ELECTRONIC WASTE AND ORGANIZED CRIME

ASSESSING THE LINKS

PHASE II REPORT FOR THE INTERPOL POLLUTION CRIME WORKING GROUP

May, 2009

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Executive Summary

This report has been completed through the participation and co-operation of police forces and regulators from Belgium, the Netherlands, France, the United States of America, Canada, Sweden, Australia, Benin, the United Kingdom and representatives from the United Nations Environment Programme.

Research conducted on behalf of the INTERPOL Pollution Crime Working Group (PCWG) has revealed the huge potential for informal networks of criminals to profit from the illegal export to developing countries of 'e-waste' – hazardous waste from the electrical and electronics industries.

This report brings together the findings from that research, which was carried out by Bureau Veritas in the UK and Europe and by Michigan State University in the United States. Their work was commissioned by the PCWG under Phase II of a project to examine the links between organized crime and pollution crimes.

The report draws on the experience of a number of organisations worldwide and includes information gathered by the Dutch Inspectorate, VROM, the Dutch Police Service, the US EPA and the Environment Agency for England and Wales.

Both groups of researchers pieced together how the e-waste disposal sector operates by using a combination of literature review, data collection and interviews with key figures in the sector – recycling companies, government agencies and customs authorities.

What emerges is a picture of an industry in which unscrupulous operators are able to profit from disposing of waste cheaply and illegally abroad instead of taking the environmentally responsible but more expensive option of full recycling to remove and neutralise toxic materials.

The research by Bureau Veritas in the UK found that:

Over 4 million tonnes of e-waste is generated internationally each year;

The need to dispose of this waste has produced an industry with an estimated turnover in excess of £2 million;

Those involved in the trade are often based overseas and operate in the UK and other European countries while visiting as tourists, or through associates who are based in the source countries for waste;

The two most common methods of illegal export are mislabelling containers to conceal e-waste and mixing waste with a legitimate consignment, such as end-of-life vehicles;

E-waste contains many harmful toxins such as lead and cadmium;

> The disposal methods used in many of the destination countries risk significant environmental degradation and damage to human health.

Michigan State University's US research found that:

> The volume of e-waste generated in the United States is enormous and growing exponentially;
>
> The disposal system is highly dependent on exports because of the lack of appropriate domestic recycling facilities for some materials;
>
> Weak regulation makes it difficult to control potentially hazardous exports and difficult to determine what proportion of waste is being disposed of improperly;
>
> Although information is very limited, export is the most common method used to dispose of cathode ray tubes (CRTs) from computer monitors and televisions;
>
> Reputable US 'zero waste stream' recyclers, who charge fees to fully extract lead and other hazardous materials from e-waste, believe that operators offering free disposal or even paying for e-waste cannot be doing so profitably without disposing of hazardous material inappropriately and irresponsibly.

Given the very limited information available about the trade in e-waste, this report should be considered an initial exploratory investigation of the issues. More research is needed. Among the areas that require further research are the true volume of e-waste being generated; the amounts that are being disposed of inappropriately; the companies and brokers involved in the export market; and the criminal and regulatory histories of those running these companies.

To research and investigate these issues effectively, there needs to be further and closer co-operation between academic researchers, customs officials and law enforcement agencies. In this way the true extent of the problem can be quantified and effective ways can be found to police compliance with what regulation does exist.

Introduction

The INTERPOL Pollution Crime Working Group (PCWG) undertook a phased project to identify and demonstrate linkages between organized crime and pollution crimes. This report summarises the findings from two strands of research in Phase II of that project. It examines criminality in the disposal of Waste Electrical and Electronic Equipment (WEEE) – known for the rest of the report as e-waste.

One strand of research, conducted by Bureau Veritas, explored e-waste disposal from a UK and European perspective. The other, conducted by Michigan State University, looked at the issue from a US point of view.

The objective of both groups of researchers was to examine in detail how the sector operates and the nature and extent of criminal activity. This involved looking at the role of organized crime; how it evades and subverts legislative controls; who is involved; and what links there are with other criminal activity. The researchers also tried to establish what volume of waste and commodities are involved; what monies are at stake; and what the potential profits and environmental impact may be.

Summary of Phase I research

Over a number of years there have been persistent anecdotes of organized gangs or groups being involved in pollution crimes. The objective of the first phase of the project was to develop an evidence base that demonstrated linkages between organized crime and pollution crime, in order to establish a basis for further research and analysis.

The UK, the United States, Canada, Sweden and the Netherlands participated in this first phase by responding to a survey questionnaire, which asked for case studies to be collated. In addition, relevant case studies from countries other than those participating in the project were extracted from a review document prepared for the US Environmental Protection Agency (EPA).

Thirty-five case studies were collated, and these provided examples of illegal import/export of waste, illegal hazardous waste disposal and illegal movement of ozone-depleting substances. The findings from Phase I were endorsed by the Working Group in June 2006, and it was concluded that an evidence base to link pollution crimes with organized crime had been established.

Background to Phase II research

The Working Group decided to focus on one sector in detail for Phase II of the project, in order to understand how it operates.

A number of factors were considered when deciding which sector to study. These included whether there was a clear environmental impact from the crime generated in the sector; whether there was a significant volume of activity; whether significant monies, profit and at least three regions of the globe were involved; and whether robust data collection would be possible.

Following discussion it was decided that the trade and export of e-waste to developing countries fulfilled the criteria and would be a suitable issue for us to focus on. It is an area where prior research by INTERPOL indicates that organized crime may play a major role.

This report presents our findings to date. It includes sections on the scale of the problem we face; the regulatory environment; and the disposal paths followed by UK and US waste exports.

Research methodology

In both the UK and the US desk research was supplemented by interviews with key players in the industry and/or regulators.

UK research approach

The UK research, conducted by Bureau Veritas, began with a desktop assessment of the sector. This was used to identify key organisations, highlight the main sources of knowledge and provide an overview of the e-waste market through the creation of a conceptual model.

Twelve key documents and two websites were reviewed, and five interviews were conducted. The details of these documents and websites are provided in Appendix I.

The five interviewees were from the Inspectorate of Housing, Spatial Planning and the Environment; the Environment Agency, England and Wales; Bureau Veritas, Her Majesty's Revenue and Customs, UK. Transcripts of these interviews are provided in Appendix II.

US research approach

The US research was led by a professor, two assistant professors and a doctoral student from Michigan State University (MSU). Their details are listed in Appendix III.

They began by gathering information on legitimate US recyclers, for several reasons. First, although INTERPOL has analysed closed cases involving pollution crimes for indications of organized crime, the US researchers did not have access to this type of data on e-waste violations in the United States. The export of US e-waste is not heavily regulated, which means that little enforcement or prosecution data exist to use as a starting point for unravelling organized crime connections.

Second, exploring business structure tells us something about formal connections between the businesses that facilitate the international shipment of e-waste from the United States. Third, the researchers' review of various organized crime literature (see below) indicated that businesses had been involved in hazardous waste violations associated with traditional organized crime groups as well as semi-organized 'group crime' in at least a few US states (Rebovich, 1992).

Thus, there may be some overlap between legitimate e-waste businesses and organized crime/group crime. In addition, if the businesses that notify the Environmental Protection Agency (EPA) of e-waste exports represent the compliant and legitimate recyclers, these compliant businesses may still have some useful knowledge of how illicit exporters operate in the United States.

Finally, corporate crime literature documents the involvement of legitimate businesses in pollution violations (see, for example, Clinard and Yeager, 1980). In some cases, criminogenic aspects of corporate organisations are similar to those of organisations involved in organized crime (Albanese, 1982).

MSU's review of research, government/NGO reports and media accounts was supplemented with interviews with a sample of governmental regulators, commercial producers of e-waste, recyclers, and NGO representatives. The project was also informed through discussion with members of the INTERPOL Pollution Crimes Committee representing law enforcement investigators and prosecutors.[1]

The primary intent of the interviews was to understand the regulatory context of the United States as well as the business of e-waste cycling and recycling. The interviews, particularly with commercial producers and recyclers, were geared towards what were believed to be examples of corporate good practice.

[1] Seven formal interviews were conducted, along with numerous informal conversations with regulators and enforcement personnel.

The electrical and electronic industries and their waste

The scale of the industries

The electronics industry is the world's largest and fastest growing manufacturing industry (Puckett, Byster, Westervelt, Gutierrez, Davis, Hussain and Dutta, 2002; Grossman, 2006). According to Grossman (2006), Americans alone own over 200 million computers, over 200 million televisions and over 150 million cell phones.

The disposal of these high-tech electronics is problematic. Each year almost 7 million tons of high-tech electronics become obsolete in the US (Grossman, 2006). The vast majority of e-waste from such products ends up in landfill, incinerators and ill-equipped recycling facilities in developing nations.[2] In some instances e-waste is shipped to areas in Asia, Africa and Latin America "where residents and workers disassemble them for sale in new manufacturing processes or where they are simply dumped as waste" (Pellow, 2007).

The scale of the UK waste problem

International estimates of e-waste generation show the scale of the problem. A study of UK e-waste exports that collected data from just eight countries[3] estimated that over 4 million tonnes of e-waste is generated per year from these countries. The wide-scale use of electrical and electronic equipment has become commonplace. The market is expected to continue to grow substantially, along with the number of countries that produce and/or use these goods. This will result not only in a growth in the numbers of new users but also a growing disposal burden as equipment is discarded or replaced because of technological development and obsolescence.

As a consequence a significant market has developed in second-hand, recyclable and waste equipment. Unless this is properly regulated, it may contribute to significant environmental pollution and contamination in receiving countries – with negative consequences for health, the environment and the local economy.

The large volume of e-waste that is produced has long been a challenge for national authorities and companies concerned with safe disposal. Legislative controls exist, but these have produced a cost burden for manufacturers and users alike. In the 1980s a market rapidly grew in the export of e-waste from developed nations to developing and eastern bloc countries. This caused concern about potential environmental damage – and prompted the development of the Basel Convention (see section on the regulatory system).

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[2] There is no universally accepted definition of electronic waste (Luther 2007). Luther defines e-waste as "obsolete, broken, or irreparable electronic equipment such as televisions, computers and computer monitors, laptops, printers, cell phones, VCRs, DVD players, copiers, fax machines, stereos, and video gaming systems".

[3] A scoping study on the UK's Export Trade in Waste Electrical and Electronic Equipment; The Environment Agency February 2006

As a result of the upgrading and obsolescence of computer hardware, around 50 million tonnes of old PCs are thrown away each year. This creates enormous problems in recycling and disposal and has led to what has been described as a 'toxic time bomb'.

Export statistics collected by the Environment Agency in the UK and by UK customs in 2006-07 showed that of 264 containers inspected, 50 were detained for non-compliance (although not all for e-waste).

