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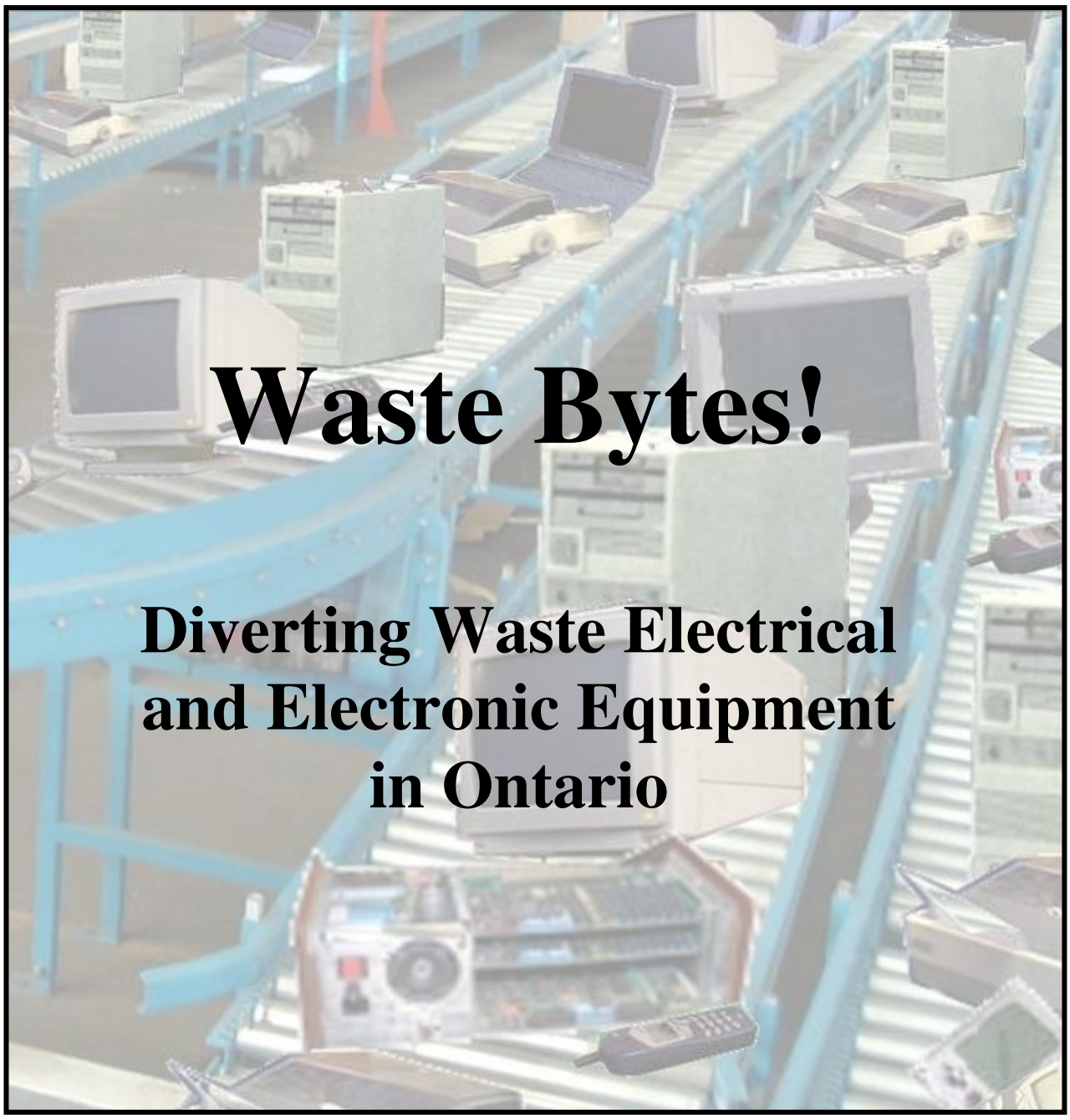

# Waste Bytes!

## Diverting Waste Electrical and Electronic Equipment in Ontario

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# Diverting Waste Electrical and Electronic Equipment in Ontario

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**and**

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## About CIELAP

Founded in 1970, as the Canadian Environmental Law Research Foundation (CELRF), the Canadian Institute for Environmental Law and Policy (CIELAP) is an independent, not-for-profit professional research and educational institute committed to environmental law and policy analysis and reform. CIELAP is incorporated under the laws of the Province of Ontario and registered with Revenue Canada as a charitable organization. Our registration number is 11883 3417 RR0001.

CIELAP provides leadership in the research and development of environmental law and policy that promotes the public interest and sustainability.

## About the Authors

Maureen Carter-Whitney is an environmental lawyer with a background in legal research and environmental public policy analysis, and a strong interest in public engagement in environmental decision-making. Prior to joining CIELAP in September 2005, Maureen worked as a legal analyst with the Environmental Commissioner of Ontario. She also teaches courses in environmental law. Maureen has a Bachelor of Laws from the University of British Columbia and Master of Laws in administrative law from Osgoode Hall Law School at York University. She has recently become the updating author of *Environmental Approvals in Canada*, published by LexisNexis Butterworths.

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# Executive Summary

This past decade has seen an explosion in the innovation, production, use, and disposal of information and communications technologies and the electronic products that are incorporated into them. It is estimated that approximately 14,586,000 household appliances, information technology equipment, telecommunications equipment, and audio-visual equipment were discarded in Ontario in 2004. Only 1,325,000 of these units (9.1%) were collected for reuse or recycling. The ever-increasing waste stream of electronics is often referred to as Waste Electrical and Electronic Equipment (WEEE).

A European Union study based on 1998 data estimated that WEEE was growing at 3-5% per year; this is three times faster than the average waste stream. These increasing quantities are particularly concerning because WEEE often contains a variety of dangerous materials and compounds including toxic heavy metals and other persistent and bioaccumulative hazardous substances that are known to be toxic and pose risks to human health and the environment.

Because of the toxic and hazardous substances that it contains WEEE should be disposed of responsibly and carefully. One estimate suggests, however, that up to 90% of WEEE from jurisdictions without a formal recovery program is currently landfilled, incinerated, or disposed of without pre-treatment. Much of this disposal happens through export to developing countries despite the United Nation's Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal and Canada's *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.

This report is an attempt to articulate and analyze this rapidly emerging issue in order to help the government of Ontario, municipalities and industry take proactive steps to advance the sustainable management of electronics and WEEE. Although the report primarily considers WEEE management at the end of a product's useful life, product management must be thoroughly considered at each stage of the life cycle: during production, sale, use, consumer disposal, collection, reuse, reduction, recycling, energy/materials recovery, and final disposal.

Over the past several years there has been significant growth in WEEE regulation in a number of Canadian jurisdictions, as well as cooperative development of Canada-Wide Principles for Electronics Product Stewardship by the Canadian Council of Ministers of the Environment.

**British Columbia** recently amended its broad Recycling Regulation to require the development of an electronics product stewardship plan. In December 2006, the Ministry of Environment approved the *British Columbia Stewardship Plan for End-of-Life Electronics* and implementation of the province-wide "Return-It Electronics" program began in August 2007.

**Alberta** established a WEEE management program in 2004, administered through the Alberta Recycling Management Authority. This program recycled more than 16,800 tonnes of electronic waste between October 2004 and October 2007.

In **Saskatchewan**, Waste Electronic Equipment Regulations have recently been put in place under the *Environmental Management and Protection Act* and the Saskatchewan Waste Electronic Equipment Program (SWEEP) came into effect in February 2007.
**Manitoba** has proposed a Household Hazardous Waste Stewardship Regulation that would prohibit the sale of regulated products, including TVs, computers, laptops, and scanners, not covered by a stewardship program.

**Quebec** has proposed legislative amendments requiring producer responsibility for WEEE.

In 2006, **New Brunswick** amended its *Clean Environment Act* to permit the Minister of Environment to establish a stewardship board to: manage the manufacture, storage, collection, transportation, recycling, disposal or other handling of a designated material. Materials will be designated by regulation.

**Nova Scotia**'s Electronic Product Stewardship Regulations will ban disposal of electronic waste in landfills and create a province-wide system for collection and recycling of electronic waste. They will come into effect in two phases: on February 1, 2008, for the first group of products and February 1, 2009, for the second.

Quebec, Nova Scotia and New Brunswick have also collaborated with 10 northeastern American states to establish Model Electronic Recycling Legislation.

The **European Union** (EU) has been a leader in WEEE management. In 2002, the EU introduced two directives: the *Waste Electrical and Electronic Equipment Directive* (WEEE Directive) to address the collection, treatment, and end-of-life materials recovery of electrical and electronic products; and the *Restriction on Hazardous Substances Directive* (RoHS Directive), which was designed to ban the use of six hazardous materials: lead, mercury, hexavalent chromium, cadmium, polybrominated biphenyls, and polybrominated diphenyl ethers in electrical and electronic equipment beginning in July 2006. Per capita diversion of WEEE from landfill has increased as a result of the WEEE Directive. However, virtually all European countries are behind in their mandated targets for per capita diversion and will likely continue to find it difficult to meet these targets in the near future.

The **United States** (US) does not have a national WEEE initiative, however the US Environmental Protection Agency (EPA) has initiated a number of federal electronics product stewardship programs: the Electronic Product Environmental Assessment Tool; a Design for the Environment (DfE) partnership program; and a Federal Electronics Challenge. The agency is also involved with public education through the Plug-In to eCycling campaign and has drafted Guidelines for Materials Management. In the face of the delays towards a national WEEE program, many individual states have also begun to take their own actions.

In **Ontario** responsible WEEE management is currently in its infancy. At a policy level, Ontario began taking action on WEEE in 2004 when it defined and designated WEEE under the *Waste Diversion Act* and asked Waste Diversion Ontario (WDO), a provincial body established to develop, implement and operate waste diversion programs, to develop a waste diversion plan for WEEE. On September 20, 2007, Ontario Electronic Stewardship was established as the Industry

Funding Organization responsible for coordinating, alongside WDO, the development and implementation of the WEEE Program. OES and WDO will present their Program Plan to the Ontario Minister of the Environment on March 31, 2008.

Ontario's proposed diversion Program may begin to ensure success by meeting the Minister's stated requirements for the Program, as laid out in the 2004 and 2007 Program Request Letters to WDO. These requirements include: ambitious collection and diversion targets; programs that are effective and convenient for consumers; strong public education and outreach campaigns to promote the program and help consumers understand how to participate; tracking and monitoring that provides useful data for the development of diversion programs; and effective vendor qualification standards and vendor audits including auditing of downstream processors.

A number of opportunities, in addition to the Program being developed by OES, exist for the province to further increase diversion of WEEE. CIELAP's recommendations in response to these opportunities are summarized below.

# Summary of Recommendations

### Consumer Participation:

WDO Program Recommendations:

1) OES and WDO should ensure that the province's proposed WEEE diversion Program involves aggressive consumer outreach and education, is accessible and convenient to all Ontarians, and includes a tracking mechanism as mandated by the Minister of the Environment.

2) The Program should include a centralized mechanism, such as the US EPA's *Plug-In To eCycling* program, to provide consumer education, information about local drop-off points and methods for consumer participation, and support for municipalities.

3) The Ontario government and WDO should take measures to ensure that the Program's educational activities are comprehensive and involve multiple perspectives.

Additional Recommendations for Governments:

4) School curriculums should be designed to include information about sustainable WEEE management including pollution prevention and diversion at every stage of the product's lifecycle.

5) The provincial and federal governments should lead by example with regard to electronics purchasing, use, reuse, and disposal by introducing standards for government agencies to follow in their procurement and end-of-life management strategies.

## Ontario's WEEE Management Sector

WDO Program Recommendations:

6) OES, in collaboration with other provincial WEEE programs, should strive for better coordination or harmonization of WEEE programs, infrastructure, and regulations to: facilitate consumer participation and steward compliance; help build markets for reusable and recyclable materials; and advance the long-term feasibility and competitiveness of the waste management sector.

7) OES and the Ontario government should work with the WEEE management sector and related industrial engineering experts to promote the research and development of improved plastics recycling capabilities.

Additional Recommendations for Governments:

8) The Ontario government should assess its current tax system and consider modifications that favour reuse and recycling activities over the extraction of virgin materials.

9) The federal government should review existing hazardous waste regulations with the aim of facilitating and promoting WEEE reuse and recycling while considering an oversight mechanism that would ensure that these materials are processed in an approved manner.

## Additional Mechanisms

WDO Program Recommendations:

10) Ontario's WEEE Program should prioritize diversion activities according to an appropriate waste hierarchy with the order of priority being: (1) to reduce waste generation in the first place; (2) to repair equipment so that it can be reused; (3) to reuse material components; and (4) to recycle material components. It should work to ensure that the handling, transport, storage, distribution, and management of WEEE maximize diversion at each level of the hierarchy.

Additional Recommendations for Governments:

11) The Ontario government should establish a comprehensive waste management policy that includes enforceable targets and timetables and that mandates maximum diversion before disposal is considered.

12) In the context of a comprehensive waste management policy, the Ontario government should work with WDO to set ambitious collection and reuse and recycling targets that aim to achieve significantly greater diversion than a business-as-usual scenario.

13) To facilitate the achievement of Program diversion targets the Ontario government should strongly consider putting in place a ban on WEEE in landfills.

14) Ontario and Canada should recognize the economic implications of this trend towards toxics reduction and work with Canadian stewards, particularly smaller stewards that are less likely to have reduced the toxicity of their products, to move in this direction. The Ontario government should then bring in regulatory requirements comparable to the EU's RoHS Directive.

## Beyond Diversion

WDO Program Recommendations:

15) The government should work with WDO to ensure that DfE principles are made a priority of the Program.

Additional Recommendations for Governments:

16) The government should consider the development of further incentives and initiatives to promote cost-effective DfE.

# 1. WEEE: An Emerging Global Problem

Since World War II there has been tremendous growth in the consumption of consumer durables and, consequently, in the generation of waste around the world. Absolute and per capita levels of consumption and subsequent waste generation have continued to climb[1] and are not expected to slow down in the foreseeable future. Rapidly industrializing countries such as China and India are expected to see economic growth rates of 10% and 7% respectively through 2008.[2] These growing markets will undoubtedly lead to further competition for virgin and recycled raw materials and even greater levels of absolute and per capita consumption and waste generation.[3]

This past decade has also seen an explosion in the innovation, production, use, and disposal of information and communications technologies and the electronic products that are incorporated into them. Miniaturization has allowed electronics to be embedded in a wide range of products; this phenomenon is known as pervasive computing.[4] Electro-Federation Canada, the umbrella association for the electronics products industry in Canada, states that it represents more than 300 corporate members that employ over 130,000 workers and contribute over $50 billion to the Canadian economy.[5] This sector will only expand in the future.

