve the performance of incinerators by more than 99 percent.[58] Similarly, electrostatic precipitation may be used to remove particulates from incineration.[59] In addition, further research is currently being pursued to reduce the amount of dioxins being produced.[60] Metals cannot be destroyed so they must be separated and stabilized.[61]

These improvements have meant an increase in the pollution concentrated in the air control residues, leading to concerns over handling and disposal of these residues. The residues must be disposed of at landfills that comply with strict technical and monitoring requirements,[62] although there may be some potential for resource recovery of metals.[63]

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[53] Franchini, Michela, et al. "Health Effects of Exposure to Waste Incineration Emissions: A Review of Epidemiological Studies" *Ann Ist Super Sanità* 40.1 (2004):101-115 at 102.

[54] Williams, Paul. *Waste Treatment and Disposal.* New York: John Wiley and Sons, 2005 at 326.

[55] Canadian Council of Ministers of the Environment, *Canada-Wide Standards for Mercury Emissions*, 2000 at 5.

[56] Franchini, Michela, et al. "Health Effects of Exposure to Waste Incineration Emissions: A Review of Epidemiological Studies" *Ann Ist Super Sanità* 40.1 (2004):101-115 at 101.

[57] Ecke, Holger. "Sequestration of Metals in Carbonated Municipal Solid Waste Incineration (MSWI) Fly Ash" *Waste Management* 23 (2003): 631-640 at 631.

[58] Porteous, Andrew. "Energy from Waste Incineration – A State of the Art Emissions Review with an Emphasis on Public Acceptability" *Applied Energy* 70 (2001): 157-167 at 160.

[59] For more information see Mizuno, A., "Electrostatic precipitation," *IEEE Transaction on Dielectrics and Electrical Insulation*, 7(5) October 2000, 615-624.

[60] Liu, Yangsheng and Yushan Liu. "Novel Incineration Technology Integrated with Drying, Pyrolysis, Gasification, and Combustion of MSW an Ashes Vitrification" *Environmental Science and Technology* 39 (2005): 3855-3863 at 3855.

[61] Williams, Paul. *Waste Treatment and Disposal.* New York: John Wiley and Sons, 2005 at 326

[62] Ecke, Holger. "Sequestration of Metals in Carbonated Municipal Solid Waste Incineration (MSWI) Fly Ash" *Waste Management* 23 (2003): 631-640 at 632.

[63] Song, G.J. *et al*., "Characteristics of ashes from different locations at the MSW incinerator equipped with various air pollution control devices" *Waste Management* 24(1) (2004) 99-104.

Gasification and Pyrolysis

Gasification and pyrolysis are similar to incineration. Rather than burning the feedstock to produce energy, high temperatures and pressures are applied in an oxygen-starved environment, causing thermal decomposition to simple molecules.[64] This process produces a fuel in the form of gas, oil or char[65] and an inert slag. The technology also exhibits much lower levels of organic chemical residual toxicity than other thermal technologies.[66] Heavy metals remain a problem. Overall, the energy production of incineration and gasification are about equal. There are a variety of methods of gasification, some of which deserve serious consideration.

Health Concerns Related to Incineration

Health issues are one of the main concerns put forward by opponents of incineration. Whether an incineration technology provides EFW benefits or not, the environmental and health impacts are the same. One of the major problems with waste incineration, whether or not it is used to produce energy, is the production of dioxins. Dioxins are formed when carbon, oxygen and chlorine are exposed to high temperatures.[67] Incineration is not the only process that causes dioxins to be emitted into the air, however. Others include: metals smelting, refining and processing; chemical manufacturing; action of micro-organisms on some chemicals, such as chlorinated phenolic compounds; and reservoir sources.[68]

Many studies have been performed to assess the true health risks posed by incineration technologies. Results have often conflicted, however. It has been shown that environmental dioxins may increase the risk of a number of diseases, including lung and larynx cancers[69] and non-Hodgkin lymphoma, among people living in the vicinity of a MSW incinerator.[70] However, other epidemiological studies claim to show that people that work or live near incinerators have no consistent increase in incidence of any specific disease.[71]

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[64] Moustakas, K. "Demonstration Plasma Gasification/Vitrification System for Effective Hazardous Waste Treatment" *Journal of Hazardous Materials* B123 (2005): 120-126 at 120.

[65] Williams, Paul. *Waste Treatment and Disposal*. New York: John Wiley and Sons, 2005 at 326.

[66] Moustakas, K. "Demonstration Plasma Gasification/Vitrification System for Effective Hazardous Waste Treatment" *Journal of Hazardous Materials* B123 (2005): 120-126 at 120.

[67] Lavric, Elena, et al. "Surrogate compounds for Dioxins in Incineration. A review" *Waste Management* 25 (2005): 755-765 at 755.

[68] Floret, Nathalie, et al. "Dioxin Emissions from a Solid Waste Incinerator and Risk of Non-Hodgkin Lymphoma" *Epidemiology* 14.4 (2003): 392-398 at 392.

[69] Franchini, Michela, et al. "Health Effects of Exposure to Waste Incineration Emissions: A Review of Epidemiological Studies" *Ann Ist Super Sanità* 40.1 (2004):101-115 at 101.

[70] Floret, Nathalie, et al. "Dioxin Emissions from a Solid Waste Incinerator and Risk of Non-Hodgkin Lymphoma" *Epidemiology* 14.4 (2003): 392-398 at 392.

[71] Porteous, Andrew. "Energy from Waste Incineration – A State of the Art Emissions Review with an Emphasis on Public Acceptability" *Applied Energy* 70 (2001): 157-167 at 160.

In 1999, MOE released a technical document on the environmental and human health risks of incineration, *Environmental Risks of Municipal Non-Hazardous Waste Landfilling and Incineration – Technical Report Summary*.[72] The ministry researchers found that:

- No significant human health effects (those being cancer, lung disease, nerve damage or reproductive effects) are likely in a typical suburban community located near an incinerator or a landfill. Under certain conditions, nuisance problems linked to malodorous compounds may affect air quality close to a landfill.
- An ecological risk assessment predicts that water and sediment quality near an incinerator or landfill will meet Ministry guidelines for the protection of aquatic life.
- Direct or indirect impacts to the terrestrial environment, vegetation or wildlife resulting from incinerator or landfill emissions are not anticipated to be significant. The main differences in terrestrial impacts between the two waste disposal methods relate to the amount of land used and to the production of nitrogen oxides.[73]

However, concerns do remain about the health effects of emissions from waste incinerators. In a 2000 publication, the U.S. National Research Council studied these effects and made recommendations on further study. The Council's Committee on Health Effects of Waste Incineration addressed the risks posed by waste incineration processes and emissions. The study found that waste incinerators could be designed and operated to achieve almost total combustion of the combustible portion of waste, and to emit low levels of the pollutants of concern under normal operating conditions, but that all types of incinerators experienced abnormal conditions, for example during start-up and shutdown, that might produce short-term emissions greater than those produced during regular operating conditions. Emissions data are usually collected from incinerators during a small percentage of the number of operating hours and do not include data from abnormal conditions. The Committee recommended that more emissions data be collected during such conditions, especially for dioxins and furans, heavy metals and particulate matter.[74]

The study also notes that while emissions from incinerators may be smaller than emissions from other sources, incinerator emissions should be assessed in the context of total ambient concentrations of pollutants in a given area because, where ambient concentrations are already near or above environmental standards, even small increments may be significant. The Committee's report also contains recommendations on how to design epidemiological studies to best assess the health effects of incinerators.[75]

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[72] This report, produced by the Environmental Sciences and Standards Division, advanced MOE's position that "both landfilling and incineration options be available for consideration so that a municipality or other proponent can develop the best environmental solution for its locality.": MOE, *Environmental Risks of Municipal Non-Hazardous Waste Landfilling and Incineration – Technical Report Summary*, July 1999 at ii: http://www.ene.gov.on.ca/envision/techdocs/3795e01.pdf:

[73] *Ibid*. at ii.

[74] National Research Council (U.S.), Committee on Health Effects of Waste Incineration, *Waste incineration & public health* (National Academy Press, 2000), Executive Summary.

[75] *Ibid*.

In 2005, the British Society for Ecological Medicine released its report on the Health Effects of Waste Incinerators. This report drew a number of conclusions suggesting that even incinerators employing more modern technologies may have adverse health effects, including the following:

- Large studies have shown higher rates of adult and childhood cancer and also birth defects around municipal waste incinerators: the results are consistent with the associations being causal. A number of smaller epidemiological studies support this interpretation and suggest that the range of illnesses produced by incinerators may be much wider.
- Incinerator emissions are a major source of fine particulates, of toxic metals and of more than 200 organic chemicals, including known carcinogens, mutagens, and hormone disrupters. Emissions also contain other unidentified compounds whose potential for harm is as yet unknown, as was once the case with dioxins. Since the nature of waste is continually changing, so is the chemical nature of the incinerator emissions and therefore the potential for adverse health effects. A March 2006 report by the BC Lung Association found that even relatively low levels of fine particles (2.5 microns and smaller) have the potential to affect human health.[76]
- Present safety measures are designed to avoid acute toxic effects in the immediate neighbourhood, but ignore the fact that many of the pollutants bioaccumulate, can enter the food chain[77] and can cause chronic illnesses over time and over a much wider geographical area. No official attempts have been made to assess the effects of emissions on long-term health.
- Incinerators produce bottom and fly ash that represent 30-50% by volume of the original waste (if compacted), requiring transportation to landfill sites. Abatement equipment in modern incinerators merely transfers the toxic load, notably that of dioxins and heavy metals, from airborne emissions to the fly ash. This fly ash is light, readily windborne and mostly of low particle size. It represents a considerable and poorly understood health hazard.[78]

These studies offer many contradictions and leave a number of uncertainties about the health effects of these technologies. Prior to introducing more incinerators in Ontario we would need to be sure that technologies have improved and don't offer undue risks to human and environmental health. The MOE should again review the health implications of these technologies to update its 1999 assessment.

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[76] BC Lung Association, News release, *Newly Released Air Quality Report Proposes New Targets to Protect Air Quality and Human Health*, March 29, 2006: http://www.bc.lung.ca/mediaroom/news_releases/nr_4_2006.html.

[77] For example, a toxic substance such as mercury accumulates in the food chain, meaning that large predatory fish species will have higher levels than non-predatory fish or species that are at lower levels in the food chain: Canadian Food Inspection Agency, *Food Safety Facts on Mercury and Food Consumption*, May 2002: http://www.inspection.gc.ca/english/fssa/concen/specif/mercurye.shtml.

[78] 4th Report of the British Society for Ecological Medicine, *The Health Effects of Waste Incinerators*, December 2005, Executive Summary: http://www.ecomed.org.uk/content/IncineratorReport.pdf?PHPSESSID=8d359a4f8276791628deaf7397b2389b.

