

August 2008

# ELECTRONIC WASTE

## EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation





Highlights of [GAO-08-1044](#), a report to the Chairman, Committee on Foreign Affairs, House of Representatives

## Why GAO Did This Study

Increasingly, U.S. consumers are recycling their old electronics to prevent the environmental harm that can come from disposal. Concerns have grown, however, that some U.S. companies are exporting these items to developing countries, where unsafe recycling practices can cause health and environmental problems. Items with cathode-ray tubes (CRT) are particularly harmful because they can contain 4 pounds of lead, a known toxin. To prevent this practice, since January 2007 EPA began regulating the export of CRTs under its CRT rule, which requires companies to notify EPA before exporting CRTs.

In this context, GAO examined (1) the fate of exported used electronics, (2) the effectiveness of regulatory controls over the export of these devices, and (3) options to strengthen federal regulation of exported used electronics. Among other things, GAO reviewed waste management surveys in developing countries, monitored e-commerce Web sites, and posed as foreign buyers of broken CRTs.

## What GAO Recommends

GAO recommends that EPA (1) develop a systematic plan to enforce the CRT rule and (2) develop options to broaden its regulatory authority to address the export of other potentially harmful used electronics. In its comments, EPA expressed significant reservations with GAO's findings and recommendations. GAO maintains, however, that they are fair and well supported.

To view the full product, including the scope and methodology, click on [GAO-08-1044](#). For more information, contact John Stephenson at (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov).

## ELECTRONIC WASTE

### EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation

#### What GAO Found

Some exported used electronics are handled responsibly in countries with effective regulatory controls and by companies with advanced technologies, but a substantial quantity ends up in countries where disposal practices are unsafe to workers and dangerous to the environment. Recent surveys made on behalf of the United Nations found that used electronics exported from the United States to many Asian countries are dismantled under unsafe conditions, using methods like open-air incineration and acid baths to extract metals such as copper and gold. GAO observed thousands of requests for these items on e-commerce Web sites during a 3-month period—mostly from Asian countries such as China and India but also from some in Africa.

U.S. hazardous waste regulations have not deterred exports of potentially hazardous used electronics, primarily for the following reasons:

- *Existing EPA regulations focus only on CRTs.* Other exported used electronics flow virtually unrestricted—even to countries where they can be mismanaged—in large part because relevant U.S. hazardous waste regulations assess only how products will react in unlined U.S. landfills.
- *Companies easily circumvent the CRT rule.* GAO posed as foreign buyers of broken CRTs in Hong Kong, India, Pakistan, and other countries, and 43 U.S. companies expressed willingness to export these items. Some of the companies, including ones that publicly tout their exemplary environmental practices, were willing to export CRTs in apparent violation of the CRT rule. GAO provided EPA with the names of these companies at EPA's request.
- *EPA's enforcement is lacking.* Since the CRT rule took effect in January 2007, Hong Kong officials intercepted and returned to U.S. ports 26 containers of illegally exported CRTs. EPA has since penalized one violator, and then only long after the shipment had been identified by GAO. EPA officials acknowledged compliance problems with its CRT rule but said that given the rule's relative newness, their focus was on educating the regulated community. This reasoning appears misplaced, however, given GAO's observation of exporters willing to engage in apparent violations of the CRT rule, including some who are aware of the rule. Finally, EPA has done little to ascertain the extent of noncompliance, and EPA officials said they have neither plans nor a timetable to develop an enforcement program.

Beyond enforcing the CRT rule, EPA can take steps to ensure that the larger universe of potentially harmful electronic devices—such as computers, printers, and cell phones—are exported in a manner that does not harm health or the environment. Among the options raised by GAO are (1) expanding hazardous waste regulations to cover other exported used electronics; (2) submitting a legislative package to Congress for ratifying the Basel Convention, an international regime governing the import and export of hazardous wastes; and (3) working with Customs and Border Protection and other agencies to improve identification and tracking of exported used electronics. Options such as these could help make U.S. export controls more consistent with those of other industrialized countries.

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### **Abbreviations**

CRT	cathode-ray tube
EPA	Environmental Protection Agency
LCD	liquid-crystal display
OECD	Organization for Economic Cooperation and Development
RCRA	Resource Conservation and Recovery Act

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United States Government Accountability Office  
Washington, DC 20548

August 28, 2008

The Honorable Howard L. Berman  
Chairman  
Committee on Foreign Affairs  
House of Representatives

Dear Mr. Chairman:

In recent years, consumers have grown more aware that tossing their old electronic devices into the trash can produce undesirable, and unintended, consequences. Toxic substances contained in used electronics—such as lead—are well known to harm people’s health, and when electronics are disposed of improperly, they can leach from discarded devices into the surrounding environment. As a result, when U.S. consumers purchase new devices, such as computers, monitors, televisions, and cell phones, they are increasingly paying electronics recyclers—who routinely assure them that the used items will not end up in a landfill—to handle their old ones. Since one person’s trash is often another person’s treasure, a thriving international trade has emerged in used electronics, largely from industrialized to developing countries. Functional secondhand computers exported from the United States to Africa, for example, can be purchased for less than 1/10th the cost of a new one, a practice referred to as bridging the “digital divide.”

As the export of used electronics has continued, however, concerns have mounted that not all recycling is conducted responsibly, particularly in developing countries, and that some U.S. recyclers and exporters may be at fault. According to the Environmental Protection Agency (EPA), Americans removed more than 300 million electronic devices from their households in 2006. As alleged in recent years by environmental groups, imported used electronics that cannot be repaired are often recycled in developing countries by crude and inefficient means and with virtually no human health or environmental protection. One report by two such groups asserted that most of the used electronics handled in this manner originated in North America.<sup>1</sup>

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<sup>1</sup>Basel Action Network and Silicon Valley Toxics Coalition, *Exporting Harm: The High-Tech Trashing of Asia* (Seattle, Washington, and San Jose, California, Feb. 25, 2002).

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Products with cathode-ray tubes (CRT), such as televisions and computer monitors, can be especially harmful to humans and the environment. CRTs contain copper—a commodity in high demand, in part because its price has increased threefold over the last several years—but also 4 pounds of lead, a toxin that can delay neurological development. Accordingly, used CRTs are the only electronic device regulated as hazardous waste and whose export is specifically controlled by EPA.<sup>2</sup> The agency’s July 2006 CRT rule required that, starting in January 2007, CRT exporters file a notification of export with EPA. For CRTs exported for reuse, the rule requires the exporter to notify EPA of intent to export CRTs for reuse or repair. Further, for CRTs exported for recycling, exporters must obtain consent from the importing country for shipment.<sup>3</sup> If these conditions are not met, CRTs, which would likely fail EPA tests for toxicity, would be considered hazardous waste. Implementation of the CRT rule is a shared responsibility between EPA’s Office of Solid Waste and Emergency Response and the Office of Enforcement and Compliance Assurance. Used electronic devices other than CRTs do not generally qualify as hazardous waste under the Resource Conservation and Recovery Act of 1976 as

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<sup>2</sup>Circuit boards (removed from any product) are also regulated under RCRA. Circuit boards intended to be disposed of, recycled, or reclaimed would come under the definition of hazardous waste. EPA regulations, however, provide a conditional exclusion from the hazardous waste definition for circuit boards that are shredded for recycling after removal of certain hazardous components and an exemption from the definition for whole circuit boards to be recycled, which are considered scrap metal. These circuit boards are not subject to any regulatory requirements when exported. Any exported circuit boards intended for disposal must comply with notice-and-consent requirements. Beyond CRTs and circuit boards, any other used electronics that qualify as “hazardous” under RCRA regulations would be subject to export provisions; EPA has stated repeatedly, however, that to its knowledge, other types of electronics do not fail its threshold toxicity test and thus are not currently regulated.

<sup>3</sup>The CRT rule requires that any exporter of CRTs for recycling (which includes reclamation and other processing) must notify EPA at least 60 days prior to the intended shipment, and that the shipment be accompanied by and conform with an acknowledgment of consent, provided by EPA, that documents the importing country’s consent. Any exporter of intact CRTs for reuse (which includes use after repair or refurbishment) must send EPA a one-time notification and maintain business records demonstrating that each shipment will be reused. Thus, broken CRTs (which cannot be reused and can only be recycled) that lack or fail to conform with an acknowledgment of consent would be in violation of the CRT rule and therefore regulated as hazardous waste. A shipment of broken CRTs falsely represented as intact CRTs for reuse would likewise be considered hazardous waste, since any shipment of broken CRTs (excluding processed CRT glass) is required to have and to conform with an acknowledgment (whether shipped for recycling under the CRT rule or as hazardous waste for disposal). Used CRTs generated by households are subject to the CRT rule when a recycler or collector mixes them with CRTs from other sources (e.g., businesses or government entities).

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amended (RCRA), which is the statute governing hazardous waste handling and disposal.

The Basel Convention, an outgrowth of the United Nations Environment Programme, in 1989 established an international legal regime governing the export and import of hazardous wastes for disposal. Ratified by 170 countries—including virtually all industrialized countries except the United States—the Basel Convention stipulates that a country may ship hazardous waste only after receiving prior written consent from the receiving country. Although not a ratifying member of the Basel Convention, the United States is a member of the Organization for Economic Cooperation and Development (OECD) and therefore has agreed to be bound by OECD Council decisions.<sup>4</sup> A 1986 decision imposes general obligations on members concerning exports of hazardous wastes to non-OECD countries (in part because of concerns over the effectiveness of developing countries' regulatory regimes) and prohibits exports unless the wastes are sent to an adequate disposal facility.<sup>5</sup> A 1992 decision established a notice-and-consent process for hazardous waste recovery among OECD members; this decision has been implemented by the United States in RCRA provisions.<sup>6</sup> In 2001, because a majority of its members are also parties to the Basel Convention, the OECD Council changed its waste classifications, including which products are considered hazardous wastes, to harmonize with those of the Basel Convention. While the 2001 decision does not require changes to the scope of hazardous wastes regulated in the United States, it does require adoption of the classification system to facilitate coordination among exporting and importing

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<sup>4</sup>Since 1961, the OECD has provided a setting where governments compare policy experiences, seek answers to common problems, identify good practices, and coordinate domestic and international policies, particularly in the areas of trade, environment, agriculture, technology, and taxation.

<sup>5</sup>OECD Council, *On Exports of Hazardous Wastes from OECD Area*, Decision-Recommendation C(86)64/Final (June 5, 1986). The decision recommends that member countries implement it by requiring exporters of hazardous waste to non-OECD countries to provide the exporting country with documentation that the proposed disposal operation will be performed in an environmentally sound manner and that the proposed disposal facility may, under the importing country's laws and regulations, dispose of the exported wastes.

<sup>6</sup>OECD Council, *Concerning the Control of Transfrontier Movements of Wastes Destined for Recovery Operations*, Decision C(92)39/Final (Mar. 30, 1992).

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countries. Although the United States has agreed to be bound by the OECD decision, the United States has not yet implemented it.<sup>7,8</sup>

As electronic devices are purchased with increasing frequency—along with the coming transition from analog to digital signals for televisions, making CRT technology obsolete—the prospect looms that many more used electronic devices will be discarded in the near future. In addition, a growing number of state laws prohibit discarding used electronics in landfills, in part because of the toxic substances contained within them. The increase in landfill bans could cause U.S. exports to increase significantly. In this context, this report examines (1) the fate of exported used electronics, (2) the effectiveness of regulatory controls over the export of used electronics from the United States, and (3) opportunities for strengthening the federal role in regulating used electronics exports.

To answer these questions, we reviewed pertinent EPA documents; interviewed EPA, State Department, and Customs and Border Protection officials; and conducted several Internet-based exercises, such as monitoring Internet e-commerce sites and posing as foreign buyers of nonworking CRTs. Specifically, we conducted the following work:

- To examine the fate of used electronics, we obtained and analyzed Basel Convention surveys and reports on electronic waste disposal in Cambodia, China, Indonesia, Malaysia, and Sri Lanka. We also interviewed a West African computer importer and officials with Hong Kong's Environmental Protection Department. As part of our monitoring of Internet e-commerce sites, we documented information on global demand for CRTs, the location of the demand, the volume requested, the price offered, and whether working or nonworking equipment was sought.
- To examine regulatory control over used electronics exported from the United States, we interviewed EPA officials to obtain information on EPA's enforcement of the CRT rule and what, if any, enforcement challenges existed. We posed as overseas and domestic scrap brokers with a clear intent to purchase and export untested, nonworking, or broken

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<sup>7</sup>OECD Council, *On the Control of Transboundary Movements of Wastes Destined for Recovery Operations*, Decision C(2001)107/ Final (June 14, 2001) as amended by Decision C(2004)20 (March 9, 2004), which replaces Decision C(92)39/Final.

<sup>8</sup>EPA submitted proposed changes to RCRA regulations to the Office of Management and Budget on May 8, 2008, and EPA officials anticipated issuing a proposed rule in the *Federal Register* by mid-November 2008.



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CRTs—items that are not likely to be recycled in an environmentally responsible manner. We e-mailed 343 solicitations to electronics recyclers and trading companies in the United States, including members of the International Association of Electronics Recyclers;<sup>9</sup> of these, 64 responded.<sup>10</sup> During the 3-month period from mid-February to mid-May 2008, we also monitored two Internet sites that facilitate trade in electronic products, among other goods.

- To examine opportunities for strengthening the federal role in regulating used electronics exports, we obtained and analyzed documentation on EPA’s authority to regulate exported used electronics. In addition, we examined other countries’ approaches to governing exported used electronics. We also obtained and analyzed EPA Office of Solid Waste and Emergency Response and Office of Enforcement and Compliance Assurance documentation on the implications of expanding EPA’s authority to regulate these items.

We found the data we obtained on Internet e-commerce Web sites to be adequate to conclude that significant demand exists for exported used electronics. Appendix I describes our scope and methodology in greater detail. We conducted our review from October 2007 through July 2008 in accordance with generally accepted government auditing standards. These standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe the evidence we obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Results in Brief

While some exported used electronics can be handled responsibly in countries with effective regulatory regimes and by companies with advanced technologies, a substantial amount ends up in countries such as China and India, where they are often handled and disposed of unsafely. These countries often lack the capacity to safely handle and dispose of

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<sup>9</sup>The International Association of Electronics Recyclers is a trade association that represents the electronics recycling industry. Its stated priority is to promote high standards of environmental quality and regulatory compliance, as well as high-quality business practices.

<sup>10</sup>It is not possible to determine why the other 279 companies did not respond to our offers from fictitious foreign brokers. It is likely that many of our e-mails did not reach recipients because of spam-mail filters.

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used electronics if the units are not in reusable condition when received, and the countries' extremely low labor costs and the reported lack of effective environmental controls make unsafe recycling commonplace. Recent surveys conducted on behalf of the United Nations Environment Programme found that used electronics imported from the United States are dismantled in many developing countries under unsafe health conditions. Other investigations have corroborated disassembly practices in some Asian countries involving the open-air burning of wire to recover copper and open acid baths for separating metals. These practices expose people to lead and other hazardous materials. China, in particular, has been at the center of much of the world's attention regarding electronic waste export issues since 2002, when environmental groups first exposed egregious electronics-recycling and disposal practices in Guiyu and other areas in southeastern China. As China's growing economy has driven its demand for raw materials, China appears to have come to also rely on the inexpensive labor and lax environmental controls reported in other countries in the region, such as Indonesia and Cambodia, to help meet its demand. Whereas used electronics exported to Asian countries are often recycled, such items are exported to West African countries primarily for reuse. Many units are exported broken, however, and some U.S. companies appear to mix broken units with shipments of working units. The nonworking units are often dumped and left for scavengers.

