

Maine's E-Waste Program

*Saving Money for Maine People
and Curbing Toxic Waste*



Progress Report
On Maine's Electronic Waste Law

April 2008



Natural Resources
Council of Maine

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In its first two years, Maine's e-waste program prevented about 1 million pounds of lead from entering Maine's landfills and incinerators. The program saves Maine people an estimated \$1.37 million annually.

Executive Summary

January 18, 2008 marked the two-year anniversary of Maine's innovative electronic waste ("e-waste") law. During these two years of program implementation, the concept of "shared responsibility" among citizens, manufacturers, and municipalities has been put to the test.

The results have been impressive:

- **More than eight million pounds of electronic waste have been collected, preventing between 700,000 and 1.5 million pounds of lead, plus significant amounts of mercury, cadmium, and other toxic compounds, from entering Maine's landfills and incinerators.**
- **More than 184,000 computers and TVs have been collected and recycled, and access to e-waste collection is now available to Maine residents statewide.**
- **More than 70% of Maine towns have year-round collection systems in place - a big improvement over the sporadic programs that existed in many towns prior to passage of the law.**
- **Drop-off fees have been significantly reduced or eliminated for recycling of obsolete computers and televisions, and manufacturers have assumed end-of-life recovery costs for products that they produced.**

- Maine's e-waste consolidation centers have submitted bills for, and received payment from, 150 manufacturers covering nearly 350 different brands of computers and TVs.
- This approach is saving Maine consumers an estimated \$1.37 million annually by transferring end-of-life recycling costs back to the manufacturers.

Maine was the first state in the nation to establish this type of shared responsibility program. Now eleven states and New York City have e-waste laws in place, and fifteen other states currently have e-waste bills under consideration for 2008.¹ The experiences of Maine's Department of Environmental Protection, Maine towns, consolidators, consumers, and manufacturers suggest that Maine's program has been a success. As envisioned when enacted, the law has created a consumer-oriented, low-cost, and efficient system for ensuring that obsolete computers and TVs are recycled of safely.



In the first two years of Maine's e-waste program, more than 184,000 computers and TVs were collected and recycled, and access to e-waste collection has become available to Maine residents statewide.

Background

Electronic waste or "e-waste" is one of the most rapidly growing waste problems in the world. Electronic waste accounts for 2 percent of America's trash in landfills but 70 percent of its toxic garbage. In the United States, we scrap about 400 million units per year of consumer electronics, translating into more

¹ Computer Takeback Campaign. www.computertakeback.com

than 3 million tons of e-waste generated annually.^{2 3} Because of the rapid pace of change with consumer electronics and the sheer number of electronic products, e-waste has become the fastest growing portion of our waste stream, growing by almost 8% from 2004 to 2005, even though our overall municipal waste stream volume is declining, according to the EPA.⁴

This is a solid waste problem, and a toxic waste problem. Consumer electronics contain toxic ingredients including lead, arsenic, mercury, cadmium, and brominated flame retardants, which pose threats to humans, wildlife, and the environment.⁵ When electronic waste is burned in incinerators, toxic materials can be released into the air; when e-waste is buried in landfills, toxic chemicals can leach into soil and drinking water.

Currently, about 40 percent of the heavy metals in landfills, including lead, mercury and cadmium, come from discarded electronic equipment.⁶ Monitors and televisions made with tubes (not flat panels) contain between 4 and 8 pounds of lead. Most flat panel monitors and TVs contain less lead, but they contain mercury, from the fluorescent lamp technology used in the monitors.⁷

The EPA estimates that, in 2005, only 12.5% of the e-waste generated in the United States was collected for recycling. The other 87.5% went to landfills and incinerators despite the fact that hazardous chemicals in them can leach out of landfills into groundwater and streams, or that burning the plastics in electronics can emit dioxin. In addition to e-waste destined for landfills and incinerators, millions of computers, monitors and TVs are stored in basements, garages, offices, closets and homes awaiting disposal.⁸

European nations have enacted manufacturer take-back systems and comprehensive recycling programs for electronic waste. In the United States, legislation was introduced in dozens of states over the past five years to establish e-waste laws. Electronics manufacturers participated with EPA and other entities for an extensive period in attempting to develop non-regulatory approaches to collection of e-waste. These efforts, in general, have had low participation rates. Meanwhile, tens of millions of obsolete computers and televisions have accumulated in homes (e.g. basements, attics, garages) and have been discarded in landfills. Large volumes of e-waste from developed countries also end up in container vessels to developing nations, where the computers and TVs are dismantled and materials are scavenged in dangerous conditions.