Comparing Relative Emission Levels of Various Waste Management Technologies

It is useful to compare the relative emissions of different forms of waste treatment and disposal. A recent study undertaken for the UK National Society for Clean Air and Environmental Protection looked at "the nature and quantity of emissions to air generated from…municipal solid waste…subjected to a range of combustion and non combustion waste treatment and disposal processes."[79]

Although the results of such a study in Ontario might be different, some of the conclusions drawn front this study about the relative emissions of these processes for municipal solid waste in the UK are interesting:

- Incineration and pyrolysis/gasification lead to higher emissions of nitrogen oxides than arise from landfill particularly where the landfill gas is flared;
- Emissions of dioxins and furans derived from flare measurements (for landfill) are considerably higher than those for other disposal options. In contrast, emissions from anaerobic digestion are low and those from the small-scale combustion plant burning pre-sorted waste are very low;
- Emissions for pyrolysis and gasification systems are similar to those predicted for incineration for most substances. The most notable exception to this is sulphur dioxide, where the values predicted for pyrolysis/gasification seem unexpectedly high;
- Emissions of the two dominant greenhouse gases (carbon dioxide and methane) show contrasting levels. Methane emissions are highest for landfills than any other option for which data was available. Carbon dioxide emissions are highest for incineration;
- There is no significant difference in emissions of particulates from the different options. Emissions from the small-scale incineration process and landfill/flaring scenario may be slightly lower than from the other options considered;
- Emissions of cadmium are highest for landfill and pyrolysis/gasification, emissions of nickel and arsenic are highest for pyrolysis/gasification;

[79] In particular, the report examined predicted air emissions per tonne of waste from: Incineration, derived from site measurements from operational data that best reflect actual current emissions from incineration plants; Incineration, derived from predictions calculated using the Environment Agency's Life Cycle Assessment (LCA) Tool, WISARD, a predictive tool which produces an estimate for a particular type of source (such as a 'typical' incinerator). It predicts values that are a function of complex assumptions and relationships between the inputs to WISARD (waste composition) and outputs (emissions to air, water and land) and therefore have an associated uncertainty; Landfill based on 75% energy utilisation, 25% fugitive release derived from site measurements; Landfill using energy utilisation, derived from predictions using the LCA tool; Landfill based on 75% flaring, 25% fugitive release derived from site measurements; Landfill using flaring, derived from predictions using the LCA tool. Values presented are the mean of estimates provided for the two types of landfill considered; Anaerobic Digestion; Pyrolysis/Gasification; and Transportation. It should be noted that detailed information on the composition of waste giving rise to the measured emissions used in this study was not available, and that the input composition of the waste would influence the nature of emissions: National Society for Clean Air and Environmental Protection, *Comparison of Emissions from Waste Management Options*, June 2002 at 5, 25, 29: http://www.nsca.org.uk/assets/EFWEA%20full%20report.pdf.

- Large discrepancies exist between values predicted using the LCA tool and those derived from measurements. A detailed comparison of WISARD[80] predictions with estimated data based on measurements lies outside the scope of this study; however such a study would prove extremely relevant, given the extensive use made of WISARD in evaluating and comparing municipal waste management options; and
- There are a large number of substances for which little data is available for most of the management options considered.[81]

The report notes that emissions data availability and quality was quite varied for the different disposal and treatment processes and substances studied, concluding that there are: 'headline' substances for which data are quite available (nitrogen oxides, particulates, sulphur oxides, hydrogen chloride, hydrogen fluoride, total VOCs, metals, dioxins and furans); substances for which limited but patchy data is available (individual VOC substances); and substances for which very little or no data is available (PCB emissions and carbon dioxide).[82] The report observes that "data coverage is poorest for emerging technologies, and those without an extensive track record of commercial and large scale operation in the UK – for example, anaerobic digestion and composting."[83]

Waste Incineration versus Landfill

Overall, the relative advantages and disadvantages of incineration in relation to landfill may be summarized as follows:

Main Advantages of Waste Incineration over Landfill

- If the public is confident about the safety of new incineration technologies there may be less opposition to locating an incineration plant near central residential areas than there would be to a landfill close by. This would lead to lower waste transportation costs.
- While incineration produces relatively inert ash that must be sent for landfill, the ash will take up only10% of the volume that would have been required for the waste had no incineration taken place.[84]

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[80] A predictive tool which produces an estimate for a particular type of source (such as a 'typical' incinerator).

[81] *Ibid*. at 29.

[82] *Ibid*. at 31.

[83] The report also suggests areas for future research: measurements of emissions to air from composting and anaerobic digestion facilities; measurements of emissions to air from pyrolysis/gasification and small-scale combustion facilities with pre-sorting; measurements of emissions to air of PCBs across the range of disposal and treatment options; measurements of emissions of greenhouse gases across the range of disposal and treatment options; recording the tonnage throughput of waste received at all facilities when measurements are being taken; measurements of the composition of waste received at all facilities; investigation of the factors affecting releases of micro-organisms; and compilation of a mass balance for waste management facilities to extend information to consider materials inputs and output routes, including disposal of residues and product streams such as re-use of incinerator ash in road building, or use of compost in agriculture: *ibid*. at 31.

[84] Williams, Paul. *Waste Treatment and Disposal.* New York: John Wiley and Sons, 2005 at 326

- Reduces reactivity by the near complete destruction of organic compounds.[85]
- Allows for energy generation by heat recovery.[86]
- The waste reduction is immediate and not dependent on long-term biological reactions.[87]
- Air discharges can be controlled to meet environmental regulations.[88]

Main Disadvantages of Incineration over Landfill

- Heavy metals can be released into the environment.[89]
- Air pollutants NO_X, SO_2 are produced.[90]
- Some materials should not be incinerated because they are more valuable for recycling, they are non-combustible or their by products may give rise to harmful emissions.[91]
- Incinerators have high capital costs and moderately high operating costs, relative to landfills.[92]
- Supplementary fuel is often required.[93]
- Incinerators do not produce biogas fuel that may be captured, as a landfill does.[94] However, biogas capture from landfill is not necessarily economical.[95]

This section has offered a general overview of incineration technologies, their disputed health effects, and how these processes compare to landfilling. A major challenge that exists is that the

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[85] S. Abanades, et al. "Fate of Heavy Metals during Municipal Solid Waste Incineration" *Waste Management and Research* 20 (2002): 55-68 at 55.

[86] S. Abanades, et al. "Fate of Heavy Metals during Municipal Solid Waste Incineration" *Waste Management and Research* 20 (2002): 55-68 at 55.

[87] McKay, Gordon. "Dioxin Characterisation, formation and minimisation during municipal solid waste (MSW) incineration: review" *Chemical Engineering Journal* 86 (2002): 343-368 at 344.

[88] *Ibid*.

[89] S. Abanades, et al. "Fate of Heavy Metals during Municipal Solid Waste Incineration" *Waste Management and Research* 20 (2002): 55-68 at 56.

[90] Eshet, Tzipi, et al. "A Critical Review of Economic Valuation Studies of Externalities from Incineration and Landfilling" *Waste Management and Research* 23 (2005): 487-504 at 488.

[91] McKay, Gordon. "Dioxin Characterisation, formation and minimisation during municipal solid waste (MSW) incineration: review" *Chemical Engineering Journal* 86 (2002): 343-368 at 344.

[92] *Ibid*.

[93] *Ibid*.

[94] Eshet, Tzipi, et al. "A Critical Review of Economic Valuation Studies of Externalities from Incineration and Landfilling" *Waste Management and Research* 23 (2005): 487-504 at 488.

[95] Hamer, Geoffrey. "Solid Waste Treatment and Disposal: Effects on Public Health and Environmental Safety" *Biotechnology Advances* 22 (2003): 71-79 at 72.

science is still not completely understood; there is little certainty about how much these technologies have improved and there is an incomplete understanding in the first place of how incineration technologies, new and old, impact human health. While it is difficult to develop regulation with such unknowns, policy makers must develop an appropriate regulatory regime that minimizes risks and provides a framework for appropriate waste management. The current and potential policy arena to control incineration will be discussed in the following chapters.

4. The Current Regulatory Regime for Incineration in Ontario and Proposed Regulatory Initiatives

This paper discussed earlier the debate in Ontario that surrounds the use of incineration for MSW and that it has been a difficult and polarized issue. Although incineration technologies were once considered unacceptable, they are now being re-evaluated in light of potential improvements to the technologies and ever-increasing concerns about how to deal with waste, and particularly MSW, in the province. Ontario municipalities are being required to make decisions about incineration and other technologies without, as we shall see, a comprehensive provincial waste management framework in place to guide approvals.

A number of different laws, regulations and policies are in place to regulate the incineration of hazardous and municipal solid waste in Ontario at the present time. This section gives a brief overview of them and describes proposed initiatives that the province is considering.

Environmental Protection Act and Related Regulations and Policies

The Ministry of the Environment administers waste management under the Part V of the *Environmental Protection Act* (*EPA*), which prohibits the establishment or operation of a waste management system or waste disposal site without a certificate of approval issued by the ministry.[96] MOE may suspend or revoke certificates of approval, and may impose terms and conditions in certificates of approval.[97] Waste incinerators are treated as final disposal sites and therefore subject to the normal approvals process. This includes EFW facilities that receive off-site wastes. Incineration sites that receive hazardous and liquid industrial wastes or municipal or solid non-hazardous waste in excess of 100 tonnes per day are subject to approval under s. 9 of the *EPA* for discharges to the air, and under s. 27 for a waste management system or waste disposal site and s. 30 for a waste disposal site for the disposal of hauled liquid industrial waste or hazardous waste. Sites receiving less than 100 tonnes of solid non-hazardous waste each day are required to obtain approvals under s. 9 for discharge to air, s. 27 and 32 (for a certificate of approval for a waste management system or waste disposal site other than those caught be s. 30).[98] An application for a certificate of approval under s. 30 of the *EPA* requires that an Environmental Review Tribunal hearing be held while a hearing is discretionary under s. 32.[99] However, MOE may choose to exempt a facility by regulation from the s. 30 hearing requirement and has done so in the case of Plasco Energy Group demonstration project, and landfills subject to an EA process.[100]

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[96] R.S.O. 1990, c. E.19, ss. 27(1).

[97] *Ibid* at s. 39.

[98] Environmental Assessment and Approvals Branch, Ministry of the Environment, *Guide for Applying for Approval of Waste Disposal Sites*, November 1999 at 30: http://www.ene.gov.on.ca/envision/gp/4183e.pdf.

[99] R.S.O. 1990, c. E.19, s. 30, 32.

[100] For example, see O. Reg. 253/06 made under the *Environmental Assessment Act*.