Current U.S. regulatory controls do little to stem the export of potentially hazardous used electronics, primarily for the following reasons:

- *Narrow scope of regulatory control.* U.S. law allows the unfettered export of nearly all types of used electronic devices. U.S. hazardous waste regulations do not consider most used electronic products, such as computers, printers, and cell phones, as hazardous, even though they can be mismanaged overseas and can cause serious health and environmental problems. Instead, under U.S. law, only exports of CRTs are regulated as hazardous waste.
- *Regulatory controls easily circumvented.* The export of CRTs from the United States in apparent violation of the CRT rule seems widespread, despite adoption of the CRT rule in 2006. Posing as fictitious buyers from Hong Kong, India, Pakistan, Singapore, and Vietnam, among other countries, we found 43 electronics recyclers in the United States who were willing to export to us broken, untested, or nonworking CRTs under conditions which would appear to violate the CRT rule. Three other companies indicated they do not export broken CRTs, and 7 others asked for more information about our fictitious identities, such as phone

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numbers, a Web site, or what we intended to do with the broken CRTs. EPA records show that none of the recyclers willing to sell to us had filed proper notifications of their intent to export CRTs for recycling, as required by the CRT rule for such shipments.<sup>11</sup> Some of these seemingly noncompliant companies actively cultivate an environmentally responsible public image; at least 3 of them held Earth Day 2008 electronics-recycling events.

- *EPA has done little to enforce the CRT rule.* EPA has taken few steps to enforce the CRT rule. Since the rule took effect in January 2007, for example, Hong Kong has intercepted and returned to the United States 26 shipping containers of used CRT monitors because these exports violated Hong Kong's hazardous waste import laws, Hong Kong officials said. Under the CRT rule, these shipments are considered illegal hazardous waste exports because the U.S. exporter did not notify EPA. Such exporters could be subject to administrative or criminal penalties. The agency can take action and seek criminal penalties of up to \$50,000 per day of violation and imprisonment of up to 2 years against exporters who knowingly violate the CRT rule's notice-and-consent requirements.<sup>12</sup> Nonetheless, EPA did not issue its first administrative penalty complaint against a company for potentially illegal CRT shipments until July 2008, and this penalty came as a result of a problem we identified. EPA acknowledges the existence of compliance problems with its CRT rule, but agency enforcement officials told us that given the rule's relative newness, the regulated community must first be made aware of the requirements. This explanation, however, is undermined by the instances we found where companies that indicated a willingness to engage in activities that would likely violate the CRT rule also indicated an awareness of the rule. Finally, EPA has done little to ascertain the extent of noncompliance, and Enforcement and Compliance Assurance officials told us they have no plans and no timetable for developing the basic components of an enforcement strategy, such as enforcement targets, monitoring, follow-up of suspected violations, and prosecution.

Beyond enforcing its own CRT rule, EPA can also take steps to ensure that the larger universe of potentially harmful electronics—possibly including

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<sup>11</sup>As of June 2008, 25 companies have submitted 47 notices for export of CRTs for recycling to EPA. These companies informed EPA that they intended to responsibly recycle CRTs at facilities in Brazil, Canada, Korea, Malaysia, and Mexico.

<sup>12</sup>To establish such a criminal violation in these circumstances, EPA would need to prove that (1) the party exported CRTs, (2) the party did not notify EPA as required by the CRT rule, and (3) the party knowingly failed to notify EPA.

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computers, flat-panel monitors, and cell phones, among other items—are also exported in a manner that does not contribute to human health and environmental harm overseas. EPA’s adoption of the CRT rule shows that the agency recognized that while certain CRTs—those being reused—may not need to be considered hazardous waste within U.S. borders, regulatory control was needed to ensure that, when exported, they are not ultimately discarded in a manner that poses a health and environmental hazard outside U.S. borders. Among the options available to EPA to deal with this larger universe of exported used electronics—options that could make U.S. export controls more consistent with international norms—is to propose amending RCRA regulations to include exports of used electronics posing health or environmental risks when disassembled or reclaimed, such as by expanding the scope of the CRT rule and revising the regulatory definition of hazardous waste. Additionally, EPA could (1) submit a legislative package to Congress for ratifying the Basel Convention, (2) work with Customs and Border Protection and the International Trade Commission to improve identification and tracking of exported used electronics, and (3) update RCRA regulations to reflect U.S. obligations under OECD.

To help ensure that EPA provides a deterrent to potentially illegal exports of CRT monitors and televisions, we are recommending that the Administrator, EPA, develop a timetable for implementing an enforcement plan for the CRT rule. We also recommend that EPA evaluate options to regulate other exported used electronics, which could include expanding the scope of the CRT rule and collaborating with other federal agencies to improve tracking of exported used electronics. In addition, determining whether to ratify international treaties is a policy decision that rests with Congress and the President; we therefore recommend that EPA submit to Congress a legislative package to complete ratification of the Basel Convention, so Congress can deliberate whether and to what extent the United States should have additional controls over the export of used electronic items that may threaten human health and the environment when disassembled overseas.

In commenting on a draft of this report, EPA generally disagreed with our recommendations, stating, among other things, that (1) it did not want to build an “extensive compliance monitoring and enforcement program” around the CRT rule or any other individual provision of its broader RCRA program and (2) it preferred nonregulatory, voluntary approaches to address the problems discussed in this report. First, we disagree that an extensive program would be required to develop the basic components of an enforcement deterrent, such as enforcement targets and a plan for

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compliance monitoring, following up on suspected violations, and prosecuting violators. Second, our findings cast serious doubt about the effectiveness of a strategy that relies almost entirely on voluntary approaches. Overall, we believe that nothing in EPA's comments changes the reality that the United States' regulatory coverage of exported used electronics is among the narrowest in the industrialized world and that the little regulation that does exist has been enforced to only a minor degree. EPA's comments and our response are included in appendix II.

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## Background

Consumers and businesses may hesitate to discard obsolete electronic devices because the devices may still function and have value. Users generally have to pay fees, however, to have their used electronics recycled or refurbished domestically. Recyclers and refurbishers charge these fees because costs associated with recycling and refurbishing outweigh the revenue received from recycled commodities or refurbished units.

The costs associated with recycling often make it unprofitable without charging fees for several reasons. First, recycling used electronics is labor intensive: the equipment must be separated into its component parts, including the plastic housing, copper wires, metals (e.g., gold, silver, and aluminum), and circuit boards, as well as parts that can be easily reused or resold, like hard drives and CD-ROM drives. Second, to obtain salable commodities, metal and plastic "scrap" must be further processed to obtain shredded plastic, aluminum, copper, gold, and other recyclable materials, and such processing typically involves multimillion-dollar machinery. Finally, recyclers incur additional expenses when handling and disposing of some toxic components (such as mercury-containing lamps). In contrast, selling these items for export can bring in revenue. According to EPA, a vast majority of used electronics (including their component parts and commodities) donated for reuse or recycling are exported, both responsibly and irresponsibly.<sup>13</sup> Responsible recyclers often test used

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<sup>13</sup>In addition to the location of markets for reusable and recyclable electronics, a number of reasons lead U.S. companies to export used products, including waste. Often, the nearest waste management facility capable of handling a particular waste stream may be just over the international border from the point of generation. In other cases, a facility in another country may specialize in treating, disposing of, or recycling a particular waste. Such a facility may be one of a kind, or it may present a more environmentally sound management solution for the waste. In some cases, hazardous wastes constitute "raw" material for industrial and manufacturing processes in many developing countries where natural resources are scarce or nonexistent. In addition, using hazardous wastes is often preferable to natural resource extraction or hazardous waste disposal.

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electronics to determine which components can be reused, then separate the remaining materials into their component parts and commodities before exporting. Recyclers like these have told us that they operate at a competitive disadvantage against companies that export whole, untested units.

Exporting used electronics from the United States brings important benefits. For example, export leads to viable and productive secondhand use of electronic devices in developing countries—a practice known as “bridging the digital divide”—where they can be purchased for 1/10th the price of a new unit and contribute significantly to the operations of schools, small businesses, and government agencies. Moreover, extending the life cycle of electronic products prevents substantial environmental damage. A United Nations University study found that the manufacturing phase takes up 80 percent of the natural resources used during the life cycle of computers, so extending the lifetime of computers provides an important environmental service.

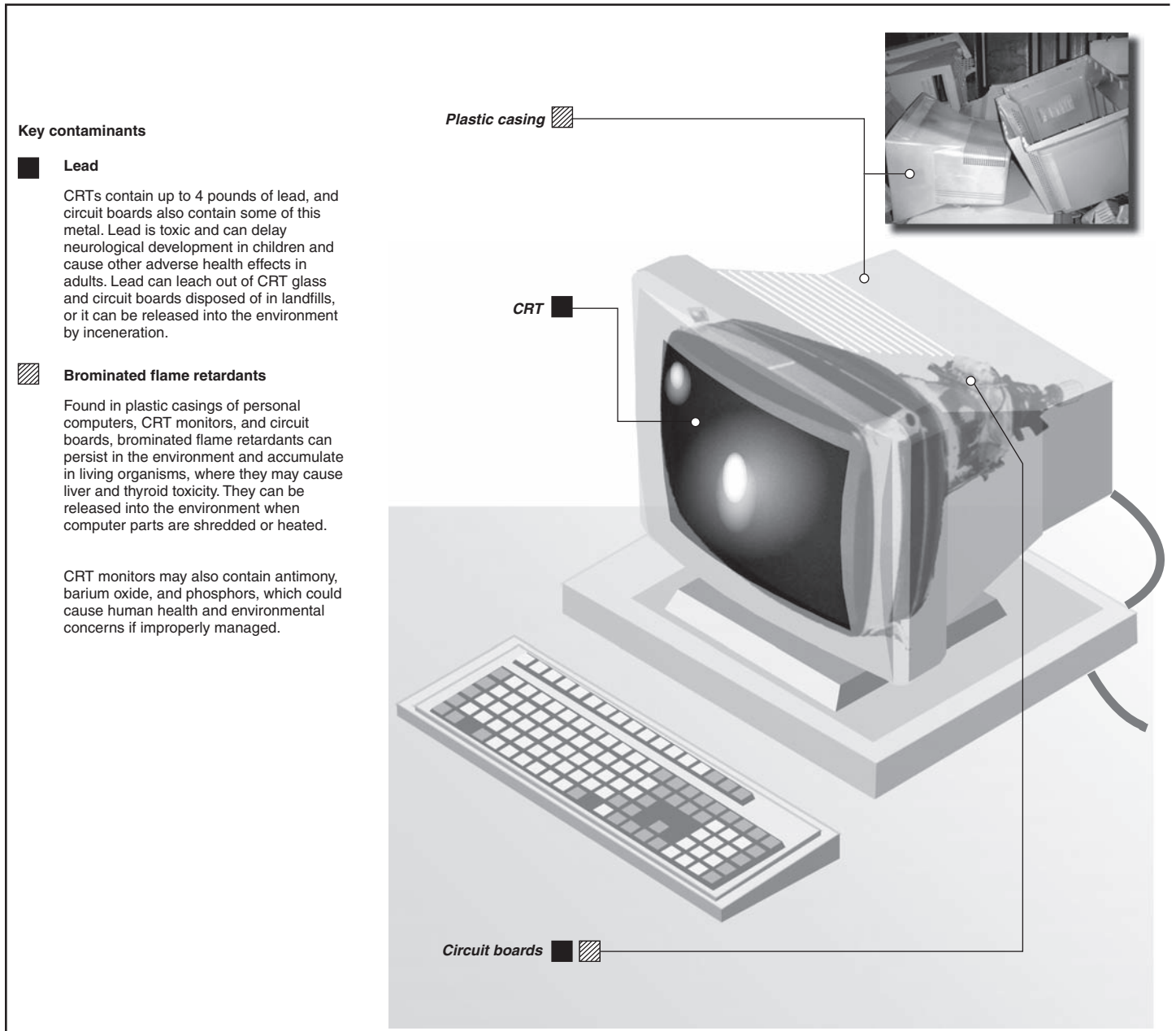
In addition, strong demand exists overseas to recycle the raw materials contained within electronic devices. State-of-the-art recycling facilities in developed countries, such as Belgium, can extract precious metals and salable commodities. Recycling in this fashion also provides an important environmental benefit: Metals can often be extracted from used electronics with less environmental impact than from mining. The U.S. Geological Survey, for instance, reports that 1 metric ton of computer scrap contains more gold than 17 metric tons of ore and much lower levels of harmful elements common to ores, such as arsenic, mercury, and sulfur.

In recent years, concerns have been raised because toxic substances such as lead, which have well-documented adverse health effects, can potentially leach from discarded electronic products, especially if disposed of improperly. Nearly all the substances of concern in an electronic appliance are in solid, nondispersible form, so there is no cause for concern with respect to human exposure or release into the environment through normal contact. Instead, human health and environmental concerns related to the presence of these substances arise if the equipment is improperly disassembled or incinerated. EPA has identified lead, mercury, and cadmium (which are typically found in computers or monitors) as priority toxic chemicals for reduction. According to EPA, these toxic substances do not break down when released into the environment and can be dangerous, even in small quantities (see fig. 1).

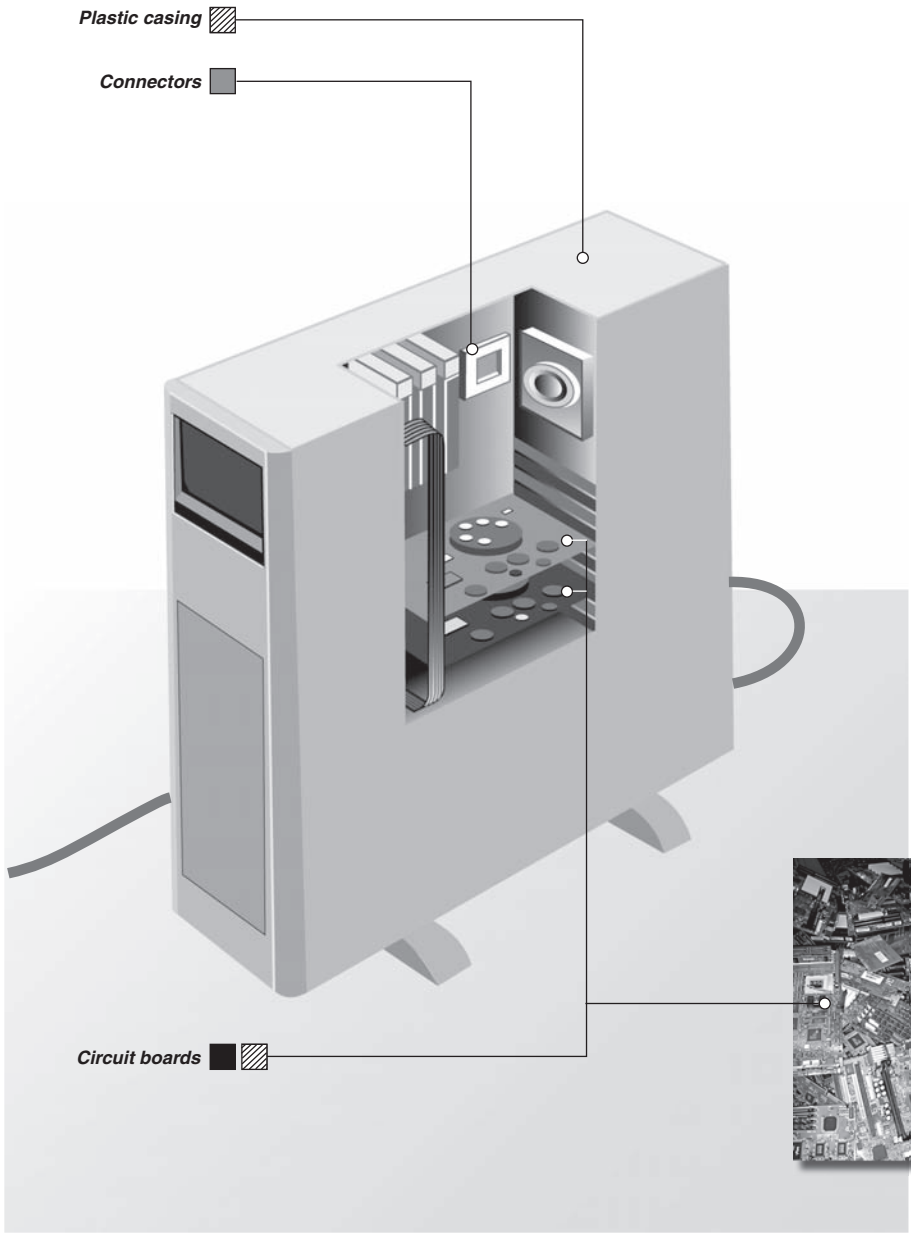
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**Figure 1: Toxic Substances Contained in a Central Processing Unit and CRT Monitor**







**Key contaminants**

**Cadmium**

Small amounts of this highly toxic metal are in electronic contacts and switches. Cadmium persists in the environment and accumulates in living organisms. It may be released into the environment by heat and incineration.