These advances have provided great benefits to the Canadian economy and have produced many gains for humans and the environment such as technologies that allow telecommuting and teleconferencing – tools that reduce the need for travel and ultimately reduce carbon emissions. These technologies, however, have caused many problems of their own.[6]

Innovation in communications and information technology has been extremely rapid, and newer, more sophisticated, and cheaper products are being released and consumed at an incredible rate. Economic growth demands increasing consumption and few regulatory incentives in North America demand that producers take full responsibility for the lifecycle of their products, particularly product disposal. These realities, combined with the fact that a globalized economy has benefited from relatively cheap labour and resources, often lead to pricing structures that make it less expensive to replace broken products than to fix them. Air Canada, for instance, offers electronic headphones to its passengers and encourages passengers to retain them as they

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1 Pricen, P., Maniantes, M. & Concia, K. "Confronting Consumption" In P. Princen, M. Miantes, & K. Concia (Eds), *Confronting Consumption* (pp. 1-20). Cambridge: MIT Press, 2002.

2 OECD Economic Outlook No. 80 - Country summaries: http://www.oecd.org/document/52/0,2340,en_2649_201185_19726196_1_1_1_1,00.html.

3 Streicher-Porte, M., Widmer, R., Jain, A., Bader, H., Scheidegger, R., Kytzia, S. Key drivers of the e-waste recycling system: Assessing and modelling e-waste processing in the informal sector in Delhi. *Environmental Impact Assessment Review* 25 (2005): 472– 491.

4 Hilty, L.M. Editorial: Electronic waste – an emerging risk? In *Environmental Impact Assessment Review*, 25 (2005), 431-435.

5 Electro-Federation Canada. *About us:* http://www.electrofed.com/about/index.html.

6 Berkhout, F. & Herton, J. De-materializing and re-materializing: digital technologies and the environment. In *Futures,* 36 (2004), 903-920.

will be disposed of rather than be recycled or recovered. Electronic goods quickly make their way from production to their final disposal.

This ever-increasing waste stream of electronics is often referred to as Waste Electrical and Electronic Equipment (WEEE). WEEE is defined in Ontario as waste that consists of any device that requires an electric current to operate and that is listed or is similar to one of the listed devices in the Ontario Ministry of the Environment's Regulation to designate WEEE under the *Waste Diversion Act, 2002*.[7] This includes products such as household appliances (fridges, ovens, toasters, air conditioners); audio-visual equipment (TVs, stereos); information technology (personal computers and monitors) and telecommunications equipment (cell phones). It is estimated that approximately 14,586,000 household appliances, information technology equipment, telecommunications equipment, and audio-visual equipment were discarded in Ontario in 2004. Only 1,325,000 of these units (9.1%) were collected for reuse or recycling.[8]

A European Union (EU) study based on 1998 data estimated that WEEE was growing at 3-5% per year; this is three times faster than the average waste stream.[9] Citizens were likely to generate between 17 and 20 kg per head per year.[10] Australia, the United States (US) and Canada estimate similar rates of growth to the EU. These increasing quantities are concerning. WEEE often contains a variety of dangerous materials and compounds including toxic heavy metals (lead, cadmium, mercury, chromium) and other persistent and bioaccumulative hazardous substances (PCBs, CFCs, brominated flame retardants) and products (batteries, cathode ray tubes, printed circuit boards, capacitors and resisters).[11] Many of these substances are known to be toxic and pose risks to human health and the environment. For instance, lead has been shown to damage the nervous system and can adversely affect the cardiovascular system and the kidneys. Cadmium can affect kidney function and cause brain damage.[12]

Electronic and electrical equipment have brought countless benefits to our lives and they are now seen as essential to how our society operates. The challenge we must now face, as a society, is how to minimize the risks of these technologies and create a more sustainable system for their production, purchase, use, and disposal.

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7 O. Reg. 393/04 under the *Waste Diversion Act, 2002*.

8 CSR, RIS International Ltd., MacViro Consultants Inc. and Jack Mintz & Associates Inc. *Waste Electronic and Electrical Equipment Study.* Prepared for Waste Diversion Ontario, 2005 at 74: http://webservices.siriusweblabs.com/dotconnector/files/domain4116/Final%20WEEE%20Study%20Report%20for%20printing%20with%20revisions.pdf.

9 Europa website, Questions & Answers on EU Policies on Electric and Electronic Waste, Memo 05/248, August 11, 2005: http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/05/248&format=HTML&aged=1&language=EN&guiLanguage=en.

10 *Ibid.*

11 Wilkinson, S., Duffy, N., Crowe, M., and Nolan, K. *Waste from Electrical & Electronic Equipment.* US Environmental Protection Agency, 2001.

12 Europa website, Questions & Answers on EU Policies on Electric and Electronic Waste, Memo 05/248, August 11, 2005: http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/05/248&format=HTML&aged=1&language=EN&guiLanguage=en.

This report is an attempt to articulate and analyze this rapidly emerging issue in order to help the government of Ontario, municipalities and industry take proactive steps to advance the sustainable management of electronics and WEEE. Although the report primarily considers WEEE management at the end of a product's useful life, product management must be thoroughly considered at each stage of the life cycle: during production, sale, use, consumer disposal, collection, reuse, reduction, recycling, energy/materials recovery, and final disposal. The sustainable management of electronics and WEEE will only become a reality when multiple parties and sectors work together to develop integrated approaches to product management. These approaches will involve planning to maximize sustainability – at all stages of the products' life cycle – well before these products even go on the production line.

# 2. How Ontario Currently Deals With WEEE

In most Canadian provinces, including Ontario, WEEE management is in its infancy.[13] In many parts of Canada WEEE management operates in a relatively unregulated environment and most initiatives to responsibly manage WEEE are driven by the internal corporate environmental policies of businesses (primarily manufacturers) that wish to be seen as leaders in corporate social responsibility.[14] At a policy level, Ontario began taking action on WEEE in 2004 when it defined and designated WEEE under the *Waste Diversion Act* and asked Waste Diversion Ontario (WDO), a provincial body established to develop, implement and operate waste diversion programs, to develop a waste diversion plan for WEEE. The province has since asked WDO to develop a waste diversion program for the effective management of WEEE. It is hoped that this program, further discussed in Section 3, will provide a stronger regulatory environment for WEEE recovery, reuse and recycling.

In Ontario, responsibility for waste management is placed primarily in the hands of municipalities. While the province sets legislative requirements, the municipalities must fund and manage many waste diversion and management programs. According to WDO the number of municipalities providing collection programs for WEEE is rising in the province. In 2004, 61 municipal programs reported collecting WEEE at special events, permanent depots, and other recycling depots.[15] By 2005 this number had risen by 16% to 72 municipal programs[16] and by 2006 some 86 municipalities reported having operated WEEE collection programs in Ontario.[17] In 2006, 19 of these programs were financed through fees at the drop-off depot; 33 programs provided these services free to residents at the depot and thus financed them through municipal revenue; and 31 programs provided services free for some items but required payment for other items.[18] While it is positive to see the number of collection programs increasing, the ultimate method of disposal for the collected wastes is not clear.

WEEE should be disposed of responsibly and carefully because of the toxic and hazardous substances and components that it contains.[19] One estimate suggests, however, that up to 90% of WEEE from jurisdictions without a formal recovery program is currently landfilled, incinerated,

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[13] Western provinces have taken a lead with regard to WEEE management in Canada. Alberta instituted an electronics recycling program in 2004 and Saskatchewan and British Columbia put in place WEEE diversion programs in 2007. Further discussion about these initiatives is given in a later section of the paper.

[14] PHA Consulting Associates. *Electronic Waste Recovery Study.* Prepared for Resource Recovery Fund Board, 2006: www.epsc.ca/pdfs/atlantic_report.pdf.

[15] Presentation made by Glenda Gies at WDO's first workshop to support the development of a diversion program for Waste Electrical and Electronic Equipment, Tuesday June 26, 2007 at the Novotel Toronto Center, Toronto.

[16] *Ibid*.

[17] Waste Electrical and Electronic Equipment (WEEE) Program Plan Development Background Paper, October 5, 2007. Posted at http://www.ontarioelectronicstewardship.ca/pdf/background_paper.pdf.

[18] *Ibid*.

[19] Europa website, Questions & Answers on EU Policies on Electric and Electronic Waste, Memo 05/248, August 11, 2005: http://europa.eu/rapid/pressReleasesAction.do?reference=MEMO/05/248&format=HTML&aged=1&language=EN&guiLanguage=en.

or disposed of without pre-treatment.[20] Landfilling is dangerous because many toxic materials, such as mercury, PCBs, PBDE, and cadmium, have the potential to leach or evaporate from the landfill. Uncontrolled fires may also take place in landfills, leading to toxic emissions including dioxins and furans.[21] The releases of these substances into the air, groundwater, and soil may pose significant health and environmental risks. Landfilling of WEEE is doubly inefficient because landfill space is then taken up by materials that tend to be highly recyclable and that are often economically valuable. Incineration and open burning are of major concern because the hazardous substances, including heavy metals, can produce emissions that are toxic to human health and the environment. The export of WEEE has risen dramatically in recent years, due to a combination of factors including: the relatively high expense of reuse, recycling, and other disposal options in tightly regulated facilities in Canada and the US; low labour costs in developing countries; worldwide demand for metallic components such as copper, lead, gold and silver; and a generally unregulated overseas "recycling" market.

## Export and the Basel Convention

Globalization of world markets has encouraged governments and private companies, particularly those in developed countries, to trade waste as a commodity to those who are able to take it for economic gain. Players in industrialized countries have also seen greater incentives to export their waste as their governments implement stricter regulatory regimes to protect human health and the natural environment, causing the cost of local disposal to rise. Ontario and other jurisdictions in North America and Western Europe in particular have been increasing their exports to the South as a result of this phenomenon.[22] It is estimated that anywhere from 50% - 80% of all end-of-life electronics are exported to Asia for processing.[23] This number cannot be verified for Canada, however, because neither Statistics Canada nor the Canada Border Services Agency tracks this information.

In developing countries, low-paid recycling workers and scavengers sort through discarded WEEE and process it through a variety of low-tech methods including manual disassembly and open burning.[24] The recycling sectors in these countries often do not have the technology or financial resources to entirely recover or recycle the usable portions of WEEE and residual hazardous waste.[25] The majority of workers in this sector also work without personal health or environmental protection measures. Toxins such as lead readily make their way to near-surface groundwater and other nearby waterways. The regular open burning of the discarded wastes emits harmful toxins, including dioxins, furans, and heavy metals, into the air, posing serious

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[20] PHA Consulting Associates. *Electronic Waste Recovery Study.* Prepared for Resource Recovery Fund Board, 2006: www.epsc.ca/pdfs/atlantic_report.pdf at ES-2.

[21] The Behaviour of PVC in Landfill, Study for DG ENV, Argus in association with the University of Rostock, 1999.

[22] Tammemagi, H. *The Waste Crisis: Landfills, Incinerators, and the Search for a Sustainable Future*. New York: Oxford University Press, 1999.

[23] Noranda Recycling – Fact Sheet, June 2005: http://www.christielites.net/recycle_pdfs/doc_20060908134826.pdf.

[24] Hicksa, C., Dietmara, R., Eugsterb, M. "The recycling and disposal of electrical and electronic waste in China—legislative and market responses" *Environmental Impact Assessment Review* 25 (2005): 459– 471.

[25] Basel Action Network. *The Digital Dump: Exporting Re-use and Abuse to Africa*. Seattle: BAN, 2005.

health and environmental threats to workers and others.[26] For instance, one year after the appearance of the WEEE industry in Guiyu, China, the city's groundwater was so contaminated with lead, cadmium, and other contaminants that the city began diverting drinking water from a nearby town.[27] The lack of awareness of the potential hazards of WEEE on the part of consumers, collectors and recyclers also poses a significant challenge for the reform of hazardous disposal practices.[28]

The United Nations adopted the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal in 1989 in response to the growing and largely negative socio-economic impacts of hazardous waste export, including WEEE, from developed to developing regions.[29] The Convention aims to limit and reduce the movement and dumping of hazardous waste across national borders, promotes cleaner methods of production, and attempts to limit the impacts of hazardous waste throughout all stages of its use.

In 1995 the UN made an Amendment to the Convention that explicitly banned the export of hazardous waste from any developed nation to a developing nation for any purpose. The Amendment has not yet come into force, however, because it has not yet received ratification from the required three-fourths of the Parties who accepted the Convention. Although Canada has signed and ratified the Basel Convention it has not yet ratified the Amendment.[30]

Canada's export of hazardous materials is also governed by the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*.[31] These regulations are designed to control the export and import of hazardous waste and, among other requirements, they maintain that: hazardous material should only be recycled and disposed at authorized facilities; all transboundary shipments of these materials must be tracked from their original facilities to their final destinations; and written confirmation of disposal or recycling must be provided.[32]

WEEE exporters are able to get around the Basel Convention and the Export and Import Regulations by stating that the material is not waste, but that the products are being exported for purposes of reuse, repair or refurbishment; exporters often tout these shipments as a means to provide computers to those who couldn't otherwise afford them and thus help fix the "digital divide."[33] Significant levels of WEEE, including hazardous materials, therefore continue to be

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[26] Basel Action Network. *The Digital Dump: Exporting Re-use and Abuse to Africa*. Seattle: BAN, 2005.

[27] Hicksa, C., Dietmara, R., Eugsterb, M. "The recycling and disposal of electrical and electronic waste in China—legislative and market responses" *Environmental Impact Assessment Review* 25 (2005): 459– 471.

[28] *Ibid*.

[29] Basel Convention Website: http://www.basel.int/text/documents.html.

[30] Basel Convention Ban Amendment Website: http://www.basel.int/pub/baselban.html.

[31] SOR/2005-149.

[32] Environment Canada, Waste Management Website: *Export and Import of Hazardous Wastes and Hazardous Recyclable Material Regulations:* http://www.ec.gc.ca/wmd-dgd/default.asp?lang=En&n=FB2EC4CD-1.

[33] Basel Action Network (BAN). Briefing Paper 10: *Preventing the Digital Dump: Ending "Re-use Abuse"*, September 2007: http://www.ban.org/Library/BP10_09_07.pdf.

exported from Canada to developing nations.[34] While some of this export is in legitimately useable products the Basel Action Network (BAN) estimates that almost 75% of the traded used computer equipment is unusable and ends up immediately being discarded.[35]

Although the export and dismantling of WEEE has led to largely negative health and environmental impacts for developing countries, the emerging resource recovery and recycling sector in these countries has the potential to play an important role in their local economies.[36] Many players in the domestic recycling industry, as well as a number of government representatives, have even suggested that the Basel Convention is a significant impediment to the interests of developing countries because it does not adequately distinguish between recyclable materials and hazardous wastes bound for disposal.[37] The concern is that the agreement prevents resource-rich materials from being exported to countries that rely on recovering cheap metals and other materials from imported scrap. These countries are then forced to import expensive raw materials for production.