Reg. 347[101] under the *EPA* is a general regulation concerning waste management. It regulates the incineration of both municipal solid waste and hazardous waste. As noted above, new MSW incinerators were banned in Ontario from 1992 to 1995 under Reg. 347.[102] Reg. 347 prescribes general standards that apply to the location, maintenance and operation of incineration sites. These standards have not been revised since the regulation was last consolidated in 1990. The standards set out a number of broad requirements, including: location of the incineration site to reduce the effects of nuisances such as dust, noise and traffic; separation and separate disposal of incinerator ash from fly-ash that is hazardous waste; location of the incinerator so that it is accessible for waste transportation without nuisance, and services and utilities required for the operation of the incinerator are available; and design and capacity of the incinerator adequate to efficiently process expected quantities of waste so that a minimum volume of residue is obtained and a minimum of air pollution results.[103] An exemption to these requirements is provided; on-site incinerators are exempt as long as no hazardous waste or liquid industrial waste is incinerated in them.[104]

The most significant MOE policy document governing the incineration of municipal solid waste is the *Guideline A-7 – Combustion and Air Pollution Control Requirements for New Municipal Waste Incinerators*, developed in 1996 with minor subsequent revisions.[105] Guideline A-7 was intended to apply to new incinerators designed to burn municipal waste, whether publicly or privately owned, and to existing incinerators being expanded or modified. MOE also intended that it might in future be applied to existing incinerators that had not been expanded or modified. The guideline is to be applied through conditions imposed on certificates of approval issued under s. 9 and s. 27 of the *EPA*.[106]

Guideline A-7 establishes minimum design and operating parameters, emission control systems and emission limits to ensure the control of emissions to the atmosphere from municipal waste incinerators of different sizes in Ontario.[107] It is stated in the guideline that the requirements specified in it are additional to those in Reg. 346[108] governing air pollution. Guideline A-7 sets out emission limits for dioxins and furans, cadmium, lead, mercury, particulate matter and acid gases that are technology based; dioxin and furan limits are established according to the Lowest Achievable Emission Rate principle and other limits are developed using the maximum

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[101] R.R.O. 1990.

[102] O. Reg. 555/92 amending Reg. 347 made under the *Environmental Protection Act*, R.R.O. 1990.

[103] Reg. 347, R.R.O. 1990 at s. 12.

[104] *Ibid* at ss. 28(1).

[105] MOE, *Guideline A-7 – Combustion and Air Pollution Control Requirements for New Municipal Waste Incinerators*, February 2004: http://www.ene.gov.on.ca/envision/gp/1746e.pdf.

[106] *Ibid*. at ii.

[107] *Ibid*. at 2.

[108] R.R.O. 1990.

achievable control technology principle.[109] There is a similar guideline for biomedical waste incinerators, but no comparable guideline for hazardous waste incinerators.[110]

Another MOE policy, Guideline A-8, introduced in 2004, provides guidance for the implementation of Canada-wide standards for mercury, dioxin and furan emissions, and monitoring and reporting requirements for municipal waste incinerators and hazardous waste incinerators. This guideline applies to new and existing incinerators and requires that all new incinerators be able to show compliance with mercury, dioxin and furan limits within six months of starting up.[111]

Environmental Assessment Act

In addition to satisfying the requirements of the *EPA* and regulations and policies made under it, a proposal for a new incinerator would also be subject to the *Environmental Assessment Act* (*EAA*).[112] The *EAA* provides for environmental assessment of public sector undertakings generally, and specific private undertakings that are designated under the Act. The public may request that a private sector activity such as a waste project be designated by regulation under the *EAA*.[113] When this is done, the project is exempt from the mandatory hearing required under the *EPA*. In preparing an environmental assessment (EA) for a proposed waste project, the proponent typically must include a description of the purpose of the undertaking and the rationale for the undertaking, as well as the alternative methods of carrying out the undertaking, and the alternatives to the undertaking. The EA also considers any environmental impacts of these various options and evaluates the advantages and disadvantages to the environment of the undertaking, the alternative methods of carrying out the undertaking and the alternatives to the undertaking.[114]

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[109] MOE, *Guideline A-7 – Combustion and Air Pollution Control Requirements for New Municipal Waste Incinerators*, February 2004.

[110] Ontario Ministry of the Environment, Guideline C-4 (formerly 14-05) – *The Management of Biomedical Waste in Ontario*, April 1994: http://www.ene.gov.on.ca/envision/gp/425e.pdf

[111] MOE, Guideline A-8 – *Guideline for the Implementation of Canada-wide Standards for Emissions of Mercury and of Dioxins and Furans and Monitoring and Reporting Requirements for Municipal Waste Incinerators, Biomedical Waste Incinerators, Sewage Sludge Incinerators, Hazardous Waste Incinerators, Steel Manufacturing Electric Arc Furnaces, Iron Sintering Plants*, August 19, 2004: http://www.ene.gov.on.ca/envision/gp/4450e.htm. The Canada-wide standards applicable to waste incineration came under review in 2006. In a scoping analysis conducted to prepare for the 2006 review, the Canadian Council of Ministers of Environment (CCME) noted that modern waste incinerator plants have combined different air pollution control technologies to achieve good overall removal of atmospheric pollutants, and a detailed review of the diverse technology combinations currently used and the related performance should be undertaken. The CCME also observed that some of the new air pollution control technologies may create additional waste streams requiring treatment prior to disposal, and that only limited information is publicly available in Canada on current flue gas treatment and residuals, or fly ash, treatment for waste incinerators: http://www.ccme.ca/assets/pdf/df_reviews_decisions_fnl.pdf.

[112] R.S.O. 1990, c. E.19.

[113] *Ibid* at s. 3, 5; MOE, *Green Facts: Environmental Assessment in Ontario* (April 2005) at 2.

[114] *Ibid* at s. 6.1.

The *EAA* also contains specific provisions that apply to the final disposal of municipal waste. Municipalities are required to obtain approval under the *EAA* before proceeding with an undertaking where the municipality enters into contracts or makes other arrangements to use the facilities or services of another party for the final disposal of waste by depositing it at a dump, landfilling or incineration.[115] These provisions specific to municipal waste were added to the *EAA* in 1996.

As stated above a number of municipalities are in the process of conducting environmental assessments under the *EAA* in relation to municipal waste disposal.

Facilitating Waste Recycling and New and Emerging Waste Management Technologies

More recently, the Ontario Ministry of the Environment invited public input on proposed regulatory amendments to facilitate waste recycling and the use of new and emerging waste management technologies. According to the public notice of this proposal on the Environmental Registry, the Ministry is proposing to amend Regulation 347 under the *EPA* to facilitate a streamlined waste approvals process for pilot and demonstration sites to test new and emerging waste management technologies, such as those typically referred to as EFW technologies. Under this proposal, hearings for pilot and demonstration projects would be discretionary rather than mandatory. MOE is also proposing regulatory amendments that would exempt pilot and demonstration sites from the *EAA*, although they would continue to require approval under the Part V and other requirements of the *EPA*. The proposed amendments to Reg. 347 would limit the exemption to projects with a maximum capacity of 75 tonnes per day of municipal waste and would set a time limit of three years for a project, with the possibility of applying for an extension of two further years. Applicants would have to indicate their desire to follow the alternative approvals process.[116]

The Ministry's rationale for proposing these regulatory amendments is to assist proponents wishing to construct and operate pilot or demonstration facilities in order to obtain necessary information, confirm information from other jurisdictions or show that technology will be effective and efficient in the Ontario context. Although new and emerging waste management technologies such as EFW technologies may be operating in other jurisdictions, these facilities tend to be small in scale and not yet proven for use with municipal waste. Also, environmental data from other jurisdictions may not adequately address all contaminants or concerns in Ontario. Because Ontario's existing approvals process applies equally to proven full-scale operations and unproven pilot or demonstration technologies, proponents may be discouraged from testing and development of emerging technologies.[117] This regulation is intended to allow proponents to use pilot and demonstration facilities to confirm equipment performance and produce the data needed to obtain more rigorous environmental approvals and technology acceptance. However, the proposal was strongly opposed by groups who argued the provincial government was "attempting

[115] *Ibid* at s. 17.1.

[116] See Environmental Registry proposal notice RA06E0008: www.ebr.gov.on.ca.

[117] *Ibid.*

to sidestep much-needed public consultation on these issues and that recently proposed regulatory changes would seriously undermine current recycling and waste diversion programs."[118] On March 23, 2007, the Ministry of the Environment announced that these regulatory amendments had been finalized.[119]

New Environmental Assessment Process for Waste Management

In December 2006, the Ministry of the Environment announced a proposed regulation that would introduce new environmental assessment process requirements for certain waste management sites that would apply equally to both public and private sector waste proposals.[120] Under the proposal, waste projects would fall into one of the following three process streams:

1. Projects with minimal environmental effects that do not require approval under the *EAA*. These would include:

- transfer, handling and composting facilities processing 1,000 tonnes of waste or less per day;
- industrial, commercial or manufacturing facilities using energy from waste in their process if using less than 100 tonnes of waste per day; and
- landfills smaller than 40,000 cubic metres.

2. Projects that have predictable environmental effects that can be readily mitigated would undergo an environmental screening process. These would include:

- transfer, handling and composting facilities processing more than 1,000 tonnes of waste per day;
- landfills or landfill expansions with total disposal volume of between 40,000 and 100,000 cubic metres;
- incineration facilities with energy from waste component; and
- incineration facilities without an energy-from-waste component if disposing of 10 tonnes of waste or less per day.

3. Projects with the potential for significant environmental impacts will require an individual environmental assessment. These would include:

- final disposal of liquid industrial or hazardous wastes;

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[118] Correspondence to Adam Ciulini, Ministry of the Environment from Sierra Legal Defence Fund et al., September 18, 2006: http://www.sierralegal.org/issue/ON.waste.EBR-sept2006.pdf

[119] See Environmental Registry decision notice RA06E0008: www.ebr.gov.on.ca; Ministry of the Environment News Release, *Province's New Rules Help Municipalities Manage Waste Better*, March 23, 2007: http://www.ene.gov.on.ca/envision/news/2007/032301.htm; see also O. Reg. 102/07, O. Reg. 103/07, O. Reg. 104/07 and consequential amendments.

[120] MOE News Release, *Province Proposes New Rules for Managing Waste More Effectively*, December 7, 2006: http://www.ene.gov.on.ca/envision/news/2006/120701.htm.

- large landfills with a total waste disposal volume of more than 100,000 cubic metres; and
- incinerators without an energy from waste component disposing of more than 10 tonnes of waste per day.[121]

Where warranted, projects requiring an environmental screening process could be elevated to an individual environmental assessment. Waste projects would also remain subject to other applicable legislation such as the *EPA*.[122] On December 7, 2006, the public was given notice and the opportunity to comment for 90 days.[123] On March 23, 2007, the Ministry of the Environment announced that this new regulation had been finalized, with some changes to the original proposal.[124]

Considering a Ban on Incineration of Tires

Also in December 2006, MOE approved a controversial proposal to allow tire incineration,[125] and at the same time announced a proposed regulation that would ban the incineration of tires for a 24 month period to permit the collection of information to confirm the environmental performance of facilities that use tires as fuel. If MOE does introduce the ban, no new approvals would be issued for the incineration of tires until the information has been collected, but the ban would not apply to any facility that already has approval to incinerate tires prior to the ban coming into effect.[126]

Impact of Regulatory Initiatives on Use of Incineration

As discussed above there are a number of regulations in place that determine appropriate assessment, ways of operating, and standards for incineration processes. The government's recent actions to encourage new and emerging technologies, through the proposed new environmental assessment process requirements and other ways now being proposed to make it easier to get approval for EFW projects, suggest that they support the exploration and use of these processes where the technologies can be successfully transferred to the Ontario context. This position is not exactly surprising; the current Liberal government has been facing increasing criticism about Ontario's waste and energy crises; the province has experienced landfill siting challenges, as discussed earlier, in addition to electricity shortages with the threat of more to come as a result of

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[121] MOE Backgrounder, *Improving the Environmental Assessment Process*, December 7, 2006: http://www.ene.gov.on.ca/envision/news/2006/120701mb.htm.