Computer central processing units may also contain beryllium and lithium, which could cause human health and environmental concerns if improperly managed.

Sources: EPA and GAO analysis of Basel Convention technical guidelines.

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## Used Electronics Are Exported Worldwide and Often Handled and Disposed of Unsafely

Some exported used electronics can be handled responsibly in countries with effective regulatory regimes and by companies with advanced technologies. A substantial quantity, however, ends up in countries where the items are handled and disposed of in a manner that threatens human health and the environment.

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## Some Exported Used Electronics Appear to Be Handled Responsibly

Certain developed countries have regulatory regimes that require safe handling and disposal of used electronics. Member states of the European Union, for example, must comply with the Waste Electrical and Electronic Equipment Directive of 2002, which established comprehensive take-back and recycling requirements involving retailers, manufacturers, and importers of electrical and electronic products. The directive requires member countries to ensure that producers and importers finance the separate collection, treatment, recovery, and environmentally sound disposal of “waste electronics,” either on their own or through collective systems financed by themselves and other members of the industry.

European Union countries are also parties to the Basel Convention. The aim of the convention is to protect human health and the environment from the adverse effects caused by the export of hazardous wastes, especially to developing countries, where the risk of unsafe hazardous waste management is often higher. As part of European Union countries’ implementation of the Basel Convention, hazardous wastes intended for disposal cannot be shipped to non-OECD countries. Exports of waste occur only under the following circumstances: (1) if the exporting country does not have sufficient disposal capacity, (2) if the exporting country does not have disposal sites that can dispose of the waste in an environmentally sound manner, and (3) if the wastes are required as a raw material for recycling or recovery industries in the importing country.<sup>14</sup>

In addition to being governed by comprehensive regulatory controls, some companies in European Union countries use advanced technologies to recycle used electronics. For example, the recycler Umicore, according to its own documents, operates a state-of-the-art facility in Belgium, where it

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<sup>14</sup>The Basel Convention also prohibits movement of waste between parties and nonparties to the convention, except when these movements occur under an equivalent bilateral or multilateral agreement. The bilateral or multilateral agreements must provide an equally sound management structure for transboundary movements of waste.

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uses advanced technologies and processes to extract precious metals from circuit boards and responsibly handles waste by-products. Umicore samples electronic scrap to determine the presence of hazardous materials. The company then captures hazardous materials, such as cadmium and mercury, in the extraction process and disposes of them in an environmentally sound manner, state company documents. Over 95 percent of the electronic items that Umicore recycles become new electronic products, and many of the remnants are recycled into construction materials.

Some companies located in developing countries also appear to safely recycle and dispose of used electronics using advanced technologies. Samsung Corning, for example, operates a plant in Malaysia that not only recycles CRT glass but also manufactures new CRT televisions containing as much as 50 percent recycled-glass content. Samsung Corning's contractor in the United States has coordinated with approximately 40 U.S. recyclers for the export of CRT glass. According to the contractor, about 250 shipping containers, totaling about 4,000 tons of CRT glass, leave the United States for the Malaysian facility each month. Malaysia's regulatory regime helps ensure safe recycling and disposal practices for CRTs; these products may be exported to Malaysia only if they meet certain conditions, according to Malaysian environmental protection officials. If local facilities lack the capacity or ability to safely carry out recycling activities, the government of Malaysia will not allow companies to import CRTs from the United States, according to a Malaysian government document. In addition, officials with the country's Department of Environment and Department of Customs have said CRTs cannot be legally imported from other countries if destined for final disposal.

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### Many Countries Receiving Used Electronics Lack the Capacity to Safely Handle and Dispose of Them

While the United States has the landfill and institutional capacity to provide safe handling and disposal of used electronics domestically, many foreign countries, particularly those in the developing world, do not. According to surveys made on behalf of the United Nations Environment Programme, many developing countries lack the infrastructure to safely manage waste, including hazardous waste. These surveys found that large quantities of used electronic items are imported by developing countries, particularly in Southeast Asia, where they are improperly handled and, in some cases, informally recycled in "backyard" operations involving open-air burning of copper wire and acid baths to recover valuable metals.

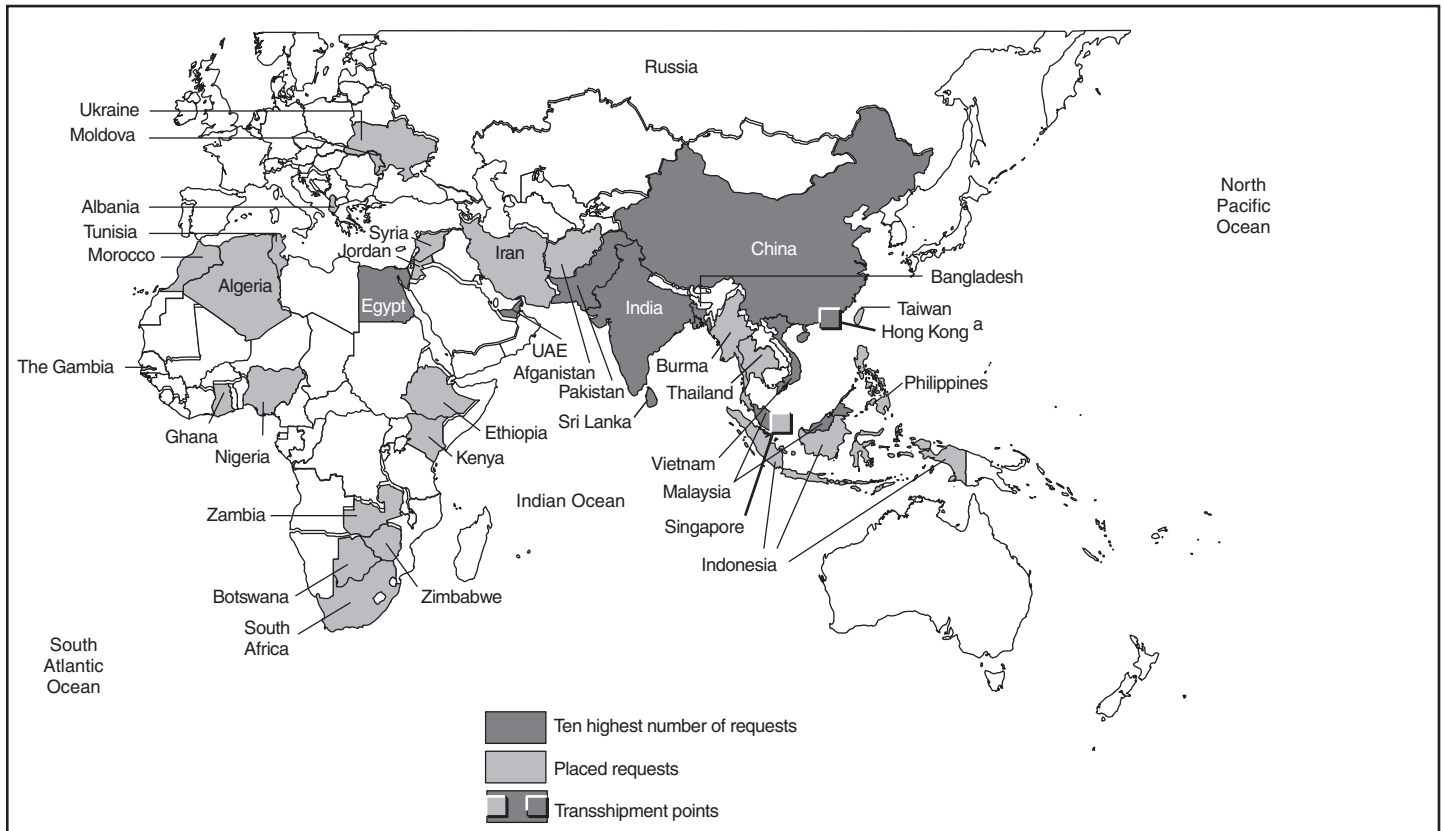
Upon importation, brokers, recyclers, and refurbishment companies in some developing countries examine items to determine how they can be

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used most profitably. According to individuals familiar with the international electronics industry, to maximize profit, working units are resold, repairable products are refurbished, and broken units are disassembled into component parts for further reclamation. Reusable electronics—those that can be directly resold or easily refurbished—generally have the highest value and are sold in retail shops in some developing countries. For nonworking or otherwise broken units, workers disassemble those that cannot be resold into their component parts, generally by hand. After disassembly, metals and plastics are recovered from the component parts, using methods that may lead to pollution and contamination. For instance, in some cases, workers burn the plastic coating off wires to recover copper and submerge circuit boards in open acid baths to extract gold and other metals. Unsalvageable computer parts are often burned in the open air.

Significant demand exists for used electronics from the United States, particularly in developing countries. In a search of one Internet e-commerce site, we observed brokers from around the world place 2,234 requests to purchase liquid-crystal display (LCD) screens. On the same site, we found 430 requests for central processing units and 665 requests for used computers. In an extensive search of two Internet e-commerce sites over a 3-month period, we observed brokers in developing countries make 230 requests for about 7.5 million used CRTs. Brokers in developing countries represented over 60 percent of all requests we observed. Over 75 percent of the brokers' requests offered \$10 or less per unit, and almost half offered \$5 or less. Low prices (under \$10 per unit) indicate a high likelihood that these items will ultimately be handled and disposed of unsafely. About 70 percent of the requests came from developing countries in Asia, with China and India posting the largest number by far; the remaining requests came largely from Africa (see fig. 2).

**Figure 2: Developing Countries Requesting CRTs on Two Internet E-commerce Web Sites, February 2008 to May 2008**



Source: GAO analysis of two Internet-e-commerce sites.

<sup>a</sup>The information presented in figure 2 assumes that buyers do not post fictitious country names. It also assumes that there is no double counting of requests. Hong Kong is a special administrative region of China. Requests were also placed in Aruba, Peru, and Venezuela.

**China and Hong Kong Define the Used Electronics Trade in Southeast Asia**

China has received global attention over electronic waste export issues since 2002, when environmental groups exposed “egregious” electronics-recycling and disposal practices in the city of Guiyu and elsewhere in southeastern China. China’s fast-growing economy drives the nation’s demand for raw materials, and one way that this demand is met is by importing used electronic products, according to a 2005 report by the

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Basel Convention Regional Centre in China.<sup>15</sup> The report concluded that Chinese importers and foreign exporters (including ones in the United States and Japan) could easily evade China's import and export controls, resulting in potentially hazardous electronic devices entering the country illegally for disassembly and recycling. Chinese and Japanese researchers told us that most of these devices are likely to be shipped through Hong Kong.

Once in China, most disassembly happens "by hand," according to the 2005 report, where workers use primitive means in workshops of seven or eight employees.<sup>16</sup> In Guiyu, the study found, more than 300 groups were active in electronic waste recovery efforts. Open burning and acid baths to recover metals are commonplace, and the residual toxic waste from such operations is simply discarded, allowing pollutants to seep into the ground and water sources.

Recent studies have highlighted the dangers of working and living near these facilities, particularly for children. For example, a study conducted by a Chinese medical school and published in 2007 in the journal *Environmental Health Perspectives* found that children in Guiyu had lead levels in their blood that were more than 50 percent higher than the limit for lead exposure set by the Centers for Disease Control and Prevention in the United States. The study also found that lead levels among children in Guiyu were also more than 50 percent higher than among children in a neighboring village where used electronics were not dismantled.

At a 2007 conference in Beijing, Chinese environmental protection officials acknowledged that the country lagged behind developed countries in its ability to ensure safe reuse, recycling, and disposal of hazardous wastes such as used electronics.

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<sup>15</sup>Asia-Pacific Regional Centre for Hazardous Waste Management Training and Technology Transfer, *Report on the Survey of the Import and the Environmentally Sound Management of Electronic Wastes in the Asia-Pacific Region* (2005). The Basel Convention Regional Centre in China, the publisher of this report, is one of 14 regional centers that assist party countries in controlling the transboundary movement of hazardous wastes.

<sup>16</sup>Hand dismantling has many positive benefits: more reusable components can be obtained, and the value of the extracted materials is higher because of less contamination. Hand dismantling is the predominant method of recycling in the United States.

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## Other Asian Countries Import Used Electronics for Recycling and Reuse

While much of the export of used electronics to date has focused on China, awareness of electronic-waste-recycling and disposal problems in other Asian countries has grown in recent years. As a reflection of this growing awareness, eight Asian countries met in Cambodia in March 2007 to discuss electronic waste management issues. At the conference, Indonesian officials disclosed that used electronics are imported from the United States for re-export to China, Hong Kong, and Taiwan, and the lack of effective environmental controls make unsafe recycling commonplace. As an archipelago, Indonesia has hundreds of seaports, which are nearly impossible to monitor, according to the environmental officials. According to these officials, electronics-recycling activities occur in east Java in an industrial estate and on Batam Island (near Singapore) in a “special bounded zone” exempt from government regulation. Recyclers at these facilities dismantle, crush, and melt used electronics. Most of the waste recycled on Batam Island is hazardous and would otherwise be more expensive to handle in “legal” facilities outside the special bounded zone, according to Indonesian officials. Photographs from the presentation show workers dismantling electronics by hand, with low-value components discarded haphazardly (see fig. 3).

**Figure 3: Three Stages of Electronics Dismantling and Disposal in Indonesia**



Source: 2007 Regional Workshop for the Environmentally Sound Management of E-Wastes.

Cambodian environmental protection officials described similar human health and environmental harm associated with unsafe disassembly of used electronics in Cambodia. These officials stated that refurbishment and reuse activities are more prevalent in their country than recycling. According to Cambodian environmental officials, the primary electronic devices for sale consist mostly of secondhand material imported from the United States, the European Union, China, and other Southeast Asian countries. According to the Basel Convention Regional Centre in China’s 2005 report, although used electronics are imported primarily for resale, some “rudimentary” recycling activities also take place. Unrepairable

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electronic products are often disposed of in municipal waste sites that are not designed to contain hazardous materials. Some scavengers in Cambodia, including children, often work directly for scrap yards, collecting material for as little as \$1 a day. At the scrap yards, material is sorted, and metals are exported abroad for recycling. Materials that lack value are often dumped and sometimes burned (see fig. 4).

**Figure 4: Open Dump Site for Electronic Waste in Cambodia**



Source: Basel Convention Regional Centre in China.

In India, which also receives used electronics from the United States, many parts of the country cannot safely handle these devices. In 2004, the environmental group Toxics Link documented containers of computer waste labeled as mixed electronics scrap imported from the United States through the port of Chennai. According to Toxics Link, more than 10,000 people—including children—work in the “informal” recycling industry in



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Delhi alone, breaking equipment, using acid baths, and openly burning wires and plastic casings to reclaim gold, copper, and other commodities.