In light of these realities and concerns, and the fact that WEEE export is likely to continue, Canada and other industrialized countries should consider ways to reduce the health and environmental risks related to WEEE trade. This would involve taking steps to minimize the adverse implications of product treatment and disposal including greater emphasis on toxics reduction during product design and production.

## Domestic Reuse, Recycling, and Recovery of WEEE

As an alternative to WEEE export and disposal, an innovative domestic waste management sector has arisen to divert WEEE from landfill using methods that reuse, recycle, recover, and extend the life of products. [38] This sector has emerged in part because of heightened worldwide demand for non-renewable resources, which has increased the viability of extracting materials from the waste products that contain them.

WEEE is more complex and difficult to manage than traditional solid or hazardous wastes. Discarded products tend to be made up of many components including plastics, metals and glass

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[34] Notably, the United States (US) was a signatory of the original Basel Convention but did not ratify it. It has also not been a signatory to the Amendment. While the US has passed the Resource Conservation and Recovery Act and other legislation designed to protect importing countries from hazardous waste, it has exempted the WEEE category from all such legislation. WEEE continues to flow from the US to developing nations, as well as to other developed nations including Canada because the Basel Convention does not specifically address the export of WEEE from one developed nation to another: Basel Action Network. *Exporting Harm: The High Tech Trashing of Asia*. Seattle: BAN, 2002.

[35] Basel Action Network (BAN). *The Digital Dump: Exporting Re-use and Abuse to Africa*. Seattle: BAN, 2005.

[36] PHA Consulting Associates. *Electronic Waste Recovery Study.* Prepared for Resource Recovery Fund Board, 2006 at 3-21: www.epsc.ca/pdfs/atlantic_report.pdf.

[37] Fothergill, J. *Scrap Mining: An Overview of Metal Recycling in Canada.* The Canary Research Institute for Mining, Environment and Health, 2004 at 5.

[38] Williams, A., Darby, L. & Hines, F. *Left on the Scrapheap? The WEEE directive and social sustainability.* ESRC Centre for Business Relationships, Accountability, Sustainability and Society: http://www.brass.cf.ac.uk/uploads/caweeessAW0603.pdf.

in addition to toxic and hazardous substances. While whole products or many of their components may be salvaged for reuse and refurbishment, these products require complex disassembly and treatment upon recycling, or at their final disposal.

A number of valuable metals, such as gold, copper, steel, aluminum, lead, and other substances, can now be recovered from WEEE and then recycled and reused in the manufacturing of other products. Technologies for the recycling and recovery of glass and plastics are also increasingly being developed and refined. Recycling and recovering these materials lessens the need for virgin resources and energy use. WEEE recycling is also much less energy-intensive and less detrimental to the environment and health compared to landfilling and incineration, and recycling reduces the need for primary electronics production processes that tend to employ toxic substances.[39]

*Metals Recycling*

The recycling of WEEE plays an important role in the scrap metal recycling sector, which has developed processes and markets to facilitate metals recycling from a wide range of products including cars, batteries, and scrap building materials. This infrastructure allows recyclers to recover significant amounts of metals and precious metals such as steel, copper, lead, zinc, gold, platinum, and silver from WEEE. Metal is a highly recyclable material and is not degraded by recycling.[40] This contrasts with materials such as paper, for example, whose quality deteriorates with each new recycling process.

Increasing scarcity of and demand for metals along with greater environmental consciousness has paved the way for metals recycling to become a profitable activity. In 1998 over 1,000 scrap metal recycling companies in Canada employed approximately 20,000 employees.[41] In 2004 Natural Resources Canada estimated the number of companies to have risen to 2800,[42] suggesting that the sector is rapidly expanding. This sector salvages approximately 10 million tonnes of metal each year worth $3 billion.[43] Many in the industry say that recycling creates more jobs than landfilling and other forms of waste disposal.[44]

Scrap metal recycling lessens the demand for virgin minerals and brings about important energy savings and reductions in pollution over primary resource extraction, including reduced emissions of greenhouse gases – which are increasingly being linked to global climate change.

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[39] Berkhout, F. & Herton, J. "De-materializing and re-materializing: digital technologies and the environment" *Futures:* 36 (2004), 903-920.

[40] Fothergill, J. *Scrap Mining: An Overview of Metal Recycling in Canada.* The Canary Research Institute for Mining, Environment and Health, 2004.

[41] Jacob, G. *A Presentation to Mining Matters for Nova Scotia '98 Mining Works for Canada.* The Mining Association of Canada, 1998: http://www.mining.ca/www/_news/news_74.php.

[42] Natural Resources Canada, *Metals Recycling Industry Structure*: http://www.recycle.nrcan.gc.ca/structure_e.htm.

[43] Fothergill, J. *Scrap Mining: An Overview of Metal Recycling in Canada.* The Canary Research Institute for Mining, Environment and Health, 2004.

[44] *Ibid*.

For instance, the recycling of aluminium achieves a 79% material conservation, a 95% energy saving, a 97% reduction of effluents, and a 95% reduction in emissions over primary resource extraction. Steel recycling brings a 90% materials savings, 86% reduction in emissions, and a 76% reduction in water pollution.[45]

*Recycling of Other Materials*

WEEE also contains a number of other materials for which recovery must be considered. WEEE has an average plastics content of approximately 30%.[46] Computer equipment is composed of approximately 25% glass and 23% plastic; a variety of metals make up the remainder.[47] Despite WEEE's large composition of glass and plastic, waste metal recycling receives much greater attention due to the higher economic value of metals, the greater capacity for their sale on the market, and their high capacity for recovery. It is important to note that while the recycling of metals generates revenue, the need to include recycling of other components often means that there is a financial cost to recycling overall. Recovery options for plastics and other materials and components that are difficult to recover, such as those that are hazardous or contaminated, are being explored by many players who are keen to achieve higher, more efficient, and more cost-effective WEEE diversion. A more detailed discussion about these efforts and methods, however, is beyond the scope of this paper.

*The WEEE Recycling Process*

Domestic recyclers employ a number of innovative processes to recover materials in WEEE. Because of its complexity, WEEE recycling occurs in multiple stages. The following is one example of how this recycling can take place:

1. Products are disassembled to retrieve parts that can be reused or resold.[48]
2. Pollutants and components that pose a safety hazard are manually removed as the equipment is dismantled. These include: nickel-cadmium batteries; lithium batteries; materials containing PCBs; mercury switches; and LCD displays.[49] These materials are then disposed of in compliance with waste legislation and storage requirements.

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[45] Fothergill, J. *Scrap Mining: An Overview of Metal Recycling in Canada.* The Canary Research Institute for Mining, Environment and Health, 2004 at 2.

[46] *Science for Environment Policy*: European Commission DG Environment News Alert Service, edited by BIO Intelligence Service: http://ec.europa.eu/environment/integration/research/newsalert/pdf/63na4.pdf.

[47] CSR, RIS International Ltd., MacViro Consultants Inc. and Jack Mintz & Associates Inc. *Waste Electronic and Electrical Equipment Study.* Prepared for Waste Diversion Ontario, 2005: http://webservices.siriusweblabs.com/dotconnector/files/domain4116/Final%20WEEE%20Study%20Report%20for%20printing%20with%20revisions.pdf.

[48] Environmental Commissioner of Ontario, *Choosing our Legacy: Annual Report 2003-2004*, at 181: http://www.eco.on.ca/english/publicat/ar2003.pdf.

[49] Welslau, G., Kraus, H.H. *Electronic Waste (WEEE).* Division for the Environment, Energy and Research , STOA, European Parliament, 1998.

3. The remaining waste is then shredded into small pieces and separated by various processes (magnets, high performance screens, sieves).[50] Precious metals such as gold and silver can be removed from printed circuit boards and components via chemical processes.[51]
4. Components are sent to undergo material-specific separation processes at smelters and recycling facilities for recovery.
5. Separated components are sold to larger wholesalers who will perform final treatment.
6. Wholesalers process the metal for sale to domestic and international firms.[52]
7. Firms then use the recycled metals as raw materials in new products.[53]

*Ontario Initiatives*

It is difficult to determine how much WEEE is recycled in Canada and Ontario for a number of reasons, including the fact that comprehensive data on the flows of recycled or recyclable materials, including supply and demand, do not yet exist.[54] Although some WEEE disposal has been tracked in the past, processes for reporting and tracking need to be implemented and strengthened if the sector is to be understood and if effective controls are to be assessed and put in place. Alberta and Saskatchewan have begun to collect this data through their provincial WEEE programs. Ontario's proposed WEEE management plan would also collect, track, and report this data once the program is approved and implemented.

*WEEE Recycling in Ontario – White Goods*

White goods (large household appliances such as washers and fridges) are by far the most commonly recycled WEEE. In 2004 approximately 62% by weight of the white goods disposed of in Ontario was diverted from landfill for the recovery of metals and other valuable resources (although approximately 83% by weight was actually collected for diversion). The majority of the remaining 38% of WEEE in the white goods category was sent to landfill.[55]

A number of white goods recycling programs in Ontario have enjoyed some success in diverting valuable resources from landfill. One example, the Cold Shoulder Program, was organized by Hydro One to allow its customers to have their old fridges, freezers or air conditioners picked up

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50 *Ibid*.

51 Equator Initiative, *Breaking Up – Spain*, March 2004: http://www.tve.org/ho/doc.cfm?aid=1454&lang=English.

52 Environmental Commissioner of Ontario, *Choosing our Legacy: Annual Report 2003-2004*, at 181: http://www.eco.on.ca/english/publicat/ar2003.pdf.

53 Natural Resources Canada, *Metals Recycling Industry Structure*: http://www.recycle.nrcan.gc.ca/structure_e.htm.

54 Natural Resources Canada – *Recycling Statistics:* http://www.recycle.nrcan.gc.ca/stats_e.htm.

55 CSR, RIS International Ltd., MacViro Consultants Inc. and Jack Mintz & Associates Inc. *Waste Electronic and Electrical Equipment Study.* Prepared for Waste Diversion Ontario, 2005: http://webservices.siriusweblabs.com/dotconnector/files/domain4116/Final%20WEEE%20Study%20Report%20for%20printing%20with%20revisions.pdf.

at no charge for recycling.[56] While the focus of this initiative was to remove old appliances that consumed too much energy from the Ontario energy grid, the end result was that old appliances were picked up and recycled instead of being sent to landfill. It is important to note that there are currently no standards in place to regulate how this diversion takes place.

*WEEE Recycling in Ontario – Non-White Goods*

Most WEEE categories in Ontario, including Small Appliances, Information Technology (IT), Telecom, and Audio Visual Equipment, have enjoyed much less success than the diversion of white goods. Products under these four categories, along with Portable Household Appliances, accounted for roughly 46% of the WEEE generated in 2004; however, only an estimated 1% – 3% of this waste was diverted from landfill.[57]

A number of players in Ontario have developed initiatives to divert, responsibly manage, and extend the end-of-life date of these other categories of WEEE. For example, the City of Ottawa has offered a Take It Back Program for residents since 1997. This program provides options for residents to return goods to their places of purchase, where the vendors will then recycle, responsibly dispose of or, in some cases, repair the goods. Over 500 local businesses currently participate in the program; some of those businesses accept a variety of electronic devices.[58]

An example of a successful electronics industry take back program is the Rechargeable Battery Recycling Corporation (RBRC) Battery and Cell Phone Program "Call2Recycle".[59] This initiative, financed by over 350 manufacturers and marketers, has more than 7,000 collection sites in Canada and more than 50,000 sites across the US where used batteries and cell phones can be returned by the public, free-of-charge, for materials recovery and safe disposal.[60]

A number of industries have created programs for consumers to return their used products. For instance, Toshiba Canada's TERRE program has made all of their notebook computers compliant with Europe's *Restriction on Hazardous Substances Directive*, and consumers can send back their used notebook computers for full recycling.[61] Apple,[62] Dell,[63] HP,[64] IBM,[65] and many other

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[56] Hydro One - Cold Shoulder Appliance Pick-up Program: http://www.hydroonenetworks.com/en/efficiency/cold_shoulder_program/default.asp.

[57] CSR, RIS International Ltd., MacViro Consultants Inc. and Jack Mintz & Associates Inc. *Waste Electronic and Electrical Equipment Study.* Prepared for Waste Diversion Ontario, 2005: http://webservices.siriusweblabs.com/dotconnector/files/domain4116/Final%20WEEE%20Study%20Report%20for%20printing%20with%20revisions.pdf.

[58] City of Ottawa. *Take it Back*: http://app01.ottawa.ca/takeitback/Welcome.do?lang=en.

[59] Rechargeable Battery Recycling Corporation website: http://www.rbrc.org/call2recycle/.

[60] *Ibid*.

[61] See the Toshiba Canada website at: http://www.toshiba.ca/web/link?id=2200.

[62] Apple Website - *Apple and the Environment:* http://www.apple.com/environment/.

[63] Dell Website – *Dell Recycling:* http://www.dell.com/content/topics/segtopic.aspx/dell_recycling?c=us&cs=19&l=en&s=dhs.

[64] HP Website – *Product Recycling:* http://www.hp.com/hpinfo/globalcitizenship/environment/recycle/.

[65] IBM Website – *Product Recycling Programs:* http://www.ibm.com/ibm/environment/.

computer brands also accept returned products at their deemed end-of-life. Producers such as Sims (formerly Noranda/Falconbridge/Xstrata), HP, Dofasco and Alcan have all developed post-consumer recycling capabilities and employ recycling as part of their operations.[66]

Since 2003 Xstrata (at the time Noranda/Falconbridge) and HP have worked in partnership to operate Sims Recycling Solutions (formerly Noranda Recycling Inc.), a state-of-the-art electronic recycling plant in Brampton, Ontario. The plant separates useful metals from hazardous materials. This facility: uses useful metals in its partners' smelters and recycles them for recovery; recycles other materials such as various grades of plastic; and sends most hazardous materials to specialty companies to be further processed.[67] The facility also tracks these materials to ensure that downstream processors handle and process them in environmentally responsible ways.[68] This plant has an annual capacity of 3 million pounds per month and is able to recycle 100% of the electronics hardware.[69] The facility uses incineration with energy recovery to deal with its plastics; this energy is then used to power the facility's processes.[70]

*Refurbishment and Reuse*

In addition to product and materials recycling, a number of other innovative businesses and programs have arisen to reuse and refurbish WEEE, thereby extending the useful lives of products. Although, as discussed earlier, some of these programs send WEEE to developing countries for disposal under the stated purpose of reuse or refurbishment, many others engage in legitimate reuse and refurbishment activities.

The Electronics Recycling Association (ERA), a non-profit association in the Greater Toronto Area, provides drop-off depots as well as pick-up services for individuals, small businesses, corporations and government departments. It then donates the old computers and electronics to schools, non-profit groups, charities and other organizations.[71] The ERA has an internal policy that it will deal with all of the components it processes in a way that is environmentally sound, that no harmful components will be sent to landfill, and that no harmful waste will be sent overseas for dumping.[72]

The Computers for Schools and Renewed Computer Technology Ontario programs accept donations of useful, slightly obsolete computers, and other such products for refurbishment. The refurbishment is completed by recent graduates who gain unpaid work experience. Once

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66 Paduada, M. "Mining the Waste Stream" *Pharmaceutical News Index* (2005) 36-40.