The scale of the US waste problem – Environmental Protection Agency data

One of the challenges in judging the risks posed by e-waste exports from the United States is the limited information and varying estimates of the volume of e-waste produced annually. To address the knowledge gap, the EPA conducted a 'snapshot' analysis of electronics in the US in 2005. This included televisions; personal computers; hard-copy computer peripherals (printers, scanners, faxes); computer mice; keyboards and cell phones.

Two different data sets and methodologies were used by the EPA to estimate the number and weight of products that become obsolete each year and the amounts that are either collected for recycling domestically, stockpiled or exported. Similar conclusions were made with both methodologies. Approximately 2 million tons of e-waste reached end of life in 2005 alone. Approximately 80 to 85 per cent of the waste was discarded (at landfill sites primarily, but also through incineration). Approximately 15 to 20 per cent was recycled.

Approximately 175,000 tons of products containing cathode ray tubes (CRTs) – that is, televisions and computer monitors – were collected for recycling in 2005. Estimates from an industry expert (based on industry data and specific knowledge of the end markets) indicate that the vast majority of CRT products collected for recycling (61 per cent, or 107,500 tons) were exported for remanufacture or refurbishment.

EPA data (from the Office of Solid Waste Management) indicate that the next largest portion (14 per cent or 24,000 tons) was CRT glass sold to markets abroad for glass-to-glass processing. An additional 12 per cent was sent for recovery of plastic, metal and other materials in either the United States or foreign markets (EPA, 2007).

In 2007 the EPA received 23 notifications from recycling businesses that intended to export broken CRTs for recycling. The notifications identified 21 unique US recycling facilities, one of which may have halted exports in the middle of 2007. Some of these individual recyclers are owned by the same parent company.

Table 1: Exporters/receivers for 2007

Number of notifications received	23
Number of unique exporters*	21
Number of receivers (destination facilities)	7

*In several cases, multiple exporting facilities are owned by the same parent company. We still included each facility as a unique exporter.

Exporters reported shipping to seven foreign recyclers located in Canada (2 facilities), Malaysia (1 facility), Brazil (1 facility) and Korea (3 facilities). The largest number of US recyclers (10) shipped e-waste to Canadian recycling facilities, with Falconbridge Inc being the most commonly used importer in the data.

The scale of the US waste problem – additional Michigan State University (MSU) calculations

To supplement EPA estimates, the MSU research team compiled an additional set of estimates using the EPA export notification data for 2007. New regulations require that exporters of broken, used CRTs notify the EPA of their intent to export. These notifications provide estimates of the volume to be exported as well as additional information about transit routes and destinations. Where the above-mentioned EPA reports describe all US accumulation, the MSU data only describe US exports of broken CRT glass.

Although in number most exporters ship to Canada, the largest volume of e-waste is exported to Malaysia (see Table 2). The MSU constructed rough estimates of the volume of broken CRTs exported from the United States and the volume by importing country. Exporters are required to estimate the total volume to be shipped over a one-year period (in kilos).[4] Estimates are provided in a variety of formats, some of which required MSU to extrapolate from average shipment size to yearly export.[5]

[4] According to the EPA's CFR 261.39 Conditional Exclusion for Used, Broken Cathode Ray Tubes (CRTs) and Processed CRT Glass Undergoing Recycling, exporters are required to provide the following information: exporter location information and, if applicable, an EPA ID number; an estimated frequency or rate at which CRTs are to be exported and the period of time over which they are to be exported; the estimated total quantity of CRTs specified in kilos; all points of entry to and departure from each foreign country through which the CRTs will pass; a description of the means by which each shipment of the CRTs will be transported (e.g. mode of transportation vehicle (air, highway, rail, water, etc.); types of containers (drum, boxes, tanks, etc); location information of the primary recycler as well as any alternative recyclers; a description of the manner in which the CRTs will be recycled in the foreign country that will be receiving the CRTs; and finally any transit countries through which the CRTs will be sent, along with a description of the approximate length of time for the CRTs to remain in such countries and the nature of their handling while there.

[5] In a few instances, businesses provided both a shipment and a yearly estimate of exports, but the MSU yearly estimate from the shipment specific data did not match the businesses' yearly estimates. In these cases, MSU reported the estimates derived from the shipment data; subsequently noting differences in what MSU found and what the companies reported as their yearly estimate of export.

In addition, estimates were provided for different 12-month periods; some notifications covered a calendar year whereas others covered some unique (specified) time period. When a specific time period was not provided, MSU researchers assumed that exports would occur in the 12 months following the notification date and so estimated the portion of shipments that would occur during 2007 (when the export notification did not cover the calendar year).[6]

Table 2: Estimated export volume by country (kilos)

	Sum	Percentage*
Canada (2 facilities)	11,174,555–11,688,927 kg	16.34%
Malaysia (1 facility)	50,698,594 kg	72.45%
Brazil (1 facility)	342,807–1,099,057 kg	1.03%
Korea (3 facilities)	7,103,175 kg	10.15%
Total volume	69,319,131–70,589,753 kg	
Average volume	4,077,596–4,152,338 kg**	

*Based on the average of estimates regarding ranges.
**The total estimated average volume is calculated based on 25 recyclers.

Although caution is urged in placing emphasis on the specific numbers, the overall ranking of volume by importing country is likely to remain even with improved measurement because the differences are so substantial. By far the largest volume of broken CRTs reported to the EPA is exported to Malaysia. Approximately 72 percent (or 51 million kilos) of the exports for which the EPA received notification are sent to one legitimate facility in Malaysia. Canada and Korea, the second largest receivers, imported a substantially smaller volume of CRTs of around 16 and 10 per cent respectively. Compared to these importers (especially Malaysia), Brazil imports very little (approximately 1 per cent).

The picture provided by the notifications to export data can be supplemented by reports from the California Department of Toxic Substances Control, which imposes similar reporting requirements on California companies that intend to export e-waste. Like the EPA data, the California estimates are thought to be under-estimates because they rely on self-reporting and because they exclude e-waste that may be shipped to other US states and then exported. They provide a useful complementary picture, however.

As Table 3 indicates, Malaysia once again emerges as the largest export destination for US e-waste. Brazil, South Korea, China and Mexico are the next most common sites. Unlike in the EPA data, Canada does not appear. The reports of exporting to China, Mexico, Vietnam and India — which were not observed in the EPA data — suggest underreporting to the EPA.

[6] When the exporter did not specify the time period, MSU assumed it was one year from the date the notification was filed eight times. In one instance, the notification did not have a date. MSU assumed the exports would occur in calendar year 2007.

Table 3: California and EPA data: 2007 estimated e-waste exports (kilos) by designated country

California Department of Toxic Substances Control	Kilos (in thousands)	EPA notifications of broken CRT export	Kilos (in thousands)
Malaysia	3,583	Malaysia	50,699
Canada	NR	Canada	11,175 – 11,689
Brazil	1,633	Brazil	3,428 - 1,099
South. Korea	1,588	S. Korea	7,103
China	1,043	China	NR
Mexico	816	Mexico	NR
Vietnam	318	Vietnam	NR
India	91	India	NR

NR = not reported

Source: California Department of Toxic Substances Control, as cited in Lee, M., 'Some US trading partners not supposed to accept it.' *San Diego Union-Tribune* (June 19, 2007); EPA notification reports.

Reports of customs seizures of e-waste provide an alternative view of the level of e-waste in global markets. The World Customs Organisation Regional Intelligence Office for Asia and the Pacific (RILO) provided a valuable report on customs seizures based on a co-operative operation known as 'sky hole patching' that occurred in 2006-2007 with a focus on Asia and the Pacific. The project examined the illegal trade in Ozone Depleting Substances (ODS) and hazardous wastes, including e-waste.

One component of the project included reports on seizures of hazardous wastes by customs officers in Hong Kong. During the first 10 months of 2007, 98 consignments of hazardous waste were seized. Of these the largest number (24) came from the US. The next largest numbers of seizures came from Japan (13), Canada (7), Panama (6) and the United Arab emirates (5). The number of seizures from Europe were smaller; three from Belgium, two from Italy and two from Germany. This perhaps reflects the fact that European Union restrictions on exports of e-waste are tougher than those in the United States (WCO Regional Intelligence Office for Asia and the Pacific, 2007).

Table 4: Seizures of e-waste by Hong Kong Customs (January 3 to October 30, 2007)

Place of loading	Seizures	Nature	Kilos (in thousands)
United States	24	Used computer and TV monitors	208

Source: WCO Regional Intelligence Liaison Office for Asia and the Pacific, *Evaluation Report on Project Sky-Hole Patching.* Regional Intelligence Liaison Office for Asia and the Pacific.

According to the EPA, most US markets (profit and non-profit) for reusable and/or recyclable electronics are export driven because of the strong foreign demand for raw materials. The US does not have any smelters for copper and precious metal recovery from circuit boards or CRT glass furnaces. There are only five copper/precious metal smelters in the world that are properly equipped to minimise the release of dioxins, and all of these are outside the United States – in Canada, Belgium, Sweden, Germany and Japan.

There are fewer than 20 CRT glass-making furnaces worldwide. These are located in Asia (there are approximately 15 in South Korea, Malaysia, India, Thailand, Singapore and China) and Poland (1). Plastic recycling is also predominantly found in other nations. The EPA estimates that as collection in the US increases, exports will also rise (Tonetti, 2007).

The sources that provide estimates of the volume of e-waste and the volume involved in export vary significantly in terms of the items included (CRTs only, all e-waste), the metrics used, time periods covered, and the detail on the methods employed to develop the estimates. Consequently, extreme caution is urged in the use and interpretation of these estimates. Table 5 provides a summary of these varying estimates.

The consistent picture that emerges in all the estimates is that a very large volume of e-waste is being produced in the US, in the developed world, and increasingly in the developing world. Unfortunately, very little is known about the extent to which this large volume is appropriately and safely re-used and recycled.

Table 5: Estimates of amounts of e-waste generated and exported

E-waste source	Time period	Amount	Type of e-waste included	Source of estimate
E-waste generated				
International	2007	50 million tons	Personal computers; e-waste	INTERPOL Pollution Crime Working Group Phase II Report (citing UNEP)
US	2006	21 million tons	E-waste	Centillion Environment and Recycling (citing EPA)
US	2002	12.5 million	Ewaste	www.ban.org (citing Carnegie Mellon University)
US	2005	2 million tons	E-waste	EPA 2007
US	2005	175,000 tons	CRTs collected for recycling	EPA 2007
US	2008	300,000–400,000 tons collected annually	Electronics	www.abcmoney.co.uk
Canada	2000 and 20003	140,000 tons	Computer equipment, phones, audio-visual equipment, small household appliances	Environment Canada www.ec.gc.ca/ envirozine/english/issues/33/
Nigeria – destination	2006	6,000 40-foot containers annually	Used electronics; 75 per cent estimated as unsalvageable	www.ban.org
Amounts exported				
US	2007	4.1 million kilos	Broken CRTs to be exported	EPA Notifications Plan to Export
California	2006	20 million tons shipped	E-waste	California Department Toxic Substances Control
US	2005	107,500 tons	CRTs to be exported	EPA 2007

The money and profits being made

Research conducted for the Environment Agency in the UK in 2006 provides a preliminary analysis of the economics of the e-waste export trade.[7] This research indicates that there are substantial profits to be made in the re-sale of e-waste. Much of it can be acquired at little or no cost to the exporter. Second-hand computers can sell for between £50 and £200, depending on specification, in some developing nations.