### Used Electronics Are Exported to Western Africa Primarily for Reuse

In contrast to the situation in many Asian countries, used electronics exported to West African countries are intended for reuse. Businesses importing used computers, for example, can sell functional units for as little as \$100, well below the cost of a new computer, bringing technology within the reach of more people, according to one African computer importer. Recycling is not as prevalent in West Africa as it is in Southeast Asia, in part because West Africa is farther from markets where recycled commodities are sought. In addition, shipping costs to Africa are considerably higher than to Hong Kong and Southeast Asian countries. One recycler told us that rates from the United States to West Africa range from \$4,000 to \$7,000 per 20-foot container—considerably more expensive than the \$750 it costs to ship 40-foot containers from the United States to Hong Kong.

Some U.S. recyclers mix broken units with working units in shipments to Africa, and the nonworking units are often dumped and left for scavengers. Accepting “junk” equipment is often part of the “arrangement” U.S. recyclers make with African importers, according to a used computer importer in Senegal. Negotiating the amount of working versus broken equipment is routinely part of the agreement, and this importer told us that even if he receives a shipment of up to 40 percent “junk,” he can still make a profit. Often, the “junk” computers are dumped in the countryside and burned, he explained. In addition, in 2007, an official with the Basel Convention Regional Centre for Africa for Training and Technology Transfer noted, on the basis of his experience that a high proportion of the units that arrive in Nigeria are unusable, that used electronics are rarely tested for functionality before export to developing countries like those in Africa.

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### U.S. Exports of Potentially Harmful Used Electronics Flow Virtually Unrestricted

Current EPA regulations for hazardous waste have not prevented the export of potentially hazardous used electronics. Most used electronics can be legally exported from the United States with no restrictions; EPA controls only the export of used CRTs under its CRT rule, yet we observed widespread willingness to engage in activities that would appear to violate the CRT rule. Further, EPA has done little to determine the extent of noncompliance with the rule and even less to deter such noncompliance.

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## Existing Regulation Focuses Only on CRTs

Current EPA hazardous waste regulations control only the export of a narrow segment of used electronics—CRTs—therefore allowing unrestricted export of nearly all others.<sup>17</sup> In issuing its final CRT rule in July 2006, EPA obtained information that prompted the agency to assert that “[CRTs] are sometimes managed so carelessly [overseas] that they pose possible human health and environmental risks from such practices as open burning, land disposal, and dumping into rivers.” As a result, for nearly 2 years, CRT exporters have been required to notify the appropriate EPA regional office when the items are destined for reuse. When CRTs are exported for recycling, the exporter must first notify EPA’s Office of Enforcement and Compliance Assurance in Washington, D.C., which then obtains consent from the importing country. The written acknowledgment of the importing country’s consent, which EPA then sends to the exporter, must accompany the shipment. If these conditions are not met, the CRTs are considered hazardous waste subject to full RCRA regulation because they typically fail EPA’s tests for toxicity.<sup>18</sup> As of June 2008, 25 companies have submitted to EPA 47 notices for export of CRTs for recycling. These companies informed EPA that they intended to responsibly recycle CRTs at facilities in Brazil, Canada, Korea, Malaysia, and Mexico.

Besides CRTs, most other types of exported used electronics can be mismanaged and cause serious health and environmental problems overseas. These products, however, are generally not considered “hazardous” under EPA’s regulatory definition. Consequently, exporters can ship most types of used electronic products, such as computers, printers, and cell phones, without restriction. Under RCRA regulations, waste products are designated as “hazardous” according to the extent to

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<sup>17</sup>EPA issued a special regulation for CRTs because, the agency stated, the products are hazardous waste under RCRA regulations as they typically fail EPA’s tests for toxicity. EPA also stated that the principal goal of this regulation was to promote the reuse and recycling of CRTs.

<sup>18</sup>U.S. exporters of hazardous wastes must comply with all applicable domestic laws and regulations, which include regulations under RCRA. In general, a U.S. exporter must prepare and submit certain documents. Before a shipment proceeds, an exporter must submit to EPA headquarters a notification of intent to export, describing the type and amount of waste, its itinerary, the number of shipments expected, and the period during which shipments will occur. EPA forwards this notification to the governments of all concerned countries. The government of the importing country must consent to the shipment before it may proceed. While a shipment is in transit, an exporter must attach a hazardous waste manifest to the shipment, along with the acknowledgment of consent from the importing and transit countries. Finally, an exporter must file an annual report with EPA headquarters summarizing the exporter’s shipments for the previous calendar year.

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which they will leach toxins if disposed of in unlined landfills.<sup>19</sup> The tests used to make such a designation do not account for the potential for toxic exposure when items are disassembled or handled differently, such as by burning, as they often are outside the United States, particularly in developing countries.

In contrast, the European Union's hazardous waste rules govern the export of nearly all types of used electronics, generally requiring that exporters notify relevant environmental protection agencies and receive consent from importing countries. In addition, the European Union has banned the export of hazardous materials contained within waste electronic and electrical equipment to non-OECD countries.<sup>20</sup>

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## Companies Exporting Nonworking CRTs Can Easily Circumvent EPA's Regulatory Controls

The limited regulation that exists over used electronics exports from the United States—namely, the CRT rule—is largely ineffectual because EPA's implementation of it apparently has not deterred companies from illegally exporting these items from the United States. When we posed as foreign buyers looking for nonworking CRT monitors, 43 U.S. companies that responded to our fictitious requests were willing to export nonworking CRTs to us, in apparent violation of the CRT rule.<sup>21</sup> According to EPA records, as of July 2008, only 1 of these 43 companies submitted a

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<sup>19</sup>EPA regulations pursuant to RCRA state that a solid waste is a hazardous waste if it exhibits one or more of the characteristics of ignitability, corrosivity, reactivity, or toxicity or if it is specifically listed as a hazardous waste (e.g., certain industrial wastes and pure chemicals). The hazardous characteristic most relevant to electronics is toxicity. By EPA regulation, toxicity is measured by a lab procedure called the toxicity characteristic leaching procedure, which predicts whether a particular waste is likely to leach toxic chemicals into groundwater at dangerous levels. A waste would fail—and be regulated as hazardous waste—if the leachate from the test exceeded specified levels of a toxic contaminant. Because many used electronics feature constituents such as plastic housing that are not prone to leach toxics, they are unlikely to exceed the concentrations because the test is performed on the entire product, not separately on its potentially toxic constituents.

<sup>20</sup>Despite this export ban, a 2006 European Union report estimates that since implementation of the ban, a small number of exporters have shipped over 2 million computer monitors and 1 million televisions out of the European Union, ostensibly for reuse; many of these items were probably for dismantling under unsafe conditions.

<sup>21</sup>Six others requested more information about our purchase offer; two indicated they would sell us only working CRTs; and three said they would not do business with us because they did not export nonworking CRTs.

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notification for recycling as required by the CRT rule.<sup>22</sup> The company that submitted the notification for recycling, however, informed EPA that it intended to export CRTs to Malaysia for recycling, whereas our fictitious request was for exports to Hong Kong. Moreover, as of July 2008, the government of Malaysia has not consented to CRT imports from this company.

We reached employees with 18 of the 43 companies and interviewed them about the effect of the CRT rule on their business. In some cases, employees claimed that their companies do not export CRTs, even though we received contradictory information from e-mails they sent to our fictitious foreign brokers, as shown by the following examples:

- A regional manager for a trading company in California stated that he was not aware of CRT rule notification requirements, but his company does not export CRTs. In an e-mail to our fictitious broker in Pakistan, however, he offered to sell “as-is” CRT monitors. In addition, his company offered 900 as-is CRT monitors, some with power cords cut, on a Chinese e-commerce Web site.
- A sales representative for a large electronics recycler in New Jersey said that he was not aware of the CRT rule and was not the right person to speak to about this issue. This same individual, however, told our fictitious buyer from Hong Kong not to worry about U.S. laws’ holding up export of untested CRT monitors. He explained that “it’s the laws at [the port of Hong Kong] that you have to find out about.”<sup>23</sup>

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<sup>22</sup>The 43 may represent the tip of an iceberg for a number of reasons. For example, over a 3-month period, we observed more than 50 U.S. companies selling nearly 1.3 million CRTs on two Internet e-commerce trade sites. In addition, according to California State officials knowledgeable about the electronics-recycling industry, the electronics-recycling community is “tight-knit” and tends to operate only within long-standing, established relationships. They said that established players do not need to advertise on Web sites for new leads and would therefore be invisible to us.

<sup>23</sup>We continue to receive requests from this company, including one from July 2008, seeking a buyer for 60 40-foot containers of used televisions “available now,” or around 48,000 used televisions. On a Chinese e-commerce Web site, this company states that it has “a continuous supply of used monitors” and currently has over 200,000 nonworking CRT monitors for sale. On its own Web site, this company claims that it is a “leader in CRT recycling” and it “satisfies all state and federal requirements regarding proper disposal of toxic/hazardous electronic waste,” as well as ensuring that “100 percent of the electronic waste we receive is reused or responsibly recycled.”

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- A representative of an electronics-recycling company in Colorado told us that the company does not export CRTs; instead, all CRTs are recycled in-house, so the CRT rule does not apply. This same person offered to sell 1,500 CRT monitors and 1,200 CRT televisions, which were ready for immediate shipment, to our fictitious broker in Hong Kong.
  - A representative of an electronics-recycling company in Washington State told us that all of its CRT monitors are sent to its shredding facility in Oregon. A sales associate at the company, however, offered to sell 4 containers of CRT monitors (approximately 3,200 units) in April 2008 and another 20 containers (approximately 16,000 units) in June 2008 to our fictitious broker in Hong Kong.
  - A representative of a metal-recycling company in Illinois told us that the CRT rule does not apply to this company because it sends all of its CRT glass to a lead smelter in the United States. In response to an e-mail inquiry to ship nonworking and untested CRT monitors to Southeast Asia, however, this person wrote back, “What are you paying for the monitors? Let me know and I’ll give you an inventory count.”

We were unable to interview the other 25 companies that indicated a desire to export CRTs to our fictitious foreign brokers, although some of them showed a willingness to knowingly export CRTs in apparent violation of the CRT rule. For example, an electronics recycler in Utah who offered to sell five containers of used CRTs stated in an e-mail that he had had “no problems with the CRT rule so far.” He offered to mix the broken materials at the back of the containers, which implies he is aware that it is illegal to export broken CRTs without consent. In addition, a computer wholesaler in Wisconsin offered to sell two containers (900 units per container), telling us that the CRT rule will definitely not affect shipment: “We ship these overseas all the time,” he wrote.

Many of the companies that responded to our fictitious foreign brokers, particularly the electronics recyclers, actively promote an environmentally responsible public image. Nearly all of the electronic recyclers claimed to be environmentally friendly, with at least 17 of these companies citing on their Web sites the hazards of improper disposal of used electronics equipment. At least 3 of these recyclers held Earth Day 2008 electronics-recycling events. Some of the electronics recyclers accept used CRTs at no charge, while others charge the consumer, ostensibly to cover recycling expenses. One Maryland electronics recycler, for instance, charges from \$10 to \$30 for CRT monitors, depending on size, to cover its “responsible, domestic recycling costs.” In fact, the company’s Web site states that its

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mission is to be globally responsible and asserts that it sends its monitors to domestic glass-to-glass recycling facilities. Yet when we posed as a buyer in Singapore, the Chief Operating Officer of this company asked what price we were paying for untested, as-is CRT monitors, suggesting that he was interested in selling CRTs to us. Another recycler from Missouri states on its Web site that it is an organization “dedicated to keeping old discarded computer equipment from entering America’s landfills.” This company, however, offered to sell a container-load of CRT monitors to our fictitious broker in Hong Kong, offering us a 10 percent discount because we were new buyers.

At least two electronics recyclers that responded to our fictitious foreign brokers have purchased used state-government surplus CRT monitors from two auction Web sites. One of these sites was GovDeals.com, a Web site that posts surplus equipment from state and local government agencies, indicating that government CRTs may be among those offered for sale to overseas brokers. In our review of one auction site’s records for sales of surplus electronics between May 2007 and May 2008, a New York electronics recycler made four purchases of used electronics from the New York state Office of General Services, including 221 CRT monitors. In response to our fictitious Hong Kong broker’s inquiry on the availability of nonworking CRT monitors, this company replied, “Yes. Many. What is your best price?” In February 2008, a Georgia electronics recycler purchased two lots of computer monitors from the state of Alabama’s Surplus Property Division on GovDeals.com, one lot of 100 CRT monitors for \$45 and another lot of 155 CRT monitors for \$366. This company was also ready to send three container-loads of a mix of untested CRT monitors to our fictitious broker in India. For an additional \$400, this company offered to “hand stuff” the container to increase the load from about 850 monitors per container to between 1,100 and 1,200 monitors per container.

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## EPA Has Done Little to Enforce the CRT Rule

EPA has done little to enforce the CRT rule. Since the rule took effect in January 2007, Hong Kong’s Environmental Protection Department and its Customs Department have worked together to intercept and return 26 containers of “waste” CRT monitors to the United States. In each instance, the U.S. exporters neither notified EPA nor received consent from Hong Kong. An official from Hong Kong’s Environmental Protection Department stated that his agency would not grant consent for importing such items because under Hong Kong regulations, it is illegal to import CRTs from the United States. From January to July 2008, we provided EPA’s Office of Enforcement and Compliance Assurance with current information we received from Hong Kong’s Environmental Protection Department, which

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### A Tale of Three Containers

Three containers were shipped across the Pacific Ocean four times before EPA initiated enforcement action. Hong Kong's Environmental Protection Department notified GAO of three 40-foot containers of CRT monitors that had been inspected in Hong Kong and returned to the Port of Los Angeles because they contained "waste" CRT monitors, which are illegal for import into Hong Kong. EPA records indicate that the U.S. exporter had not notified EPA. GAO notified EPA's Office of Enforcement and Compliance Assurance that the containers were still at the Port of Los Angeles. After sitting at the port for 11 more days, the three 40-foot containers were loaded onto another cargo ship and re-exported to Hong Kong. An EPA Office of Enforcement and Compliance Assurance official explained to GAO that the original shipper had placed the CRT monitors in the containers "by mistake" and that the company had voluntarily removed the CRT monitors before re-exporting the containers to Hong Kong. About 3 weeks later, Hong Kong's Environmental Protection Department intercepted the containers a second time and verified that the three containers still contained the same "waste" CRT monitors. They were returned again to the Port of Los Angeles, at which time EPA detained the containers and arranged for their inspection. The result of EPA's investigation is pending. According to an EPA inspector, the shipper had simply changed the name of his business to a fictitious company and re-exported the containers after they had originally been returned from Hong Kong.

included information on six shipments (10 40-foot containers) of waste CRTs intercepted and returned to the United States during this period, one of which was returned from Hong Kong multiple times.

In one instance, we asked U.S. Customs and Border Protection to detain a container that was intercepted in Hong Kong and returned to the United States in February 2008. We viewed the contents of this container at the Port of Long Beach, California. We observed hundreds of CRT computer monitors stacked haphazardly, some with cracked plastic cases and broken glass tubes (see fig. 5).<sup>24</sup>

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<sup>24</sup>California's Department of Toxic Substances Control sent investigators to inspect the containers and, upon inspection, pursued administrative penalties against the shipper for potentially violating California's hazardous waste storage and transportation laws. The outcome of California's action against the shipper was pending as of August 2008. Like all states, however, California does not have authority over exports.

**Figure 5: Broken CRT Monitors from an Illegal Shipment of Used CRTs**



Source: GAO.

We received photographic evidence showing that this illegal shipment of CRT monitors originated from the Denver metropolitan area. According to a third-party source, these monitors came from an electronics recycler in Colorado, which claims to hold 20 to 30 community recycling events each year for homeowners' associations, city governments, and property managers. The company's Web site also states that "many domestic recycling companies ship e-waste to China, where it ends up harming the environment and the population. With [this company], your e-waste is recycled properly, right here in the United States, not simply dumped on somebody else."