[122] *Ibid*.

[123] See Environmental Registry proposal notice RA06E0018: www.ebr.gov.on.ca.

[124] See Environmental Registry decision notice RA06E0018: www.ebr.gov.on.ca; Ministry of the Environment News Release, *Province's New Rules Help Municipalities Manage Waste Better*, March 23, 2007: http://www.ene.gov.on.ca/envision/news/2007/032301.htm; see also O. Reg. 101/07.

[125] MOE News Release, *Province Imposes Strict Conditions on Lafarge for Testing of Used Tires as Fuel*, December 21, 2006: http://www.ene.gov.on.ca/envision/news/2006/122101.pdf.

[126] See Environmental Registry proposal notice RA06E0024: www.ebr.gov.on.ca.

a lack of electricity capacity to meet current demand. The government is obviously seeking to encourage innovative solutions to these challenges and the promise of combining waste disposal capacity with energy production is a very enticing option.

A major concern with this direction, however, is that in its rush to find solutions to immediate problems the government of Ontario is encouraging incineration technologies without a strong legal foundation to lay out the role that incineration should play in solid waste management in Ontario. Rather than discussing the merits and shortfalls of the legal instruments that regulate how incineration takes place we need to first examine the larger framework for solid waste management and how it could provide a stronger foundation upon which to assess whether incineration should be an option for Ontario. This will be explored in the following chapter.

5. Incineration within the Context of Waste Management and the Need for a Comprehensive Waste Management Framework

The following section presents the legal context that currently regulates waste management in Ontario.

Waste Diversion Act

Ontario's *Waste Diversion Act* (*WDA*)[127] is a law enacted to promote the reduction, reuse and recycling of waste and to provide for extended producer responsibility in the development, implementation and operation of waste diversion programs.[128] The *WDA* prohibits a waste diversion program developed under the Act from promoting the burning of waste designated for the purposes of the Act.[129] The following types of waste have been designated under the *WDA*: blue box waste materials (glass, metal, paper, plastic and textiles);[130] used tires;[131] used oil material;[132] waste electrical and electronic equipment, such as household appliances and computers.[133] In December 2006, MOE made a regulation that designated a number of hazardous and special wastes under the *WDA*.[134] In doing so, the Minister has asked Waste Diversion Ontario (WDO) to develop a new program for household hazardous and special wastes, including materials such as paint, household cleaners, fluorescent tubes, batteries and pharmaceuticals.[135]

The *WDA* established WDO and gave it responsibilities for developing, implementing and operating waste diversion programs and monitoring their effectiveness and efficiency.[136] However, WDO has faced obstacles in its attempts to initiate diversion programs for the other

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[127] S.O. 2002, c. 6.

[128] *Ibid* at s. 1.

[129] *Ibid* at ss. 25(2).

[130] O. Reg. 273/02 under the *Waste Diversion Act, 2002*.

[131] O. Reg. 84/03 under the *Waste Diversion Act, 2002*.

[132] O. Reg. 85/03 under the *Waste Diversion Act, 2002*. Although the designation regulation for used oil remains in place, the Minister of the Environment announced in April 2006 that MOE would include used oil containers and filters in its new household hazardous and special waste diversion program, and then ask WDO to cancel further development of the used oil program, based on the current used oil collection rate of about 78 per cent and the belief that energies and efforts should be focused elsewhere; MOE, Notes for remarks by the Honourable Laurel Broten, Minister of the Environment, New directions in waste management in Ontario, Waste Diversion Ontario Annual General Meeting, April 20, 2006: http://www.ene.gov.on.ca/envision/news/speeches/042006.htm.

[133] O. Reg. 393/04 under the *Waste Diversion Act, 2002*.

[134] O. Reg. 542/06 made under the *Waste Diversion Act, 2002*: http://www.ene.gov.on.ca/envision/land/wda/542-06.pdf.

[135] See Environmental Registry proposal notice RA06E0003: www.ebr.gov.on.ca.

[136] *Waste Diversion Act*, S.O. 2002, c. 6, s. 5.

wastes that have been designated. Despite the fact that several different types of wastes have been designated, only one waste diversion program has been established thus far, for blue box waste.[137]

60% Waste Diversion Goal

In June 2004, the Ministry of the Environment issued a discussion paper in order to seek stakeholder and public input on how to reach the Ontario government's goal of diverting 60% of its waste from disposal by the end of 2008.[138] This was intended to be an ambitious increase from Ontario's 2002 diversion rate of 28% in the residential and IC&I sectors.[139] The new Liberal government set this goal to fulfill a promise made in the 2003 provincial election. As of 2005, municipal waste diversion rates in the Greater Toronto Area in 2005 ranged from 31% to 40%.[140]

The 2004 discussion paper outlined a broad framework for improved waste management through greater diversion, proposing for the purposes of consultation a number of potential actions such as these:

- setting mandatory waste diversion targets for municipalities, and reviewing and more consistently enforcing diversion regulations governing the IC&I sectors;[141]
- implementing increased residential collection of organic waste and centralized composting in Ontario's larger municipalities;[142]
- making available and encouraging different financing options for the creation of new waste diversion programs and infrastructure;[143]
- review and revise O. Reg. 103/94 to ensure waste diversion in the IC&I sector; require large waste generators to report their waste diversion rates to the public;[144]
- introducing a phased-in ban on the disposal of key organics and recyclables;[145]
- streamlining the process for approvals under the *EPA*, and ensuring that small scale research and demonstration projects for new waste diversion technologies are not subject to the *EAA*;[146]

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[137] See http://www.wdo.ca/content/?path=page80+item32897 for more information on this program.

[138] MOE, *Ontario's 60% Waste Diversion Goal – A Discussion Paper*, June 10, 2004 at 1: http://www.ene.gov.on.ca/programs/4651e.pdf.

[139] *Ibid*. at 1.

[140] *Ibid*..

[141] *Ibid*. at 19.

[142] *Ibid*. at 21.

[143] *Ibid*. at 24.

[144] *Ibid*. at 25.

[145] *Ibid*. at 27.

[146] *Ibid*. at 28.

- improving programs to reduce packaging, increasing the recycled content of products in cooperation with other levels of government, and disseminating information about best practices in packaging reduction, reuse and recycling;[147]
- increasing public education on the 3Rs;[148]
- introducing a province-wide monitoring system for waste diversion and disposal.[149]

Following public meetings and submissions, MOE released a summary report on public input on how to achieve the goal of 60% waste diversion in Ontario.[150] The report reflected in detail a range of stakeholder and public views, and provided a summary of recurring themes arising during the consultation process. A primary recurring theme was the need for the province to show strong leadership in the 60% waste diversion initiative.[151]

Many participants in the consultation stressed that promoting public education and awareness would be critical to achieving higher rates of waste diversion. Many others believed that improved and transparent enforcement of government regulations, and particularly of existing regulations, would be necessary.[152]

In spite of this intensive public consultation effort in the summer of 2004, the government has not continued active work on its goal of achieving 60% diversion of waste. Although the discussion paper – *Ontario's 60% Waste Diversion Goal* – was posted as a proposal notice on the Environmental Registry on June 10, 2004,[153] MOE has never posted a decision notice in relation to the waste diversion policy goal, nor has it publicly issued a response to the public input received as a result of the consultation process. Some of the issues highlighted by participants in the 2004 consultation may have been addressed by MOE to some degree. For example, with respect to enforcement of existing regulations, MOE's Sector Compliance Branch began a sweep of inspections to determine how members of the IC&I sector are complying with 3Rs regulations in March 2006.[154]

In a recent fact sheet, MOE reported that municipal waste diversion rates in the Greater Toronto Area in 2005 were 40% for Toronto, 37% for Peel, 31% for York and 36% for Durham.[155] It is

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[147] *Ibid*. at 29.

[148] *Ibid*. at 29.

[149] *Ibid*. at 30.

[150] MOE, *Summary Report: Consultation Sessions on Achieving Ontario's 60% Waste Diversion Goal*, June 18 - July 30, 2004: http://www.ene.gov.on.ca/programs/4942e.pdf.

[151] *Ibid*. at 5.

[152] *Ibid*. at 7.

[153] Environmental Registry Notice #PA04E0037: www.ebr.gov.on.ca.

[154] MOE Fact Sheet, *How Ontario Manages Its Waste: The Basic Facts and Figures*, August 31, 2006: http://www.ene.gov.on.ca/envision/news/2006/083101.htm.

[155] *Ibid*..

clear that there is still a great deal of work needed to reach the 60% waste diversion target by 2008.

In his 2005/2006 annual report, the Environmental Commissioner of Ontario expressed concerns about how serious MOE was about meeting to 60% waste diversion goal:

> MOE's tardy follow-up to the 2004 Discussion paper will make [sic] very difficult for many municipalities and the IC&I sector to meet the 60 per cent goal. Most of the suggestions in the 2004 Paper relied on MOE – not municipalities nor the IC&I sector – to take the first step, which it did not take until two years later. The ECO continues to believe that a provincial waste management strategy that addresses both waste disposal and waste diversion for all waste is urgently required. The delays thus far may have already rendered the 60 per cent goal a pipe dream.[156]

Life Cycle Analysis

Life Cycle Analysis (LCA) involves examining the impact of a process throughout its entire lifetime, from the production phase to ultimate disposal; it also involves looking at the impacts of necessary but ancillary processes, for instance transportation that is required for landfilling and incineration. The National Society for Clean Air study, referred to in Section 3, used an LCA tool to predict relative emissions of incineration and landfilling. LCA has also been used to evaluate more broadly the environmental burdens associated with the various processes for the management and disposal of waste. A recent paper detailed studies that compared curbside recycling against either landfilling or incineration with energy recovery.[157] The studies showed that

> recycling has substantial benefits compared with disposal in terms of reducing energy consumption and environmental burdens imposed by methods used for managing solid wastes. Specifically, recycling compared with disposal reduces potential impacts of solid waste management activities on all public health and environmental impact categories examined – global warming, acidification, eutrophication, human health effects from criteria air pollutants, human toxicity, and ecological toxicity. This conclusion holds regardless of whether disposal is via landfill without LFG collection, landfill with LFG collection and flaring, landfill with LFG collection and energy recovery, incineration without energy recovery, or [EFW] incineration. For several environmental impact categories the net environmental benefits of recycling are reduced by [EFW] incineration as compared with landfilling, but the conclusion remains the same – recycling is environmentally preferable to disposal by a substantial margin.[158]

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[156] Environmental Commissioner of Ontario, *Neglecting our Obligations: Annual Report 2005-2006*, at 32-33: http://www.eco.on.ca/english/publicat/ar2005_en_report_01.pdf.

[157] Jeffrey Morris, "Comparative LCAs for Curbside Recycling Versus Either Landfilling or Incineration with Energy Recovery" *International Journal of Life Cycle Assessment* 2004 (Online) 2: http://www.zerowaste.com/graphs/rr/lca2004.09.180.10.pdf.

[158] *Ibid*. at 11.

It is obvious from this and other studies that diversion efforts must continue to be a priority whether or not Ontario expands its use of incineration.