Investigations during the TFS project[8] have indicated that exporting this kind of waste is very cheap but highly profitable. Individual shipments can potentially provide three sources of income: one from waste collection on behalf of local authorities trying to achieve recycling targets; a second from companies obligated under the Producer Responsibility Regulations; and a third from brokers abroad to whom the waste is sold. Unfortunately, limited work has been done to fully quantify the economics of illegal exports on a large scale.

In Holland brokers can buy televisions from shops for €4-5 each, then sell them on in Africa for around €5 profit per piece. Generally e-waste can produce returns of around €450/tonne. In African countries precious metals are recovered by small-scale processors, and in Asia almost all e-waste is sent to metal recyclers.

Hazardous substances and their health and environmental impact

E-waste contains a number of toxins, including[9]:

Lead in cathode ray tubes (CRTs) and solder;
Arsenic in older CRTs;
Antimony trioxide as flame retardant;
Polybrominated flame retardants in plastic casings, cables and circuit boards;
Selenium in circuit boards as a power supply rectifier;
Cadmium in circuit boards and semiconductors;
Chromium in steel as corrosion protection;
Cobalt in steel for structure and magnetivity;
Mercury in switches and housing.

The combination of these substances, along with smelting and burning of waste, causes local air pollution and contaminates ground and surface. These toxins also pose potential health problems including lung disease, lead poisoning and cancer.

MSU's desk research for Phase II of this project provides more detail on some of the hazards posed by e-waste toxins:

[7] Environment Agency Scoping Study on the UK's Export Trade in Waste Electronic and Electrical Equipment (2006).

[8] IMPEL-TFS Seaport II Project Report September 2004–May 2006.
[9] http://news.bbc.co.uk/1/hi/world/africa/6193625.stm

Lead
Computer and television displays contain an average of four to eight pounds of lead each (Pellow, 2007; Silicon Valley Toxics Coalition, 2008). This means that "the 315 million computers that became obsolete between 1997 and 2004 contained more than 1.2 billion pounds of lead" (Pellow, 2007). Lead can cause damage to the brain and nervous system, blood disorders, kidney damage and developmental damage to an unborn foetus. Huo and colleagues (2007) found that the blood lead levels of children in Guiyu, a Chinese e-waste recycling town, were higher than those of children living in the neighbouring town of Chendian. The researchers concluded that the elevated levels were a result of exposure to lead contamination caused by primitive e-waste recycling activities.

Cadmium
Long-term exposure to cadmium can cause kidney damage and damage to the bone structure. It is also a known carcinogen.

Beryllium
Exposure can cause lung cancer and chronic beryllicosis, which also affects the lungs.

Mercury
High levels of exposure contribute to brain and kidney damage and harm to the developing foetus. Health problems can be passed down through breast milk and passed on through fish consumption (Silicon Valley Toxics Coalition, 2008). Mercury that is inhaled or ingested can damage the central nervous system.

Trichloroethylene (TCE) and trichloroethane (TCA)
Both TCE and TCA are volatile organic, chlorinated compounds and can remain in the environment for long periods of time. They are both ozone-depleting chemicals and are toxic to the "nervous, respiratory, endocrine and reproductive systems, as well as to kidney and liver function" (Grossman, 2006).

Plastics
Plastics make up about 20 per cent of an average computer. Polyvinyl chloride (PVC) makes up a portion of the plastic composition (Computer Takeback Campaign, 2004). The production and burning of PVC products generates dioxins and furans. The effects of this include immune suppression, liver damage, cancer promotion, hormonal disruptions and behavioural changes (Jackson, Shuman and Dayaneni, 2006).

In addition to the human health consequences of high-tech e-waste, the environment is adversely affected – "when computer waste is landfilled or incinerated, it poses contamination problems in leaking to water sources and toxic air emissions" (Computer Takeback Campaign, 2004). Heavy metals – including mercury, lead and cadmium – contaminate groundwater and pose environmental risks.[10] Uncontrolled fires may arise at a landfill site, causing burning waste to emit toxic dioxins and

[10] The Silicon Valley Toxics Coalition recently documented the impact upon the Erren River in southern Taiwan where fish are reported to perish within two minutes of exposure and human cancer rates are very high. The river is in a region with concentrated illegal and improper e-waste recycling facilities (see http://www.etoxics.org/site/PageServer?pagename=taiwan_story).

furans. These dioxins further contaminate the atmosphere and contribute to the depletion of ozone.

While there are many risks associated with using landfill and incinerators as a means of disposing of e-waste, recycling these materials also poses a risk. According to the Computer Takeback Campaign, improper handling, weak regulation and 'sham' recycling may result in increased environmental, public and worker exposure to hazardous materials. People and the environment are still exposed to the toxins in these high-tech electronics after recycling, and so the benefit of recycling these hazardous materials is limited. It serves only to move the hazards into secondary products that will eventually need disposal.

The regulatory system

International regulation

The most high-profile international instrument for controlling e-waste disposal is the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. This voluntary treaty was first adopted by governments in Basel, Switzerland, on 22 March 1989, and came into force on 5 May 1992. It was initiated in response to numerous international scandals regarding hazardous waste trafficking that began to occur in the late 1980s.

The Basel Convention was the first global environmental treaty regulating transboundary movements and disposal of hazardous waste. Many environmental organisations have denounced it, however, as an instrument that serves to legitimise the hazardous waste trade.

In 1995 the Basel Convention was amended by the Basel Ban. This has still to be ratified by all the signatories of the original convention. The Basel Ban effectively outlawed (from January 1998) all forms of hazardous waste exports from the 29 wealthiest countries of the Organisation of Economic Cooperation and Development (OECD) to all non-OECD countries.

In recent years, there has been a significant increase in international transboundary transactions in used electrical and electronic equipment for the removal of usable parts, refurbishment and reuse, and for the recovery of raw materials. Much of this equipment is destined for developing countries and countries with economies in transition, where the authorities are then confronted with the challenge of managing the recovery, recycling or disposal of the equipment properly.

Growing demand from local populations for electrical and electronic equipment, coupled with a lack of adequate infrastructure to manage the disposal of waste equipment safely, may result in these wastes being burned in the open air or dumped into sewers, rivers or in the ground without safeguards to deal with hazardous content.

The OECD has its own control system in place that covers recycling. It requires notification and consent, but is more streamlined than the Basel Convention (it allows tacit consent, for example, linked to pre-approved facilities). The OECD control system uses different definitions of hazardous waste from those set out in the Basel Convention. The OECD definition is based on risk while the Basel definition is based on the presence of toxins. As of 2007, the OECD control system was used to move CRTs internationally as hazardous waste, but circuit boards were still defined as commodities (Tonetti, 2007).[11]

The regulations for the international shipment of e-waste are as follows[12]:

All transfrontier shipments fall under the control of the Waste Shipments Regulation;

Shipment for disposal is prohibited;

Hazardous e-waste can be exported for recovery to OECD countries;

The export of hazardous e-waste to non-OECD countries is prohibited;

Shipment to non-OECD countries for recovery is permitted if the waste is non-hazardous (hazardous wastes include televisions and computer monitors) and if the shipment is consistent with Green List Regulations and the export ban;

Shipment to non-OECD countries is permitted for the second hand market. This would include televisions and computer monitors, including those that require minor repair (but not those used for salvage of parts).

The shipment of components of electrical and electronic products to non-OECD countries for recovery is legitimate, providing they are not hazardous. This can include products of WEEE dismantling in the UK, such as wires and cables.

US federal law

In comparison to international treaties, regulation in the United States is much less extensive. Many items considered to be hazardous under the Basel Convention are defined as non-waste or non-hazardous under US regulations. Given the lack of e-waste regulation in the US, very little data is available to describe the nature and extent of the problem.

[11] The OECD also developed an Environmentally Sound Management (ESM) programme (Tonetti, 2007b). Under this programme, the OECD makes recommendations to member countries regarding adequate regulations and enforcement (including monitoring and controlling), the need to encourage technological advancement and information exchange among facilities, and integrating performance elements into national policies. It also defines core performance elements for facilities, including obtaining the proper licence and having an environmental management system in place that includes measurable objectives/targets, progress review, audits/inspections and facility reporting. The OECD ESM also encourages facilities to protect worker safety; monitor, record and report compliance, emissions, and waste levels; and to have adequate training and emergency response programmes. Finally, the ESM contains waste stream specific guidelines regarding substances of concern and appropriate handling, dismantling and transporting steps.

12 Source: Environment Agency Scoping Study on the UK's Export Trade in Waste Electronic & Electrical Equipment (2006)

The United States has not ratified the Basel Convention. This means that it is not legally required to comply with its terms. Its signature does require, however, that the US should "refrain from acts which would defeat the object and purpose" (Vienna Convention, Article 18).

The US is affected by the Convention's ban on trade with countries that have not ratified it. But it is free to establish special agreements with other nations as long as these "do not derogate from the environmentally sound management of hazardous wastes and other wastes as required by this Convention" (Article 11.1).

Countries that do not belong to the OECD cannot legally accept hazardous waste from the US without a bilateral agreement. According to the EPA, the US has no such agreements with non-OECD countries (Tonetti, 2007).

The United States does have bilateral waste regulation agreements with Canada and Mexico (both OECD members), dating back to 1986. These agreements appear to have been signed so that Mexico and Canada could continue to trade waste with the US even though it has not ratified Basel. Both agreements define hazardous waste only as those wastes that are defined as hazardous under domestic laws, thereby limiting the scope of these provisions for e-waste.

Current US efforts to regulate domestic and international disposal and recycling of e-waste are relatively weak. The Resource Conservation and Recovery Act (RCRA) is the primary piece of United States federal legislation regulating hazardous waste.[13] Yet RCRA regulations only apply when materials are first classified as waste and then classified as hazardous waste.

Although RCRA legislation does not address e-waste as a unique category of waste, at the federal level many electronic devices (or parts of electronic devices) are categorised as either 'non-hazardous waste' or 'non-waste'. Thus, most e-waste is either exempt (as non-hazardous waste) or excluded (as a non-waste) from regulation.