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The director of EPA's Waste and Chemical Enforcement Division explained that inspections to determine compliance with environmental laws are labor intensive because inspectors must spend time planning and preparing before each inspection occurs. After an inspection, inspectors must spend time analyzing any information collected, drafting an inspection report, and determining necessary follow-up actions. Given the number of regulated facilities and competing priority demands, the director said, EPA must "carefully plan" how it directs its inspection resources.

In at least one case, EPA chose not to physically inspect and detain a container that was intercepted and returned to the United States by Hong Kong, even though EPA acknowledged that the container likely contained broken CRTs. In this case, referring to a container returning to the Port of Tacoma in April 2008, EPA asked a Customs and Border Patrol officer not to detain the container on its behalf, according to an Enforcement and Compliance Assurance regional manager:

EPA has reason to believe that this container includes used CRTs that may be in broken or unstable condition. Since CRTs typically contain hazardous constituents, I recommend that the contents of the container should not be opened or disturbed unless appropriate precautions have been taken to protect individuals handling the materials and to prevent the materials from being released to the environment.

EPA concluded that an inspection of the container was not necessary to address the apparent noncompliance. Customs and Border Protection inspected the container and provided information to EPA about the container's contents and the identity of the shipper. Upon consultation with EPA, Customs and Border Protection released the container, which was re-exported to Hong Kong. We do not know if Hong Kong's Environmental Protection Department again intercepted the container. EPA's deputy director for Civil Enforcement stated that EPA intended to initiate contact with the responsible party for this shipment. The outcome of EPA's investigation was pending at the time of our report.

The Deputy Director of EPA's Office of Civil Enforcement told us that EPA's enforcement of the CRT rule relies primarily on tips and complaints. As of August 2008, EPA reported having 10 ongoing investigations of potentially illegal CRT shipments based on such complaints (7 of which appeared to be from us.) As a result of its investigations, in July 2008, EPA issued its first administrative penalty complaint against a California company we identified, seeking the maximum civil penalty of \$32,500. In the view of one recycler, who had expressed willingness to sell

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nonworking CRTs to our fictitious broker from Singapore, “If EPA whacked some [exporters], then they would comply with the rule.”

The Director of EPA’s Hazardous Waste Identification Division acknowledged in an e-mail to EPA’s RCRA regional directors, “[I] expect there has been considerable noncompliance with the rule’s notification provision.” The Deputy Director of the agency’s Office of Civil Enforcement, however, told us that EPA’s initial efforts to address noncompliance have been aimed at education and outreach. He explained that given the rule’s relative newness, the regulated community must first be made aware of the rule’s requirements.<sup>25</sup> His statement is consistent with the Office of Enforcement and Compliance Assurance’s *Guide for Addressing Environmental Problems*, which states that the regulated community should be aware of and understand the regulations that apply to it and have the means of achieving compliance with those requirements.<sup>26</sup>

We believe that EPA’s explanation that it needs to focus on education and outreach is insufficient. The explanation that an enforcement deterrent should await the effects of an education program implies that violations to date have resulted largely from unawareness of the rule and not from willful disregard for it. This implication has clearly not been borne out. With little effort, we were able to observe substantial willingness to engage in activities that would appear to violate the CRT rule—including instances where the exporters were aware of the CRT rule—by simply monitoring e-commerce Web sites and conducting limited follow-up. EPA, on the other hand, has done little to ascertain the extent of noncompliance with the CRT rule. In the absence of such an effort, it has set no enforcement targets, conducted no monitoring, and taken only one action

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<sup>25</sup>EPA advised the public as early as 2001 that CRTs were generally regulated as hazardous waste because they typically fail the toxicity test. EPA officials told us, however, that before the CRT rule, the agency had not made its regulatory policy on CRT exports clear.

<sup>26</sup>The agency’s May 2006 communication plan for the CRT rule states that EPA would notify its regional offices, state hazardous waste directors, the press, environmental groups, and relevant associations. It is unclear, however, the extent to which these efforts have focused on educating the regulated community about the need to notify EPA when exporting used CRTs. For example, an internal EPA document from March 2008—20 months after adoption of the rule—states that “the agency still needs to develop a strategy for educating the regulated community about CRT rule notification requirements.” One electronics recycler, for instance, told us that he has “not seen any effort to publicize the rule besides seeing it in print, which is in contrast to EPA’s previous [outreach] efforts.”

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## EPA Has Several Options That Would Strengthen the Federal Role in Reducing Harmful Exports of Used Electronics

against a violator of the rule.<sup>27</sup> Moreover, the agency has not taken the initial steps necessary to develop a program for identifying and prosecuting exporters who do not notify the agency when shipping CRTs overseas for recycling or reuse, and it does not have plans to develop such a program. The deputy director of EPA's Office of Civil Enforcement explained that there is no "hard and fast" rule on how long EPA is going to rely on outreach as its primary tool for the CRT rule or when the agency will use its enforcement resources to deter noncompliance. He added that enforcement of the CRT rule is one of the office's many responsibilities, but it is not among its highest enforcement priorities.

Even if there were total compliance with the CRT rule, the effect would reach only a small percentage of all potentially harmful used electronics exported from the United States. Enforcement and Compliance Assurance guidance states that if an environmental problem would not be solved if 100 percent compliance were achieved within the regulated community, then modification of regulations or other initiatives may be necessary.<sup>28</sup> It adds that if "gaps" exist in the regulatory structure and opportunities exist for filling these gaps, voluntary initiatives, new regulations, or combinations of multiple approaches may be needed to fill these gaps. As we have shown, such a gap exists with respect to used electronics that do

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<sup>27</sup>RCRA provides EPA with broad authorities to collect information and to inspect facilities to investigate suspected violations, as well as to evaluate compliance. EPA has the authority to contact exporters who have notified the agency, when appropriate, to ask for verification that the CRTs are exported for reuse instead of recycling or disposal. These persons must keep copies of normal business records demonstrating that each shipment of exported CRTs will be reused, and this documentation must be retained for 3 years from the date the CRTs were exported. For any past or present violation, EPA may issue an administrative enforcement order assessing a penalty of up to \$32,500 per day or requiring compliance. Further, EPA may submit a civil judicial referral to the Department of Justice. RCRA also provides for criminal penalties for knowing violations; if an exporter of CRTs knowingly fails to file a notification—or if the CRTs were intended to be or actually were discarded and the exporter did not obtain an acknowledgment—then the exporter may be subject to criminal penalties. Relevant to the CRT rule's documentation requirements, criminal penalties are authorized for any person who knowingly omits material information or makes any false material statement or representation in any document filed, maintained, or used for purposes of compliance with RCRA regulations or who exports a hazardous waste and knowingly destroys, alters, conceals, or fails to file any document required to be maintained or filed. Criminal penalties also are authorized for any person who knowingly exports a hazardous waste without the consent of the receiving country. The criminal penalties may include a fine of up to \$50,000 per day of violation or imprisonment of up to 2 years.

<sup>28</sup>EPA, Office of Enforcement and Compliance Assurance, *Guide for Addressing Environmental Problems: Using a Strategic Approach* (Washington, D.C., March 2007).

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not meet the current U.S. regulatory definition of hazardous waste. More comprehensive regulation of used electronics exports could narrow this gap. Options in this regard include, but are not limited to, amending RCRA regulations to include exports of used electronics posing health or environmental risks when disassembled or reclaimed, expanding the scope of the CRT rule, and revising the regulatory definition of hazardous waste. In addition, EPA has options to enhance U.S. control over the export of used electronics: It could submit a legislative package to Congress for ratifying the Basel Convention, work with Customs and Border Protection and with the International Trade Commission to improve identification and tracking of exported used electronics, and update RCRA regulations to reflect U.S. obligations under OECD decisions.

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## Amend RCRA Regulations

EPA could amend RCRA regulations to cover exports of used electronics where risks exist to human health or the environment when reclaimed for reuse or recycling, an amendment that—if implemented—could bring U.S. export controls more in line with those of other industrialized countries. For example, EPA could revise the definition of “hazardous” in its RCRA regulations to encompass certain used products that can pose risks upon disassembly or reclamation, including desktop computers, laptop computers, printers, and cell phones. Currently, many electronics contain toxic constituents in small quantities, yet do not come within the regulatory definition of “hazardous” because these substances do not leach from the electronic products at unsafe amounts under tests simulating disposal in a landfill. Compelling evidence shows, however, that when exported, many of these used electronics are disassembled in a way that results in human and environmental exposure to toxic components.

As long as the regulatory definition of “hazardous” does not include such used products, they will not be subject to any of RCRA’s export provisions, such as notice and consent, and the burden for identifying and controlling the flow of such products will remain solely with the receiving country. A revised definition or new rule for other used electronics could be developed to effectively cover only exports while conditionally exempting domestic activity from substantive requirements, if EPA determines that such conditions along with other approaches—such as voluntary initiatives and existing regulatory controls on recycling facilities—provide adequate domestic protection of health and the environment.

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If EPA expanded the scope of used electronics subject to RCRA export rules, it could consider requiring exporters of such products for reuse—not just those for recycling—to notify EPA. The rationale for regulating used electronics destined for reuse with at least a notification requirement would be the same as for the CRT rule. In the preamble to the final CRT rule, for instance, EPA explained that it obtained compelling evidence showing that exported CRTs often are not handled as valuable commodities in foreign countries. Used and unused intact CRTs are identical in appearance; consequently, it would be difficult to distinguish between intact CRTs destined for recycling (including disassembly and reclamation) and those for reuse. This same difficulty characterizes other used electronic products, such as desktop computers, laptop computers, flat panel monitors, and cell phones, which can look identical whether functional or broken.

Moreover, EPA could examine its authority to modify its regulations so that regulated used electronics—when shipped for reuse and indistinguishable from those shipped for recycling—would be subject to the same control procedures as when shipped for recycling. Currently, exporters of CRTs for reuse or repair are required to notify EPA of their intent to export CRTs, whereas exporters of CRTs for recycling are required to notify EPA and to obtain consent from the importing country. Thus, although exporters of CRTs for reuse have a lesser requirement than those exporting CRTs for recycling, the former need only assert that the products are reusable or repairable, and the products can be visually indistinguishable. Regulating used electronics exported for reuse in this manner, however, would likely create an “overwhelming” number of notice-and-consent requests for EPA to handle each month, according to EPA officials, and could be successfully managed only with additional resources.

Revising RCRA regulations to more comprehensively cover used electronics for export could help ensure that they are handled as commodities and, if necessary, disposed of safely. Once regulated as hazardous wastes, such used electronics would be subject to RCRA’s existing export provisions. Revising RCRA regulations would require one or more rule makings, which could take several years to implement.

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## Provide Congress with a Legislative Package for U.S. Ratification of the Basel Convention

U.S. regulations contain no provisions for addressing situations when a waste is not classified as hazardous under U.S. law but is so classified—with its trade restricted or prohibited—under an importing country’s law. The effect is that the importing country bears the full burden of identifying and intercepting such materials, without the benefit of U.S. cooperation as the export country. By contrast, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal—effectively the international standard for hazardous wastes shipped for disposal or recycling—provides for cooperation between exporting and importing countries. For example, the convention requires that an exporting country stop shipments of waste if it has reason to believe that the waste will not be handled in an environmentally sound manner, as well as an obligation to prohibit exports to countries that have prohibited the import of that type of waste. The Basel Convention also established a prior notice-and-consent system for such wastes. While the U.S. has an existing notice-and-consent system, the Basel Convention and its system have significant distinctions. According to EPA’s International and Transportation Branch Chief, U.S. ratification of the Basel Convention has five key implications:

- *Scope of waste.* The Basel Convention has a much broader definition of “controlled” waste than the current RCRA regulatory definition. In contrast to the United States, which, to encourage recycling and reuse, has numerous conditional exclusions and exemptions to the definition of waste, the Basel Convention considers a broader range of items as waste. In addition, unlike the United States and OECD, the Basel Convention defines hazardous waste in terms of intrinsic hazards; therefore, a product is potentially hazardous even when it contains very small amounts of toxic substances, as is the case with cell phones and other electronic devices.<sup>29</sup>
- *Notice-and-consent process.* If the United States ratified the Basel Convention, an exporter would typically need to work through EPA to obtain written consent from the importing country before exporting material to a country that considered this material to be hazardous waste. U.S. law provides a notice-and-consent process for regulated hazardous waste exports; if the United States ratified the Basel Convention, the number of products requiring notice and consent would likely increase.

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<sup>29</sup>Under the Basel Convention, a country may use its own national definition of hazardous waste. If a country prohibits import of a hazardous waste, other countries must prohibit or not permit exports of such wastes to that country.

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- *Environmentally sound waste management.* The Basel Convention imposes a requirement on the exporting country to ensure that the wastes will be handled and disposed of in an environmentally sound manner. Implementing this provision would require EPA to make this determination, which could involve evaluating overseas facilities. EPA has already developed a plan to determine environmental soundness in this fashion, but actual implementation will likely require additional resources.
  - *Understanding importing countries' laws.* U.S. ratification of the Basel Convention would impose on the United States a greater obligation to understand the hazardous waste laws of foreign countries to determine what materials U.S. exporters cannot export to other countries. Exporting countries must prohibit or not allow exports to countries that have informed the Basel Secretariat of an import prohibition.
  - *Take-back provisions.* The Basel Convention requires that if an export of hazardous waste is refused by the importing country or facility, the exporting country must take it back. At present, EPA lacks the legal authority or the implementing regulations to take back waste, according to EPA officials. For example, from 1998 through 2001, Pyramid Chemicals shipped 29 containers of falsely labeled hazardous wastes, which were intended for Nigeria, from the United States to the Netherlands. Environmental protection officials in the Netherlands noticed leakage from some of the shipping containers and detained the shipment. Dutch officials cooperated with EPA, but EPA could not have the containers returned to the United States for proper handling. Instead, EPA had to work with its criminal investigative units to prosecute Pyramid Chemicals. According to EPA's International and Transportation Branch Chief, EPA found itself in an embarrassing position. Ultimately, the containers were not returned; they instead had to be disposed of by Dutch officials.<sup>30</sup> In proposing the implementing legislation necessary for U.S. ratification of the Basel Convention, EPA would seek to obtain the statutory authority to take back hazardous waste shipments denied by an importing country.

Some government and industry officials have expressed concerns about some aspects of the Basel Convention. For example, the scrap-recycling

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<sup>30</sup>The owner and an affiliated company were indicted and pleaded guilty to illegally storing, transporting, and exporting hazardous waste. The damages imposed as part of the sentences (which included over \$2 million in restitution and fines) covered the port operator's costs for storing the hazardous wastes for 3 years, the Dutch government's cost in incinerating the almost 300 tons of hazardous wastes, and EPA's cost in overseeing the warehouse cleanup in the United States, according to EPA.

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industry has mixed views about Basel ratification because of lingering uncertainties over the convention's definitions of exports for recycling, refurbishment, and reuse. Some Basel parties argue, for example, that the Basel Convention regulates the international movement of used products for repair, refurbishment, or remanufacture. If Basel Convention parties decide that exports for refurbishment should be controlled in the same way that other exports are controlled, then, according to EPA officials, the agency would have to manage an "overwhelming" number of notices and consents. The U.S. State Department takes the position that trade of used products for refurbishment is not within the convention; it has also asserted that the current Basel system for controlling international shipments of hazardous waste makes trade in many used and scrap electronics "difficult." The department favors alternative systems for such wastes under the convention. Although disagreement persists, some Basel parties are working together to develop interim proposals, described in the Mobile Phone Partnership Initiative, for managing exports for refurbishment under the Basel Convention. Under these proposals, the Basel Convention is exploring appropriate mechanisms for exports of mobile phones destined for the reuse and refurbishment markets. These proposals could serve as a model for regulating reuse and refurbishment exports of other potentially hazardous items.