Municipal Tools for Waste Management

In an MOE backgrounder released in August 2006, the Ministry outlined the various waste management tools it was attempting to provide to assist Ontario municipalities and industries to "increase the amount of waste they divert from disposal and [promote] home-grown solutions for waste."[159] These actions or proposed actions, some referred to above, include:

- streamlining the approvals process to allow municipalities and industry to recycle more waste materials;
- proposing to remove approvals requirements for the conversion of certain wastes into alternative fuels so they will be kept out of landfills;
- encouraging new waste technologies by simplifying the environmental assessment (EA) process for pilot or demonstration facilities that have potential to reduce waste volumes and recycle certain materials;
- improving the EA process so that it is more straightforward and enables major environmental infrastructure projects that have been well planned to proceed more quickly;
- directing WDO to develop diversion plans for household hazardous and special wastes, and electronics to increase recycling; and
- conducting field inspections of the IC&I sectors to encourage waste diversion and greater compliance.[160]

The rapid swings in policy during the 1990s have likely slowed momentum towards the development of good waste management policy. Despite today's current challenges, however, the province cannot simply respond to the crisis without mending the underlying policy issues. As noted above, stakeholders in the 2004 public consultation sessions on the 60% waste diversion initiative consistently emphasized the need for the province to show strong leadership in this area. Unfortunately the provincial government still views waste management as the responsibility of municipalities and industry and they are not yet taking a strong and focused leadership role. While the government may be working to provide tools for municipalities and industry to carry out this responsibility, there is no commitment on the part of the province to the development of a waste management strategy at a broad policy level that would ensure maximum diversion throughout Ontario.

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[159] MOE Backgrounder, *The Ontario/Michigan Waste Issue*, August 31, 2006: http://www.ene.gov.on.ca/envision/news/2006/083101mb.htm.

[160] *Ibid*.

The lack of a strategy to ensure that waste diversion efforts are prioritized over disposal methods underlies one of the significant concerns expressed by those who are wary of incineration technologies: that authorities will have little incentive to reduce waste, or divert it from landfill or incineration once these disposal methods provide sufficient capacity to manage the waste, and an immediate crisis of capacity is averted. In fact, the use of incineration could seriously undermine Ontario's waste diversion efforts because in order to maintain optimal combustion, incinerators need a guaranteed constant supply of waste.[161]

Life cycle analysis has shown that waste diversion consumes much less energy and causes a smaller environmental burden than incineration, landfilling, or other disposal methods. The provincial government must quickly take measures to ensure that incineration does not become a technical fix that ultimately leaves Ontario without a commitment to diversion and in worse shape over the long run. It is possible to create a legal framework that places emphasis on diversion efforts as a priority. The following chapter will illustrate how various European countries have emphasized diversion efforts within a larger policy strategy in an attempt to ensure that landfilling and incineration are only used for waste that is truly residual.

[161] Connett, P., and E. Connett. 1994. *Municipal waste incineration: Wrong question, wrong answer.* Ecologist 24(1): 14-20

6. Experience with Incineration in Europe

When proponents of modern incineration technologies advocate greater use of them in Canada, they frequently point to Europe as a model; European countries are recognized for their strong environmental record and yet many have embraced incineration as a method of waste management. What Canadian proponents fail to bring forward, however, is that these European countries have very different policy frameworks to guide how incineration is used in municipal solid waste management.

At present throughout Europe about 50 million tonnes per year, or 24%, of MSW is thermally treated in approximately 420 EFW plants.[162] A recent report indicated that almost every country in the European Union uses incineration to manage a certain amount of municipal waste, with the highest rates of incineration found in Denmark (54%), Sweden (45%), Luxembourg (41%), Belgium (35%), France (34%) and the Netherlands (32%).[163] It has been observed that a lack of fossil fuel resources and a large heat requirement due to cold climates spurred the development of EFW use in some Member EU states such as Denmark, Sweden and Austria.[164]

For instance Denmark, in the mid-1990s, began to focus on electricity generation to address carbon dioxide emissions so that "new and existing facilities are now obliged to recover both forms of energy, with national targets of ten and three percent for heat and electricity, respectively."[165] In Sweden as well, 15% of all heating is generated through waste through district heating systems that date back to the 1960s.[166]

EU Legislative Framework

Incineration is widely used in many European countries at least in part as a response to European Union legislation that placed strict limitations on the landfilling of waste. In 1999, the EU Council Landfill Directive was adopted with the objective

> to prevent or reduce as far as possible negative effects on the environment, in particular the pollution of surface water, groundwater, soil and air, and on the global environment, including the greenhouse effect, as well as any resulting risk

[162] Gerard Nieuwendijk, Confederation of European Waste-to-Energy Plants, *Waste-to-Energy in Europe*, RCO's Energy From Waste Forum, November 3, 2006 at 3: http://www.rco.on.ca/CEWEP.pdf.

[163] Institute for Public Policy Research and Green Alliance, *A Zero Waste UK*, November 2006 at 18.

[164] The Chartered Institution of Wastes Management, *Delivering Key Waste Management Infrastructure: Lessons Learned from Europe – Final Report*, November 2005 at i: http://www.ciwm.co.uk/mediastore/FILES/12134.pdf.

[165] *Ibid*. at 14: Indeed, EFW has commonly been used for district heating as well as electricity generation in Europe. For example, Danish households have used district heating since the 1960s. This method of heating was originally fueled by oil but many systems now depend on EFW as a year-round source of fuel in colder regions.

[166] *Ibid*. at 48.

> to human health, from the landfilling of waste, during the whole life-cycle of the landfill.[167]

The Landfill Directive requires Member states to create a national strategy to reduce the amount of biodegradable municipal waste going to landfills and puts in place demanding targets for achieving this. These targets would reduce the amount of biodegradable municipal waste being landfilled to: 75% of the amount produced in 1995 by 2010; 50% of that produced in 1995 by 2013; and 35% of that produced in 1995 by 2020.[168]

In 2000, the EU Council adopted a Directive on the Incineration of Waste to prevent or limit as much as possible the negative effects of waste incineration on the environment of pollution from emissions into the air, soil, surface water and groundwater that result in risks to human health. The Incineration Directive aims to accomplish this by implementing stringent operational conditions and technical requirements by setting emission limits for waste incineration and co-incineration plants in the European Community.[169] The Directive sets out specific requirements for incineration plants in Europe, relating to: applications and permits; delivery and reception of waste; operating conditions; air emission limit values; waste water discharges from the cleaning of exhaust gases; handling of residues; control and monitoring; measurement of pollutants; access to information and public participation; and abnormal operating conditions.[170]

The EU also adopted a directive specific to the incineration of hazardous waste in 1994 with an objective of reducing negative effects of hazardous waste incineration on the environment, and in particular the pollution of air, soil, surface and groundwater, and of reducing the resulting risks to human health. Like the directive on municipal waste, the Hazardous Waste Directive sets out appropriate operating conditions and emission limit values for hazardous waste incineration plants within the Community.[171]

Although incineration is commonly used in Europe, it is important to recognize that the waste management policy context in Europe is very different from that in Ontario. For many years,

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[167] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (OJ L 182, 16.7.1999, p. 1–19), at Art. 1.1: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31999L0031:EN:NOT.

[168] *Ibid.* at Art. 5; see also http://www.defra.gov.uk/environment/waste/topics/landfill-dir/pdf/landfilldir.pdf and http://www.foe.co.uk/resource/factsheets/eu_landfill_directive.pdf. Under the Directive, Member States must ensure that operating permits are obtained for landfill sites, and that applicants provide specific information, including proposed methods for pollution prevention and abatement and, in the case of certain public and private projects, an impact assessment study of the effects on the environment. Member States are required to make sure that all landfill projects for which permits are issued comply with all relevant requirements included in the Landfill Directive. The Directive also provides that Member States must ensure that existing landfill sites do not continue to operate unless they come into compliance with the provisions of the Directive as soon as possible.

[169] Council Directive 2000/76/EC of 4 December 2000 on the incineration of waste (OJ L 332, 28.12.2000, p. 91), at Art. 1: http://europa.eu.int/eur-lex/en/consleg/pdf/2000/en_2000L0076_do_001.pdf.

[170] *Ibid*. at Art. 4-13 and annexes. A review of the Ontario government's Guidelines A-7 and A-8 in light of current regulatory standards in the EU would be very useful.

[171] Council Directive 94/67/EC of 16 December 1994 on the incineration of hazardous waste (OJ L 365, 31.12.1994, p. 34–45) at Art. 1: http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1994/L/01994L0067-20031120-en.pdf.

European waste management policy has been based on the notion of a waste hierarchy. In its 1975 Waste Framework Directive, the EU Council required that Member States take steps to encourage the prevention, recycling and processing of waste, including the extraction of raw materials and possibly of energy, as well as any other process for the re-use of waste.[172] This directive was revised by a 1991 amendment that clearly stated the hierarchy that Member States are required to follow in managing waste:

> Member States shall take appropriate measures to encourage:
>
> (a) firstly, the prevention or reduction of waste production and its harmfulness, in particular by:
>
> - the development of clean technologies more sparing in their use of natural resources,
> - the technical development and marketing of products designed so as to make no contribution or to make the smallest possible contribution, by the nature of their manufacture, use or final disposal, to increasing the amount or harmfulness of waste and pollution hazards,
> - the development of appropriate techniques for the final disposal of dangerous substances contained in waste destined for recovery;
>
> (b) secondly:
>
> (i) the recovery of waste by means of recycling, re-use or reclamation or any other process with a view to extracting secondary raw materials, or
>
> (ii) the use of waste as a source of energy.[173]

This concept of a waste hierarchy has since been incorporated into the waste management policies of member states in the EU. The waste hierarchy prioritizes the options available for waste management:

Prevent the waste in the first place *Best option*

⇓

Re-use the product

⇓

Recycle or compost the material

⇓

Recover the energy (by incinerating)

⇓

Dispose of the product (in a landfill) *Worst option*[174]

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[172] Council Directive 75/442/EEC of 15 July 1975 on waste (OJ L 194, 25.7.1975, p. 47–49) at Art. 3: http://www.europa.eu.int/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&lg=en&type_doc=Directive&an_doc=1975&nu_doc=442.

[173] Council Directive 91/156/EEC of 18 March 1991 amending Directive 75/442/EEC on waste (L 078, 26/03/1991 p. 32-37) at Art. 3: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991L0156:EN:HTML.

[174] European Commission, *The Story Behind the Strategy – EU Waste Policy*: http://ec.europa.eu/environment/waste/pdf/story_book.pdf.

The primacy given to waste reduction in Europe has led to much stricter measures on packaging and packaging waste, and a strong focus on extended producer responsibility. In 1994, the EU Council adopted a directive on packaging and packaging waste. See Appendix C – (European Directive on Packaging and Packaging Waste) for more information about this directive. Since adopting it the EU Council has continued to strengthen waste management policies in the Community. For example, a 1997 Council resolution articulated a Community strategy for waste management that, among other things, recognized that, despite efforts made to contain it, waste generation had continued to grow and reconfirmed the need, in the interest of environmental protection, for a comprehensive waste policy in the Community in order to ensure environmental protection.[175]

The EU Community continues to discuss and refine its waste management policy and is currently considering revisions to the 1975 Waste Framework Directive that would adopt a new strategy on the prevention and recycling of waste.[176] Introduced in 2005, the Environment Committee of the European Parliament adopted a number of amendments to the draft revision of the framework directive in November 2006.[177]

The Sweden Example

In Ontario, Sweden is often cited as an example to be followed. For example, a recent media article in the Toronto Star featured Malmo, a Swedish city with a population of 500,000 that is a partial owner of an incineration plant that provides heat for 40% of Malmo homes and 40% of local power. The article argues that this type of incineration facility is feasible as part of the redevelopment of Toronto's waterfront.[178] In considering Sweden as an example for Ontario however, it is essential to consider the context within which incineration is situated.