67 Now Magazine. *E-waste Article*: http://www.nowtoronto.com/issues/2006-04-20/goods_next.php.

68 Noranda Website, *Electronics Recycling*: http://www.micrometallics.com/homepage/ElectronicsRecycling.aspx.

69 Noranda Recycling. *Fact Sheet*, June 2005: http://www.christielites.net/recycle_pdfs/doc_20060908134826.pdf.

70 While the Ontario Ministry of the Environment does not consider incineration to be a form of recycling or diversion, the Sims facility argues that plastics replace virgin fuels that would otherwise be used for energy production.

71 Electronic Recycling Association, Welcome Page: http://www.era.ca/donations/recycling/index.html.

72 Electronic Recycling Association, Computer & Electronic Reuse, Recycling, Disposal, Handling Services: http://www.era.ca/donations/recycling/services.html.

refurbished, these products are redirected to schools.[73] Initiatives such as these not only extend the product's life for a period of time; they also provide a number of socio-economic benefits. Emerging initiatives such as these advance the sustainability of the electronics sector by promoting social and environmental aims, while also providing economic gains.

[73] Computers for Schools: http://cfs-ope.ic.gc.ca/; Computers for Schools Ontario: http://www.computersforschoolsontario.com/cfs.html.

# 3. Examining WEEE Policy

## Ontario's Waste Diversion Policy Landscape

The *Waste Diversion Act*

The primary legislation regulating waste diversion in Ontario is the *Waste Diversion Act* (*WDA*).[74] It was enacted in 2002 to promote the reduction, reuse and recycling of waste and to provide for extended producer responsibility in waste diversion programs. Under the *WDA*, Waste Diversion Ontario (WDO) was established as a non-crown corporation with responsibility to develop, implement and operate waste diversion programs and monitor their effectiveness and efficiency.[75] Thus far, the following categories of waste have been designated under the *WDA*: blue box waste materials (glass, metal, paper, plastic and textiles);[76] used tires;[77] used oil material;[78] municipal hazardous and special waste;[79] and waste electrical and electronic equipment, such as household appliances and computers.[80]

In December 2004, the Ministry of the Environment (MOE) designated WEEE regulation for the purposes of the *WDA*. The regulation sets out in detail the types of electrical and electronic devices that are designated for diversion (see Appendix A).[81] This is by far the most extensive list of devices regulated in North America. WDO has certainly faced obstacles in its efforts to initiate diversion programs for other wastes that have been designated under the *WDA*. 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. In the case of the WEEE, it is expected that an implementation timeframe will be announced in 2008 with implementation to occur in 2009/10.[82] A scheduled government review of the *WDA* is expected to begin early in 2008 to assess the effectiveness of this piece of legislation and the operation of the WDO and its programs.

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74 S.O. 2002, c. 6.

75 *Waste Diversion Act*, S.O. 2002, c. 6, s. 5.

76 O. Reg. 273/02 under the *Waste Diversion Act, 2002*.

77 O. Reg. 84/03 under the *Waste Diversion Act, 2002*.

78 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% 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.

79 O. Reg. 542/06 under the *Waste Diversion Act, 2002*.

80 O. Reg. 393/04 under the *Waste Diversion Act, 2002*.

81 O. Reg. 393/04, s. 1.

82 Katalin Feszty and James Calder, "E-waste legislation grows in Canada" *Green SupplyLine*, February 19, 2007.

Facilitating WEEE recycling under the *Environmental Protection Act*

In March 2007, the MOE amended the General Waste Regulation – Reg. 347 – made under the *Environmental Protection Act* in order to promote recycling of WEEE. The amended regulation provides an exemption from approval requirements in s. 27, 40 and 41 of the *EPA* for waste management systems or disposal sites that deal only in the collection, handling, transportation, storage or transfer of waste electrical and electronic equipment that is intact, transferred by a generator and destined for a site where the waste will be processed for the recovery of materials.[83]

## Future of WEEE Diversion in Ontario

In 2004, just after it made a regulation under the *WDA* designating WEEE, the Ontario Minister of the Environment formally requested in writing that WDO develop a waste diversion program for the listed WEEE materials. In this letter, the Minister set out four priority WEEE categories and asked WDO to develop program requirements for these priority categories and conduct a study on the state of WEEE management in Ontario prior to the final Minister's Program Request Letter. The Minister specifically asked that the WEEE program be developed in cooperation with a new Industry Funding Organization (IFO) to be incorporated by WDO for the waste diversion program.[84]

The Minister specified a number of other program requirements for WEEE, requiring WDO to:

- consider the Canada-Wide Principles for Electronics Product Stewardship as issued by the Canadian Council of Ministers of the Environment;
- include a plan to internalize all program costs;
- develop or adopt a set of vendor qualification requirements to ensure WEEE is processed in a safe and environmentally sound manner that satisfies local, provincial, national and international regulations;

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[83] Reg. 347, R.R.O. 1990, s. 8.

[84] Letter from Hon. Leona Dombrowsky, Minister of the Environment, to Mr. Bas Balkissoon, Chair, Waste Diversion Ontario, December 20, 2004. The WEEE materials included in the four priority categories are as follows: Schedule 1, Household Appliances [Air conditioner, Clothes dryer, Clothes washer, Dishwashing machine, Freezer, Refrigerator, Stove and five additional devices listed in Schedule 1 as recommended by the IFO representing the most commonly used household appliances such as toasters, coffee makers and blenders]: Schedule 2, Information Technology Equipment [CD-ROM drive, Computer disk drive, Computer keyboard, Computer mouse, Computer terminals, Copier, Monitor (CRT), Monitor (LCD), Monitor (Plasma), Personal computer (Desktop), Personal computer (Handheld), Personal computer (Laptop), Personal computer (Notebook), Personal computer (Notepad), Personal digital assistant (PDA), Printer, Computer flatbed scanner, Typewriter]; Schedule 3, Telecommunications Equipment [Fax machine, Modem, Pager, Telephone (Cellular), Telephone (Cordless), Telephone (Wire line), Telephone answering machine]; and Schedule 4, Audio-Visual Equipment [Amplifier, Audio player (tape, disk, digital), Audio recorder (tape, disk, digital), Camera (film, tape, disk, digital), Equalizer, Preamplifier, Radio, Receiver, Speaker, Television (CRT), Television (LCD), Television (Plasma), Television (Rear Projection), Tuner, Turntable, Video player or projector (tape, disk, digital), Video recorder (tape, disk, digital)].

- include incentives encouraging stewards to initiate measures designed to reduce waste resulting from their products, increase recyclability of products and increase use of recycled content of products;
- include a research and development component to increase the efficiency of WEEE diversion systems and an educational and public awareness component to support the program;
- provide at a minimum for waste generated from residential sources;
- define stewards as persons who are the brand owners, assemblers in the case of non-branded equipment, and first importers of products; and
- ensure that stewards' fees payable for WEEE material under the Program shall apply to WEEE material produced in Ontario or entering Ontario, for sale to the consumer for use by the consumer in Ontario, regardless of the selling technique used, including internet sales.[85]

In response to the Minister's letter, WDO released its *Consultation Plan to Support the Development of a Diversion Program for Waste Electronic and Electrical Equipment* in April 2005.[86] In July 2005, WDO issued the *Waste Electronic and Electrical Equipment Study* it had prepared, in consultation with a multi-stakeholder working group, to respond to the request of the Minister.[87] The study presented advice and recommendations developed by the WEEE Working Group, including: advice on which funding option was most appropriate to Ontario; additional equipment in the priority categories that should be included; that a 12-month timeline would be adequate to implement the program; recommendations on annual collection and diversion targets; and that the IFO should require stewards to report both residential and Industrial, Commercial and Institutional (IC&I) sales from the beginning of the program commencement and then begin to develop a plan for IC&I in the second year of the program.[88]

The Working Group suggested the following program funding options for consideration by WDO:

- A "zero fee" for WEEE product management costs for both historical and future products that are managed by stewards directly.
- Reserve cumulation for historic wastes and future wastes, where appropriate. Examples of appropriate situations include where products are being replaced in the marketplaces and will not be sold into the future (e.g. fax machines) and for products where a significant proportion of orphan waste is anticipated due to the typical lifespan of companies.

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[85] Letter from Hon. Leona Dombrowsky, Minister of the Environment, to Mr. Bas Balkissoon, Chair, Waste Diversion Ontario, December 20, 2004.

[86] Waste Diversion Ontario, *Consultation Plan to Support the Development of a Diversion Program for Waste Electronic and Electrical Equipment*, April 2005.

[87] Waste Diversion Ontario, *Waste Electronic and Electrical Equipment Study*, July 8, 2005.

[88] *Ibid*.

- Fixed fees for some categories of historic waste and perhaps some limited use for financing management of future wastes.
- Variable fees to reflect differences in end-of-life management costs (and perhaps other considerations) for different product categories and for different brands, where data are available to support fee differentiation.
- Allocating WEEE management costs on the basis of the proportion of returned products for historic wastes where technically possible and economically efficient and on the basis of current market share (sales) for future wastes.[89]

In June 2007, the Minister of the Environment sent a final Minister's Program Request Letter to WDO, requiring it to proceed with developing the WEEE program. The Minister's letter requires WDO to ensure that WEEE is processed in a safe and environmentally sound manner through the program. The program will be phased in. Phase One will focus on Information Technology equipment (such as desktop and portable computers, monitors and printers) and Audio-Visual equipment (including televisions). The Minister asked that the proposal for Phase One be completed by February 1, 2008. The Minister will then require a proposal for Phase Two items within a year of approving the Phase One proposal.

The Minister's final 2007 Program Request Letter specified a number of program requirements in addition to those laid out in the Minister's first Program Request Letter for WEEE:

- The program must provide for WEEE that is generated both by residential and IC&I sources;
- Designated Stewards must finance all of the program costs. These costs will include, at minimum: the collection, storage, transportation, processing, and marketing of all WEEE that is collected for diversion, including the residual waste material after diversion takes place; research and development to support and increase collection and diversion activities; activities for public education and awareness raising; and activities to develop and promote WEEE diversion.
- A set of funding rules are to be followed. These include that fees collected during Phase One of the program must be used to pay for program activities and that they must be used to maximize diversion rather than fund landfilling or incineration.
- A tracking and auditing mechanism for WEEE from the point of collection through to its final destination. The program will also include provisions for stewards to report both residential and IC&I sales upon the start of Phase One of the program.
- The program should attempt to maximize WEEE management where limited reuse and recycling options are available.
- WEEE collection programs and sites will be established or expanded so as to be convenient and accessible to all Ontarians, including high-density urban areas, rural communities, and northern Ontario.

[89] Waste Diversion Ontario, *Waste Electronic and Electrical Equipment Study*, July 8, 2005 at 15.

- The program will include collection and diversion targets for each WEEE item in Phase One for the first five years of the program. Accessibility targets will also be set in order to ensure that the program is convenient and accessible to all Ontarians.[90]

On September 20, 2007, Ontario Electronic Stewardship (OES) was established by manufacturers, retailers, and other stakeholders as the IFO responsible for coordinating, alongside WDO, the development and implementation of the WEEE program. Since its establishment OES has been consulting with stakeholders in the development of the WEEE Program Plan. In response to a request by OES, the Minister of the Environment extended the deadline of February 1, 2008 for OES' Program Plan to March 31, 2008.

## WEEE Management Strategies in Other Jurisdictions

*Other Canadian Jurisdictions*

Over the past several years there has been significant growth in WEEE regulation in a number of Canadian jurisdictions, as well as cooperative development of Canada-Wide Principles for Electronics Product Stewardship by the Canadian Council of Ministers of the Environment (see Appendix B).[91]

British Columbia recently amended its broad Recycling Regulation[92] to require the development of an electronics product stewardship plan. In October 2006, Environmental Product Stewardship Canada (EPSC) submitted the *British Columbia Stewardship Plan for End-of-Life Electronics* to the BC Ministry of Environment, followed by additional information in November 2006. In December 2006, the Ministry of Environment approved the stewardship plan[93] and implementation of the province-wide "Return-It Electronics" program began in August 2007. This program is funded by an Environmental Handling Fee (EHF), differentiated by product, on the sale of new products.[94] On December 6, 2007, the BC Ministry of the Environment issued a press release applauding the program and reporting that it had already diverted more than 1.8 million kilograms of WEEE from landfill during its first three months in operation.[95]

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[90] Letter from Hon. Laurel Broten, Minister of the Environment, to Ms. Gemma Zecchini, Chair, Waste Diversion Ontario, June 11, 2007.

[91] CCME, *Electronics Waste*: http://www.ccme.ca/ourwork/waste.html?category_id=129.

[92] B.C. Reg. 449/2004.

[93] British Columbia Ministry of the Environment – Environmental Protection Division: http://www.env.gov.bc.ca/epd/epdpa/ips/electronics/index.html.

[94] Electronics Stewardship Association of BC website, *Frequently Asked Questions for Consumers*: http://www.encorp.ca/cfm/index.cfm?It=925&Id=66.

[95] BC Ministry of Environment, Information Bulletin, *E-waste recycling diverts waste from landfills,* December 6, 2007: http://www2.news.gov.bc.ca/news_releases_2005-2009/2007ENV0129-001561.pdf.

Alberta established a WEEE management program in 2004,[96] administered through the Alberta Recycling Management Authority. The program is funded through non-refundable environmental fees that are charged on the sale of designated new electronics and collected by electronics retailers. The collected fees are used to pay the costs of implementing the electronics recycling program, including collection and transportation from collection sites to recyclers, processing and recycling of waste electronics material, public information and awareness programs, and research into improved technologies for processing and recycling. There is no cost associated with dropping off eligible electronics at collection sites for recycling, and there are more than 220 such sites in Alberta, not including collection day events.[97] Electronics are disassembled at Registered Processors' facilities and shipped to downstream processors for further recycling.[98] This program recycled more than 16,800 tonnes of electronic waste between October 2004 and October 2007.[99]

In Saskatchewan, Waste Electronic Equipment Regulations have recently been put in place under the *Environmental Management and Protection Act*.[100] As a result, the Saskatchewan Waste Electronic Equipment Program (SWEEP) came into effect in February 2007. SWEEP is a non-profit corporation established by manufacturers, retailers, and other stakeholders in Saskatchewan to collect and recycle waste electronics responsibly. "First sellers" of electronic products must either join the SWEEP program or establish their own province-wide, government-approved program for taking back and recycling these products. All programs must include collection and recycling of a share of historic and orphan waste.[101]

Manitoba has proposed a Household Hazardous Waste Stewardship Regulation that would prohibit the sale of regulated products, including TVs, computers, laptops, and scanners, not covered by a stewardship program. Although it was anticipated that a program might be announced in mid 2007, to commence in 2008, this has not yet occurred.[102] The expected program would require producers of electronic waste materials to implement and fund a program to address waste collection and processing. More information is expected in March 2008.[103]

Quebec has also proposed legislative amendments requiring producer responsibility for WEEE and suggested that they may come into effect in 2007.[104] These amendments have also been delayed, however.