Excluded materials include electronic equipment designated for reuse and materials that can be recycled into new products (i.e. processed scrap metal, shredded circuit boards, CRT glass, intact CRTs and partially processed CRT glass for recycling).[14] These are instead classified as products or commodities. Exempt materials include household waste (including electronics), scrap metal, whole circuit boards and precious metals designated for recycling. Obsolete electronics may be classified as waste if they cannot be reused (Tonetti, 2007).[15]

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[13] Hazardous waste generators are regulated according to the amount of waste they generate on a monthly basis. Households and some small businesses are exempt from most RCRA requirements (Luther 2007).

[14] A CRT is the glass video display component in electronic devices, most often a computer or television monitor (Federal Register 71, 145).

[15] Despite the paucity of regulation, the US EPA does provide some guidelines for the management of used and scrap electronics (EPA 'Plug-In' Guidelines issued in 2004) that cover sales, recycling facilities and export for recycling. The EPA suggests that sale shipments should meet reuse specifications, be packaged to protect the environment, and be appropriately recorded by the business. Materials sent for reuse should not be shipped in mixed loads. Recommendations for recycling facilities are similar to those specified by the OECD ESM programme (see below). Finally,

The exclusion of CRTs from the definition of waste was a controversial EPA decision. Opponents of the exclusion argued that CRTs are not handled as commodities when shipped abroad; instead they are often managed improperly and create significant environmental damage (Federal Register 71, 145). Nonetheless, the EPA granted a conditional exclusion to CRTs in 2006.

Given the lead content of the glass in CRTs, the EPA requires that exporters of broken CRTs notify its International Compliance Assurance Division of the intent to export. This is so that the EPA can attempt to prevent the shipment of broken CRTs to countries that have banned their import. Exporters of unbroken CRTs are required to notify regional offices of the EPA that they are shipping unbroken CRTs. Commercial enterprises are prohibited from disposing of e-waste in landfill but beyond these provisions, e-waste is not considered hazardous waste.

The relaxed regulatory system for e-waste in the United States reflects a philosophy that functional, used e-waste equipment should be made available for re-use. Indeed, some argue that re-used e-waste can be a step toward narrowing the digital divide by providing cheap electronics to the developing world. This rationale is supported by professional lobbying associations in the scrap and recycling industries who seek to keep the international distribution networks for used electronics open.

US state controls

In the absence of federal e-waste regulation, 12 states had enacted their own legislation on e-waste management by 2007. Each state management programme identifies the specific types of electronic devices that are covered. Although legislation varies by state, reducing landfill disposal is a common goal.

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the EPA recommends that “designated materials” be removed prior to export if the materials are destined for a non-OECD country (Tonetti, 2007b). Overall, the EPA suggests that facilities exercise due diligence and maintain records to demonstrate such efforts. Namely, recyclers should examine whether ‘downstream’ customers operate consistently with guidelines and ensure that transactions are legitimate (including internet sales). The EPA also supports recycler certification as an alternative to regulation (Tonetti, 2007b).

Under the proposed R2 Export Recycler Provisions, certification would be voluntary. Certified recyclers would be asked to obtain documentation from importing and transit countries regarding the legality of the imported materials. The EPA would provide assistance and make the documentation publicly available, including a list of foreign facilities that are authorised (or not authorised) to receive specific types of e-waste. If the receiving country is non-OECD and a member of the Basel Convention, the US recycler cannot export wastes that the importer considers to be hazardous without a bilateral agreement. The recycler must also have documentation that the receiving facility is in compliance with its host country. The EPA hopes to complete the recycler export certification programme by the end of the summer in 2008, although the agency itself will not be the certifier (Tonetti, 2007b).

Some states have banned landfill disposal and incineration, but did not implement a recycling programme. In other states, landfill bans were followed by the creation of an e-waste recycling programme. Another approach taken in some states was to implement collection and recycling programmes prior to enacting a landfill ban.[16] To avoid creating new negative environmental impacts, some states have developed recycling standards. Some have also placed restrictions on the export of e-waste, although most have not.[17] But no state specifically requires consumers to recycle (Luther, 2007).

Most state programmes require electronics manufacturers to register with the state and to place a visible, permanent manufacturer label on products. California and Minnesota have additional requirements consistent with a European Union directive that restricts certain hazardous substances in any electrical/electronic equipment. Products with these hazards may not be sold in these states. Because most electronics manufacturers sell to a global market, a small number of such state bans may have the same effect as a nationwide ban (Luther, 2007). Some states have additional (more stringent) requirements in that households and small businesses are not exempt (NCER, 2008).

Twenty-six more states are currently considering e-waste legislation (NCER, 2008). Many are concerned that the patchwork nature of state regulations will place an undue burden on manufacturers or recyclers. Although little analysis of the costs of national versus state programmes exists (for an exception, see NCER, 2006), there is currently an industry push for a national recycling management programme (NCER, 2008).

Federal regulations are complemented by the emergence of regulations in a number of states that prohibit disposal in landfill. A number of states now require 'buy-back' programmes for e-waste, although there is significant variation across the states.

Waste disposal and export routes

UK waste

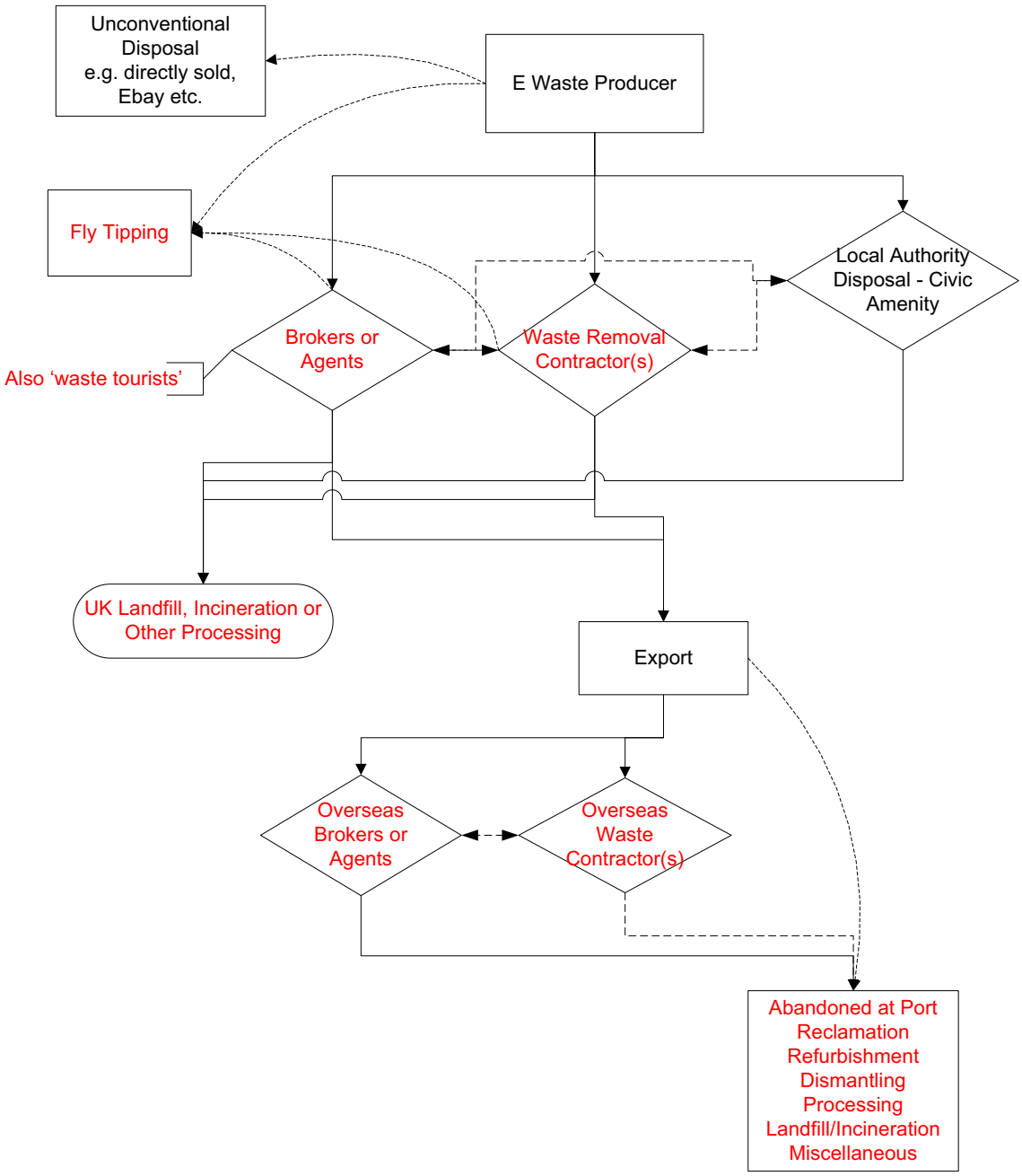
Figure 1 (below) provides a summary of the e-waste disposal system in the UK. It is based on the interviews, discussions and desk research that together formed the Bureau Veritas contribution to Phase II of this project. Areas highlighted in red indicate those points in the system that present a particular opportunity for organized

[16] States most often fund recycling programmes using manufacturer/producer paid systems. One state uses a consumer-paid system. Under the 'producer pays' model, manufacturers are required to finance a collection and recycling programme for their returned e-waste and a share of orphan waste. The costs of recycling orphan waste, waste that cannot be tied to a specific manufacturer, is usually split among the manufacturers. Under the 'consumer pays' model, consumers generally pay an advanced recycling fee when designated electronics are purchased. The proceeds fund the e-waste collection and recycling infrastructure (Luther, 2007).

[17] California requires recyclers to notify the state Department of Toxic Substances Control before covered electronic wastes are exported to foreign countries. Beginning in 2009, covered electronic devices collected in any Connecticut state program cannot be exported for disposal in any manner that poses a significant risk (Luther, 2007).

criminality to intervene in the process. These opportunities are summarised below, with a focus on export rather than disposal within the UK.

Figure 1 Conceptual model of e-waste disposal



The six broad categories of illegal e-waste disposal in the UK context are as follows:

Direct illegal disposal e.g. fly tipping

Use of unlicensed waste management sites

The deliberate disposal of e-waste at UK waste management sites which are not licensed to accept it.

Use of unlicensed carriers, brokers or waste tourists

The use of, or sale of equipment to, unregulated recipients such as contractors, brokers or waste tourists. Waste tourists are individuals or groups who temporarily travel to the UK from Asia and West Africa to buy up e-waste for export and/or sale, and are then involved in its illegal disposal.