For the United States to become a party to the Basel Convention, Congress would need to enact implementing legislation giving a U.S. agency, such as EPA, the authority to enforce the convention's provisions domestically.<sup>31</sup> Passage of such legislation would complete the prerequisites to ratification and, in effect, would make the United States party to the Basel Convention. EPA informs us that the United States supports ratification of the Basel Convention, but to date no implementing legislation has been enacted. Although EPA had developed a legislative package that, if signed into law, would give EPA the statutory authorities it needs to fulfill the requirements of the Basel Convention, the legislative package has not been submitted to Congress. The legislative package has not been submitted to Congress because, according to Solid Waste officials, the agency has other

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<sup>31</sup>The United States Ambassador to the United Nations signed the Basel Convention on March 21, 1990. The United States Senate gave consent to ratification in 1992 (138 *Congressional Record* 12291-92). The State Department has advised the Senate that it will not ratify the convention before the enactment of implementing legislation. (Ratification occurs when a country submits its documents of ratification to the Secretariat.) Thus, the next step in ratification would be congressional passage of implementing legislation, followed by presentation to the President.



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priorities for congressional attention. These officials told us that EPA instead wants attention devoted to its legislative package on the Stockholm Convention on Persistent Organic Pollutants, which is a global treaty to protect human health and the environment from widely distributed toxic chemicals that remain intact in the environment for long periods.

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### Cooperate with Other Federal Agencies to Improve Tracking of Exported Used Electronics

The U.S. government has adopted the Harmonized Tariff Schedule as the basic system for tracking exports for duty, quota, and statistical purposes. While the schedule is based on an international standard, the United States uses more detailed categories to track goods of particular national interest. The U.S. International Trade Commission is responsible for the Harmonized Tariff Schedule, while Customs and Border Protection is responsible for interpreting and enforcing it.

At present, the harmonized tariff codes neither enable identification of used electronics nor distinguish whether such electronics are being exported for recycling or reuse. Through identification of potentially illegal shipments of CRTs, we observed that shippers described used electronic exports as “mixed plastics” and “scrap metals.” Customs regulations require that U.S. exporters use the 7-digit international standard code that most closely describes the contents of a container, but there is no such code for used electronics. U.S. exporters can use 8- or 10-digit codes, which helps Customs and Border Protection officials track specific product types.

Adding more detailed codes to the schedule could assist other countries in controlling used electronics exported from the United States. For example, a country such as China, which reports it has tried to ban all imports of used electronics, could use the codes as listed on the shipper export declaration accompanying the shipment to select shipments for inspection and potential rejection at the border. Further, such codes could facilitate basic statistical tracking of such exports, including by type, price, and receiving country, among other data.

Customs and Border Protection appears to have a framework in place that could help EPA obtain data and improve oversight of exported used electronics. The agency’s automated tracking systems electronically store information from shippers’ export declaration forms, which include tariff

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codes. These systems help Customs monitor and, if necessary, enforce the provisions of agreements it has with other agencies.<sup>32</sup> For example, these systems are used to target high-risk outgoing shipments, such as those possibly containing materials that would have national security implications. To determine which shipments to target, Customs uses criteria based on those provided by the responsible agency, such as EPA for hazardous waste shipments. While most of Customs' monitoring and enforcement efforts directed to outgoing containers occur on behalf of the State Department and the Department of Commerce, Customs officials told us that provisions are in place to monitor outgoing shipments of RCRA hazardous wastes and CRTs. Because Customs enforces the policies, directives, and regulations of other agencies, if EPA were to designate used electronics as hazardous waste, and tariff codes were developed to describe such shipments, Customs could give additional scrutiny to outgoing shipments of used electronic products. Moreover, EPA could ask for greater scrutiny of particular types of shipments. One Customs official stated that, to his knowledge, EPA has not requested Customs' assistance to enforce RCRA hazardous waste export provisions. Beyond potentially using the information for enforcement, EPA could benefit from the data that detailed codes would generate, such as quantitative information not currently available about potentially hazardous exports, whether regulated or not.

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## Update RCRA Regulations to Reflect OECD Changes

Although a member of OECD, the United States has not yet updated its RCRA regulations to reflect the 2001 OECD decision concerning transboundary shipments of wastes for recovery and its subsequent 2004 amendments. Because the majority of OECD members are also Basel parties, the OECD decision revised waste classifications to harmonize them with those of the Basel Convention. The decision also altered the OECD notice-and-consent framework. Although the 2001 change does not require changes to the scope of hazardous wastes regulated in the United States, it does require adoption of the classification system to facilitate coordination among exporting and importing countries.

EPA has acknowledged that the 2001 decision is legally binding and must be implemented by amending RCRA regulations. EPA told us that they

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<sup>32</sup>Customs and Border Protection has existing memorandums of understanding with EPA; EPA, however, told us that its current coordination activities with Customs focus mainly on imports.

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submitted proposed changes to RCRA regulations to the Office of Management and Budget on May 8, 2008, and EPA officials anticipate issuing a proposed rule in mid-November in the *Federal Register*. The proposal would revise RCRA regulations to be completely consistent with the 2001 OECD decision, according to EPA officials, and would give EPA the regulatory authority to fulfill its obligations as described in the decision.

The options described above—amending RCRA regulations to broaden U.S. control over exported used electronics, submitting a legislative package to Congress for consideration to complete ratification of the Basel Convention, working with Customs and Border Protection and with the International Trade Commission to improve identification and tracking of exported used electronics, and updating RCRA regulations to reflect U.S. obligations under OECD—are just several possible options to strengthen the federal role in preventing exports of harmful used electronics. These options are not mutually exclusive, and they could be used together in any combination. In particular, the first three options could explicitly address exports to developing countries where adverse human health and environmental effects occur. Broadening U.S. control over exported used electronics, and cooperating with other federal agencies to improve identification and tracking of these devices, are actions that can be spearheaded by EPA.

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## Conclusions

Americans have increasingly adopted the environmental tenet of “reduce, reuse, recycle,” but when it comes to obsolete electronics, they lack sound information on their disposal options. Exporting used electronics to support reuse and recycling ought not be discouraged. Recycling electronics can provide social, economic, and environmental benefits, both in the United States and abroad, such as providing affordable computers to the developing world. In recent years, however, irresponsible practices have come to light, prompting EPA to implement notification requirements for any company exporting CRTs. To date, the agency has established no enforcement targets, done no monitoring, conducted only preliminary follow-up of suspected violations, and taken only one enforcement action. Not only do EPA’s present enforcement efforts fall short, but the agency also apparently has no tangible plans to develop more effective ones. Until an enforcement mechanism is developed and effectively implemented, consumers and businesses aiming to be environmentally responsible with their used electronics—particularly CRT monitors and televisions—should be skeptical of some companies that claim to responsibly recycle these devices.

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Because of high demand for the metals and other resources within electronic products, all kinds of exported used electronics—computers, televisions, laptops, printers, and cell phones, among others—are dismantled in developing countries where local waste management systems are often not equipped to handle them. Despite well-documented health and environmental effects, EPA’s regulation of exported used electronics is confined only to CRTs. In stark contrast, countries that are party to the Basel Convention, including most members of OECD, have largely embraced the idea that industrialized countries should be responsible for ensuring the environmentally sound management of potentially hazardous items exported to countries that cannot guarantee the safety of workers who will handle them. In issuing the CRT rule, EPA exercised its authority to regulate exports of functional CRTs because of the likelihood that some will be handled unsafely and the danger that they pose when disassembled. Following the rationale of this rule to provide controls over other potentially harmful used electronics could help bring the United States in line with important international norms. A number of options could move EPA forward along these lines, such as providing controls over electronic products that pose health and environmental risks when unsafely disassembled, such as in another country, and taking steps to honor key international agreements.

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## Recommendations for Executive Action

We recommend that the Administrator, EPA, identify a timetable for developing and implementing a systematic plan to enforce the CRT rule. This plan should include the basic elements of effective enforcement, such as enforcement targets, monitoring, follow-up of suspected violations, and prosecution.

We recommend that the Administrator, EPA, direct the heads of appropriate offices to take the following two actions:

- Develop options on how the agency could broaden its regulations under existing RCRA authority to address the export of used electronic devices that might not be classified as hazardous waste by current U.S. regulations but have a high likelihood of threatening human health and the environment when unsafely disassembled, as often occurs overseas. Among the options that should be considered is expanding the scope of the CRT rule to cover other exported used electronics and revising the regulatory definition of hazardous waste.

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- Cooperate with other federal agencies to improve the tracking of exported used electronics, which could be accomplished by implementing specific harmonized tariff codes for these devices.

In addition, because determining whether to ratify international treaties is a policy decision that rests with Congress and the President, we recommend that EPA submit to Congress a legislative package for ratification of the Basel Convention, so Congress can deliberate whether and to what extent the United States should adopt additional controls over the export of used electronics that may threaten human health and the environment when disassembled overseas.

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## Agency Comments and Our Evaluation

We provided a draft of this report to the Administrator, EPA, for review and comment. EPA's August 1, 2008, letter said the draft report "does not provide a complete or balanced picture of the agency's electronic waste program" and disagreed with our recommendations to improve enforcement of the CRT rule and to broaden EPA's authority to cover used electronics exports other than CRTs. We continue to believe that, as now constructed, the breadth of U.S. regulation covering exported used electronics is unacceptably narrow—an outlier among most industrialized countries in the world. We also believe that EPA's enforcement over used CRT exports—the only electronic device currently covered by U.S. regulations—has done little to deter violations.

The following paragraphs summarize EPA's comments and our responses. In keeping with the structure of EPA's letter, we then address the agency's comments on our findings related to (1) EPA's enforcement of the CRT rule, (2) EPA's outreach to affected parties about CRT rule requirements, and (3) the potential expansion of regulation over exported used electronics.

**Overall observations.** EPA wrote, "Overall, as a general matter, EPA is concerned that readers of the report may be misled to believe that a very large percentage of U.S. electronic waste is currently being reused and recycled globally." The agency then cited statistics showing that "80 to 85 percent of used electronics are disposed of domestically, primarily in landfills." The wording suggests that because only 15 percent to 20 percent of used electronics are collected for reuse or recycling, our report overstates the health and environmental problems associated with exported used electronics. We find that this response needs to be put in the proper perspective. First, the document EPA references shows that 330 million electronic products were "ready for end-of-life management" in

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2006. Fifteen percent to 20 percent of 330 million (50 million to 66 million) is still a significant number—especially in light of EPA’s estimate that “a vast majority” of such products are exported. Second, and more important, it is EPA’s stated goal to significantly reduce the amount of used electronics going into landfills—a goal that is also pursued by a growing number of states that are banning the dumping of electronics in their landfills. Over time, the effect of these efforts can be expected to greatly increase the quantity of used electronics being both recycled and exported. Under this likely scenario, it will become that much more important to ensure that used electronics are handled safely and exported in a manner that complies with U.S. and international laws.

**EPA’s enforcement of the CRT rule.** Among EPA’s most significant comments regarding our enforcement-related findings is its contention that the agency should not be asked to “build an extensive compliance monitoring and enforcement program” around the CRT rule or any other individual provision of its broader RCRA program. We believe the comment mischaracterizes our recommendation and the resource commitment that would be needed to establish a credible enforcement deterrent. We are not recommending that EPA establish an extensive program, but rather that it develop the basic enforcement components needed to enforce the CRT rule, such as enforcement targets and a plan for compliance monitoring, following up on suspected violations, and prosecuting violators. Moreover, we continue to believe that these actions are reasonable and necessary in light of (1) the substantial number of exporters we observed willing to export in apparent violation of the CRT rule and (2) EPA’s very limited enforcement of the CRT rule. In this connection, our work has demonstrated that much can be done to identify violators and deter noncompliance without an exorbitant commitment of resources. It took little of our time and effort, for example, to identify potential violators and potentially illegal shipments. Specifically, in several hours—rather than days—of monitoring e-commerce Web sites, we observed substantial willingness to engage in activities that would appear to violate the CRT rule. Similarly, it took only minutes to identify potentially illegal CRT shipments by contacting environmental protection officials in countries known to import these items and by working with Customs and Border Protection officials to detain and observe the shipments.

**EPA’s outreach to affected parties about CRT rule requirements.** EPA stated that our draft report incorrectly described the agency’s outreach efforts as consisting of only a limited number of presentations at conferences and similar venues. The letter points to the agency’s CRT rule

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“Communication Plan,” stating that the plan “sets forth a number of specific activities to reach out to the regulated community.” It further states that EPA “implemented this plan immediately after the rule was published” in July 2006. We have used the information provided by EPA to more fully describe what the agency states is the entire range of its outreach activities. That said, our characterization of EPA’s actual outreach efforts is based on comments we obtained from EPA program officials during our review and, most recently, at meetings with EPA Enforcement and Compliance Assurance and Solid Waste officials in May and June 2008. Moreover, although an outreach plan may have existed for some time, it is unclear to what extent these efforts have focused on educating the regulated community about the need to notify EPA when exporting used CRTs. For example, a March 2008, internal Office of Solid Waste e-mail to EPA’s RCRA division directors—prepared 20 months after the rule’s adoption—stated, “We expect that there has been considerable noncompliance with the notification provisions of the CRT rule and we are *planning to develop* [emphasis added] a strategy for reaching out to the regulated community and the states to educate them about the [notification] requirements.” Hence, the e-mail suggests that a plan for educating the regulated community was still needed at the time of our report.

**Potential expansion of regulation over exported used electronics.**

EPA disagreed with our conclusion that the regulatory framework governing used electronic exports was too narrowly constructed and with our recommendation that it broaden its regulations under existing RCRA authority to address the export of used electronics other than CRTs (such as computers and cell phones). EPA contends that it should instead pursue nonregulatory, voluntary approaches to address the problems discussed in this report, because developing options to broaden its RCRA regulatory authority might take years and would entail legal complexities. Our findings, however, cast serious doubt about the effectiveness of a strategy that relies almost entirely on voluntary approaches. Given the compliance issues and market realities we identified with just the CRT rule, it is not realistic to expect that sufficient control over exports of nonworking and potentially harmful electronic devices will be achieved without a credible and enforceable regulatory framework. Moreover, we do not believe that the time and complexities in establishing necessary regulatory controls over electronic waste exports is a sufficiently compelling reason for not doing so, particularly in light of the anticipated increase in potentially harmful electronic devices available for export.

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EPA's letter appears in appendix II, along with our responses. The agency also provided technical comments that were incorporated in our final report, as appropriate.

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to interested congressional committees, the Administrator of the Environmental Protection Agency, and other interested parties. We will also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov). Contact points for our Office of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix III.

Sincerely yours,

A handwritten signature in black ink, reading "John B. Stephenson". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

John B. Stephenson  
Director, Natural Resources and Environment



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# Appendix I: Scope and Methodology

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To examine the fate of used electronics, we obtained and reviewed surveys from Basel Convention Regional Centres in Africa, China, and Southeast Asia on electronic waste disassembly and disposal practices. We obtained and reviewed conference proceedings and presentations from a regional workshop in Siem Reap, Cambodia, held from March 13 through 15, 2007, on environmentally sound management of electronic wastes in Southeast Asia. We interviewed officials with Hong Kong's Environmental Protection Department about imports of used electronics from the United States. We interviewed experts from government, industry, environmental groups, and academia and obtained and reviewed documents authored by them to learn how used electronics exported from the United States are managed overseas. For example, we interviewed officials with Dell on its overseas recycling practices and two companies that export CRT monitors to facilities in Southeast Asia from the United States. To learn firsthand about practices in Africa, we also spoke with a West African computer dealer who imports used computers from the United States. In addition, we spoke with officials from Greenpeace in China and the Basel Action Network in the United States. We also reviewed published scientific studies about the health effects of improper recycling practices in Asia. We interviewed a professor at Arizona State University currently conducting research on used electronics exports. We also attended two conferences on the export of used electronics, where we interviewed officials with Toxics Link, a nonprofit organization; academic officials from research institutions in China, Japan, Switzerland, and the United States; electronics-recycling and scrap industry officials; and officials from the Environmental Protection Agency's (EPA) national and regional offices.