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[96] Katalin Feszty and James Calder, "E-waste legislation grows in Canada" *Green SupplyLine*, February 19, 2007.

[97] Alberta Recycling Management Authority website – Quick Facts and Stats: http://www.albertarecycling.ca/BasicContent.aspx?id=66.

[98] Alberta Recycling Management Authority, *Electronics recycling FAQs*: http://www.albertarecycling.ca/Article.aspx?id=422&ekmensel=8_submenu_18_btnlink.

[99] Alberta Recycling Management Authority website – Quick Facts and Stats: http://www.albertarecycling.ca/BasicContent.aspx?id=66.

[100] Chapter E-10.21 Reg 4.

[101] Saskatchewan Waste Electronic Equipment Program: http://www.sweepit.ca/.

[102] Katalin Feszty and James Calder, "E-waste legislation grows in Canada" *Green SupplyLine*, February 19, 2007.

[103] Green Manitoba, EPR – Electronics Program: http://www.greenmanitoba.ca/cim/1001C1_1T93T.

[104] Katalin Feszty and James Calder, "E-waste legislation grows in Canada" *Green SupplyLine*, February 19, 2007.

In 2006, New Brunswick amended its *Clean Environment Act* to permit the Minister of Environment to establish a stewardship board to: manage the manufacture, storage, collection, transportation, recycling, disposal or other handling of a designated material; and ensure that these activities are conducted by industry in accordance with a board-approved stewardship plan.[105] Materials will be designated by regulation.[106]

Nova Scotia's Minister of Environment and Labour announced Electronic Product Stewardship Regulations in February 2007.[107] These regulations will ban disposal of electronic waste in landfills and create a province-wide system for collection and recycling of electronic waste. The regulations will come into effect in two phases: on February 1, 2008, for the first group of products and February 1, 2009, for the second.[108] The Electronics Stewardship Program Plan submitted by the Resource Recovery Fund Board (RRFB), the entity chosen through a competitive bid process to develop, implement, and administer the industry-led program, was approved by Nova Scotia's Minister of Environment and Labour on October 5, 2007.[109] Beginning in February 2008, this program will provide a province-wide drop-off network for household residents and the IC&I sector and provide for the collection, transportation, consolidation and responsible recycling of end-of-life electronics that are identified in the regulation.[110] Electronic product brand owners – manufacturers and distributors – will be responsible for the costs of the program.

Quebec, Nova Scotia and New Brunswick have also collaborated with 10 northeastern American states to establish Model Electronic Recycling Legislation.[111]

*European Union*

The European Union (EU) has been a leader in WEEE management. In 2002, the EU introduced two directives: the *Waste Electrical and Electronic Equipment Directive* (WEEE Directive) and the *Restriction on Hazardous Substances Directive* (RoHS Directive).

The WEEE Directive addresses the collection, treatment, and end-of-life materials recovery of electrical and electronic products. Producers are responsible for cradle-to-grave stewardship of their products. The stewards are to finance the collection and subsequent processing, resource recovery, and safe disposal of residual materials. The intent of the legislators was to give manufacturers the incentive to both design their products in such a way as to lengthen their initial

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[105] *Clean Environment Act*, R.S.N.B. 1973, c. C-6, s. 1, 22.1.

[106] Katalin Feszty and James Calder, "E-waste legislation grows in Canada" *Green SupplyLine*, February 19, 2007.

[107] Nova Scotia news release, *New Regulations Passed for E-Waste*, February 23, 2007.

[108] Nova Scotia Ministry of Environment and Labour website, *Nova Scotia's New Electronic Waste Regulations*: http://www.gov.ns.ca/enla/waste/ewaste.asp.

[109] Atlantic Canada Electronics Stewardship website: http://www.acestewardship.ca/.

[110] *Ibid*.

[111] RSJ Technical Consulting website, *Model Electronic Recycling Act*: http://www.rsjtechnical.com/NewsNErecycling.htm. See: http://www.nerc.org/adobe/ElectronicRecyclingLegislation/RegionalDraft5-06_revised.pdf.

useful life, and make eventual end-of-life processing as easy as possible. These two ideals are known as Design for Environment (DfE) and Design for Disassembly (DfD).[112]

The RoHS Directive was designed to ban the use of six hazardous materials: lead, mercury, hexavalent chromium, cadmium, polybrominated biphenyls, and polybrominated diphenyl ethers in electrical and electronic equipment beginning in July 2006.[113] This directive ensures that products are safer and have a lower environmental impact when they are disposed. The individual member states of the EU are required to transpose the directive into national legislation to deal with WEEE that harmonize with the overarching WEEE and RoHS Directives. There are a variety of national programs that deal with WEEE. They employ a variety of methods of collection and processing that are suited to national and local conditions and practices.[114]

Per capita diversion of WEEE from landfill has increased as a result of the WEEE Directive, particularly in member states that already had a strong history of recycling behaviour.[115] However, virtually all European countries are behind in their mandated targets for per capita diversion and will likely continue to find it difficult to meet these targets in the near future. This is due in part to the increasing use of electrical and electronic components in consumer products and the increasing consumption and disposal of these products, as well as the fact that adequate markets for all of the materials that could be recovered from WEEE do not yet exist. Although the EU WEEE Directive has perhaps not yet been as effective as anticipated, it is important to note that the EU has made much more progress in adequately addressing the issue of WEEE than other jurisdictions.[116]

*United States*

The United States (US) does not have a national WEEE initiative. In contrast to the EU, where policymakers at the European Council coordinated the WEEE policy response, the US approach has been to seek stakeholder leadership, particularly through the large Original Equipment

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[112] Nakajima, N. & Vandenburg, W.H. "A Failing Grade for WEEE Take-Back Programs for Information Technology Equipment" *Bulletin of Science, Technology, & Society,* 26 (6) (2005): 507-517.

[113] Boon, J. "Stemming the Tide of Patchwork Policies: The Case of E-Waste" *Transnational law and Contemporary Problems,* 15 (2006), 731-756.

[114] Nakajima, N.,& Vandenburg, W.H. "A Failing Grade for WEEE Take-Back Programs for Information Technology Equipment" *Bulletin of Science, Technology, & Society,* 26 (6) (2005): 507-517; Boon, J. (2006). "Stemming the Tide of Patchwork Policies: The Case of E-Waste" *Transnational law and Contemporary Problems,* 15 (2006): 731-756.

[115] Nakajima, N. & Vandenburg, W.H. "A Failing Grade for WEEE Take-Back Programs for Information Technology Equipment" *Bulletin of Science, Technology, & Society,* 26 (6) (2005): 507-517. For instance, in its first year of implementation, Ireland greatly exceeded the EU's 2008 collection target and saw a five-fold increase in the recycling of household WEEE. Ireland implemented the WEEE Directive using an industry-based national registration body for producers and two collective compliance schemes. In the first year of the program's implementation over 2 million pieces of electrical equipment were collected for recycling. For more information see Ireland's Department of the Environment, Heritage and Local Government's progress report: 193.178.1.117/attached_files/RTF%20files/EnvironmentHeritageAndLocalGovProgress07.rtf.

[116] Nakajima, N. & Vandenburg, W.H. "A Failing Grade for WEEE Take-Back Programs for Information Technology Equipment" *Bulletin of Science, Technology, & Society,* 26 (6) (2005): 507-517.

Manufacturers (OEMs). The National Electronic Product Stewardship Initiative (NEPSI), created by the large OEMs, also included other stakeholders such as federal and state-level policymakers, academics, and representatives from non-governmental organizations. NEPSI favoured a harmonized national WEEE framework as opposed to a patchwork of individual state sponsored WEEE policy responses. However, disagreement between the different OEMs about methods for financing a national WEEE program has led to delays in this process.[117]

The US Environmental Protection Agency (EPA) has initiated a number of federal electronics product stewardship programs. To promote its goals of fostering environmentally conscious design and manufacturing and increasing the purchasing and use of more environmentally sustainable electronic products, the EPA is engaged in the Electronic Product Environmental Assessment Tool, a Design for the Environment (DfE) partnership program and a Federal Electronics Challenge, all aimed at encouraging procurement of the most environmentally responsible electronic products.[118]

Despite its goal of increasing safe, environmentally sound reuse and recycling of used electronics, the EPA does not administer any federal reuse or recycling programs. However the agency is involved with public education through the Plug-In to eCycling campaign and has drafted Guidelines for Materials Management. In addition, the EPA is engaged in a Mid-Atlantic eCycling Pilot Project that is demonstrating the feasibility of a multi-state, public/private residential electronics collection, reuse, and recycling program based on shared responsibility.[119]

In the face of the delays towards a national WEEE program, many individual states have begun to take their own actions. For example, California has put in place a number of legislative initiatives and some infrastructure for recycling a variety of WEEE. The state has also made provisions in its legislation to account for the EU WEEE and RoHS Directives.[120] California's leadership and its efforts to align its legislation with that of the EU are no doubt largely driven by the economic benefits of keeping doors open to trade with the EU and other nations that are setting strict product standards.

There are also two promising regional state-level developments (one with some Canadian provincial involvement) designed to develop coordinated policy responses to WEEE. As stated above, in 2006 ten northeastern states and the provinces of Quebec, New Brunswick and Nova Scotia, in collaboration with recyclers, developed Model Electronic Recycling Legislation.[121] Likewise, seven Midwest states are developing the Midwest Regional Electronic Waste

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[117] *Ibid*.

[118] US EPA Product Stewardship website, *Electronics Federal Programs – Activities Promoting EPA's Goals for Electronics*: http://www.epa.gov/epaoswer/non-hw/reduce/epr/products/ele-programs.htm.

[119] *Ibid*.

[120] RSJ Technical Consulting – *What is California WEEE*: http://www.rsjtechnical.com/WhatisCaliforniaWEEE.htm.

[121] RSJ Technical Consulting website, *Model Electronic Recycling Act*: http://www.rsjtechnical.com/NewsNErecycling.htm. See: http://www.nerc.org/adobe/ElectronicRecyclingLegislation/RegionalDraft5-06_revised.pdf.

Recycling Policy Initiative that appears to be reflective of the northeastern states' Model Electronic Recycling Legislation.[122]

[122] Midwest Regional Electronic Waste Recycling Policy Initiative: http://www.pca.state.mn.us/oea/stewardship/electronicsmidwest.cfm.

# 4. Expanding WEEE Diversion in Ontario

Given the environmental and health implications of improper WEEE disposal, it is encouraging that the MOE has made a commitment to increase WEEE diversion through the *WDA* process, and that a coordinated effort for managing this waste stream sustainably will hopefully soon be underway. It is important, given the expenses and efforts that stewards are being asked to incur, that the program live up to its potential.

The program may begin to ensure success by meeting the Minister's stated requirements, as laid out in the 2004 and 2007 Program Request Letters. These elements include:

- ambitious collection and diversion targets;
- programs that are effective and convenient for consumers;
- strong public education and outreach campaigns to promote the program and help consumers understand how to participate;
- tracking and monitoring that provides useful data for the development of diversion programs; and
- effective vendor qualification standards and vendor audits including auditing of downstream processors.

The importance of these elements, in combination with a number of others, will be elaborated upon in the following section. This section will also discuss a number of other opportunities, in addition to the program being developed by OES, for the province to further increase diversion of WEEE.

## Participation in WEEE Diversion Activities by Consumers

*General Public*

There are a number of socio-economic reasons why WEEE reuse, recycling, and other methods of diversion have not risen beyond the previously noted levels in Ontario, and why public participation in these efforts has remained so low.[123]

Under the *Municipal Act*, municipalities are responsible for the delivery of waste management services to their residents. This has led to a diverse and somewhat bewildering array of municipal waste diversion programs, regulations, and financial incentives across different

[123] CSR, RIS International Ltd., MacViro Consultants Inc. and Jack Mintz & Associates Inc. *Waste Electronic and Electrical Equipment Study.* Prepared for Waste Diversion Ontario, 2005: http://webservices.siriusweblabs.com/dotconnector/files/domain4116/Final%20WEEE%20Study%20Report%20for%20printing%20with%20revisions.pdf.

municipalities that can be extremely confusing to consumers.[124] Some of the services provided may also be more effective than others. For example, a national survey undertaken in the US found that ongoing collection programs recovered over 50% more waste material than special events.[125] Municipalities have been financially stretched, however, and are often unable to provide ongoing diversion programs, or to provide effective education about municipal programs for that matter. In addition, given the cost of recycling WEEE properly, it is uncertain as to whether WEEE collected by municipalities has been responsibly recycled or exported.

As discussed in Section 2, a number of industries have created programs for consumers to return their used products. Initiatives such as these are uncoordinated, however, and consumers continue to experience confusion and a general lack of awareness about what disposal options exist for their waste electronics.

Another barrier for diversion is that consumers must make more of an effort to dispose of WEEE outside of the convenient curbside collection system and there is no regulatory requirement for residents to treat WEEE any differently from household waste. Not only does responsible behaviour go unrewarded but WEEE diversion programs often charge a fee, creating a further disincentive for reuse or recycling. However, while creating a separate curbside collection system for WEEE might be ideal for consumer participation, this option is not preferable from an environmental or financial perspective.[126]

Underlying all of these barriers is the reality that the public remains generally unaware of the negative socio-economic and environmental implications associated with WEEE and what alternatives – for greener purchases as well as diversion options – exist. Businesses have remained relatively quiet on this issue; most do little to provide and promote greener options or to encourage responsible purchasing and disposal.

Many approaches have been shown to increase consumer participation in waste diversion activities. For instance, teenagers and young adults have shown increased diversion activity when they have been exposed to ongoing consumer and public education initiatives that highlight the benefits of recycling.[127] HP and Scholastic have developed an educational initiative for grades 4-6 in the US, with a variety of skills-building materials and lesson plans, to help youth understand the impact of electronics on the environment.[128] This program is currently being extended to Canada through a partnership with Learning for a Sustainable Future; the material is being

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[124] MOE – Ontario Ministry of the Environment. *Ontario's 60% Waste Diversion Goal: A Discussion Paper.* Queen's Printer for Ontario: Toronto, 2004.

[125] Northeast Recycling Council. *National Survey of Government Operated Electronics Collection Programs and Training Manual for Setting Up and Operating Collection Programs*, 2001: www.nerc.org.

[126] Curbside collection is unlikely to become a major diversion option due to a number of economic and environmental challenges: the costs associated with this option are significant; the likelihood of weather damage from being left at the curb, as well as breakage while handling and hauling, nearly eliminates the potential for WEEE reuse; and rain, among other elements, can cause toxic substances to be leached into the soil.