Shipping infringements

These include, for example, the provision of false shipment details to Her Majesty's Revenue and Customs (HMRC), the UK customs authority. The experience in Holland is that e-waste is shipped under various false headings (e.g. personal effects, used goods), as well as being mixed in with End of Life Vehicles (ELVs)[18]. The UK's Environment Agency has observed that, from an enforcement perspective, it is difficult for regulators to prove that a consignment labelled for a recovery market is actually waste – unless products are manually tested for functionality. The Environment Agency's experience from the TFS Ports study has demonstrated that waste is often exported to a broker's business address, or to a fictitious address, and thus not to a reputable contractor or disposal site. This breaks the continuity of the waste stream, and presents potential for organized criminality and illegal practices.

Mis-description of waste

Illegal activities associated with the mis-description of waste span all types of illegal waste export. The scale and nature of this illegal and unregulated recycling or other disposal activities need to be better understood.

Unregulated recycling and other disposal activities

Activities such as burning, unregulated dismantling or smelting to extract metals, fly tipping etc. Experience from the UK Environment Agency and the Dutch Inspectorate of Housing, Spatial Planning and the Environment indicates that the majority of E waste exported is disposed of in such a way once the working equipment has been salvaged (a recent BBC news report from Nigeria estimated around 75 per cent of IT exports destined for the second hand market to be unsalvageable[19].

[18] VROM Inspectorate officer; personal communication.
[19] http://news.bbc.co.uk/1/hi/world/africa/6193625.stm

US waste

Exporters of broken CRTs in the United States are required to report not only the volumes exported but also the mode of transport used, the type of container, and departure and entry ports. Most recyclers report multiple modes, containers and ports. The following tables provide a count of the number of times various modes of transport and ports were mentioned in the 23 notifications. To the extent that legal exports overlap with illegal exports, this information may direct enforcement agents to specific locations and containers to search.

Most exporters reported using multiple modes to transport e-waste out of the US. Because the largest number of exporters ship e-waste to Canada, road and rail are the most commonly reported modes of transport (see Table 6). Because of the frequent use of Canadian recycling facilities, Michigan and New York are the most commonly cited points of departure and Canadian ports are the most commonly cited points of entry (see Tables 7 and 8). Although China no longer accepts e-waste for recycling, it was cited as a transit country for exports designated for Malaysia (see Table 9).

Table 6: Frequency of transportation modes

Road	15
Rail	15
Sea	8

*Some recyclers use multiple modes of transport for broken CRTs. Thus, these numbers add up to a total that is greater than the number of notifications to the EPA.

Table 7: Ports of departure*

Departure	Number	Departure	Number
Alexandria Bay, MI	2	Port Newark	1
Alexandria Bay, NY	1	Portal, ND	1
Alexandria Bay (unknown)	4	Rooseveltown, NY	1
Blaine, WA	1	Saint Leonard, Canada	2
Boston, MA	3	San Diego, CA	1
Buffalo, NY	8	San Francisco, CA	1
Calais, ME	1	Sault Ste. Marie, MI	3
Champlain, NY	5	Savannah, GA	2
Charleston, SC	2	Seattle, WA	2
Derby Line, VT	1	Summas, WA	1
Detroit, MI	7	Sweet Grass, MT	1
Gatineau, QC	2	United States	1
Highgate (unknown)	4	Woodstock, Canada	2
Highgate Springs, VT	1		
Houlton, ME	2		
Houston, TX	1		
International Falls, MN	1		
Lewiston, NY	1		
Long Beach, CA	5		
Los Angeles, CA	3		
New York, NY	2		
Niagara Falls, NY	7		
Norfolk, VA	2		
Oakland, CA	3		
Pembina, ND	1		
Point Roberts, WA	1		
Port Huron, MI	7		

*Some recyclers use multiple ports of departure. Thus, these numbers add up to a total that is greater than the number of notifications to the EPA.

Table 8: Ports of entry*

Entry	Number	Entry	Number
Cornwall, ON	1	North Portal, SK	1
Coutts, AB	1	Philipsburg, QC	5
Delta, BC	1	Pusan Port, South Korea	2
Emerson, MB	1	Queenston, ON	1
Fort Erie, ON	7	Rock Island, QC	1
Fort Frances, ON	1	Saint Leonard, Canada	2
Gumi, South Korea	2	Sao Paulo, Brazil	1
Huntington, BC	1	Sarnia, ON	7
Kelang, Malaysia	2	Sault Ste. Marie, ON	7
Klang, Malaysia	4	St. Bernard, QC	1
Korea	1	St. Stephan, NB	1
Lacolle or R. Points	4	Surrey, BC	1
Lansdowne, ON	7	Windsor, ON	7
Niagara Falls, ON	8	Woodstock, NB	4

*Some recyclers use multiple ports of entry. Thus, these numbers add up to a total greater than the number of notifications to the EPA.

Table 9: Ports of transit

Transit	Number
Qingdao, China	2
Shanghai, China	2
Hong Kong, China	2
Beihai, China	2
Singapore, Singapore	2
Keelong, Taiwan	1

*Some companies use multiple ports of transit.

Further light may be shed on the patterns of US e-waste disposal, including illegal disposal, by looking at the structure of different types of businesses in the sector and how they relate to each other. The corporate crime literature indicates that business structure and diversification can facilitate or impede criminal activity (see, for example, Clinard and Yeager, 1980).

Exporters

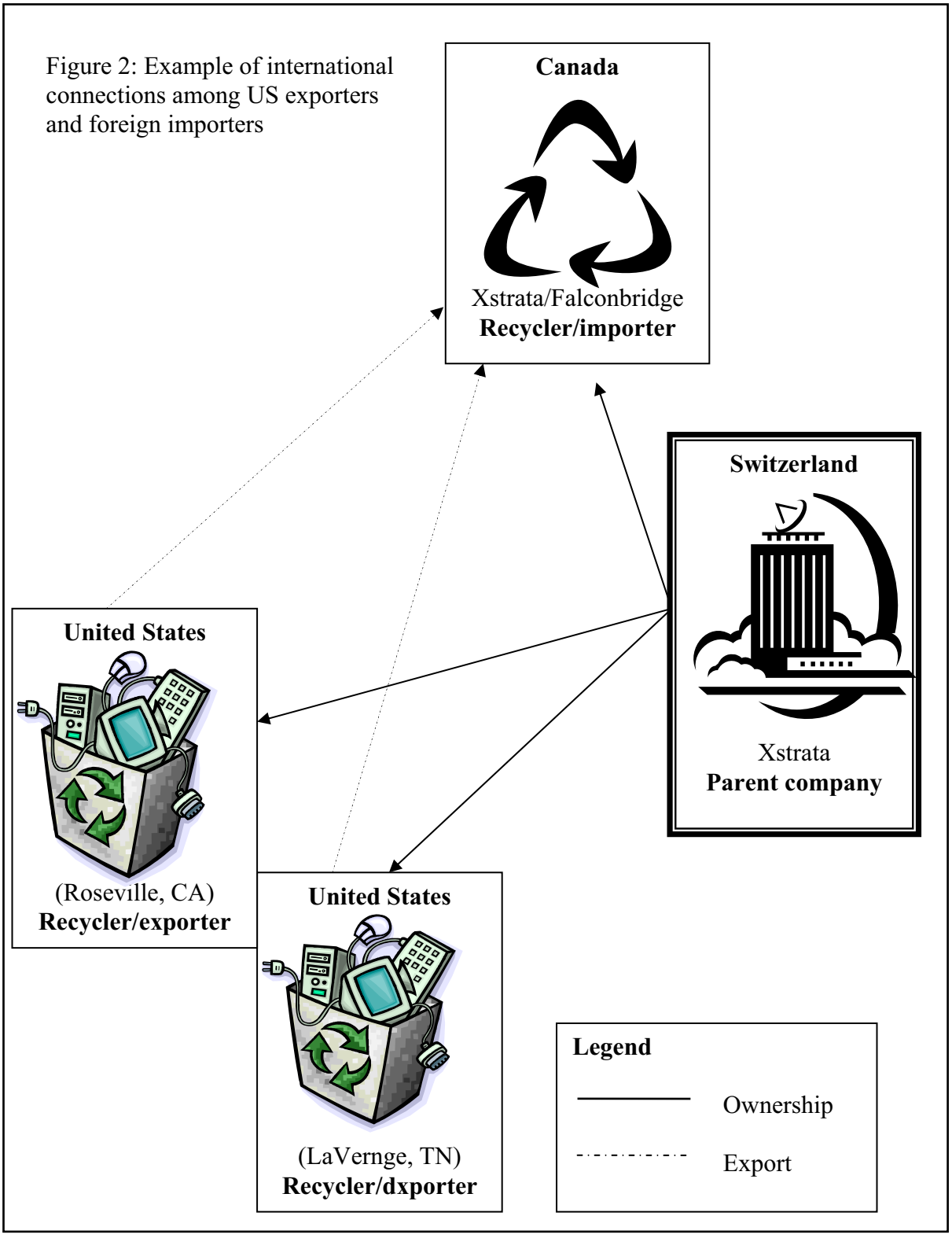
These businesses are structured in a variety of ways.[20] Although many appear to be small independent businesses that specialise in recycling, some electronic recyclers are part of larger US-based corporate structures of varying size. For example, one US-based company appears to consist of a 'corporate' headquarters and one facility while another company owns at least seven electronics recyclers (including three that export e-waste).

In these economies of scale, some facilities send e-waste to other facilities owned by the same parent company for the actual export. Other US exporting facilities are owned by parent companies headquartered outside of the United States. In a few cases, a large international parent company owned both the US exporter and the foreign e-waste importing facility for some period of time.

Specifically, before selling its US facilities to the Sims Group (an Australian based company), Xstrata (a Swiss based mining company) owned not only one US recycling facility in Tennessee and another in California, but also an importing recycler (Falconbridge) in Canada (see Figure 2). Similarly one US company, RMG Recycling owns both a recycler in the US and an importer in Canada. In such cases the company is actually exporting to itself.

[20] Because it is difficult to obtain information on businesses that are not part of large, publicly traded corporations, specific numbers for various business structures and strategies have not been provided at this time. General descriptions are offered based on publicly available data sources.

Figure 2: Example of international connections among US exporters and foreign importers



There is no apparent correlation between business structure/diversification and the volume of e-waste exported. Some of the largest exporters (in terms of volume) are small businesses, while others are part of larger corporate structures.

Yet variation in business structure still raises several questions for further exploration. Does the nature of the e-waste business vary between small businesses and those embedded in larger corporate structures? For example, are small businesses more likely to collect e-waste from the general public and other businesses? And why do companies move CRT glass from US recycling operations to foreign ones? Do facilities vary in capacity or technology or is it less expensive (even within the same company) to recycle CRT glass in foreign countries? Do these differences in the nature of the activity have any bearing on whether exports are legally recycled or illegally disposed of?

Although data has not been accessed at the current time to assess these issues, certain ownership structures and business strategies (e.g. diversified versus undiversified) may be associated with different records in the handling of e-waste. For example, non-diversified businesses or companies may have incentive to ensure that exports are appropriately recycled, as international scandals could do significant harm to their main line of business. Recyclers that are part of a large corporate structure, however, have other lines of business to rely on in the face of public pressure regarding e-waste that is disposed of illegally. This may meant that they are less likely to closely monitor the ultimate destination of international shipments.