² Slade, Giles. "[iWaste](#)", Mother Jones, [2007-04-01](#).

³ Computer Takeback Campaign. www.computertakeback.com

⁴ Ibid.

⁵ Ibid.

⁶ *Center for Environmental Health E-waste Issues Page*. Accessed 12/20/2007. Center for Environmental Health. <http://www.cehca.org/ctbchealththreats.htm>

⁷ Computer Takeback Campaign. www.computertakeback.com

⁸ Ibid.

During 2004, California adopted an e-waste law based upon an Advanced Recovery Fee (ARF) model - requiring consumers to pay an up-front fee (deposit) that would pay for end-of-life recycling. Maine lawmakers were not persuaded that such an approach would be as successful as a “shared responsibility” approach through which manufacturers would shoulder much of the cost associated with collecting and recycling their e-waste. Through this approach of “internalizing” costs associated with safe disposal of products containing toxic metals and substances, manufacturers have an incentive to design products to be less toxic and more easily recycled. Maine Governor John Baldacci signed the e-waste bill into law on April 20, 2004. Rulemaking occurred through November 2005, and the program officially began on January 18, 2006.



Large volumes of e-waste from developed countries end up in container vessels to developing nations, where the computers and TVs are dismantled and materials are scavenged, leaving a legacy of environmental harm and public health hazards.



Our high tech society now generates a huge volume of electronic trash. Electronic waste accounts for two percent of America's trash in landfills but 70 percent of its toxic garbage. In 2009 the problem is expected to worsen, as the nation's television broadcasters go digital.

Maine's E-waste Problem

Prior to the passage of Maine's landmark electronic waste legislation in 2004, the cost of managing discarded computers and electronics fell solely on taxpayers and local governments. In 2003, Maine people discarded an estimated 80,000 waste television sets and computer monitors, adding almost 4 million pounds of toxic trash to Maine's solid waste system.⁹ Due to the expense of electronic waste recycling, most towns did not recycle and instead shipped this e-waste to regional landfills and incinerators. Such waste constituted the single largest source of lead and other toxic heavy metals to Maine's solid waste stream.

While a few Maine towns did collect TVs and monitors for recycling, they typically charged between \$15 and \$25 a unit to do so.¹⁰ This fee provided a significant disincentive for citizens to bring their e-waste for recycling, and many outdated electronics were simply stockpiled in closets, garages and attics. In 2003, an estimated 400,000 TVs and computers were stockpiled in Maine homes, and that number was expected to grow to one million units by 2010.¹¹

⁹ Maine Department of Environmental Protection. Testimony of Paula Clark before the Joint Committee on Natural Resources on L.D. 1892. 2/15/2007.

¹⁰ Ibid.

¹¹ Ibid. In some instances, stockpiled computers can become an environmental hazard. In 2004, NRCM discovered two sites where landowners were stockpiling hundreds of old computer monitors and CPUs in sheds. In one site, the shed floor was in disrepair and broken monitors were sitting on bare ground.

Lawmakers, Maine citizens, environmental and public health organizations agreed that we had a problem that needed to be fixed.



More than 70% of Maine towns now have year-round collection systems in place - a big improvement over the sporadic programs that existed prior to passage of the law.

Maine's E-waste Solution

Maine's solution to the e-waste challenge requires manufacturers of computer monitors and television sets to pay the operational costs of consolidators to gather e-waste from Maine towns and to ensure it is safely recycled. The system involves "shared responsibility," as described below:

- Consumers take their e-waste to their town collection facility.
- Municipalities determine whether they want to operate an on-going collection center, hold scheduled collection days, or ask residents to deliver directly to a nearby consolidation facility. Municipalities pay operational costs of collection, arrange with consolidators for pick up of a minimum amount and may choose to charge a small drop-off fee for any extra costs they incur.

- **Waste consolidation facilities** (operated by consolidators approved by Maine DEP) count the waste household televisions and computer monitors by manufacturer; some consolidators act as e-waste recyclers as well. Those that don't, or are only partial recyclers, ship the remaining e-waste to New England e-waste recyclers. Waste consolidation facilities are responsible for billing manufacturers for allowable costs, and for
- shipping only to recyclers that provide certification of meeting Maine's *Environmentally Sound Management Guidelines*.¹²
- **Manufacturers** are responsible for paying the consolidators for the costs of handling, transportation and recycling of their own television and computer monitor products plus a pro rata share of "orphan" products.¹³ Manufacturers also have the option of taking back their own products for remanufacturing.