In the 1980s, Sweden experienced problems due to dioxin emissions that led to stringent legislated emissions limits and the installation of advanced flue gas cleaning systems in

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[175] Council Resolution of 24 February 1997 on a *Community strategy for waste management* (OJ C 076, 11/03/1997 p. 1-4): http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31997Y0311(01):EN:HTML.

[176] European Commission Press Release, *New waste strategy: Making Europe a recycling society*, December 21, 2005: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/05/1673&format=HTML&aged=0&language=EN&guiLanguage=en. See also: http://ec.europa.eu/environment/waste/pdf/directive_waste_en.pdf.

[177] European Parliament, *Environment Committee takes first steps to sort waste directive*, November 28, 2006: http://www.europarl.europa.eu/news/expert/infopress_page/064-334-331-11-48-911-20061127IPR00318-27-11-2006-2006-false/default_en.htm.

[178] Christopher Hume, "Sweden's burning with enthusiasm: Waste-to-energy incineration is clean, efficient and 'absolutely feasible for Toronto' disposal executives say," *The Toronto Star*, September 16, 2006: http://www.seas.columbia.edu/earth/wtert/sofos/Hume_Sweden's%20burning%20with%20enthusiasm.pdf.

incinerators.[179] "The result of this 'crisis' was an integrated waste management system, stringent emissions limits and better communication about waste issues."[180]

Sweden's waste management policy is based on strict environmental quality objectives and on the waste hierarchy noted above. Since 1994, Sweden has had in place Environmental Producer Responsibility (EPR) legislation that includes mandatory recycling targets.[181]

> Municipalities limit their role to principally the provision of 'bring facilities' and meeting the EPR responsibilities is largely private sector driven, with few doorstep collections of recyclables, which are generally limited to paper collection by community groups.[182]

On its website, the Swedish government emphasizes that

> [w]aste volumes must be reduced if we are to achieve greater ecological sustainability in our waste management. Even at the manufacturing stage, producers must consider the environmental impact of products in a lifecycle perspective. Construction, choice of material and energy consumption during both manufacture and use must be considered.[183]

Sweden has proposed a government bill aimed at sustainable environmental life-cycle management that would further extend producer responsibility for packaging and wastepaper by giving Swedish municipalities greater influence over information about and planning in relation to producer responsibility. It is proposing to eventually extend the deposit system for aluminum cans and PET bottles to cover all plastic and metal packaging for ready-to-drink beverages, and to set new interim targets for biological treatment for improved recovery of nutrients and phosphorus from food waste.[184]

The European experience provides an example of the use of incineration as one form of waste management within the context of a waste hierarchy that gives clear priority to waste prevention and reduction. The European Community has put in place clear policies and regulations including extended producer responsibility and packaging regulations. The Europe example is valuable to Ontario not because incineration is widely used, but because it is used within a comprehensive waste management framework. Incineration may or may not turn out to be an appropriate technology for Ontario, but this determination should only be made once an overarching waste management policy for the province is put in place.

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[179] Energie, *Comparison of public acceptability of energy from waste and energy from biomass residues in 5 EU states*, 2001 at 32: http://www.etsu.com/integrate/INTEGRATEReport_for_web.pdf.

[180] *Ibid*. at 33.

[181] The Chartered Institution of Wastes Management, *Delivering Key Waste Management Infrastructure: Lessons Learned from Europe – Final Report*, November 2005 at 48: http://www.ciwm.co.uk/mediastore/FILES/12134.pdf.

[182] *Ibid*. at 48-49.

[183] Government Offices of Sweden website, *Ecocycle policy*: http://www.sweden.gov.se/sb/d/2972/a/17218.

[184] Sweden Ministry of Sustainable Development, *An Ecoefficient Society: non-toxic, resource-saving environmental life cycles – Summary of Government Bill 2002/03:117*, June 2003 at 2.

7. A Policy Perspective on Incineration and Recommendations for Ontario

Regardless of whether or not modern incineration technologies are cleaner and able to produce energy, the primary focus should not be on the technologies. The important policy question to be addressed is how we as a society will manage and reduce the amount of waste we produce.

Waste management policy should define what technologies, if any, should be used to minimize and manage waste. The technologies should not define our waste policy. Ontario needs a wide-ranging and serious public discussion and debate about the problem of waste. While it may be improving as a technology, incineration should not automatically be seen as a miracle cure to the generation of waste. As noted above, studies using life cycle analysis have shown the significant advantages to reducing and diverting waste in the first place, rather than dealing with it only at the stage of final disposal.

Even if the use of incineration is expanded in Ontario, it should only be used for waste that is truly residual, within a waste hierarchy framework that primarily seeks to prevent and reduce the generation of waste, and then seeks to achieve the highest possible rate of diversion. Municipalities deserve provincial direction and should demand, along with other key stakeholders, a strong and comprehensive waste management strategy and regulatory framework, with funding to support the strategy.

The Role of Incineration

When considering the role of incineration within a provincial waste management policy, objective and thorough analysis is required. Among the many issues that will need to be addressed, the following should receive attention:

- the landfill capacity required for proper disposal of incinerator ash;
- the expense of incineration as an option, including capital investment and operating costs;
- the most appropriate methods for use in identifying and measuring the health effects of incineration;
- the amount of energy that will be derived from the incinerator relative to the energy required to operate it; and
- the scale of the incinerator so that it can operate on a limited supply of feedstock consisting of truly residual waste, and efficiently produces energy.

In order to assess these factors, however, there is a great need for an independent, fair and impartial scientific assessment of the relative risks and benefits of incineration technologies.

This study would update MOE's 1999 technical document,[185] but would also provide a more comprehensive assessment of the pros and cons of incineration technologies.

It is important that the results of this independent technological assessment be made available to the public in order to raise public awareness and provide information for those making decisions with respect to these technologies.

> **Recommendation #1**
> The Ontario government should fund an independent, fair and impartial study of the true costs of incineration and a scientific assessment of the risks and benefits of incineration technologies currently available in order to raise public awareness and inform decision-making.

It is important to evaluate incineration technologies mainly in terms of their appropriateness for waste management in Ontario, with less emphasis on their value as a means of producing energy, given questions about whether or not incineration would be a cost-effective and efficient means of providing energy.

> **Recommendation #2**
> The Ontario government should evaluate incineration technology primarily on the basis of whether or not it is an appropriate means of waste disposal rather than as a means to provide energy.

The Need for a Provincial Waste Management Policy

There is an urgent need for a strong and comprehensive waste management policy in Ontario. The provincial government has an essential role in exercising its jurisdiction to consult with stakeholders, experts and the public to establish the most effective strategy for dealing with waste issues facing the province.

The province should provide more than just a process for environmental assessment and approval of waste management facilities. Municipalities are well aware that they would benefit from provincial guidance and coordination when determining the best options for waste management. In December 2005, the Association of Municipalities of Ontario (AMO) called for a provincial integrated waste strategy based on the following principles:

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[185] MOE, *Environmental Risks of Municipal Non-Hazardous Waste Landfilling and Incineration – Technical Report Summary*, July 1999 at ii: http://www.ene.gov.on.ca/envision/techdocs/3795e01.pdf: This report, produced by the Environmental Sciences and Standards Division, advanced MOE's position that "both landfilling and incineration options be available for consideration so that a municipality or other proponent can develop the best environmental solution for its locality."

(1) Waste policies and programs must be evaluated according to a Triple Bottom Line approach that considers the financial, social, and environmental impact of a given initiative.

(2) Sustainable waste management is a responsibility shared by industry, consumers, as well as federal, provincial, and municipal governments.

(3) New waste diversion, management, and product regulation programs must follow a waste hierarchy, where integration is a common thread.[186]

The waste hierarchy proposed by AMO draws on the concepts discussed earlier in this paper drawn from the EU's Waste Framework Directive, and begins with "prevention by either reducing the content of waste or by reusing the waste is the ideal, followed by conversion into secondary raw materials (some parts can be composted and others used as a source of energy), and the remaining residual waste will likely continue to be landfilled."[187] AMO's proposal also notes that

> it is generally accepted that jurisdictions with an integrated plan such as those in Europe and the best Canadian example, Nova Scotia, are more successful in diverting waste from landfill, reducing costs to governments, creating new economic opportunities, and preserving the natural environment.[188]

Nova Scotia has had a provincial strategy for managing solid waste since 1995. This strategy was based on a discussion paper and widespread consultation, and set a goal of achieving 50% waste reduction by 2000.[189] The Nova Scotia strategy includes many elements including disposal bans, industry stewardship, a bottle deposit/refund system, milk carton recycling, a tire return system, used oil return, creation of a Resource Recovery Fund Board, regional cooperation to reduce disposal sites, and education and awareness.[190] A summary of the strategy is provided in Appendix C.

> **Recommendation #3**
> The Ontario government should establish a strong, effective and comprehensive provincial waste management policy that includes enforceable reduction targets and timetables, and develops provincial regulations and coordinated regional approaches to using the best available technology for dealing with residuals.

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[186] Association of Municipalities of Ontario, *AMO's Proposal for a Provincial Integrated Waste Strategy*, December 2005 at 3: http://www.owma.org/db/db2file.asp?fileid=355.

[187] *Ibid*. at 4.

[188] *Ibid*. at 4.

[189] Nova Scotia, *Solid Waste-Resource Management Strategy*, October 27, 1995: http://www.gov.ns.ca/enla/waste/swrmstrategy.asp#executivesummary.

[190] Nova Scotia website, *Nova Scotia: Too Good to Waste – A Summary of the Nova Scotia Solid Waste-Resource Management Strategy*: http://www.gov.ns.ca/enla/waste/strategysummary.asp.

Considerations in Developing a Provincial Waste Management Policy

Life Cycle Analysis

Life cycle analysis should be used in considering all of the many (and sometimes hidden) environmental, economic and social costs of different ways currently available for managing waste, including impacts on greenhouse gas emissions and air quality. LCA is capable of comparing landfills, incineration and recycling in terms of economic, environmental and social costs.[191]

> **Recommendation #4**
> The Ontario government should make use of life cycle analysis methods to consider all of the environmental, economic and social costs implicit in the various options for managing waste.