[127] Saphores, J-D.M., Nixon, H., Ogunseitan, O.A. & Shapiro, A.H. "Household Willingness to Recycle Electronic Waste: An Application to California" *Environment and Behaviour,* 38 (2) (2006): 183-208.

[128] HP and Scholastic partnership: Environmental Education Program for 4-6 Grades: http://www.hp.com/hpinfo/grants/us/programs/techloop.html.

significantly expanded and translated into French, to fit Canadian curriculums across the country.[129]

Older adults, meanwhile, participate more fully in diversion activities when this participation is made easy for them.[130] Recent surveys have consistently shown that consumers would participate in electronics recycling if they had convenient access to programs and if they did not have to pay a cost or could receive an incentive for participating.[131] Consumers have cited retailers of electronics products as an obvious choice for WEEE drop-off. A recent study found that 61% of its respondents would prefer to return a used product to a retailer for recycling rather than taking it to a local landfill or transfer station, or shipping it to its original manufacturer, even if there was no cost involved.[132] However, the Retail Council of Canada (RCC) has consistently advocated against legislated return-to-retail programs for a number of reasons including retailers' shortage of floor space and the need for them to hire additional staff to accommodate returns.[133]

The US Environmental Protection Agency (EPA) has created an innovative program, *Plug-In To eCycling,* to help coordinate education, reuse, recycling, and other infrastructure needed to address WEEE. This partnership between the EPA and consumer electronics manufacturers consists of a number of activities whereby it:

- educates consumers about WEEE and its hazards;
- provides informational resources to municipalities and companies on how to build successful electronics recycling programs;
- helps consumers understand how to find recycling vendors who will take and manage waste responsibly;
- establishes pilot projects to test innovative methods for safe electronics reuse and recycling;[134] and
- creates an infrastructure that links consumers to responsible manufacturers and retailers.[135]

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[129] Personal Communication with Frances Edmonds, Director of Environmental Programs, HP Canada.

[130] Saphores, J-D.M., Nixon, H., Ogunseitan, O.A., & Shapiro, A.H. "Household Willingness to Recycle Electronic Waste: An Application to California" *Environment and Behaviour,* 38 (2) (2006): 183-208.

[131] PHA Consulting Associates. *Electronic Waste Recovery Study.* Prepared for Resource Recovery Fund Board, 2006: www.epsc.ca/pdfs/atlantic_report.pdf.

[132] SoundStats for Washington Citizens for Resource Conservation, *Public Opinion Research on Electronics Recycling*, August 2002: www.prrbiz.com/WCRC_Report2.pdf.

[133] Retail Council of Canada, RCC Submission to the Alberta Standing Committee on Resources and Environment, August 24, 2007: http://www.assembly.ab.ca/resourcesandenvironment/Submissions/RE-RR-088.PDF; RCC Submission to EBR Registry Posting #RA06E0003, *Designation of Municipal Hazardous or Special Waste under the Waste Diversion Act, 2002,* July 10, 2006: http://www.retailcouncil.org/advocacy/environment/submissions/submission_ebr_registryposting.asp.

[134] It is important to note that there are no enforceable standards for these pilot projects; this is a significant omission.

[135] US EPA Plug-In To eCycling program: http://www.epa.gov/epaoswer/osw/conserve/plugin/index.htm.

*Industrial, Commercial and Institutional Sectors*

Participation by the Industrial, Commercial and Institutional (IC&I) sectors in voluntary reuse and recycling activities also appears to be largely determined by the amount of effort required to participate and whether there is a cost to participation.[136] The relative lack of collection and diversion programs for waste diversion presents a major barrier for these sectors. Any WEEE collection programs that currently exist are, for the most part, limited to computers and IT equipment. The majority of programs also target large companies, leaving small businesses with few cost-effective options for responsible waste management.[137]

In Ontario, specified IC&I businesses are identified as subject to O. Reg.102/94 and 103/94 requirements for waste reduction and recycling. O. Reg. 102/94 requires identified IC&I establishments to conduct waste audits and develop and implement waste reduction work plans. O. Reg. 103/94 requires source separation programs for specified wastes. However, the Ontario government has only recently begun to enforce these regulations.[138]

Many corporations have chosen to be good corporate citizens, despite a number of financial and other barriers, by contracting private sector companies to collect and process recyclable materials. Other companies, especially in highly competitive or cost-conscious environments, hesitate to engage in voluntary waste diversion activities that would add to their bottom-line costs if their competitors do not also do so.

Unfortunately governments themselves have not yet shown enough leadership through their own WEEE procurement or management practices. The US Federal Electronics Challenge (FEC) can be looked to as an example of how provincial and federal governments could become role models in this area. The FEC is a voluntary program that encourages federal facilities and agencies to purchase greener electronics, to reduce the impacts of electronics during use, and to dispose of them in an environmentally sound way.[139] The FEC is managed by the US EPA and provides resources and technical assistance, awards, and recognition to federal facilities and agencies that have achieved greener electronics practices and met specific program goals.[140]

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[136] Personal Communication with Dennis Maslo, Managing Partner, Computation Inc. Dennis Maslo has observed that with small/medium businesses the size of the cost is not so much an issue as whether there is a cost. Any resistance to paying a cost appears to be more a matter of principle than an actual financial barrier.

[137] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-37: www.epsc.ca/pdfs/atlantic_report.pdf.

[138] MOE Fact Sheet, *Ensuring a High Level of Environmental Protection*, June 2007 : http://www.ene.gov.on.ca/en/publications/6307e.pdf.

[139] Federal Electronics Challenge: http://www.federalelectronicschallenge.net.

[140] The national goals of the FEC are: 1) By 2008, 95% of computer units purchased by eligible FEC partners are EPEAT Bronze-qualified or higher; 2) By 2008, 100%of computer units purchased by eligible FEC partners will have an average life span of at least four years; 3) By 2008, ENERGY STAR® features will be enabled on 100% of computer monitors in operation at eligible FEC partner facilities; 4) By 2008, 100% of eligible FEC partners' non-reusable computer units will be recycled using environmentally sound management as defined by EPA's Plug-In to eCycling guidance: Federal Electronics Challenge – *Goals Identification Form:* http://www.federalelectronicschallenge.net/forms/goals5.pdf.

Two years after its launch in 2004, 133 federal agencies and facilities representing over 442,000 employees were participating in the program, including the Departments of Agriculture, Commerce, Homeland Security, Transportation, and the Executive Office of the President. For the 2006 year, the program reported energy savings of 134,924 MWh, primary material savings of 29,715,633 kg (the equivalent weight of 230,354 refrigerators), significant greenhouse gas, air and water emissions savings, and cost savings of $11.7 million.[141]

Governments in Canada could show similar public leadership for computer purchasing, use, reuse, and disposal, with cost savings from the program being put towards offsetting its coordination costs. Setting up a system, such as the US' user-friendly Electronic Product Environmental Assessment Tool,[142] or gaining access to an existing system, would also assist agencies to acquire and procure computer products that meet approved standards. Government leadership on the development and use of procurement standards would also go a long way toward leveraging product design changes in the sector.

WDO Program Recommendations:

1) OES and WDO should ensure that the province's proposed WEEE diversion Program involve aggressive consumer outreach and education, is accessible and convenient to all Ontarians, and includes a tracking mechanism as mandated by the Minister of the Environment.

2) The Program should include a centralized mechanism, such as the US EPA's *Plug-In To eCycling* program, to provide consumer education, information about local drop-off points and methods for consumer participation, and support for municipalities.

3) The Ontario government and WDO should take measures to ensure that the Program's educational activities are comprehensive and involve multiple perspectives.

Additional Recommendations for Governments:

4) School curriculums should be designed to include information about sustainable WEEE management including pollution prevention and diversion at every stage of the product's lifecycle.

[141] Federal Electronics Challenge. *2006 Accomplishments Summary*, updated May 10, 2007: http://www.federalelectronicschallenge.net/resources/docs/accomplishments06.pdf.

[142] The Electronic Product Environmental Assessment Tool (EPEAT) is a user-friendly product assessment tool that allows purchasers to compare and select computer desktops, monitors, and notebook computers based on their environmental attributes, cost and performance considerations. It helps the US Federal Electronics Challenge (FEC) facility and agency partners meet the acquisition and procurement standards of the FEC: http://www.epeat.net.

5) The provincial and federal governments should lead by example with regards to electronics purchasing, use, reuse, and disposal by introducing standards for government agencies to follow in their procurement and end-of-life management strategies.

## Ontario's WEEE Management Sector

An innovative and market-driven WEEE management sector has been emerging in Ontario for the better part of a decade, as is taking place around the world. This sector is made up of a wide range of businesses and organizations. Some have emerged to take advantage of market gaps for the reuse and recycling of economically valuable waste resources. Other businesses in this sector are producers and retailers that are choosing to model responsible behaviour by dealing with the waste generated by their products.

The WEEE management sector in Ontario faces a number of challenges and barriers to more extensive and sustainable reuse and recycling, many of which are economic. Reuse and recycling are currently more cost-effective for some WEEE products, for instance computer and computer-related products, than others because these products and the materials they contain have high market value.[143] Unfortunately, the recycling of most electronic products is currently unable to recover its costs.[144]

WEEE reuse and refurbishment (collection for resale in the market) appears to be profitable for a small number of product categories: IT equipment (primarily PCs and monitors); telecom equipment (primarily cell phones); household appliances (primarily large appliances); and audio visual equipment (primarily televisions and stereos).[145] Waste handlers trying to make a profit often reuse and refurbish less WEEE than they receive.[146] As discussed earlier, a number of businesses have developed economically viable programs that advance sustainable communities through job creation, the donation of products to needy schools and causes, and other socially

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[143] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-26: www.epsc.ca/pdfs/atlantic_report.pdf; Personal Communication with Dennis Maslo, Managing Partner, Computation Inc. Dennis Maslo suggests that approximately 20% of IT equipment currently received by the WEEE diversion industry could be reused. While the final processed value of a unit of reused equipment exceeds that of a unit of recycled equipment, the inputs required by WEEE processing organizations to achieve reuse are also greater than those required for recycling. Dennis suggests that the net value economics within an organization facilitating both reuse and recycling of *waste* IT equipment from a demographically average urban area are relatively equal between the reuse and recycling streams. While the final products of WEEE processing often have net positive value, external financial inputs are still required to fund the process of converting the liabilities of the WEEE stream into assets or environmentally benign substances/products.

[144] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-26: www.epsc.ca/pdfs/atlantic_report.pdf.

[145] CSR, RIS International Ltd., MacViro Consultants Inc. and Jack Mintz & Associates Inc. *Waste Electronic and Electrical Equipment Study.* Prepared for Waste Diversion Ontario, 2005 : http://webservices.siriusweblabs.com/dotconnector/files/domain4116/Final%20WEEE%20Study%20Report%20for%20printing%20with%20revisions.pdf.

[146] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-27: www.epsc.ca/pdfs/atlantic_report.pdf.

responsible activities. Many European countries have made a conscientious effort to support these businesses and their initiatives.[147]

The lack of cost-effective and stable markets for recycled materials is a major barrier for this sector in Canada. Market prices are partly determined by the quantity of materials being sold and by how frequently they are available.[148] Canada's low population density and the large distances that exist between major centres in much of Canada, particularly northern communities, have made it difficult for recyclers to amass large quantities of materials and to make them consistently available.

The levels of contamination of materials also impacts market prices.[149] Plastics are frequently contaminated by hazardous compounds such as heavy metals, brominated flame retardants, and polybrominated dioxins and furans.[150] This presents a number of challenges for reuse and recycling, including safety concerns as well as the fact that contamination limits the future applications of the materials.[151] Scrap plastics also come in a wide variety of polymers that must be separated for effective recycling. A number of advances are being made to separate plastics and detect contaminants. Until these processes are more developed, however, recyclers will continue to favour incineration processes, perhaps with energy recovery, over recycling to deal with plastics. This is unfortunate; Life Cycle Analysis studies that have examined recycling in comparison with incineration and landfilling have shown recycling to be environmentally preferable to incineration or landfilling by a large margin.[152]

Market prices for scrap materials are global. High demand for scrap metals from developing countries, especially in Asia and China, have led to volatile markets in recent years. Rising demand and subsequent increases in prices have led to greater exports of scrap metals and declining sales within North America. [153] This has led to further weakening of the domestic recycling sector and many processing facilities now operate below capacity despite the production of large quantities of WEEE in the country.[154]

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[147] Williams, A., Darby, L. & Hines, F. *Left on the Scrapheap? The WEEE directive and social sustainability*. ESRC Centre for Business Relationships, Accountability, Sustainability and Society at 2: http://www.brass.cf.ac.uk/uploads/caweeessAW0603.pdf.

[148] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-28: www.epsc.ca/pdfs/atlantic_report.pdf.

[149] *Ibid*.

[150] *Science for Environment policy*: European Commission DG Environment News Alert Service, edited by BIO Intelligence Service: http://ec.europa.eu/environment/integration/research/newsalert/pdf/63na4.pdf.

[151] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-29: www.epsc.ca/pdfs/atlantic_report.pdf.

[152] 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.

[153] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-29: www.epsc.ca/pdfs/atlantic_report.pdf.

[154] PHA Consulting Associates. *Electronic Waste Recovery Study*. Prepared for Resource Recovery Fund Board, 2006 at 3-37: www.epsc.ca/pdfs/atlantic_report.pdf.

Canadian provinces have so far been unable to develop cost-effective programs for WEEE reuse and recycling. The lack of coordinated WEEE management infrastructure in Ontario has aggravated the challenges noted above and has been a particular barrier to the recycling of plastics. This problem is cited as one of the major reasons that the National Electronic Product Stewardship Initiative in the US has been less successful than anticipated.[155]

Municipalities, despite holding responsibility for overall waste management, have had few resources to establish, coordinate, harmonize, and develop infrastructure for effective programs, with no legal mandate to provide incentives to businesses to promote extended producer responsibility and encourage more responsible design. Each of the economic costs discussed above has acted as a barrier to sustainable WEEE management, particularly in the absence of regulation and the lack of willingness, among producers, retailers, consumers, and other stakeholders, to pay for sustainable diversion efforts.

It is hoped that these issues will no longer present significant barriers to WEEE diversion in Ontario with the proposed implementation of a coordinated WEEE Program in Ontario. The Ontario Minister of the Environment's June 2007 Program Request Letter to WDO identified product stewards, defined as brand owners, first importers, and assemblers of non-branded products, as responsible for financing the full costs of the WEEE Program that is to be developed in Ontario.[156] This means that stewards, as a collective, must ensure the safe and environmentally sound disposal of their own products.[157]

MOE's decision to make the product stewards financially responsible should be applauded. Leadership from the stewards should ideally support and complement the efforts of municipalities, who have faced challenges in developing effective programs on their own. WDO's province-wide Program will also hopefully help to develop materials markets and to achieve economies of scale for reuse, recycling and other diversion activities. This will, ideally, make WEEE diversion a more profitable activity and provide greater incentives for industries to embrace waste diversion activities.