On the other hand, small businesses may have fewer resources than large companies to ensure compliance. In this scenario, being part of a large corporate structure may make exporting less risky because large companies have more resources to expend.

These business structures may also have implications for possible unintentional and intentional organized/group crime connections. For example, recycling facilities exporting to other facilities owned by the same company do not have to rely as extensively on third parties to transport and recycle e-waste. E-waste exported from small businesses may change hands several times, creating more opportunity for illegal practices.

Facilities/companies that specialise in recycling may have more knowledge of legitimate e-waste handlers and may therefore be better equipped to ensure safe disposal. Moving to the question of intentional criminal activity, small businesses may have more incentive than large companies to rely on questionable shippers/recyclers in order to reduce costs.

As noted in the organized crime literature reviewed by MSU, many forms of business crime have occurred in conjunction with hazardous waste violations. MSU has been unable to gather any concrete information on violations in the export of US e-waste, but it did examine exporters' record of compliance with US and state RCRA regulations using the EPA Enforcement and Compliance History Online (ECHO) database. It searched by EPA identifier (when provided), name and address. Of the 21 unique facilities that had notified the EPA of exports, seven facilities could not be

found on the enforcement database (including three facilities that provided EPA identifiers).

It is unclear whether businesses absent from the EPA databases and/or without a RCRA permit are in violation of US regulations. Because of the patchwork nature of US federal and state as well as international regulations, it is unclear whether businesses that collect e-waste for the purposes of recycling have to obtain a US RCRA permit. Specifically, it is unclear whether businesses that collect e-waste strictly for export (without doing recycling themselves) must still obtain a permit.

Of the remaining 14 facilities that could be found in EPA enforcement data, around two-thirds had never been inspected. Of the five facilities that had been inspected, three had been inspected only once in the past few years.

Two facilities, however, had clearly received closer attention from the authorities. One facility had been found to be in violation of US regulations during six quarters of the past three years and had been inspected twice in the previous five years. Another facility had been inspected eight times in the past five years and had received fines totalling $7,560. It also received four written informal enforcement actions in a period of past five years.

Importers

MSU was unable to explore the ownership structures of importers as extensively as those of exporters because of the limited availability of public data on non-US companies. It did verify that Falconbridge is owned by a Swiss mining company named Xstrata and believes that RMG Canada is owned by a US company (RMG Enterprises). Because of the well-known names of the remaining importers (e.g. Samsung Corning, LG/Philips), it is believed that some are part of larger corporate structures.

Less was learned less about the three Korean importers, but there are indications of connections. For example, United Recycling Industries exports to Sam Bu Inc, but also lists Korea China Enterprises (another importer) as a secondary recycler.

There are several other patterns in the data that merit additional exploration. First, a number of facilities were sold several times. In other comparable industries, companies have been known to sell problematic facilities rather than improving environmental technologies. Thus, facilities that have been sold multiple times may have more environmental violations.

Several businesses had connections to China that go beyond using it as a transport country and may merit further investigation. For example, a US company that claims to be one of the few to be licensed by China's Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) is not recorded on any EPA database.

The role of organized crime

Criminality, by its very nature, is a secretive business. It is difficult to identify the criminals involved in illegal e-waste disposal. It is interesting, however, to note the findings of a recent study undertaken by the Inspectorate of Housing, Spatial Planning and the Environment in the Netherlands. This concluded that almost all companies are somehow involved in illegal exports of e-waste, whether they are aware of it or not.[21]

In 2006 the INTERPOL Pollution Crime Working Group (PCWG) completed a study of the links between organized crime and pollution crimes using information on 36 closed court cases from Sweden, Canada, Italy, the United States, Mexico, Japan, Germany and the UK. Based on the numbers of individuals and organisations involved and the period and nature of criminal activity (i.e. much of it involved smuggling and fraud), the PCWG concluded that organized crime groups are actively involved in pollution crimes.

Rather than exhibiting the traditional hierarchical, centralised structure of organized crime, the involvement of organized criminality in pollution crimes is more loosely structured. Small groups organize for a period of time to commit crime to obtain financial or other benefit, but disperse under pressure to form new groups.

UK waste and crime

The opportunities for criminal involvement in UK e-waste disposal are many and varied, as is demonstrated by Figure 1 (page 22). Criminals will exploit any weaknesses in the system, particularly where e-waste can be disguised or mislabelled so that it has the appearance of legitimacy.

It has been claimed[22] that many fishermen in China, unable to make a living from fishing, have reverted to ferrying cargoes of illegal e-waste from Hong Kong to the Chinese mainland, where it is disposed of illegally.

'Waste tourists' is a term used to describe those individuals who visit the UK as tourists with the intention of organising the purchase and export of waste. While in the UK they will get a container filled and arrange for export, but due to their tourist status and their lack of links to customs they can avoid detection.

Some criminals exploit the need of local authorities to meet recycling targets by buying e-waste directly from municipal sites for recycling. It is alleged that often the equipment they buy is exported directly to non-OECD countries with no, or only minimal, recycling of key components.

This can be a highly profitable business. Televisions and monitors, for instance, can be bought for £2-£3 each and sold on for twice that. Because of the volume of waste

[21] Representative, VROM Inspectorate of Housing, Spatial Planning and the Environment
[22] Representative, VROM; personal communication

involved, the trade is estimated to have an annual turnover of approximately £2 million[23].

In many cases the exporters will change the means of shipment in the event of an enforcement clampdown. If customs officials decide to intercept 40ft containers at a particular port, for example, the waste shippers will switch to smaller containers or alternative forms of transport such as open-sided lorries – or temporarily use a different port. This suggests a combination of premeditation and organisation, as well as indicating the perpetrators' awareness that the waste shipment is illegal (i.e. organized criminal activity).

US waste and crime – summary of literature review

Very few academic studies have examined organized criminal involvement in pollution crimes. Much of the literature is regionally limited and somewhat contradictory. But general patterns can still be surmised. Overall, it seems that traditional crime families had some level of involvement in the hazardous waste industry, but this type of organisation is far less common than loosely structured networks.

It is common knowledge that traditional organized crime groups were involved in the solid waste (i.e. garbage) industry in New York and New Jersey in the 1970s (Lyman and Potter, 2004; Szasz, 1986). Under the guise of legitimate business, organized crime groups used property rights, predatory pricing and threats of violence to dominate the solid waste industry. Waste hauling contracts were illegally shared out between affiliated haulers. Non-affiliated firms were pressured with threats and violence to either join the infrastructure or exit the business, creating a system of territorial monopolies with non-competitive pricing (Szasz, 1986).

Although the extent of organized crime involvement in hazardous waste disposal is unknown, evidence suggests that some organized crime groups used the existing garbage hauling organisational infrastructure to begin transporting and disposing of hazardous waste in New York and New Jersey after the passage of the Resource Conservation and Recovery Act (Block and Scarpitti, 1985; Lyman and Potter, 2004; Szasz, 1986).

Congressional investigations revealed that organized crime groups used several different methods to illegally dispose of hazardous waste. Because of prior involvement in the garbage industry, some mob-affiliated individuals already owned municipal waste landfill sites. These owners simply accepted hazardous waste labelled as municipal waste (Szasz, 1986). In some instances "landfill owners not directly associated with organized crime could be bribed to sign manifests for shipments never received or to accept hazardous waste that was manifested elsewhere" (Szasz, 1986).

Organized crime figures also purchased licensed hazardous waste treatment facilities and illegally stockpiled or dumped the hazardous waste rather than treating it. In

[23] Environment Agency, England and Wales representative; personal communication

some extreme cases, organized crime figures filed false manifests for non-existent disposal sites (Szasz, 1986).

Rebovich (1992) also found evidence of traditional organized crime involvement in his analysis of hazardous waste offences and offenders in 71 case studies and interviews with law enforcement personnel in Maine, Maryland, New Jersey and Pennsylvania. However, the involvement of traditional organized crime was limited; organized crime links were detected in only three of the 72 cases (all in New Jersey). In these cases individuals charged with hazardous waste violations were identified as associates of traditional criminal organisations.

Most hazardous waste offences in the Rebovich (1992) study did not result from industry takeovers by traditional organized crime groups. These offences more closely resembled the model detected by INTERPOL. The criminal units involved were not as large or as centralised as traditional syndicate crime; they were 'organized' on a more basic level (Rebovich, 1992). Hazardous waste violations were committed by multiple offenders operating in independent or semi-independent units.

Many of these violations were in the context of legitimate business. For example, in some cases multiple hazardous-waste business entities participated in hazardous waste violations together via criminal agreements. Generators, haulers, and treatment, storage and disposal (TSD) operators agreed to illegally dispose of waste to either save money or generate profits.

Based on this kind of evidence, Rebovich (1992) argues that the term 'organized crime' is inappropriate to describe these hazardous waste violations. He uses the term 'group crime' to refer to crime committed by two or more people (as opposed to members of a more structured organisation) for illegal profits and power, advanced by racketeering activities and intricate financial manipulations. This is consistent with other descriptions of current forms of organized crime.

Today organized crime in the United States is a multi-ethnic enterprise, most of it involving small groups who emerge to exploit criminal opportunities. According to Albanese (2005), many of these groups are short lived and are comprised of 'career criminals' who form temporary networks of individuals with desired skills to exploit a criminal opportunity. Some of these flexible, network-based forms of organisation have global reach (Galeotti, 2004; Naim, 2005; Wood and Shearing, 2006).

Although the studies are limited in scope and number, this literature is useful for anticipating the nature of and possible methods for illegal disposal of e-waste. Given the similarity in business structure in each industry, some of the specific methods used to illegally dispose of hazardous waste may also be used in e-waste violations.

US e-waste disposal incentives and disincentives – pointers from Michigan State University interviews

Michigan State University has added to the information provided by its literature review by conducting a range of interviews to build up a picture of the e-waste disposal sector in the United States and how producers of waste engage with it.

An interview with one commercial producer of e-waste revealed how a pattern of influences and events can shape disposal practices. First, the efforts of NGOs during the late 1990s and the early part of the 21st century served to highlight the potential risks posed by e-waste to human health and the environment. This led to this particular producer reassessing the practice of sending computers, monitors, circuit boards, and other e-waste "straight to the dumpster". Instead the company's waste was sent to a prison industry programme, at no cost to the producer.

Concerns then arose about the health effects that prisoners might suffer from e-waste toxins. Simultaneously, the producer became concerned about the potential for those acquiring computers to get access to sensitive information.