In addition, we monitored two e-commerce Web sites to obtain information on requests for used monitors, untested monitors, nonworking monitors, cathode-ray tubes (CRT), used CRTs, untested CRTs, nonworking CRTs, liquid-crystal displays (LCD), used LCDs, untested LCDs, nonworking LCDs, central processing units (CPU), used CPUs, untested CPUs, nonworking CPUs, used computers, untested computers, and nonworking computers. We collected information from these Internet sites from February 2008 to May 2008. Among the information we obtained were data on the volume requested, location of request, price, and quality of equipment sought (such as working, nonworking, untested, as-is, or broken). For CRTs in particular, we estimated the total number of units requested using conservative assumptions. For example, if a buyer requested one container per month, we estimated that 800 CRTs fit in a container and multiplied this number by three to obtain an estimated request of 2,400 monitors for the 3-month period.

To determine the effectiveness of regulatory controls over used electronics exported from the United States, we took several approaches. First, we interviewed EPA officials and reviewed key documents. For example, we interviewed officials in the Office of Solid Waste and Emergency Response, the Office of Enforcement and Compliance Assurance, and the Office of Civil Enforcement to determine what challenges exist to implementing EPA's CRT rule. We also reviewed EPA's CRT rule and hazardous waste export provisions of the Resource Conservation and Recovery Act of 1976 (RCRA), as amended, and its implementing regulations. Finally, we reviewed EPA's *Hazardous Waste Civil Enforcement Response Policy* and the Office of Enforcement and Compliance Assurance's *Guide for Addressing Environmental Problems*.

Second, we posed as buyers of CRTs from India, Indonesia, Hong Kong, Pakistan, the Philippines, Singapore, South Korea, and Vietnam. We also posed as a United States-based broker working for a fictitious company in Hong Kong. Using these identities, we e-mailed 343 U.S. companies, including members or affiliates of an electronics recyclers' association and other companies that posted CRT "sell" offers on the e-commerce Web sites we monitored. From these companies, we requested CRT monitors that were unlikely to be reused (untested, nonworking, and broken CRTs), clearly destined for export, and could be supplied in less than the 60-day time period for export notifications under the CRT rule. Of the 64 firms that responded to our requests, 43 expressed a willingness to export. Among the other 21 companies that responded, 3 stated that they did not export broken CRT monitors; 7 asked for more information about our fictitious identities, such as phone numbers, a Web site, or what we intended to do with the broken CRTs; and the remaining 11 provided various responses, such as offering broken CRT monitors from Canada, currently not having CRT monitors in inventory, offering working televisions, or offering Pentium IV motherboards. Of the 43 companies that expressed a willingness to export, we reached 18 in separate interviews and asked employees about their knowledge of the CRT rule and their perspectives on its effect on their business. We obtained notifications for CRT exports for recycling from EPA's Office of Enforcement and Compliance Assurance, and from EPA's regional offices, we obtained notifications to export CRTs for reuse. We used this information to determine whether the U.S. companies that responded to our fictitious foreign buyers had previously filed a notification for export with EPA.

Third, we obtained information from Hong Kong's Environmental Protection Department on shipments of used CRTs that the department had intercepted and returned to the United States because, according to

the officials, the shipments violated Hong Kong's hazardous waste import laws. For the shipments that occurred during our review, we referred the information to EPA's Office of Enforcement and Compliance Assurance. On one occasion, we personally viewed one of these shipments at the Port of Long Beach, California, with the assistance of Customs and Border Protection officials.

To examine options for strengthening the federal role in regulating used electronics exports, we interviewed EPA officials in the Office of Solid Waste and Emergency Response and the Office of Enforcement and Compliance Assurance about the implications of (1) expanding the scope of the CRT rule to cover other exported used electronics, (2) submitting to Congress a legislative package for ratification of the Basel Convention, and (3) updating RCRA regulations to reflect a key 2002 decision by the Organization for Economic Cooperation and Development. We interviewed Customs and Border Protection officials about the implications of working with EPA to improve tracking of exported used electronics. We also examined the regulatory regimes of European Union countries pertaining to hazardous waste exports.

We found the data we obtained on e-commerce Web sites to be adequate to conclude that a significant demand exists for exported used electronics. We conducted our review from October 2007 through July 2008 in accordance with generally accepted government auditing standards. These standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe the evidence we obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# Appendix II: Comments from the Environmental Protection Agency

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

AUG 1 2008

Mr. John B. Stephenson, Director  
Natural Resources & Environment  
Government Accountability Office  
441 G. Street, NW Room 2075  
Washington, DC 20548

Dear Mr. Stephenson:

Thank you for the opportunity to review and comment on the draft report, "*EPA Needs to Take a Stronger and More Comprehensive Enforcement Action to Control Harmful U. S. Exports.*" dated August 2008. We have completed our review and have significant concerns with the completeness and accuracy of this draft report.

EPA believes the GAO draft report does not provide a complete or balanced picture of the Agency's electronic waste program. In particular, the draft report fails to consider enforcement of the Cathode-ray tube (CRT) rule in the larger context of the Resources Conservation and Recovery Act's (RCRA's) enforcement program and mischaracterizes EPA's actions with respect to incidents of non-compliance with the rule. Further, EPA disagrees with the recommendation to develop a separate program for compliance monitoring and enforcement of the CRT rule. In reviewing the draft report, we address each of these issues by providing background on the responsibilities of the RCRA enforcement program, discussing how EPA has responded to information provided by GAO, and explaining what EPA will do to help address the larger issue of non-compliance with the rule. In addition, we have provided a number of comments, attached, that correct technical and factual errors we identified during our review.

Overall, as a general matter, EPA is concerned that readers of the report may be misled to believe that a very large percentage of U.S. electronic waste is currently being reused and recycled globally. To avoid this mistaken conclusion, the report should put into proper perspective the amount of used electronics now being reused or recycled. Consumer electronics – including TVs and other video equipment, computers, assorted peripherals, audio equipment, and phones – comprise less than two percent of the municipal solid waste stream. US EPA, *Municipal Solid Waste in the United States: Facts and Figures for 2005*. EPA 530-R-06-011. EPA estimates that, in the U.S., between 15-20 percent by weight of used and end-of-life electronics (TVs, computer products, and cell phones) are collected for reuse and recycling. The remaining 80-85

See comment 1.

See comment 2.

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percent is disposed of domestically, primarily in landfills. US EPA, Office of Solid Waste. *Electronics Waste Management in the United States: Fact Sheet: Management of Electronic Waste In the United States*. April 2007. EPA530-R-07-004a. [www.epa.gov/ecycling/manage.htm](http://www.epa.gov/ecycling/manage.htm).

See comment 3.

We also recommend changing the report's title by eliminating the term "Enforcement," because singling out enforcement does not accurately reflect the report's content. The report discusses the regulation of used electronics. In fact, only one of the report's four recommendations is directed at strengthening enforcement.

#### **Enforcement**

The Office of Enforcement and Compliance Assurance (OECA) and its counterparts in EPA's 10 regional offices oversee the compliance monitoring and enforcement program for all environmental statutes, including RCRA. RCRA regulates the transport, treatment, storage, and disposal of hazardous waste. Monitoring compliance and enforcing these regulations is no small task. Tens of thousands of entities generate and manage more than 80 billion pounds of hazardous waste a year in the United States.

See comment 4.

EPA does not agree that formally subdividing the RCRA enforcement program to dedicate resources solely to the CRT export rule is wise or necessary. The RCRA regulations governing hazardous waste are comprehensive and complex and the threats posed to human health and the environment by non-compliance are serious and diverse. The current RCRA enforcement program has a demonstrated track record of success enforcing all of RCRA's requirements. Given the diversity of facilities and problems that the RCRA enforcement program must address, it is not practical for EPA to build an extensive compliance monitoring and enforcement program around every limited provision of the RCRA hazardous waste regulations. That does not mean that EPA will not take steps to monitor and compel compliance with the CRT rule. In fact, EPA has quickly responded to the problems identified by GAO, issuing one administrative penalty complaint, initiating eight additional investigations, and planning a number of inspections to take place this year.

See comment 5.

EPA's RCRA enforcement program makes significant contributions to protecting human health and the environment. In fiscal year 2007, the program conducted nearly 4,000 inspections, of which approximately 2,000 revealed incidents of non-compliance with the RCRA hazardous waste requirements. During the same year, EPA concluded 446 RCRA enforcement actions. These actions reduced, treated, or eliminated nearly 100 million pounds of hazardous waste that companies mismanaged, mischaracterized, or illegally disposed – posing a threat to human health and the environment. Through these actions, EPA also collected approximately \$9 million in civil penalties and secured complying actions and supplemental environmental projects totaling over \$400 million.

See comment 6.

For the majority of the RCRA regulations EPA shares its compliance monitoring and enforcement authorities with the States. The states typically conduct more inspections and enforcement actions than EPA, while EPA tends to focus on facilities and problems

where the threats to human health and the environment are most significant. This leads to a broad range of cases, against a variety of entities that address a number of different problems.

EPA appreciates the time and effort that GAO expended to identify compliance problems with the CRT rule. The report notes that GAO discovered 22 shipments where the exporter failed to provide proper notice; GAO informed EPA of seven of these shipments. In addition, GAO identified in its report 43 companies that appeared willing to violate the RCRA hazardous waste regulations. Contrary to statements in the report, EPA does ensure that every tip and complaint is investigated.<sup>1</sup> However, investigations do not always mean “inspections.”<sup>2</sup> EPA uses a variety of means to collect evidence, including working with Customs and Border Protection (CBP) to obtain information and issuing information request letters to exporters or other potentially liable companies or individuals.<sup>3</sup> To be effective, RCRA enforcement actions require the development of information and evidence and take time to reach a conclusion. To date, EPA has issued one administrative penalty complaint against a company associated with one of the seven shipments, seeking the statutory maximum civil penalty of \$32,500.

The report suggests that EPA has not taken sufficient action against violators and bases this conclusion on EPA’s statements that for new rules EPA primarily focuses on outreach to ensure that the regulated community is aware of the requirements. EPA does follow that general principle; however, a primary focus on outreach does not mean that EPA will not take enforcement actions if it learns of specific incidents of non-compliance. EPA is investigating and will take appropriate action to address violations of the CRT rule. EPA currently has ten ongoing investigations and the regions plan to conduct inspections at electronic waste collection and recycling facilities this year. In addition to EPA’s investigations of the specific incidents shared by GAO, EPA has initiated an internal discussion to raise awareness of the issue within the RCRA enforcement program and identify steps that EPA could take to help address the problem.

<sup>1</sup> EPA has asked GAO for information regarding the other 15 shipments but, to date, EPA has not yet received that information from GAO.

<sup>2</sup> GAO also appears to criticize EPA for not detaining shipments. EPA has no explicit authority to detain shipments or seize personal property under RCRA. With respect to the shipment in Long Beach, referenced in Figure 5 of the report, CBP exercised its authority to detain the shipment. CBP also made the decision to release the containers based on a letter from the exporter to Customs that the exporter would remove the CRTs from the container. EPA was not aware of the exporter’s letter until after the containers arrived back in Long Beach, and after Hong Kong had rejected the container for the second time.

<sup>3</sup> EPA issues information request letters pursuant to RCRA §3007. 42 U.S.C. 6927 (2000). GAO questions whether we obtain any meaningful information from such information request letters. EPA commonly issues information request letters in RCRA investigations. We usually receive useful information because recipients know that they can be penalized for failing to respond. A person who fails to respond to such a letter is subject to penalties of up to \$32,500 a day under RCRA. In addition, all information submitted in response to a 3007 request must be certified as true, accurate, and complete; a knowing submittal of false information in response to a 3007 request may be actionable under 18 U.S.C. § 1001 and 42 U.S.C. § 6927(d).

See comment 7.

See comment 8.

See comment 9.

See comment 10.

See comment 11.

### Outreach

The draft report criticizes EPA's implementation of the CRT rule, stating that "EPA has conducted virtually no outreach beyond a limited number of presentations..." (See the top of page 31 of the draft report.) We believe this significantly understates EPA's outreach efforts to the regulated community relative to the CRT rule. EPA's outreach efforts consisted of much more than "a limited number of presentations at annual scrap-recycling conferences." In fact, the Agency's "Communication Plan" for the CRT rule set forth a number of specific activities to reach out to the regulated community. We implemented this plan immediately after the rule was published. EPA mailed and e-mailed copies of the rule and Fact Sheet to numerous interested parties, including all relevant trade associations, public interest groups, states (through the Association of State and Territorial Solid Waste Management Officials), local government associations, the trade press, and the print media. EPA made many presentations at major e-waste conferences (which are attended by the major recyclers), and also invested significant staff time in providing assistance to the regulated community, states, and others to enhance their understanding of the rule. Further, EPA spoke with the national press on issues related to electronics in general and on export requirements under the CRT rule, specifically. Moreover, EPA believes our website is an excellent source of information on the rule. We also believe this statement is contradicted by several statements reflecting GAO's own experiences in its contacts with electronics recyclers. For example, in the paragraph that follows (with similar statements made on pages 7, 21, and 23 through 26 and in the draft report "GAO Highlights"), GAO states that it observed that recyclers had a "substantial willingness to engage in activities that would appear to violate the CRT rule—including instances where the exporters were aware of the CRT rule..." Additionally, the electronics recycling industries closely followed the progress of the rule and were well aware of its issuance through implementation of our outreach strategy and through their persistent inquiries as to the rule's status.

The RCRA enforcement program also has discussed the issue at length during regularly scheduled monthly conference calls and biannual meetings. OECA has also talked with individual regional offices with large U.S. ports. These discussions have already led three EPA regional enforcement programs to conduct additional investigations of companies beyond those shared by GAO. The conversations have also generated the following ideas for actions that EPA plans take to better monitor compliance and enforce the rule:

- Review existing enforcement guidance to determine the need for modifications to address the unique aspects of compliance monitoring and enforcement of the CRT rule. Such documents include the *National Program Managers Guidance* (2008)(revised annually) and the *Hazardous Waste Enforcement Response Policy* (2003).
- Hold discussions with CBP and individual port authorities about the CRT rule and ways to improve the monitoring of CRT shipments.
- Publicize concluded enforcement actions to deter others from non-compliance.

- Refer the most serious violations of the CRT rule to the OECA's Office of Criminal Enforcement, Forensics and Training (OCEFT) for criminal investigation into whether the violations were "knowing", i.e., where the alleged violators knew that they were exporting electronic waste and were aware of the general hazardous character of the waste.
- Offer compliance assistance to the e-waste recycling industry, states and retailers.

EPA believes these actions will lead to increased compliance with the rule and increase the number of identified violations. Therefore, we believe that the draft report should be modified to more accurately reflect the Agency's outreach efforts on the CRT rule.

#### **Regulatory Program**

One of the GAO's recommendations to address electronic waste is for EPA to "...develop options on broadening its authority to address the export of other potentially harmful used electronic items that are currently unregulated." Specifically, GAO identified a number of options that EPA could consider, including "...amending RCRA regulations to include exports of used electronics posing health or environmental risks when disassembled or reclaimed, expanding the scope of the CRT rule, and revising the regulatory definition of hazardous waste." (See pg 32 of draft report.) Furthermore, GAO suggested that "... a revised definition or rule for other used electronics could be developed to cover only exports or to exempt domestic activity from substantive requirements if EPA determines that other approaches—such as voluntary initiatives and existing regulatory controls on recycling facilities—provide adequate domestic protection of health and the environment." (See pg 33 of draft report.) GAO also suggested that EPA examine its authority to regulate used electronics shipped for reuse under the same control procedures as electronics shipped for recycling (see pg 34 of draft report).