A challenge for stewards may come from a lack of WEEE program coordination or harmonization across Canadian provinces. Although the Canadian Council of Ministers of the Environment (CCME) has held deliberations over harmonization and developed the Canada-Wide Principles for Electronics Product Stewardship (see Appendix B), differences in regulation,

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[155] *Ibid* at 3-6.

[156] Stewards will likely pass the fees onto consumers. WDO does not have the authority to prescribe how the program's financing takes place, including whether fees are made visible or invisible to consumers.

[157] The notion of making producers responsible for the costs of product disposal is referred to as Extended Producer Responsibility (EPR). It is important to note, however, that the program being developed in Ontario does not represent EPR in the most complete sense of the term. EPR in its fullest sense refers to the notion that if a manufacturer is responsible for the final disposal of its products, and hence the raw materials contained within them, that manufacturer has the incentive to design and produce the product so that, at the end of the product's usable life, it presents a financial asset or at least not a significant liability. The product should thus be able to be recycled and/or reused in a cost-effective and sustainable manner. The problem with a collective stewardship program, such as the one being developed in Ontario, is that while it provides financing for more sustainable disposal, it will actively discourage manufacturers from investing in more sustainable product design in the first place as any benefits that may be obtained are spread out among the collective, including competitors.

business support, infrastructure, and other program elements remain. These distinct environments may lead to challenges and lost opportunities including the following: stewards will need to vary their activities in different regulatory environments; there may be confusion on the part of consumers, particularly members of the IC&I sectors with offices in different jurisdictions; and there may be duplicated efforts among provinces with regard to developing and managing these programs.

The waste management industry faces additional barriers to sustainable WEEE management. One issue that is particularly problematic with regard to the recycling of metal and glass is that the existing tax system favours the extraction of virgin materials and places higher taxation rates on recycled materials. Recycling activities are disadvantaged by subsidies and tax incentives that flow towards the mining sector, while taxes on capital and business inputs affect scrap firms more than resource and manufacturing firms.[158]

The WEEE management industry also faces a number of challenges when it aims to recycle materials that are classified as hazardous waste by federal standards. While special classification, handling, and treatment are important for toxic materials such as lead or mercury that are to be slated for disposal, these considerations may also impede reuse, recycling and recovery activities and may be less necessary when the materials are being used as feedstock for future products. The regulations currently in place raise handling and shipping costs and act as additional barriers to reuse and recycling activities.[159] One way to increase reuse and recycling activities would be to offer an exemption mechanism to waste managers who properly reuse and recycle WEEE without triggering restrictions currently mandated by federal hazardous waste regulations.

<u>WDO Program Recommendations:</u>

6) OES, in collaboration with other provincial WEEE programs, should strive for better coordination or harmonization of WEEE programs, infrastructure, and regulations to: facilitate consumer participation and steward compliance; help build markets for reusable and recyclable materials; and advance the long-term feasibility and competitiveness of the waste management sector.

7) OES and the Ontario government should work with the WEEE management sector and related industrial engineering experts to promote the research and development of improved plastics recycling capabilities.

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[158] Fothergill, J. *Scrap Mining: An Overview of Metal Recycling in Canada.* The Canary Research Institute for Mining, Environment and Health, 2004 at 2 and 3. A more detailed discussion is beyond the scope of this report. A number of resources, however, can provide further information about this issue: Scharf, K. "Tax Incentives for Extraction and Recycling of Basic Materials in Canada", *Fiscal Studies* (1999), 20(4): 451-477 – can be accessed at http://www.ifs.org.uk/fs/articles/0016a.pdf; MiningWatch website - http://www.miningwatch.ca/index.php?/Newsletter_16/Mining_Taxation.

[159] Fothergill, J. *Scrap Mining: An Overview of Metal Recycling in Canada.* The Canary Research Institute for Mining, Environment and Health, 2004 at 5; The Mining Association of Canada. A briefing note – *Resource Recovery, Recycling and Mining Innovation*, September 2002 at 2.

Additional Recommendations for Governments:

8) The Ontario government should assess its current tax system and consider modifications that favour reuse and recycling activities over the extraction of virgin materials.

9) The federal government should review existing hazardous waste regulations with the aim of facilitating and promoting WEEE reuse and recycling while considering an oversight mechanism that would ensure that these materials are processed in an approved manner.

## Additional Mechanisms for Sustainable WEEE Management

In addition to the required elements of the Program being developed by OES, the Ontario government should take a number of measures to create a regulatory environment that advances the safe and environmentally sound management of WEEE.

A primary consideration is that the management of WEEE should be achieved within the context of a broader and more comprehensive waste hierarchy, where diversion activities such as reduction, reuse and recycling are mandated to occur before disposal is allowed. A comprehensive waste management framework, as recommended by CIELAP in its report *Ontario's Waste Management Challenge – Is Incineration an Option?*,[160] would help promote maximum waste diversion of WEEE in Ontario.

Similar to the European Union's WEEE Directive, Ontario's WEEE Program should prioritize diversion activities according to an appropriate waste hierarchy with the priority being placed on reducing waste generation in the first place, followed by reuse and then recycling.[161] In fact the EU requires that priority be given to repairing equipment first so that it can be reused; where this is not possible, the WEEE Directive requires that targets for the reuse and recycling of components as well as slightly higher recovery targets be met.[162] Ontario's diversion Program should work to ensure that the handling, transport, storage, distribution, and management of WEEE maximize diversion at each level of the hierarchy. For instance, reuse organizations need to receive products that are undamaged; this is very different from the needs of recyclers, who can process broken equipment. A process for screening products for reuse could be made an important part of the Program.

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[160] Carter-Whitney, M. *Ontario's Waste Management Challenge – Is Incineration an Option?*. CIELAP: March, 2007.

[161] Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE). Item 3 states "where the generation of waste cannot be avoided, it should be reused or recovered for its material or energy"; Item 18 states "Where appropriate, priority should be given to the reuse of WEEE and its components, subassemblies and consumables. Where reuse is not preferable, all WEEE collected separately should be sent for recovery, in the course of which a high level of recycling and recovery should be achieved. In addition, producers should be encouraged to integrate recycled material in new equipment." http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32002L0096:EN:HTML.

[162] CEMarketing.Net Website - Questions & Answers on EU Policies on Electrical and Electronic Waste: http://www.cemarking.net/ce-marking/faqs/faqs/questions_&_answers_on_eu_policies_on_electrical_and_electronic_waste.html.

In the context of a comprehensive waste management policy, the Ontario government should work with WDO to set ambitious collection and diversion targets for different categories of WEEE. The Minister's Program Request Letter has recognized the importance of both collection and diversion targets and has mandated that the Program provide these anticipated targets for each WEEE item in the Program.[163] The EU, which has set reuse and recycling targets of 50% to 70% of WEEE by weight depending on the product type, may be useful as an example. The Ontario government should ensure that the targets set by WDO are ambitious and aim to achieve significantly greater diversion than a business-as-usual scenario. To facilitate the achievement of these targets, the Ontario government should strongly consider instituting a ban on WEEE in landfills, similar to the ban put in place by Nova Scotia that will come into effect for the first group of targeted products in Nova Scotia's program on February 1, 2008.[164]

It will also be important for the WEEE Program currently under development to ensure that businesses that undertake WEEE management activities follow safe and responsible procedures. The Minister recognized this need and, in the 2007 Program Request Letter, mandated that vendor qualification requirements be established to ensure the safe and environmentally sound management of WEEE.[165] OES and WDO propose to use the Electronics Recycling Standard developed by Electronics Product Stewardship Canada as the basis for the standards used in Ontario.[166] OES will approve for operation only those processors that meet the standards and thus can demonstrate that they can process materials in a manner that is environmentally sound and economically efficient. It is likely that OES will also use processors that can maximize diversion, so as to meet Program targets. It is important that appropriate qualification standards that are protective of the environment be developed for all types of WEEE processors, including reuse and recycling organizations, to acknowledge their distinct methods of operating.

The Program is also required to involve a tracking and auditing mechanism, including the auditing of all downstream processors.[167] This auditing process, achieved by a third party, will ensure that vendors are meeting the vendor qualification standards as well as regulatory requirements. The development of standards in combination with an auditing mechanism to

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[163] Letter from Hon. Laurel Broten, Minister of the Environment, to Ms. Gemma Zecchini, Chair, Waste Diversion Ontario, June 11, 2007; Item 9 of the Letter states that the WDO Program submission "shall describe and include an assessment of (…) the anticipated collection and diversion targets for each WEEE item for the first five years of the program".

[164] Nova Scotia Ministry of Environment and Labour website, *Nova Scotia's New Electronic Waste Regulations*: http://www.gov.ns.ca/enla/waste/ewaste.asp.

[165] Letter from Hon. Laurel Broten, Minister of the Environment, to Ms. Gemma Zecchini, Chair, Waste Diversion Ontario, June 11, 2007; Item 7 of the Letter states that "WDO shall develop and adopt a set of vendor qualification requirements to ensure WEEE is processed in a safe and environmentally sound manner that satisfies local, provincial, and national regulations and international obligations, including the *Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal*. The set of vendor qualification requirements should form part of the WEEE Program submission".

[166] As stated in a program consultation with ENGOs, December 17, 2007. The EPSC Electronic Recycling Standard can be accessed at: http://www.epsc.ca/pdfs/March2006_RVQP_standard.pdf.

[167] Letter from Hon. Laurel Broten, Minister of the Environment, to Ms. Gemma Zecchini, Chair, Waste Diversion Ontario, June 11, 2007; Item 8 of the Letter states that "The Program submission shall identify a tracking and auditing mechanism for WEEE from the point of collection through to its final destination, including verification of processing, in accordance with Phase One of the phase-in schedule".

ensure that all processors, including downstream processors, abide by current regulations will go a long way to making WEEE management more sustainable. The government should be commended for requiring these Program components; it is hoped that the MOE, WDO, and OES will be able to ensure that they are consistently followed.

Even if processors follow best practices, however, a major concern for sustainable WEEE management is the presence of toxic and hazardous materials contained within the products in the first place. A number of jurisdictions have begun to require that electrical and electronic equipment be designed and produced with less toxic materials. As discussed in Section 3, the EU has been a leader in this area; its RoHS Directive has been in force since July 2006. This regulation has led jurisdictions around the world to debate whether to follow suit by adopting similar regulations to limit toxic materials in electronic and electrical equipment. Canada and Ontario have not yet adopted similar legislation or regulations. However, the Canada-Wide Principles for Electronics Product Stewardship adopted by the CCME emphasize the importance of reducing toxic materials in products.[168]

The move towards toxics reduction would alleviate a number of related concerns. The challenges presented by contaminated plastics and other hazardous materials, which were discussed earlier, would become less of an issue for recyclers. The elimination of many hazardous materials in scrap components will also present significant gains for the safety of domestic and international workers who reuse and recycle these materials, to the advantage of the industry.

A large number of major brands have taken a leadership role by becoming RoHS compliant for all of their products, not just those shipped to the EU (the only place where RoHS is mandated).[169] Retailers have also been shifting in this direction.[170] It is a positive sign that businesses are moving towards RoHS compliance for competitive business purposes. Canada's small businesses, which make up a large percentage of Canadian stewards, however, have expressed concern that they would be at a significant disadvantage if they had to meet standards similar to those set out by the RoHS Directive.[171] Failure to acknowledge this environmentally progressive trend, however, is more likely to put these same businesses at a trade disadvantage, both as suppliers to major companies who have become RoHS compliant and as direct exporters to RoHS compliant countries. While market share has significant potential to influence business practices in this area and deserves greater discussion, it is beyond the scope of this paper to provide further details.

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[168] PHA Consulting Associates, *Electronic Waste Recovery Study* Prepared for Resource Recovery Fund Board, 2006 at 3-12: www.epsc.ca/pdfs/atlantic_report.pdf.

[169] In June 2003 Matsushita Electric Industrial Co., owner of Panasonic brand, announced that as of April 2005 all of its new products, including those manufactured in or sold to other countries outside of the EU, would no longer use RoHS restricted substances. This decision was made, in part, due to the assumption that other countries would adopt similar regulations. A number of other manufacturers, including Canon, Toshiba, and HP have also taken important steps to reduce the toxicity of their products.

[170] For instance Wal-Mart decided that, as of July 2006, all computers sold in its stores in the United States must be RoHS compliant.

[171] Concern was expressed by the Canadian Federation of Independent Businesses in response to Nova Scotia's proposed regulations to deal with electronic waste in 2005: Leanne Hachey, *Electronic Waste: Heavy-handed regulation will hurt small business*, Canadian Federation of Independent Businesses, April 2005: http://www.cfib.ca/legis/novascot/pdf/6124.pdf.

Ontario and Canada should recognize the economic implications of this trend towards toxics reduction and help convince Canadian stewards, particularly smaller stewards, which are less likely to have reduced the toxicity of their products, of the benefits of moving in this direction. The Ontario government should then bring in regulatory requirements comparable to the EU's RoHS Directive.

In order to facilitate each of the above recommendations there is a need for better monitoring and reporting from retailers and distributors. The Minister's 2007 Program Request Letter to WDO recognizes and makes provisions for this; the Program will require stewards to report their WEEE sales and will also require a tracking and auditing mechanism from the WEEE's collection to its final disposal.[172] Accurate data, including the quantities and types of WEEE that are put on the market, reused or recycled, and disposed of, will help in the assessment of diversion rates as well as the appropriate development and evaluation of Ontario's diversion Program. WEEE disposal data will also improve understanding of how much of this waste stream is being exported and what impact our waste export may be having on environmental health abroad.

WDO Program Recommendations:

10) Ontario's WEEE Program should prioritize diversion activities according to an appropriate waste hierarchy with the order of priority being: (1) to reduce waste generation in the first place; (2) to repair equipment so that it can be reused; (3) to reuse material components; and (4) to recycle material components. It should work to ensure that the handling, transport, storage, distribution, and management of WEEE maximize diversion at each level of the hierarchy.

Additional Recommendations for Governments:

11) The Ontario government should establish a comprehensive waste management policy that includes enforceable targets and timetables and that mandates maximum diversion before disposal is considered.

12) In the context of a comprehensive waste management policy, the Ontario government should work with WDO to set ambitious collection and reuse and recycling targets that aim to achieve significantly greater diversion than a business-as-usual scenario.

13) To facilitate the achievement of Program diversion targets, the Ontario government should strongly consider putting in place a ban on WEEE in landfills.

[172] Letter from Hon. Laurel C. Broten, Minister of the Environment, to Ms. Gemma Zecchini, Chair, Waste Diversion Ontario, June 11, 2007; Item 8 states that "The Program submission shall identify a tracking and auditing mechanism for WEEE from the point of collection through to its final destination, including verification of processing, in accordance with Phase One of the phase-in schedule."; Item 13 states that "The Program shall include provisions for stewards to report both residential and Industrial, Commercial and Institutional (IC&I) sales beginning upon commencement of Phase 1 of the Program".