A combination of these concerns – about the risks associated with exports, prison industry recycling and privacy of confidential data – resulted in the producer looking for recycling services that would properly certify the elimination of confidential information and the proper disposal of the materials. The company eventually selected for the job was not the cheapest, but the one that appeared to offer the best-value professional service delivering guarantees of data elimination and the avoidance of shipping waste overseas. The producer now pays approximately $12,000 per year for this service to dispose of approximately 8,000 monitors, and views this as a basic business cost.

The two recyclers that MSU interviewed represent the types of companies that accept e-waste from producers concerned about information security and export. The companies interviewed operate in different states in different regions of the US.

These companies took pride in being 'zero waste stream' recyclers that erase all memory within computers and electronics, prevent hazardous waste from moving to landfill, do not export, and do not use prison labour. Both work primarily with commercial producers but would accept e-waste from individuals. One specialises in all types of electronic waste and the other is a company that has long been involved in recycling precious metals from manufacturing processes but has added specific capacity for recycling e-waste.

Both companies described services that involved picking up e-waste from producers and then initiating a process of separating materials that could be re-conditioned for re-use from materials that were no longer useable. For the non-useable materials, both employ processes whereby the materials are broken down, hazardous wastes separated, precious metals or other materials of value separated for re-sale, and non-toxic waste minimised and then disposed of. For hazardous materials, both companies relied on third-party contractors for disposal.

Both identified the high costs associated with processing and disposal as the reason why they had to charge producers and individual citizens to take their e-waste from

them. They estimated that it costs approximately $18 to properly remove the lead from a computer monitor or television screen. Although the recyclers were able to recoup revenue through the sale of precious metals and other recycled materials, this was not sufficient to offset all the costs associated with picking up and transporting e-waste, shredding information and (most importantly) retrieving and disposing of toxins. This is particularly the case for computer monitors that have little value but that do have significant costs associated with lead removal.

The costs for recycling vary, with larger commercial enterprises receiving discounts based on volume and individual consumers paying a premium due to the inefficiencies of recycling one machine at a time. For commercial producers, there is value in having information destroyed but beyond this the only incentive for paying for the disposal of e-waste is from a 'good corporate citizen' standpoint. Otherwise, the economic incentive is to find a recycler who will accept the materials for free or purchase them cheaply and then not worry about what happens to them.

For individuals, the disincentives for proper recycling are even more pronounced. Unless one lives in a state that has prohibited individuals from disposing in landfill, the consumer is likely to incur significant costs for recycling. For example, one company charges a $50 fee to take back a computer and monitor from individuals. This obviously represents a significant barrier to appropriate disposal and is one of the reasons why a number of states are working with computer manufacturers on 'take back' campaigns that reduce direct recycling costs to the consumer.

The recyclers interviewed by MSU said they believed that their counterparts in the industry who accept materials for free, or who purchase used e-waste, must be involved in the export of these materials. This is because the costs associated with zero waste stream recycling make it essential to charge for this service.

They said they did not believe that the costs associated with international shipping and proper separation and disposal of hazardous wastes could generate a profit without charging a fee up front. They felt that where e-waste is being shipped overseas without a fee being paid by the commercial producer, it is likely that the waste will be broken down for retrieval of materials with value but also that it will then be discarded without proper disposal of toxic materials.

The zero waste stream recyclers said it was likely that some functional used electronics were being shipped for re-use. But they did not believe this constituted a large proportion of the export market. They argued that if a review of US recyclers could be carried out to distinguish those who charge a fee from those who accept material for free or purchase used e-waste, then this could serve as an indicator of legitimate versus illegitimate recycling.

Assuming that it is sound to make a key distinction between fee-charging recyclers and those who either do not charge or purchase e-waste, a risk-based picture for investigating and regulating e-waste recycling emerges. As Figure 2 indicates, there are related but distinct markets for individual consumers versus commercial producers of e-waste. The fee-based versus free or purchase distinction is the next key criterion. After that an idea of whether or not the recycler plans to export provides

an additional indication of risk.[24] This should be considered preliminary and should be subject to testing but it does look as if a risk-based approach can be productively applied to analysing the e-waste recycling market. It should be noted that this does not mean that fee charging recyclers re not exposed to the risk of dumping E waste abroad if they are involved in E waste export as well as recycling in the US. However, it is more likely that the fees charged reflect US based recycling capacity.

The importance of such an approach is also suggested by the preliminary finding by MSU that well over 2,000 businesses are involved in the collection of e-waste.[25] With this number of businesses, targeted rather than random inspections are likely to be a far more productive strategy for reducing illegal disposal.

Although the recyclers both claimed that there was widespread knowledge within the e-waste recycling business of 'shady operators', neither was aware of organized crime involvement or of international 'tourists' coming to the US to purchase used e-waste, as has been reported in Europe. However, both said that they simply did not have adequate knowledge of how international shipping of e-waste occurs.

Consistent with the description from recyclers, the regulators and enforcement personnel that were interviewed noted that the primary aim of buyers of e-waste in developing countries is to retrieve precious metals. But provision for worker safety and the proper disposal of toxic materials and other wastes would incur significant costs that rapidly eat away or eliminate the profit from selling precious metals. This suggests – and this is a view that is reinforced by evidence from NGOs such as the Basel Action Network – that the importers and recyclers of e-waste are not handling it properly because it is uneconomic to do so.

Regulators and enforcement personnel note that much of the worldwide distribution of e-waste appears to be conducted over the internet. Like the recyclers, the regulators also note that there are 'high probability violators' (or high-risk companies and networks of companies) that are most likely to be involved in the global transport of e-waste.

[24] Although yet to be determined, information on business structure, process, and diversification may further develop this risk-based model.

[25] This is based on several websites that identify e-waste recycling locations in communities across the US. Undoubtedly it is an underestimate of the number of such locations.

Conclusions

E-waste exports are a persistent problem, despite the implementation of international conventions.

Much of the evidence regarding export mechanisms and how the sector operates is anecdotal. But volumes of e-waste are estimated to be in the region of millions of tonnes, creating a significant and highly profitable illegal industry.

E-waste recycling, reuse and disposal in the developing world is undertaken under unhealthy and sometimes dangerous conditions. Plastics are burned in the open air in order to retrieve valuable commodities such as copper. Waste gets dumped on the ground or into rivers, and this has the potential to cause pollution of water supplies and soils.

The nature of criminal activity makes it very secretive but from recorded prosecutions it would appear to be a vast and lucrative industry. The criminal activity involves theft, fraud, smuggling, conspiracy and money laundering.

Our research in the UK and Europe suggests that the opportunities for criminal involvement in e-waste disposal are plentiful, and some of this is ‘quasi’ legal. Experience from Holland, for example, shows that an electrical take-back scheme – of the type required by the WEEE Regulations – may lead to increased illegal activity. Criminals buy returned equipment from Dutch shops (or sometimes get paid to take it away), under the pretence of re-use or recycling, and then ship it away for illegal disposal.

A similar operation is the collection of e-waste from municipal sites in the UK (often for free, or with a small charge made to the local authority for the removal of the waste). The waste is apparently acquired for recycling or re-use. Local authorities are often keen to dispose of WEEE in this way because they can then make a claim against their recycling targets. It is alleged, however, that this e-waste is often exported and sold for disposal abroad.

The usual method of illegal export of UK e-waste is through mislabelling of containers (often as personal effects) or mixing waste with other commodities e.g. second hand and end-of-life vehicles.

Waste exports usually pass through one or more international ports. Evidence gained through telephone conversations would indicate that Rotterdam is central to this trade, perhaps reflecting its pre-eminent position as an international port.

The criminals involved are often based outside of the main OECD countries and will visit to secure quantities of e-waste. They will then use small-time operators in the country of origin to organize collection and shipment.

The volume of e-waste being generated in and exported from the United States is very large, and it is growing. Although it is impossible to discern the relative amounts of US exports that end up being disposed of improperly in the developing world, at

the very least these exports pose risks to human health and the environment and warrant continued risk analysis and assessment.

It is clear that there are market incentives for fraud (fraudulent certifications of no export and zero waste disposal) and the involvement of crime groups. Zero waste recycling and clean disposal of e-waste are costly. But illicit revenue is readily available through extraction of precious metals, particularly in conditions minimising worker safety standards and dumping of waste. NGOs such as BAN, Greenpeace, and the Silicon Valley Toxics Coalition have documented the nature of these risks in many regions of the developing world.

In terms of the research goals for this project, the most significant gap remains understanding the involvement of organized crime in the global distribution of e-waste. We do not have enough information to make definitive judgments. But given the financial incentives and the sheer volume of e-waste, the environment appears ripe for organized crime to be involved.

In both Europe and the United States, our research suggests that the involvement of organized crime is likely to be less structured and centralised than in traditional patterns of organized crime. Crime groups are likely to be loosely structured and network based, with working relationships designed to exploit criminal opportunities. Although it would be premature to draw firm conclusions, the evidence in the United States suggests a range of such crime groups, including small-scale family-based networks and more sophisticated crime groups, are familiar with moving illicit goods through international borders.

One of the richest sources of information used by Michigan State University (MSU) in its research has been the customs-based RILO report from the ‘sky-hole patching’ project of the WCO Regional Intelligence Office for Asia and the Pacific. This project pointed to the rich source of information on illicit trade generally, and e-waste in particular, available through customs organisations.

When combined with other regulatory and enforcement data, MSU believes that this type of information offers the greatest opportunity for assessing the nature of international markets in the trade of e-waste and the involvement of crime groups. More partnerships are needed between law enforcement agencies and academic researchers to bring more and better analysis of this kind to the fore.

The goal should be to bring together the deep knowledge about crime types and patterns of law enforcement professionals; the records systems that provide information on seizures, arrests, and prosecutions; and the analytical ability of academic researchers in looking across these sources of information for strategic and tactical intelligence. Partnerships can help support intelligence-led policing and advance our collective knowledge about crime, organized crime, and associated risks.

Such partnerships may prove particularly beneficial in the area of e-waste. The global nature of the issue, the massive and growing volume, the uneven regulatory context, and the lack of information sources, initially make this seem like a ‘needle in the haystack’ type of investigation. Yet in previous Pollution Crime Working Group

reports as well as the present study, patterns do emerge suggesting different risk profiles that could be profitably studied through risk assessment analyses.

Proposals for future work

Research and investigation in Europe

Research in the UK and Europe conducted for this report by Bureau Veritas suggests that an industry has developed around illegal trade in e-waste. To investigate this criminality adequately, we need the full involvement of law enforcement agencies experienced in intelligence and criminal analysis as well as enforcement. The brokers and waste tourists behind criminal activity need to be identified.

Bureau Veritas argues that the trade in e-waste generated in the UK should be addressed at source. Better regulation is required but also an investigation into the role of municipal waste sites in the illegal export of WEEE. It is likely that most site operators are unaware of the final destination of the e-waste they trade; such waste is probably sold with the expectation that it will be recycled, reused or disposed of appropriately in the UK. But the link between municipal waste disposal and illegal export should be more clearly defined. This will require the input of law enforcement agencies and associated personnel.