EPA is well aware of the numerous challenges in appropriately controlling the management of e-waste, both domestically and internationally. However, we are not convinced that developing a regulatory scheme to address these issues is the most appropriate course of action. First, as GAO itself acknowledges, the development of regulations would take several years. In addition, we believe that there may be legal questions that would limit our authority or would need to be resolved. For example, many of the concerns that were identified by GAO deal with worker safety issues, which are addressed domestically by the Occupational Safety Health Act. Additionally, defining a waste as hazardous based on another country's management scheme may also raise legal questions since RCRA does not apply extra territorially. Therefore, because we believe that we should not wait years to address some of the issues identified by GAO, we believe that non-regulatory approaches can make important contributions when it comes to safe exports of electronic equipment. As an example, EPA, along with numerous other stakeholders, has invested a great deal of effort over the last couple of years in our "Responsible Recycling" initiative. 'R2' is a voluntary, third-party, e-waste recycler certification program. EPA is now working with electronics recyclers on a voluntary basis to determine which exports of various kinds of electronics equipment are

See comment 12.

See comment 13.



or are not allowed to enter various foreign countries. We believe we will learn a great deal about the regulatory programs of countries such as China (including Hong Kong), South Korea, India, and others through our communication with the competent authorities in those countries concerning allowable imports of electronics to those countries.

Regarding EPA's ongoing rulemaking effort related to the Organization for Economic Co-operation and Development (OECD) Council Decision, on page 3 the draft report reads as follows – "In 2001, because a majority of its members are also Basel parties, the OECD council changed its waste classifications, including what products are considered hazardous wastes, to harmonize with those of the Basel Convention. Although the United States has agreed to be bound by such decisions, the U.S. has not yet implemented the 2001 change." We believe this statement is misleading and could be read to imply that under our OECD responsibilities, the U.S. must modify our hazardous waste determinations to comport with those contained in the Basel Convention. This is not the case. The 2001 OECD Decision still retains the fundamental approach of allowing each Member country to employ its "national procedures" to determine whether a waste is hazardous under its laws and regulations, and therefore whether it is subject to the OECD controls. The national procedures for the U.S. specify that OECD's "Amber list controls" (i.e., hazardous waste controls) apply to the wastes that are: (1) defined as RCRA hazardous waste in 40 CFR 262.3, and (2) subject to Federal hazardous waste manifesting requirements or to the universal waste management standards. (See 40 CFR 262.89(a).) Therefore, although the OECD waste lists were modified to align more closely with the Basel Convention waste lists, this does not change the scope of wastes in the U.S. subject to Amber controls, nor does this OECD decision obligate the U.S. to change its national procedures for defining Amber wastes. A more accurate description of the waste classification change would be:

In 2001, because a majority of its members are also Basel parties, the OECD council changed its waste classifications to harmonize with those of the Basel Convention, although the application of the waste lists is different under the OECD than it is under Basel.

In addition, while the draft report correctly notes (on page 40) that the Agency is in the process of modifying its hazardous waste regulations to reflect the 2001 OECD Council Decision, we believe such statements (in a footnote) should also be noted when GAO discusses this issue, such as on pages 3, 8, and 32.

Furthermore, in a number of places in the draft report, GAO recommends that EPA could work with Customs and the International Trade Commission to improve identification and tracking of exported electronics" and thus enhance control over the export of used electronics. We agree with GAO and intend to contact representatives of those agencies.

We are providing an enclosure to this response which provides our more detailed comments on this draft report. We would like your office to consider our comments as


See comment 14.


See comment 15.

you finalize this report. Please see the enclosure for additional detailed technical comments.

We appreciate the opportunity to work with your team on this review, and your consideration of our significant reservations with the findings and recommendations of this report. If you have any comments or questions regarding this Agency response, you may contact Margaret Schneider, Director, Office of Administration and Policy at 202-564-2530.

Sincerely,

  
Grant Y. Nakayama  
Assistant Administrator  
Office of Enforcement and Compliance Assurance

  
Susan Parker Bodine  
Assistant Administrator  
Office of Solid Waste and Emergency Response

The following are GAO's comments on the Environmental Protection Agency's letter dated August 1, 2008.

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## GAO Comments

1. EPA's statement incorrectly characterizes our recommendation in asserting that the recommendation calls on EPA "to develop a separate program for compliance monitoring and enforcement of the CRT rule." Rather, the recommendation asks EPA to "identify a timetable for developing and implementing a systematic plan to enforce the CRT rule," which would "include the basic elements of effective enforcement such as enforcement targets, monitoring, follow-up of suspected violations, and prosecution." We do not see why such basic elements could not be developed within the context of the overall RCRA enforcement program. In any case, our May 2008 meeting with EPA officials to discuss preliminary findings made it apparent that a strategy for enforcing the rule was needed. Specifically, we were told at that time that the agency had not begun to consider how it would enforce the rule (it also did not have a time frame for doing so) because it was still emphasizing outreach to the regulated community. We continue to believe that without the minimal elements of a formal enforcement strategy, it will be difficult to determine whether the single penalty EPA has levied to date is an isolated action or part of an overall strategy to deter noncompliance.
2. EPA stated that our report should "put into proper perspective the amount of used electronics now being reused or recycled," noting that "80-85 percent is disposed of domestically, primarily in landfills." EPA's comment implies that because only 15 percent to 20 percent of used electronics are collected for reuse or recycling (since the other 80 percent to 85 percent is primarily disposed of in landfills), we overstate the human health and environmental problems associated with exported used electronics. We find that this response needs to be put in the proper perspective. First, the document EPA references shows that 330 million computer products were "ready for end-of-life management" in 2006. Fifteen to 20 percent of 330 million is not an insignificant number—especially in light of EPA's acknowledgment that "a vast majority" of such products are exported. Second, and more important, it is EPA's stated goal to significantly reduce the 80 percent to 85 percent of used electronics going to landfills—a goal that is also pursued by a growing number of states enacting bans on disposing of used electronics in landfills. Over time, the effect of these efforts can be expected to greatly increase the quantity of used electronics being both recycled and exported—but especially exported, given the relatively greater profitability of that alternative. Under this likely

scenario, it will become that much more important to ensure that exported used electronics are handled safely.

3. We did not delete the word *enforcement* from the title, as suggested by EPA, given the state of present CRT rule enforcement. We did, however, broaden and clarify our title to reflect our findings beyond enforcement, particularly the limited scope of U.S. regulation. The title now reads, *Electronic Waste: EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation*.
4. This paragraph restates what we believe to be a misinterpretation of our recommendation. EPA's comment implies we are recommending that the agency build an extensive compliance monitoring and enforcement program for the CRT rule. To the contrary, we are recommending that the agency take reasonable steps to establish a credible enforcement deterrent—such as developing enforcement targets and plans for monitoring, following up on suspected violations, and prosecuting violators. We continue to believe that these actions are necessary and appropriate in light of what we observed, including exporters willing to engage in apparent violations despite awareness of the CRT rule. We believe our own work demonstrates that much can be done to identify violators and deter noncompliance without establishing the “extensive compliance monitoring and enforcement program” that EPA describes. In particular, little effort was required on our part to identify potential violators and potentially illegal shipments. In just several hours of monitoring of e-commerce Web sites, we were able to observe substantial willingness to engage in activities that would appear to violate the CRT rule. Additionally, in only minutes, we were able to identify 26 potentially illegal CRT shipments by simply e-mailing environmental protection officials in countries where such imports are known to occur. While collecting evidence to establish a violation would take additional efforts, our experience suggests that obtaining leads is relatively simple.
5. We acknowledge EPA's response to the violations we identified, but also note that 2 years after the CRT rule's implementation, the agency has demonstrated little effort to identify noncompliance on its own. We would note further that the only administrative penalty EPA has issued to date was on July 31, 2008, more than 5 months after we identified that violation for the agency in February 2008. Thus, while we acknowledge this action, we continue to believe that until EPA adopts the basic elements of an enforcement strategy, it will remain unclear whether this single penalty was an isolated action—that, in

turn, is unlikely to deter future violations—or part of an emerging enforcement strategy.

We also acknowledge EPA’s claim that it is “planning a number of inspections to take place this year,” and see this as a positive development if it is part of an overall strategy to ensure greater compliance as part of a formal, written plan.

6. EPA notes that for most RCRA regulations, it shares its compliance monitoring and enforcement authorities with the states. We acknowledge that this practice is common among RCRA and other environmental programs, but, as agency officials told us on May 28, 2008, states do not have authority over export provisions. Hence, the states’ lack of jurisdiction over this particular issue amplifies the importance of EPA’s role.
7. EPA’s letter states that the agency “uses a variety of means to collect evidence, including working with Customs and Border Protection to obtain information and issuing information request letters to exporters or other potentially liable companies or individuals.” EPA does, in fact, have two memorandums of understanding with Customs and Border Protection to promote information sharing and enforcement of environmental laws. The memorandum on information sharing addresses imports only. The memorandum on enforcement of environmental laws is intended to ensure the timely coordination, communication, and cooperation necessary to process violations of environmental regulations as they relate to exports and imports. During our May 28 meeting with EPA officials, they told us they had worked with Customs and Border Protection only on imports of potentially hazardous waste, not exports.
8. We applaud EPA’s issuance of the administrative penalty on July 31 but, as noted above, believe this action should be part of an emerging enforcement strategy and not an isolated instance. We also note that we had identified this particular shipment as a potentially illegal export of CRT monitors 5 months earlier, after we were told by Hong Kong authorities that it was being returned to the United States as an illegal shipment of used electronics. On February 20, 2008, we informed EPA of the shipment and asked Customs and Border Protection to detain it. We viewed the container’s contents on February 27, 2008, and observed hundreds of CRT computer monitors stacked haphazardly, some with cracked plastic cases and broken glass tubes. EPA completed its action 5 months later.

9. The EPA comment suggests it is waiting for information from us. In fact, an Office of Solid Waste official told us EPA already has this information. In January 2008, when we began to uncover potentially illegal shipments of CRTs where the exporter failed to provide proper notice, we also began to provide this information to EPA. EPA implies that it asked us for information on all shipments mentioned in our draft report. During a June 2008 meeting with the agency, however, EPA officials asked us to verify only the information we obtained on the shipments we identified during our review. EPA did not ask us for information on the containers that were returned before our review began (although this information would have been easy for EPA to obtain from Hong Kong environmental protection officials). We understand that EPA has since obtained this information.
  
10. EPA's comment suggests that the agency was not aware of the potential illegality of the three containers until they had been shipped to Hong Kong for the second time. We find this suggestion puzzling since we provided EPA with information on these containers when they were returned from Hong Kong the first time. We had several telephone conversations and sent numerous e-mails to EPA staff in the Office of Enforcement and Compliance Assurance. Before the three containers were re-exported to Hong Kong, about 4 weeks after being returned to the Port of Los Angeles, a director in EPA's Office of Enforcement and Compliance Assurance e-mailed us, stating that the exporting company had contacted Customs and Border Protection and intended to remove the monitors before shipping the containers back to Hong Kong. As we note in our report, the exporter did not remove the monitors. In fact, according to an Office of Enforcement and Compliance Assurance investigator, the exporter merely changed his company's name and re-exported the used CRTs.
  
11. Our characterization of EPA's outreach efforts was based on (1) interviews during two meetings with EPA officials in May and June 2008, and (2) an internal EPA document from March 2008—20 months after adoption of the rule—stating that “the agency still needed to develop a strategy for educating the regulated community about CRT rule notification requirements.” In our final report, we have nonetheless used the information provided by EPA to more fully describe what the agency states is the entire range of its outreach activities. For example, the agency's communication plan for the CRT rule states that EPA is to notify its regional offices, state hazardous waste directors, the press, environmental groups, and relevant associations.

12. EPA contends that because developing options to broaden the agency's regulations under existing RCRA authority might take several years and require addressing legal complexities, the agency should instead pursue nonregulatory, voluntary approaches. We disagree. First, as EPA's experience has shown, voluntary programs can also take years to implement—and in some cases may never attain effective broad coverage since in a voluntary scheme, the agency has no enforcement recourse against reluctant participants. Second, given the widespread willingness to export in apparent violation of EPA's one existing electronics export regulation (the CRT rule), including some exporters' admitting knowledge of the rule, we do not assume that the industry will voluntarily agree to adopt and adhere to broader, meaningful export controls in the absence of a broader, better enforced regulatory framework.
13. Among the factors EPA cites as drawbacks to the regulatory options we identified are possible "legal questions that would limit [EPA's] authority or would need to be resolved" involving the Occupational Safety and Health Act (OSH Act) and RCRA. We believe these concerns are not well founded. With respect to the applicability of the OSH Act, EPA states that many of the concerns our report identified relate to worker safety risks, which in the United States are regulated under the OSH Act by another agency. Although EPA's statement is correct as far as it goes, it does not explain why the other risks our report identified—risks to the environment—cannot be regulated by EPA under RCRA in the ways we have suggested. We note that the OSH Act focuses solely on workplace safety, including controlling exposures to hazardous materials, while RCRA grants EPA broad authorities to regulate management of hazardous waste to protect human health and the environment. Many of the improper management practices we have cited pose a risk both to workers' health *and* to the environment (e.g., via related releases of gases and liquids and potential dumping of materials without value). Because RCRA and the OSH Act regulate different aspects of the same toxic substances, applicable OSH Act regulations may be an appropriate consideration in crafting a RCRA approach to used electronics. As a part of developing options on how the agency can broaden its RCRA regulations to address used electronic devices, EPA should address any legal issues it may identify involving the OSH Act.

With respect to EPA's suggestion that a regulatory program to include additional used electronics "may also raise legal questions since RCRA does not apply extraterritorially," we are not suggesting that EPA apply RCRA extraterritorially. We recommend that EPA develop options to

address management of used electronics under existing RCRA authority, including RCRA's existing subtitle C export provisions, which apply to parties in the United States, on the basis of conditions in the United States. These provisions control exports by imposing requirements, such as notice and consent, upon parties in the United States who are exporting regulated wastes. Our recommendation would expand the scope of the regulated wastes subject to existing export provisions, not extend the geographical application of the export provisions themselves. The basis for this expansion of the scope of regulated wastes subject to export provisions is EPA's existing broad legal authority under RCRA. Thus, we are not suggesting that EPA "define a waste as hazardous based on another country's management scheme." Although our rationale for our recommendation acknowledges the risks to health and the environment that can occur when these items are exported, as documented in this report, it also involves concerns about domestic management, which fall squarely within EPA's RCRA authorities.<sup>1</sup> We believe EPA has authority to regulate at least some used electronics on the basis of potential domestic mismanagement. While RCRA provides EPA with broad authority and significant flexibility in its regulatory approaches, EPA should address any legal issues it may identify as part of developing options on how the agency can broaden its RCRA regulations to address used electronic devices. If, after studying the options that we discuss herein, EPA concludes it needs additional authority to implement its preferred approach, then the agency should seek such authority.

14. Our statement is accurate as written. But to avoid any implication that our OCED responsibilities require the United States to modify its hazardous waste determinations to comport with those contained in the Basel Convention, we have added the following sentence: "While the 2001 change does not require changes to the scope of hazardous wastes regulated in the United States, it does require adoption of the

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<sup>1</sup>See, for example, GAO, *Electronic Waste: Strengthening the Role of the Federal Government in Encouraging Recycling and Reuse*, [GAO-06-47](#) (Washington, D.C.: Nov. 10, 2005).



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classification system to facilitate coordination among exporting and importing countries.”

15. We added footnotes as requested, noting that EPA has stated that it intends in the fall of 2008 to propose regulatory amendments to implement the 2001 OECD decision.

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# Appendix III: GAO Contact and Staff Acknowledgments

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## GAO Contact

John B. Stephenson, (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov)

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## Staff Acknowledgments

In addition to the individual named above, Steve Elstein, Assistant Director; Nathan Anderson; Elizabeth Beardsley; Mark A. Braza; Ellen W. Chu; Michael Derr; Paul Kazemersky; David Stickers; and Arvin Wu made key contributions to this report. Also contributing to the report were Lydia Araya and Katherine Raheb.

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