Promotion of Waste Prevention and Reduction

There has been much public debate in recent years about the prospect of achieving zero waste.[192] A recent report by the UK's Institute for Public Policy Research and Green Alliance made note of some countries, regions and cities that had adopted zero waste goals:

> for example, New Zealand, The Philippines, San Francisco and in the UK, Bath and North East Somerset. By this, they mean a goal of zero waste to landfill over a period of five to 15 years: recycling 100 per cent of waste. Many of these places have dramatically improved recycling rates and raised awareness about the nature of waste, and they are far ahead of UK performance. Recycling rates of over 70 per cent are already being seen, for example, in Flanders, Belgium, Kamikatsu, Japan and Canberra, Australia, whereas Britain can manage just 42 per cent of all waste and 23 per cent recyling [sic] of household waste in England. But even these pioneers are struggling with waste prevention, largely because the public authorities involved have little control over the kind of products that are put on the market.[193]

It is helpful to think of the notion of zero waste this way; as a goal that informs policy decisions and has the effect of creating strong regulations to prevent the creation of waste in the first place and to improve recycling rates. Industries choose to manufacture products designed not to last or

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[191] See Jeffrey Morris, *Environmental Economics of Discards*, RCO's Energy From Waste Forum, November 3, 2006: http://www.rco.on.ca/Jeffrey%20Morris.pdf.

[192] A recent issue of *Alternatives Journal* was devoted to this theme: *Alternatives Journal*, vol. 32, no. 1, 2006: www.alternativesjournal.ca.

[193] Institute for Public Policy Research and Green Alliance, *A Zero Waste UK*, October 2006 at 6.

to be repaired and package them in materials that cannot be recycled or reused. Individual choices may involve over-consumption that results in the production of additional waste. A goal of as near 'zero waste' as possible, establishing short and long term reduction targets, and possibly setting medium term targets above 90% diversion, may help to educate and inform the public.

Recommendation #5

The Ontario government should strive for as near 'zero waste' as possible, by establishing short and long term reduction targets for waste generation to guide policy decisions and creating strong policies and regulations that provide policy certainty, work towards the prevention of waste creation, improve recycling rates and challenge consumer choices.

Extended producer responsibility is a fundamental concept that could be better implemented in Ontario. Industry should be required to take responsibility for, and better manage, the waste it produces. The government should strengthen the powers of Waste Diversion Ontario through amendments to the *Waste Diversion Act* to increase the role of industry stewardship in reducing and recycling waste.

Recommendation #6

The Ontario government should introduce strong policies and regulations on extended producer responsibility requiring industry to take responsibility for managing consumer-generated waste itself, and should strengthen the powers of Waste Diversion Ontario through amendments to the *Waste Diversion Act* to increase the role of industry stewardship in reducing and recycling waste.

Strong packaging regulations could help to prevent and reduce unnecessary packaging. Much waste could be easily avoided by strictly regulating packaging. Development of provincial packaging regulations could be coordinated through the Canadian Council of Ministers on the Environment (CCME) to ensure a consistent approach across Canada. The CCME has already done work on a voluntary National Packaging Protocol.[194]

Recommendation #7

The Ontario government should develop and implement strict packaging regulations to prevent and reduce consumer goods packaging.

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[194] CCME website, *Packaging*: http://www.ccme.ca/initiatives/waste.html?category_id=18.

Other instruments are available to be considered for use in promoting waste reduction in Ontario, such as garbage bag fees, limits on the number of garbage bags collected and other incentives to create less waste. The provincial government might put in place a regulatory requirement to ensure that municipalities introduce garbage bag fees and limits.

Recommendation #8

The Ontario government should consider introducing a regulatory requirement for municipalities to use economic and other tools to promote waste reduction in Ontario, including garbage bag fees and limits on the number of garbage bags collected.

High Environmental Standards

Whatever waste disposal method is chosen, a waste management policy must include rigorous regulatory standards, monitoring and enforcement. Regardless of the disposal option, this will be necessary to address continuing environmental and human health impact concerns. There should be progressively higher environmental standards with a goal of virtual elimination of dioxins and furans and other pollutants.

To ensure that excellent environmental performance is achieved, companies would have to commit to financial investment in the best available technologies. In order to make sure that this is done, the provincial government should review and update its guidelines to require that the most current environmental standards are reflected and included.

Recommendation #9

The Ontario government should ensure the development of progressively higher regulatory standards, monitoring and enforcement, regardless of the disposal options pursued, to address environmental and human health impact concerns and pursue a goal of virtual elimination of dioxins and furans and toxic pollutants. In connection with this, the government should review Guidelines A-7 and A-8 in light of current regulatory standards in the US and EU.

Public Involvement

It is important that the public be meaningfully informed about and engaged in the process of forming a provincial waste management policy. Public consultation process will ideally: encourage public ownership of the waste policies pursued; improve public awareness and knowledge of the issues; be open to all for genuine participation; and build trust and

understanding.[195] The U.S. National Research Council report on *Waste incineration & public health* made the following observations on public consultation:

> Developing effective participatory programs is very difficult, but some general principles are beginning to emerge. The process of public involvement should be open, inclusive, and substantive, and members of the public in an affected area should be involved early and often.[196]

Recommendation #10

The Ontario government should ensure that the public is meaningfully informed about and engaged in the development of provincial waste management policies and regulations. Public consultation should be designed to encourage public commitment to the waste policies adopted, improve public awareness and knowledge of waste management issues, be open to all for real participation and build trust and understanding.

In order for the public to better understand the various issues around the management of municipal and industrial waste in Ontario, the Ministry of Environment should work with the municipalities to provide comprehensive information on the volumes of municipal and industrial wastes generated in Ontario, the costs to manage these wastes and how much waste by type that goes to each of the various waste management options including resource recovery, recycling, landfill, composting, incineration, etc.

Recommendation #11

The Ontario government should provide to the public an annual summary of the volumes and weights of municipal and industrial wastes, household hazardous wastes and hazardous industrial wastes. The summary should include information about the end disposition of the wastes by different methods, whether by reuse, recycling, landfilling or incineration.

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[195] National Society for Clean Air and Environmental Protection, *Public Acceptability of Incineration – Summary and Conclusions*, 2001 at 4: http://www.nsca.org.uk/pages/topics_and_issues/waste.cfm.

[196] National Research Council (U.S.), *Committee on Health Effects of Waste Incineration*, Waste incineration & public health (National Academy Press, 2000), Executive Summary.

8. Conclusion

Waste management in Ontario continues to be a vital issue that will impact the environmental and human health of Ontario residents enormously in the years to come. A strong, effective and comprehensive waste management policy is clearly needed before specific decisions on proceeding with waste management options, such as incineration, are made. Any framework for waste management must include waste prevention and reduction, as well as strong diversion targets and programs. Placing a priority on developing a waste management policy in Ontario will ultimately benefit the health of Ontario residents and provide all stakeholders with certainty.

Appendix A: Other Current and Emerging Waste Management Technologies

Landfill

Landfill disposal is currently the main method being used to manage municipal solid waste.[197] It is becoming increasingly difficult to find locations for landfills and they may cause a number of environmental problems. Leachate, containing soluble components, is produced, and has the potential to contaminate the groundwater if not properly managed.[198] In addition, greenhouse gases such as methane and carbon dioxide may be emitted into the atmosphere, along with volatile organic compounds.[199]

However, new technology developed for landfill construction and maintenance has significantly reduced the risks of these problems,[200] and also allows for energy generation.[201] Other forms of MSW treatment generally will continue to require landfill at minimum to dispose of inert non-reusable fractions of the waste stream at the end of their processes.

Biological Treatment

Biological treatment only breaks down components that are biodegradable. The remainder must be sent to a landfill. However, the organic fraction of the waste can be treated with methods such as aerobic or anaerobic digestion. There is a wide range of biological treatment systems available and biological treatment should continue to be the preferable option for organic waste.[202] If sources of organic waste can be separated, the clean biodegradable fraction can be used as high quality compost. Anaerobic digestion also produces biogas, which can be used as a fuel.[203]

Disinfection

Autoclaving and microwaving are two alternative forms of disinfection that may be used to kill biological elements by increasing the burning temperature to between 120 or 165 degrees Celsius. However, this method does not destroy toxic chemicals and there is no overall reduction in volume.

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[197] Al-Jarrah, Omar and Hani Abu-Qdais. "Municipal Solid Waste Landfill Siting using Intelligent System" *Waste Management* 26 (2006): 299-306 at 299.

[198] Eshet, Tzipi, et al. "A Critical Review of Economic Valuation Studies of Externalities from Incineration and Landfilling" *Waste Management and Research* 23 (2005): 487-504 at 488.

[199] Al-Jarrah, Omar and Hani Abu-Qdais. "Municipal Solid Waste Landfill Siting using Intelligent System" *Waste Management* 26 (2006): 299-306 at 299.

[200] Hamer, Geoffrey. "Solid Waste Treatment and Disposal: Effects on Public Health and Environmental Safety" *Biotechnology Advances* 22 (2003): 71-79 at 71.

[201] For example, see: http://www.ec.gc.ca/wmd-dgd/default.asp?lang=En&n=70F5EB5B-1.

[202] De Baere, L. "Will Anaerobic Digestion of Solid Waste Survive in the Future?" *Water Science & Technology* 53.8 (2006): 187-194 at 187.

[203] *Ibid*. at 188.

Hazardous Waste treatment options

Wastes can be classified as hazardous for a variety of reasons, and there is no single best option for their disposal. In fact it is not possible to destroy some hazardous wastes and those must be stored indefinitely. It is important that hazardous waste streams be kept separate from MSW streams because they often require additional treatment before disposal due to their hazardous properties. A waste may be labeled hazardous if it is toxic, corrosive and flammable. However, there are many other reasons why a waste may be considered hazardous.

In relation to different hazardous wastes it is important to tailor the treatment method to the specific waste. For example it may be possible to use only disinfection methods in treating medical waste if the only form of hazard involved is biological; however, if the hospital waste also contains toxic chemicals, it may be necessary to use a properly designed thermal treatment method to destroy the chemicals rather then risk them escaping from a landfill. Certain wastes may also be unsuitable for thermal or biological treatment, such as heavy metals like mercury.

Appendix B - R.R.O. 1990, REGULATION 347 under EPA

Amended to O. Reg. 461/05

GENERAL — WASTE MANAGEMENT

12. The following are prescribed as standards for the location, maintenance and operation of an incineration site:

1. The location of the incineration site shall be selected so as to reduce the effects of nuisances such as dust, noise and traffic.

2. Fly-ash that is hazardous waste and that results from the incineration of waste that is neither hazardous waste nor liquid industrial waste shall be kept separate from incinerator ash and disposed of or otherwise dealt with separately from incinerator ash.

3. Fly-ash that is hazardous waste and that results from the incineration of waste that is neither hazardous waste nor liquid industrial waste shall only be disposed of at,

i. the TRICIL Limited landfilling site located on Lot 9, Concession 10, Township of Moore, County of Lambton, or

ii. a landfilling site authorized to accept fly-ash that is hazardous waste and that results from the incineration of waste that is neither hazardous waste nor liquid industrial waste by the terms of,

A. a certificate of approval or provisional certificate of approval issued after the 1st day of January, 1990, or

B. an amendment to a certificate of approval or provisional certificate of approval made after the 1st day of January, 1990.

4. The incinerator shall be located,

i. so that it is accessible for the transportation of wastes thereto without nuisance,

ii. taking into account meteorological considerations to minimize environmental effects, and

iii. so that the services and utilities required for the operation of the incinerator are available, including facilities for the disposal of residue and of quenching and scrubbing water.