Maine's e-waste law went into effect on January 18, 2006. Since then, approved consolidators have been collecting and billing manufacturers for recycling their e-waste. Most towns that previously provided e-waste disposal services for their citizens have opted into the program.¹⁴ On July 1, 2006, Maine law banned landfill disposal of all monitors and television sets. This landfill disposal ban resulted in nearly all other municipalities joining the program. Maine law has also banned retail sales by manufacturers that do not meet their responsibilities, and the law has also established a strong enforcement mechanism to ensure compliance.



¹² Guidelines for the Environmentally Sound Management of Televisions and Computer Monitors. Maine Department of Environmental Protection.

<http://www.maine.gov/dep/rwm/recycle/tvcomputerguidelines.htm>

¹³ "Orphan waste" means products made by companies that are no longer in business, (and have no successor in business) or products whose producers are unknown. Bills need to find some way to pay for orphan waste, since it can't be assigned to a particular responsible company.

¹⁴ Cifrino, Carole. Environmental Specialist. Maine Department of Environmental Protection. 10/12/2006.

Progress Report

We evaluated Maine's e-waste recycling system according to how well it achieved a series of objectives:

- Create a system of shared responsibility.
- Maximize collection of household TVs and monitors.
- Minimize toxic materials from e-waste in Maine landfills and incinerators
- Serve the entire population of the state of Maine.
- Minimize new costs to municipalities and shift financial burden for e-waste recycling from taxpayers to manufacturers.

Shared Responsibility

Maine convened a stakeholder process to develop and implement the system. According to Maine DEP, the program now has broad participation and successful compliance, based on the following:¹⁵

- 150 manufacturers participating, covering 347 brands.
- 446 local jurisdictions are served.
- 6 approved consolidators.
- 4 recyclers.
- Broad retailer participation.
- Relatively low-burden and low-cost role for the state of Maine (Department of Environmental Protection, the State Planning Office and the Office of the Attorney General).

Participation in the system has been a success. The requirements of the law, combined with the landfill disposal ban and DEP's outreach, have effectively encouraged municipal solid waste operations in the state to participate in the system. The threat of a ban on retail sales has helped encourage participation and compliance by manufacturers. Private waste consolidation companies and e-waste recyclers have benefited from the business that the law provides. After two years of the program, the basic components are in place and working effectively:

- Residents are delivering units to municipal locations for recycling.
- Nearly all towns have identified collection locations for residents.
- Consolidators are recording data and billing manufacturers.
- Manufacturers are paying or taking waste for recycling.
- Retailers are implementing the sales ban on non-compliant manufacturers.¹⁶

¹⁵ Cifrino, Carole. Environmental Specialist. Maine Department of Environmental Protection. 1/8/2008.

¹⁶ Ibid.



Maine's e-waste recycling system safely recycled over eight million pounds of e-waste during the program's first two years.

Maximizing Collection Rates

Since establishment of the program, there has been a large influx of e-waste moving out of Maine's solid waste disposal system (and out of the homes of Maine people) and into the e-waste recycling system. During the first 18 months of the program, from January 18, 2006 to June 30, 2007, the system collected 127,475 units, translating into nearly 6 million pounds of electronic waste diverted from Maine landfills and into a safe disposal and recycling system.¹⁷

In 2007, Maine's e-waste system collected an estimated 4,688,552 pounds of e-waste, an 22% increase over 2006's total of 3,847,669 pounds.¹⁸ According to 2006 and 2007 data and estimates, Maine's e-waste recycling system has safely disposed and recycled over eight million pounds of e-waste during the program's first two years of implementation.

¹⁷ Maine Department of Environmental Protection. 1/8/2008.

¹⁸ *Based on estimates from the first six months of 2007 data on units and weight collected.

Table 1: *Total Amount of E-waste Collected: January 1, 2006 - Dec. 31, 2007*

	Count (units)	Prod/Weight (pounds)
Est. January 1 - Dec. 31, 2007		
Monitors	44,342	1,398,398
TVs	59,787	3,290,154
Grand Total for 2007	104,129	4,688,552
January 1 - Dec. 31, 2006		
Monitors	33,247	1,099,283
TVs	46,988	2,748,386
Grand Total for 2006	80,235	3,847,669
<i>Grand Total for 2006-07</i>	<i>184,364 units</i>	<i>8,536,221 pounds</i>

One way analysts examine participation in electronic waste programs is to evaluate the pounds per capita collected from consumers. During the first year of the program, Maine's e-waste system collected 80,235 units or 3,847,669 pounds of electronic waste. This amounts to approximately 3.0 pounds of e-waste per capita. During 2007 data, it is estimated that Maine's e-waste system collected 104,129 units or 4,688,552 pounds of e-waste, 3.36 pounds per capita for 2007. These figures signify a 12 % increase in e-waste collected per capita compared with 2006, and a 29.8% increase in units over 2006.