14) Ontario and Canada should recognize the economic implications of the trend towards toxics reduction and work with Canadian stewards, particularly smaller stewards that are less likely to have reduced the toxicity of their products, to move in this direction. The Ontario government should then bring in regulatory requirements comparable to the EU's RoHS Directive.

# 5. Beyond Diversion – Achieving a Sustainable Industry

A product's life cycle potentially involves a number of phases from cradle to grave: design, production, sale, consumer purchase, use and disposal, collection, reuse, recycling, energy recovery, and final disposal.[173] Responsible waste management must be considered at each of these stages. Although this report has primarily focused on options for end-of-life management – that is, management of products once they are to be disposed of – a brief discussion of the importance of design is needed.

Design for Environment (DfE) can be approached in a number of ways including: reducing resource use during a product's production; reducing a product's toxic components; increasing recycled content in a product; extending a product's lifetime; and increasing a product's potential for being recycled or reused through disassembly and other considerations. The EU's RoHS Directive is a good example of a regulation that was created to enhance design leading to toxics reduction.

DfE should involve planning and considering the fate and impact of the product at its end-of-life during its design and production stages. By designing a product with its disposal in mind, the impact on the environment at the end of its life can be minimized. Sustainable design can provide many economic advantages by helping avoid costly and inefficient clean-up and management options that would otherwise be necessary. DfE also allows a company to demonstrate corporate responsibility and has the potential to put companies at an advantage when compliant with regulations such as the EU's RoHS Directive. The Canada-Wide Principles for Electronics Product Stewardship adopted by the CCME emphasize the importance of DfE in Principle 3 – that "[e]nvironmental and human health impacts are minimized throughout the product life-cycle, from design to end-of-life management."[174]

A number of challenges exist with regard to DfE. One that stems from toxics reduction is that a toxic material might be replaced by a material that is less toxic but that may be required in greater quantities. For instance lead-free solder successfully reduces the use of lead but requires higher levels of tin, silver, and copper, each of which can have its own toxic effects.[175] Another challenge for DfE is that electronics and electrical equipment are made up of a range of components. Component design including the design of the entire product, therefore, needs to be taken into account when considering DfE.[176]

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[173] United Nations University & United Nations Environment Program. Compendium on National WEEE Legislation, 2006: http://www.uneptie.org/pc/pc/waste/pdfs/National_WEEE_Legislation_Compendium.pdf.

[174] Canadian Council of Ministers of the Environment (CCME). *Canada-Wide Principles for Electronics Product Stewardship*. Released June 25, 2004.

[175] PHA Consulting Associates. *Electronic Waste Recovery Study.* Prepared for Resource Recovery Fund Board, 2006 at 3-11: www.epsc.ca/pdfs/atlantic_report.pdf.

[176] *Ibid* at 3-11.

Manufacturers in Canada have, to date, been given few financial or regulatory incentives to employ DfE practices for electronic and electrical equipment.[177] One of the incentives that has the potential to encourage DfE is requiring producers to be responsible for the costs of their products' disposal. This can lead stewards to be increasingly concerned about product quality and safety,[178] and provides an incentive for products that are designed to be more easily refurbished and reused. OES' proposed Program for Ontario should ensure that stewards take responsibility for sustainable WEEE diversion. The collective nature of this responsibility, however, and the reality that the resulting benefits from any design changes will likely benefit the collective rather than directly benefit those initiating the design changes, may provides less incentive for better design and therefore hinder improved DfE in these products.

Fortunately, the Minister's Program Request Letter to WDO states that "[t]he Program shall consider incentives encouraging stewards to initiate measures designed to reduce waste resulting from their products, increase recyclability of products and increase use of recycled content of products."[179] This encouragement of DfE principles is commendable. The government should now work with WDO to ensure that DfE principles are made a priority of the Program. It should also consider the development of further incentives and initiatives to promote cost-effective DfE.

<u>WDO Program Recommendations:</u>

15) The government should work with WDO to ensure that DfE principles are made a priority of the Program.

<u>Additional Recommendations for Governments:</u>

16) The government should consider the development of further incentives and initiatives to promote cost-effective DfE.

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[177] Nakajima, N. & Vandenburg, W.H. "A Failing Grade for WEEE Take-Back Programs for Information Technology Equipment" *Bulletin of Science, Technology, & Society,* 26 (6) (2005), 507-517.

[178] Williams, A., Darby, L. & Hines, F. *Left on the Scrapheap? The WEEE directive and social sustainability*. ESRC Centre for Business Relationships, Accountability, Sustainability and Society: http://www.brass.cf.ac.uk/uploads/caweeessAW0603.pdf.

[179] Letter from Hon. Laurel C. Broten, Minister of the Environment, to Ms. Gemma Zecchini, Chair, Waste Diversion Ontario, June 11, 2007 – Item 10.

# Conclusion

Rapidly increasing quantities of WEEE have now become a major concern for human health and the environment around the world. Governments everywhere are beginning to recognize that the sustainable management of these wastes must be made a priority; many are beginning to take strong action on this issue.

CIELAP is encouraged by the recent progress made by the government of Ontario on the issue of WEEE management. The WDO Program that the Minister of the Environment called for in July 2007 will lead to better tracking and reporting of waste, heighten public education and awareness of the issue, and ultimately bring about greater waste diversion, among many other gains. The government will, however, need to show continued leadership on the issue of sustainable WEEE management by taking further measures such as: providing further incentives and requirements for diversion, extended producer responsibility and design for the environment; examining legislation that currently impedes diversion activities; and establishing a comprehensive waste management policy to enhance overall waste diversion.

As it stands the WDO Program mandated by the Ontario government places its emphasis on achieving greater diversion of WEEE at later stages of the product lifecycle including reuse and recycling. All stages of product development must be considered, however, in order to achieve a truly sustainable electronics industry. This requires that we reconsider product design as well as patterns of consumption, and that sectors work together to develop integrated and innovative solutions to the issue. Human creativity has been able to develop transformative communication and information equipment and other electronic products that have radically improved our quality of life. We must now apply this ingenuity to making these developments more sustainable.

# Appendix A - ONTARIO REGULATION 393/04, made under the *Waste Diversion Act, 2002*

**Waste Electrical and Electronic Equipment**

**Interpretation**

**1.** In this Regulation,

"waste electrical and electronic equipment" means a device that is waste, that requires an electric current to operate and that is,

(a) a household appliance, whether used inside or outside a home, including any device listed in Schedule 1,

(b) information technology equipment, including any device listed in Schedule 2,

(c) telecommunications equipment, including any device listed in Schedule 3,

(d) audio-visual equipment, including any device listed in Schedule 4,

(e) a toy, leisure equipment or sports equipment, including any device listed in Schedule 5,

(f) an electrical or electronic tool, including any device listed in Schedule 6, but not including a large-scale stationary industrial tool, or

(g) a navigational, measuring, monitoring, medical or control instrument, including any device listed in Schedule 7, but not including any implanted or infected medical instrument.

**Designation**

**2.** Waste electrical and electronic equipment is prescribed as a designated waste for the purposes of the Act.

**Schedule 1**
**Household Appliances**

1. Air purifier
2. Air conditioner
3. Answering machine
4. Barbeque starter
5. Blender
6. Bottle or can dispenser
7. Can opener
8. Carpet sweeper
9. Clock
10. Clothes dryer
11. Clothes washer
12. Coffee grinder
13. Coffee maker
14. Curling iron
15. Dehumidifier
16. Dishwashing machine
17. Electric hot plate
18. Fan
19. Food processor
20. Freezer
21. Fryer
22. Glue gun
23. Hair dryer
24. Heat gun
25. Heater
26. Hot drink dispenser
27. Humidifier
28. Iron
29. Kettle
30. Knitting machine
31. Microwave oven
32. Mixer

33. Radiator
34. Razor
35. Refrigerator
36. Scissors
37. Sewing machine
38. Slicing machine
39. Solid product dispenser
40. Stove
41. Toaster
42. Toaster oven
43. Toothbrush
44. Vacuum cleaner
45. Vacuum sealer
46. Watch
47. Water purifier
48. Weaving machine
49. Weigh scale

**Schedule 2**
**Information Technology Equipment**

1. Analog computer
2. Automatic teller machine (ATM)
3. Bar code scanner
4. Calculator
5. CD-ROM drive
6. Computer disk drive
7. Computer keyboard
8. Computer mouse
9. Computer terminal
10. Copier
11. Joystick
12. Mainframe computer
13. Microcomputer
14. Minicomputer
15. Monitor (CRT)
16. Monitor (LCD)
17. Monitor (Plasma)
18. Personal computer (Desktop)
19. Personal computer (Handheld)
20. Personal computer (Laptop)
21. Personal computer (Notebook)
22. Personal computer (Notepad)
23. Personal digital assistant (PDA)
24. Point-of-sale (POS) terminal
25. Printer
26. Computer router
27. Computer flatbed scanner
28. Typewriter

**Schedule 3**
**Telecommunications Equipment**

1. Antenna, transmitting or receiving
2. Broadcast equipment (including studio), for radio or television
3. Cable television transmitting or receiving equipment
4. Citizens' band (CB) radio
5. Closed circuit television equipment
6. Fax machine
7. Global positioning system (GPS)
8. Infrared wireless device
9. Intercom system
10. Local area network (LAN) communication equipment
11. Modem
12. Pager
13. PBX (private branch exchange)
14. Satellite television transmitting or receiving equipment
15. Switching equipment
16. Telephone (Cellular)
17. Telephone (Cordless)
18. Telephone (Wire line)
19. Telephone answering machine
20. Telephone carrier line equipment
21. Telephone carrier switching equipment
22. Telex machine
23. Traffic signal

24. Wide area network communications equipment

**Schedule 4**
**Audio-Visual Equipment**

1. Amplifier
2. Audio player (tape, disk, digital)
3. Audio recorder (tape, disk, digital)
4. Camera (film, tape, disk, digital)
5. Equalizer
6. Headphone
7. Microphone
8. Mixing board
9. Musical instrument
10. Preamplifier
11. Public address system
12. Radio
13. Receiver
14. Speaker
15. Television (CRT)
16. Television (LCD)
17. Television (Plasma)
18. Television (Rear projection)
19. Tuner
20. Turntable
21. Video player or projector (tape, disk, digital)
22. Video recorder (tape, disk, digital)

**Schedule 5**
**Toys, Leisure Equipment and Sports Equipment**

1. Action figure and accessories
2. Arts, crafts or hobby device
3. Building set
4. Doll
5. Game or puzzle
6. Infant or preschool toy
7. Learning or exploration toy
8. Outdoor or sports toy
9. Plush toy
10. Vehicle
11. Video game and accessories

**Schedule 6**
**Electrical and Electronic Tools**

1. Bender
2. Blower
3. Cutter
4. Disperser
5. Drill
6. Fastener
7. Folder
8. Grinder
9. Hammer
10. Joiner
11. Lathe
12. Lawn mower
13. Mill
14. Nail gun
15. Nibbler
16. Planer
17. Polisher
18. Punch
19. Riveter
20. Router
21. Sander
22. Saw
23. Screwdriver
24. Shear
25. Soldering gun
26. Sprayer
27. Spreader
28. Staple gun
29. Trimmer
30. Vacuum
31. Welder
32. Wrench

**Schedule 7**
**Navigational, Measuring, Monitoring, Medical or Control Instruments**

1. Alarm system
2. Analyzer
3. Automatic environmental controller or regulator
4. Cardiology equipment
5. Dialysis equipment
6. Drafting instrument
7. Fertilization tester
8. Fire detection and alarm system
9. Freezer
10. Hearing aid
11. Heating regulator
12. Humidistat
13. Instrument for industrial process control
14. Irradiation equipment
15. Laboratory analytical instrument
16. Laboratory equipment for in-vitro diagnosis
17. Medical equipment, ultrasonic
18. Medical radiation therapy equipment
19. Meteorological instrument
20. Meter
21. Nuclear medicine equipment
22. Oscilloscope
23. Process controller
24. Pulmonary ventilator
25. Radiation detection or monitoring instrument
26. Radiotherapy equipment
27. Refractometer
28. Scanner (CT/CAT)
29. Scanner (MRI)
30. Scanner (PET)
31. Smoke detector
32. Soil testing or analysis instrument
33. Surgical support system
34. Surveying instrument
35. Temperature instrument
36. Thermostat

# Appendix B - Canada-Wide Principles for Electronics Product Stewardship adopted by the Canadian Council of Ministers of the Environment (CCME)

**Preamble**

The management of used electrical and electronics equipment (e-waste) is rapidly becoming a major public policy issue in Canada and elsewhere around the world. Environmental concerns relate to the potentially hazardous nature of some of the materials these products contain and the increasingly large quantity of these products that require disposal in waste management systems. E-waste may contain lead, cadmium, mercury, and other potentially hazardous materials.

In accordance with CCME principles for pollution prevention, producers of electrical and electronic products are responsible for their products at end-of life. It is widely recognized that legislative/regulatory initiatives are required to establish a level playing field for industry in the management of e-waste. The objective of these Canada-wide principles is to assist and support jurisdictions in the development of e-waste programs. While recognizing differences in the legislative/regulatory framework and existing programs among jurisdictions, CCME encourages regional or national cooperation in the development of e-waste programs. Specific measures undertaken by each jurisdiction will be at their discretion, with the goal of effective, efficient, and harmonized implementation.

To promote harmonization of approaches to the greatest extent possible, and to prevent market distortions among jurisdictions, the Canadian Council of Ministers of the Environment (CCME) endorses the following Canada-wide principles for electronics product stewardship:

**Principles**

1. Responsibilities associated with management of e-waste are primarily borne by producers of the products, where "producer(s)" means the manufacturer, brandowner or first importer of the product who sells or offers for sale the product in each jurisdiction.
2. Costs of program management are not borne by general taxpayers.
3. Environmental and human health impacts are minimized throughout the product life-cycle, from design to end-of-life management.
4. Management of e-waste is environmentally sound and consistent with the 4**R** waste management hierarchy:
    a. **R**educe, including reduction in toxicity and redesign of products for improved reusability or recyclability
    b. **R**euse
    c. **R**ecycle
    d. **R**ecovery, of materials and/or energy from the mixed e-waste stream
5. Consumers have reasonable access to collection systems without charge.

6. Education and awareness programs ensure that consumers, retailers and other stakeholders have sufficient information on program design and knowledge of their roles.
7. Program design and implementation will strive for equity and consistency for consumers, particularly between those who live in adjacent jurisdictions and between those who live in small, rural and remote communities and large urban centres
8. Adjacent jurisdictions will strive for consistency in e-waste products collected.
9. Programs will include residential, commercial, historic and orphan products.
10. Programs will report on performance, specify objectives and targets, and be transparent in financial management.
11. E-waste is managed in the most economically and logistically feasible manner, while striving to maximize local economic and social benefits.
12. E-waste is exported from Canada for recycling only at facilities with a documented commitment to environmentally sound management and fair labour practices