5. The design and capacity of the incinerator shall be in accordance with accepted engineering practices and of a type and size adequate to efficiently process the quantities of waste that may be expected, so that a minimum volume of residue is obtained, the putrescible materials remaining as residue are reduced to a minimum and a minimum of air pollution results.

6. The following equipment shall be provided as necessary for particular applications:

i. Scales for the accurate determination of the input of all wastes by weight.

ii. A storage pit or other storage facilities.

iii. A crane or other means of removing waste from the pit or other storage facilities.

iv. Means of controlling dusts and odours.

v. Such instruments as may be necessary for the efficient operation of an incinerator.

7. The incineration site shall include an unloading area properly enclosed and of sufficient size for the intended operation.

8. Access roads shall be provided for vehicles hauling waste to the incineration site.

9. On-site fire protection shall be provided and, where possible, arrangements shall be made with a fire department or municipality for adequate fire fighting services in case of an emergency.

10. Scavenging shall not be permitted.

Appendix C – An Example of a European Directive to Reduce Waste at Source: Packaging and Packaging Waste

The purpose of this directive is to harmonize national measures on the management of packaging and packaging waste, both to protect the environment by preventing or reducing the environmental impacts of packaging in Member States and other countries, and to avoid obstacles to trade and the distortion and restriction of competition within the European Community.[204] To accomplish this, the directive

> lays down measures aimed, as a first priority, at preventing the production of packaging waste and, as additional fundamental principles, at reusing packaging, at recycling and other forms of recovering packaging waste and, hence, at reducing the final disposal of such waste.[205]

The Packaging Directive deals first with prevention, requiring that Member States take additional preventive measures to prevent the formation of packaging waste beyond those measures required in the directive.[206] The essential requirements specified by the directive are outlined in Annex II to it and include requirements relating to the manufacturing and composition of packaging, the reusable nature of packaging and the recoverable nature of packaging (see Appendix B).[207] The additional measures required to be established by Member States must comply with the objectives of the directive, and may include

> national programmes, projects to introduce producer responsibility to minimise the environmental impact of packaging or similar actions adopted, if appropriate in consultation with economic operators, and designed to bring together and take advantage of the many initiatives taken within Member States as regards prevention.[208]

To assist with prevention, the European Commission is required to help promote prevention by encouraging the development of suitable European standards to minimise the environmental impact of packaging.[209] The Commission must also, where appropriate, propose measures

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[204] Directive 94/62/EC of 20 December 1994 on packaging and packaging waste (OJ L 365, 31.12.1994, p. 10–23) at Art. 1: http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1994/L/01994L0062-20050405-en.pdf.

[205] *Ibid*. at Art. 1.

[206] *Ibid*. at Art. 4.1.

[207] *Ibid*. at Art. 9 and Annex II.

[208] *Ibid*. at Art. 4.1.

[209] *Ibid*. at Art. 4.2. The standards promoted should relate to: criteria and methodologies for life-cycle analysis of packaging; methods to measure and verify the presence of heavy metals and other dangerous substances in the packaging and their release into the environment from packaging and packaging waste; criteria for the minimum content of recycled material in packaging for appropriate types of packaging; criteria for recycling methods; criteria for composting methods and the compost produced; and criteria for the marking of packaging: *Ibid*. at Art. 10.

designed to strengthen and complement the enforcement of the essential requirements and ensure that new packaging is only put on the market where the producer has taken "all necessary measures to minimise its environmental impact without compromising the essential functions of the packaging."[210]

After dealing with waste prevention, the Packaging Directive goes on to include very specific targets with dates for improved waste recovery and recycling that Member States must take measures to attain.[211] The Council is charged with creating a clear and legible marking system for industry identification and classification of the nature of packaging material in order to facilitate collection, reuse and recovery, including recycling.[212]
Member States must also take steps to put in place other measures: return, collection and recovery systems; mechanisms to ensure that concentration levels of lead, cadmium, mercury and hexavalent chromium present in packaging does not exceed maximum levels set in the directive; harmonized databases to provide information on packaging and packaging waste; and consumer information and awareness programs for the users of packaging.[213]

[210] *Ibid*. at Art. 4.3.

[211] *Ibid*. at Art. 6.

[212] *Ibid*. at Art. 8.

[213] *Ibid*. at Art. 7, 11, 12 and 13.

Appendix D - ANNEX II to the EUROPEAN PARLIAMENT AND COUNCIL DIRECTIVE 94/62/EC of 20 December 1994 on packaging and packaging waste

ESSENTIAL REQUIREMENTS ON THE COMPOSITION AND THE REUSABLE AND RECOVERABLE, INCLUDING RECYCLABLE, NATURE OF PACKAGING

1. Requirements specific to the manufacturing and composition of packaging

— Packaging shall be so manufactured that the packaging volume and weight be limited to the minimum adequate amount to maintain the necessary level of safety, hygiene and acceptance for the packed product and for the consumer.

— Packaging shall be designed, produced and commercialized in such a way as to permit its reuse or recovery, including recycling, and to minimize its impact on the environment when packaging waste or residues from packaging waste management operations are disposed of.

— Packaging shall be so manufactured that the presence of noxious and other hazardous substances and materials as constituents of the packaging material or of any of the packaging components is minimized with regard to their presence in emissions, ash or leachate when packaging or residues from management operations or packaging waste are incinerated or landfilled.

2. Requirements specific to the reusable nature of packaging

The following requirements must be simultaneously satisfied:

— the physical properties and characteristics of the packaging shall enable a number of trips or rotations in normally predictable conditions of use,

— possiblity of processing the used packaging in order to meet health and safety requirements for the workforce,

— fulfil the requirements specific to recoverable packaging when the packaging is no longer reused and thus becomes waste.

3. Requirements specific to the recoverable nature of packaging

(a) Packaging recoverable in the form of material recycling

Packaging must be manufactured in such a way as to enable the recycling of a certain percentage by weight of the materials used into the manufacture of marketable products, in compliance with current standards in the Community.

The establishment of this percentage may vary, depending on the type of material of which the packaging is composed.

(b) Packaging recoverable in the form of energy recovery

Packaging waste processed for the purpose of energy recovery shall have a minimum inferior calorific value to allow optimization of energy recovery.

(c) Packaging recoverable in the form of composting

Packaging waste processed for the purpose of composting shall be of such a biodegradable nature that it should not hinder the separate collection and the composting process or activity into which it is introduced.

(d) Biodegradable packaging

Biodegradable packaging waste shall be of such a nature that it is capable of undergoing physical, chemical, thermal or biological decomposition such that most of the finished compost ultimately decomposes into carbon dioxide, biomass and water.

Appendix E - The Nova Scotia Solid Waste-Resource Management Strategy at a Glance

Disposal Bans
Valuable resources that can be recycled or composted are no longer accepted for disposal in Nova Scotia. These include:

- Food Waste
- Leaf and yard waste
- Beverage containers
- Newsprint
- Corrugated cardboard
- Steel/tin food containers
- Glass food containers
- Select plastics
- Used tires
- Waste paint
- Car batteries
- Antifreeze

Industry Stewardship

Bottle deposit/refund system
Deposits and returns apply to the following non-refillable beverage containers:

Non-Alcoholic	Alcoholic	
< 500 ml	> 500 ml	
10 cent deposit	10 cent deposit	20 cent deposit
5 cent return	5 cent return	10 cent return

Deposits applied to refillable containers are completely refundable.
To drive these economic and environmental benefits, the Province legistated a goal of 50% diversion ofwaste from disposal. The steps requires to reach this goal are detailed in the Province's Solid Waste-Resourse Management Strategy. Read on for an overview of the Strategy and a summary of what it means for Nova Scotians.

Milk Carton Recycling
Nova Scotia milk producers provide funding and in-kind advertisement to municipalities in Nova Scotia to recycle milk cartons.

Tire return system
Tires sold within the Province are diverted from disposal and reprocessed into valuable products right here in Nova Scotia. An Environmental Fee of $3.00 for all new passenger tires and $9.00 for all new truck tires is applied to manage this system.

Used oil return
Retailers who sell motor oil must either accept used oil or provide a collection depot within 5 kilometers of their business. This ensures that all Nova Scotians have a convenient place to deliver their used oil for reprocessing.

Future agreements
Stewardship agreements are being negotiated on an on-going basis with industries whose products and packaging generate solid-waste.

Job Creation
A new resource requires a new work force to handle and process the banned materials and to create valuable new products. There are now thousands of jobs in Nova Scotia directly related to waste-resource management.

The Resource Recovery Fund Board (RRFB) Inc.
The RRFB is a private, not-for-profit organization with a mandate to:

- oversee the deposit-refund program for beverage containers;
- create jobs by promoting the manufacturing of new products;
- negotiate industry stewardship agreements;
- direct funding to municipalities; and
- educate the general public.

Regional Cooperation and Disposal Sites
Cooperation amongst bordering municipalities will reduce the number of disposal sites from 40 in 1995 to less than 10 in 2005. All new disposal sites must meet strict environmental regulations. Open burning of municipal solid waste is banned in Nova Scotia.

Education and Awareness
The RRFB is coordinating a provincial education and awareness program to help Nova Scotians understand how the Strategy will affect them in their homes and at work.

What the Strategy Means for Nova Scotians

A Trip to the Enviro-Depot®
Many Nova Scotians visit their local Enviro-Depot to redeem their beverage containers. Residents can also return other materials such as newsprint, cardboard and automotive batteries. Community charitable groups often benefit from donated returns.

Curbside Recycling

Nova Scotians can place a wide variety of materials at the curb for recycling. The types of materials acceptable in these programs are expanding every year.□ □Almost 100% of Nova Scotians have access to curbside recycling.

Backyard Composting
Backyard composting is an easy and cost-effective means of diverting a portion of the banned compostable organic material.

Curbside Composting
Compostable organic material is collected from a majority of Nova Scotian households and composted at central composting facilities.
Compostable organic materials include:

- all food (including meat, fish, bones and dairy products); and
- leaf and yard waste.
- non-recyclable paper products (e.g. soiled paper towels, napkins, etc.).

Combined with Enviro-Depot and curbside recycling, centralized curbside composting can divert over 75% of a homeowner's waste! Over 70% of Nova Scotians have access to curbside organic collection.

Recycling and Organics Collection at Work
The introduction of the disposal bans has meant that more and more Nova Scotians can recycle at work as well as at home.
Providing access to recycling and composting will ensure a level playing field exists for all businesses.

Household Hazardous Waste
Many Nova Scotians have access to permanent or periodic Household Hazardous Waste (HHW) Depots for recycling or safe disposal of waste paint, batteries and other HHW. Waste oil can be returned to waste oil depots set up by retailers who sell oil.

Less Waste Means Better Business
The Strategy has both challenged and created opportunities for business owners and operators. Responsible waste management and job creation leads to a more prosperous community in which to do business.

What the Strategy means for Nova Scotia
Less waste means fewer and safer disposal sites, a cleaner environment and a stronger economy. Nova Scotia is moving into the next century with a sustainable vision and a will to ensure that our natural resources are protected and job opportunities are maximized for future generations.

From http://www.gov.ns.ca/enla/waste/strategysummary.asp.