California is the only state that established an e-waste program before Maine, although California's program uses a different model for funding and collecting e-waste, and includes recycling of e-waste from businesses. Maine's results compare favorably to California's e-waste system, which collected 1.8 pounds per capita in 2005 and 3.1 pounds per capita in 2006.¹⁹ These results indicate that Maine's system may be working better than the California model at encouraging participation from consumers. In addition, Maine's system has the advantage of encouraging manufacturers to design their products with reuse and recycling in mind.

¹⁹ Inform. *A Review of California's and Maine's Electronic Recycling Laws*. February 2007. <http://www.informinc.org/maineca.pdf>

Table 2: *Total Increase in Participation Rates from 2006-2007*

	Count	% Increase	Lbs. / Capita	% Increase
2006	80,235		3.00	
2007	104,129	29.8 %	3.36	12 %

Based upon 2003 estimates and current data, Maine's e-waste system is effectively maximizing collection rates for old computers and televisions. The significant increase in collection rates from 2006 to 2007 may indicate that more citizens are aware of the law and are beginning to clear out stockpiled units.

Collecting Hazardous Materials

Old computer monitors and television sets contain an estimated 4-8 pounds of lead. Because the Maine system has collected 184,364 units during the first two years of its existence, it has prevented between 700,000 and 1.5 million pounds of lead from entering Maine landfills and waste incinerators. This is in addition to preventing the many other toxic chemicals present in waste monitors and TVs from entering Maine's solid waste system and environment.

Table 3: *Estimated Lead Prevented from Entering Maine Landfills*

Total Units Collected	Est. 4 lbs. / unit	Est. 8 lbs. / unit
184,364	737,456	1,474,912

Maine's e-waste law has also served to prevent the release of many other toxic compounds, including arsenic, cadmium, mercury and hazardous flame retardants, from entering the environment. Precise estimates are not feasible due to lack of information about the volume of such materials in specific electronic devices. Precise estimates are not feasible due to lack of information about the volume of such materials in specific electronic devices.



Now that Maine's e-waste program is in place, additional products such as computer central processing units (CPUs) and desktop printers - not covered for manufacturer reimbursement or recycling - are also collected for recycling for a large percentage of the population.

Maine's People Served

One of the most critical goals of Maine's e-waste law was to provide functional, low-cost options for e-waste recycling for the entire state of Maine. As previously mentioned, towns are given the choice of determining how they will provide e-waste collection for their residents, and whether they will charge a small drop-off fee for any extra costs they incur. To maximize participation and collection rates, it is important that disposal and collection are easy and convenient for Maine people.

Ongoing collection at municipal transfer facilities is preferred because it is the most convenient option for Maine citizens. Annual collection days are least effective, since many residents often don't know about the collections and/or may be unable to dispose of their e-waste on a specific day.

In order to determine how well Maine people are being served by the system, NRCM partnered with Maine DEP and the University of Southern Maine (USM) to conduct a survey of Maine municipalities' e-waste recycling systems. Based on survey results from municipalities that encompass approximately 86% of Maine's population, we learned that more than 73% of Maine people have access to ongoing collection. Only 5% of Mainers are served by once-a-year annual collections. These numbers are significantly better than originally anticipated and demonstrate that there is good access to the system for most Maine people.

The data also shows that additional products like computer central processing units (CPUs) and desktop printers - not covered for manufacturer reimbursement or recycling - are also collected for recycling for a large percentage of the population.



Former NRCM Staff Attorney Jon Hinck, and DEP Environmental Specialist Carole Cifrino, played important roles in helping draft and secure passage of Maine's e-waste law.

Table 4: *Access to E-waste Collection*

	Number of municipalities	Percent Maine population
Responses received	343	85.8%
Annual collection	20	4.9
Semi annual/periodic collection	18	6.4
On-going collection	272	73.3

Table 4: Access to E-waste Collection (continued)

	Number of municipalities	Percent Maine population
Household monitors	293	78.3
Household TVs	286	77.6
Business monitors	293	78.3
Business TVs	144	39
Also collect computers	147	42.7
Also collect desktop printers	124	37.1
Also collect peripherals	54	24.5



Portland Mayor James Cohen spoke out in support of Maine’s e-waste program, citing the money it saves for residents and municipalities. Maine towns and taxpayers have saved \$2,731,591 during the first two years.

Shifting Costs to Manufacturers

Maine's e-waste law transfers much of the transportation and all of the recycling costs from Maine residents and municipalities to manufacturers. Some municipalities, which have waste consolidation facilities nearby, may direct residents to take e-waste to consolidators, thereby eliminating transportation and handling as well as recycling costs. This has enabled municipalities to reduce or eliminate drop-off fees. Before the law was implemented, municipalities typically charged between \$15 and \$25 per unit to residents.²⁰ This fee discouraged some people from discarding their e-waste properly.

Using data covering 86% of the population, it is clear that the law has helped to significantly reduce and in many cases eliminate drop-off fees altogether. Since the law has been implemented, nearly 30% of municipalities have eliminated drop-off fees entirely. Another 35% of towns have set drop-off fees at between \$0 and \$5 per unit. This means that over 65% of the population has access to no or low-cost drop-off fees (\$0-\$5 per unit).²¹ Another 10% of towns have established drop-off fees between \$5 and \$10, which are still substantially below rates prior to passage of the law.

Table 5: *Drop-off Fees for Computer Monitors for 2007*

Drop-off fee - monitors	\$0	\$1-5	\$6-10	\$11-15	\$16-20	>\$20	Fee Unknown
Number of municipalities	116	101	55	11	8	3	15
Percent of Maine population	29.1%	35.0%	9.9%	1.9%	1.4%	1.8%	1.5%

Table 6: *Drop-off Fees for Television Sets for 2007*

Drop-off fee - televisions	\$0	\$1-5	\$6-10	\$11-15	\$16-20	>\$20	Fee Unknown
Number of municipalities	116	98	54	10	8	3	15
Percent of Maine population	29.1%	34.4%	9.8%	1.2%	1.4%	1.8%	1.5%

To determine cost savings for Maine municipalities and residents, we multiplied the estimated 8,536,221 pounds of e-waste collected annually by the average cost per pound for current Maine consolidators. Currently consolidators charge manufacturers an average of 32 cents per pound of e-waste recycled.

Maine towns and taxpayers have saved \$2,731,591 over the first two years of the program for an estimated annual cost savings of \$1.37 million.

²⁰ Maine DEP, NRCM, University of Southern Maine Municipal Survey Results. 1/8/2007.

²¹ Ibid.

Table 7: *Estimated Savings for Maine Taxpayers*

	Lbs. E-waste Collected	Savings to Maine Taxpayers
2006-2007	8,536,221	\$2,731,591
Estimated Annual Savings		\$1.37 million

In order to further reduce costs and streamline the system, Maine DEP has also assisted municipalities in setting up or modifying collection systems through free training and outreach. In addition, the State Planning Office has provided grants for building infrastructure to safely store e-waste before shipping to consolidation facilities.



Because manufacturers have control over the design, manufacturing and marketing of the electronic devices that become e-waste, a shared responsibility system provides incentives to improve recyclability and reduce the toxicity of their products.

Conclusion

We are more aware today than ever of the public health problems created by exposure to the toxic compounds found in electronic equipment. Lead, arsenic, mercury, cadmium, PVC and brominated flame retardants are just some of the materials in consumer electronics that must be properly managed at the end of their useful life.

In order to tackle the problem, Maine's system was carefully developed over several years of a stakeholder process where the affected parties worked to create a system that makes sense for the state. This report demonstrates that the system is working to ensure Maine's e-waste is recycled in an environmentally responsible manner; that manufacturers share in the costs and have an incentive to produce less toxic, more easily recyclable products; and that efficiencies and economies of scale are built into the system so that the market sets costs and our state government is not overly burdened with administrative responsibilities.

This analysis also shows that a shared responsibility system - with manufacturers shouldering the costs of collecting and recycling their e-waste - can work well to meet the demands that environmentally-sound electronic waste recycling requires. Manufacturers are the parties with control over the design, manufacturing and marketing of the electronic devices that become e-waste. Without sharing responsibility, they lack direct incentives to improve recyclability and reduce the toxicity of their products. Maine's landmark electronic waste law is a shining example of how the Maine Legislature, Department of Environmental Protection, municipalities, electronic manufacturers and Maine people have put a workable solution in place to deal with a serious environmental problem.

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The Natural Resources Council of Maine is Maine's leading membership-supported environmental advocacy organization dedicated to protecting the nature of Maine now, and for future generations.

Credits

This publication has been made possible by the generous support of the members of the Natural Resources Council of Maine and the Abramson Family Foundation, Beldon Fund, Island Foundation, Inc. and John Merck Fund.

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Photographs: Matt Prindiville - cover, page 2, 7, 14, 15, and 17; Beth Dimond - page 3, 8 and 13; Basel Action Network - page 5; Photos to Go - page 6, Tom Gatto - page 10.