A common method of illegal disposal appears to be mixing e-waste with other, legal shipments – in particular second hand vehicles and ELVs. In the first instance more research is required into the source and destination of these vehicles, in order to define more clearly the links between the trades and the criminality involved.

It has been suggested that the introduction of the WEEE Directive in Europe will lead to an increase in the problems of illegal export. An equipment return policy will probably be introduced. Research should be undertaken into what lessons can be learned from countries where this type of programme has existed for a number of years, e.g. the Netherlands.

Research and investigation in the United States

Michigan State University has extensive plans for continued research. In addition to continuing to explore unanswered questions about EPA notifiers, it is compiling a database of all US electronics recyclers from open data sources. MSU plans to interview a sample of these recyclers to explore several sets of questions.

Questions over exports are one of the areas that need to be addressed. Although the US does allow businesses to legally export e-waste, very little information is available on how this export occurs. For example, how do US exporters locate importers that will accept the waste (when it is not shipped within company)? What type of handler or transporter/shipper do US exporters use?

Preliminary evidence – from the EPA notifications (some of which contain a list of shippers) and from one case brought against the United Parcel Service (UPS) by US

Customs – indicates that exporters rely on traditional shippers. Following this network/export chain will help determine where opportunities exist for illicit disposal. MSU would also like to collect information on the amount of e-waste on site, how much is sent abroad, and where it goes. At the very least there is a need to get some sense of how decisions are made regarding international versus US recycling.

As with the EPA notifiers, MSU plans to collect information on the business structure of all (or a sample of) US electronics recyclers. Business structures will reveal potentially useful things about formal connections between businesses that facilitate international shipment of e-waste. In addition, MSU would ultimately like to connect information on business structure to businesses' (and owners') criminal histories – to determine whether specific types of business arrangements are more associated with illegal disposal than others. MSU researchers therefore plan to collect information on criminal history as well.

The US uses harmonised tariff codes administered by the World Customs Organisation for international exports but there is no separate tariff code for e-waste. The Seattle-based Basel Action Network believes that exporters put CRTs in under the 'waste and scrap' code, mixing e-waste with scrap metal. MSU plans to collect data on US exports of waste and scrap metal as a proxy for e-waste. It also plans to contact Customs and the Department of Justice to look for data on enforcement actions or prosecutions regarding e-waste.

Finally, MSU is developing a coding scheme for conducting newspaper research in select countries to search for media accounts of e-waste. The sampling of countries will be driven by those most commonly identified in previous research and investigative journalism reports as being recipients or shipment points. Of particular interest will be reports of US companies identified in the export of e-waste.

INTERPOL Pollution Crime Working Group

In discussion following a review of the report findings the Pollution Crime Working Group agreed that it needed to take forward some actions to progress its understanding of this area of criminal activity. These included:

Developing a more detailed understanding of destinations and the routes used to carry illegal shipments to them so that contacts could be made with regulators and enforcers in those destination countries.

Raising awareness about and gathering more information on those individuals suspected of organising large scale illegal E waste shipments.

Analysis of criminal activity and crime types associated with illegal E waste shipments and drawing on other work being carried out targeting illegal E waste exports on an international scale

Identifying loopholes and gaps in legislation that currently enable illegal waste shipments to occur evidence of which could be used in future analysis of the problem.

Drawing out key issues and barriers that facilitate and provide opportunity for illegal E waste activity.

Developing case studies demonstrating levels of organisation and financial benefits.

Promoting case studies across key stakeholder groups to demonstrate involvement of organized crime in E waste export activity.

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Appendices

Appendix I – List of documents and websites reviewed during UK research

The following documents were reviewed as part of the Phase II research in the UK.

Illegal Waste Exports – Risks And SWOT Analysis; UK Environment Agency 2006.

Illegal Waste Shipments – Headlines; UK Environment Agency December 2006.

The Illegal Shipment Of Waste Among Impel Member States. Impel-TFS Threat Assessment Project: Short Report, May 2005.

Waste Crime Data and Action Planning – Final Report; Environment Agency, August 2006.

The Threat to the United Kingdom from the Illegal Transfrontier Shipment of Waste; National Criminal Intelligence Service, March 2005.

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal; Signatories to the Basel Convention, March 1989.

Scoping Study on the UK's Export Trade in Waste Electronic and Electrical Equipment (draft). Environment Agency, February 2006.

IMPEL-TFS Seaport II Project Report, September 2004–May 2006.

Exporting Harm; The High-Tech Trashing of Asia. The Basel Action Network (BAN), February 2002.

The Basel Treaty's Ban on Hazardous Waste Exports: An Unfinished Success Story. Jim Puckett, December 2000.

Nigeria fears e-waste 'toxic legacy'. Liz Carney, BBC World Service's Dirty Business, December 2006.

'Who is involved in illegal export? – Enforcement experiences'. Transcript of presentation by Carl Huijbregts, Inspectorate of Housing, Spatial Planning and the Environment, Netherlands.

The following websites were also reviewed:

The Basel Action Network www.ban.org

BBC News online http://news.bbc.co.uk.

Appendix II – transcripts of UK research interviews

1. Teleconference 7 March 2007 between a representative of the Inspectorate of Housing, Spatial Planning and the Environment, Netherlands and Bureau Veritas.

Briefly confirm roles and responsibilities of the Inspectorate of Housing, Spatial Planning and the Environment

Carl works in the area of compliance with European Shipment Regulations and the Basel treaty. Undertook first investigation in 2004.

Ask for overview of waste management system operating in Netherlands – any significant difference from UK? Specifically, are the NLDS used as an exchange/set down point for waste in transit from/to other countries? Bear in mind the criminal opportunities this presents.

In the Netherlands shops have been taking back WEEE since 1999. Shops sell discarded WEEE to brokers. All equipment returned to shops is considered waste until it is sorted into working and not-working.

Non-repairable equipment is shipped out – TVs to Africa and IT to Asia. Some (most?) shipped as second hand but 60-90 per cent is broken.

The Netherlands acts as a transit point for large volumes of WEEE. Germany and the UK are the biggest exporters through the Netherlands.

Based on your knowledge of the flow of e-waste through the Netherlands, do you see opportunities for a criminal syndicate to profit from purchase, shipment and disposal of electronic waste?

Evidence that criminal activity is centred on Ghana and Nigeria, with main players in those countries using 'little fish' in WEEE origin countries.

Anecdotal evidence that similar route is used for drugs into Europe, i.e. drugs shipped through African countries.

Brokers can buy TVs (for example) from shops for €4-5 a piece, and can sell on in Africa for around €5 profit per piece.

€450/tonne for waste WEEE. In Africa precious metals are recovered; in Asia almost all WEEE is sent to metal recyclers.

Do you know of any specific instances of illegal handling of e-waste by organized criminal syndicates? If yes, ask follow-up questions:

Which countries were involved?
From which country/countries did the group operate?
What illegal acts occurred? (*e.g.*. illegal dumping, illegal recycling operations using sweatshop labour, etc)
Was there any law enforcement action in response to the criminal

activity?

Prosecutions are handled by a separate department but most illegal trade in WEEE is related to the Nigerian network.

Are shipments disguised? For example, If a container is being used to transport electronic waste, how would the container manifest describe the contents? False headings or labelled as working condition for resale markets?

Most shipped as second hand goods with furniture etc, particularly as most receiving countries have special regulations on receiving WEEE.

Notification and consent are required for waste. Do they seek this consent or circumvent it?

Both. Evidence of mislabelling and forging of paperwork.

Which specific points in the overall waste system does organized crime target?

Criminality targets many different points in the waste stream including mislabelling; re-routing equipment before it reaches its certified destination; re-routing at sea.

Do you know to which countries the electronic waste is being shipped? Is there a trend? Non-OECD? Similarly, where does most waste originate?

A lot of the waste is shipped through the Netherlands and on to China and Vietnam (via Hong Kong), Ghana and other African countries.

2. Teleconference 15 March 2007 between a representative for the Environment Agency, England and Wales and Bureau Veritas

Briefly confirm roles and responsibilities

Representative project-managed the EA's TFS Ports investigation into illegal waste shipments. The investigation ran from September 2004 to March 2006, and covered exports and, to a lesser extent, imports of waste at six major UK ports: Felixstowe, Thamesport, Tilbury, Southampton, Liverpool and Holyhead. Over the course of the project, around 400 containers were inspected. A synopsis of the outcomes of the project is presented in a draft report supplied to Bureau Veritas.

Do you know or measure the approximate amount of electronic waste that moves through the ports in a typical month or year? What is the rough percentage that is illegal?

This is extremely difficult to quantify and is therefore largely unknown. The EA's Ports study found around 50 per cent of export shipments inspected to be illegal in some way (a much smaller percentage for imports, however).

From an enforcement perspective, it is difficult for the regulators to prove that a consignment labelled for a recovery market is actually waste, save for manually testing products for functionality, so it is possible that these figures are an understatement.

Based on your knowledge of the flow of e-waste, do you see opportunities for a criminal syndicate to profit from purchase, shipment and disposal of electronic waste?

A very good potential in financial terms, particularly for intermediary waste disposal companies supplying local authority civic amenity sites under contract and subsequently selling the material on for disposal to a broker or 'waste tourist' for eventual export and disposal ('waste tourists' travel from Asia/West Africa as visitors to buy up e-waste for export and sale).

In this way, the disposal company is paid twice for the waste, and does not need to physically collect or physically export the waste. It merely processes it (i.e. it bails it up etc) and passes it on. Further profit can be realised by brokers who pay a low price per unit and sell on abroad for salvage/processing/disposal. However, only limited work has been done to fully quantify the economics of this activity, so no figures are available at this stage.

Extremely cheap export costs combined with a lack of e-waste processing and recycling capacity in the UK add to, and arguably cause, this problem/opportunity.

UK companies supply containers of waste to various intermediaries, but are often not directly linked to its final shipment. This makes it difficult to prove that there is/was intent to dispose of the equipment illegally. Further complication is caused by the fact that consignees, particularly in the Far East, are sometimes labelled as brokers e.g. an urban business address, rather than the ultimate disposal site. In these cases the 'cradle to grave' link is often lost.

Do you know of any specific instances of illegal handling of e-waste by organized criminal syndicates? If yes:

What countries were involved?
From what country/countries did the group operate?
What illegal acts occurred? (e.g. illegal dumping, illegal recycling operations using sweatshop labour, etc)
Was there any law enforcement action in response to the criminal activity?

Various prosecutions (both settled and pending) associated with the project were discussed, including:

Grosvenor (unsorted waste)

Beccis and its Managing Director (mixed waste)
Remet (hazardous waste)
Greenway (now All Trade Recycling) for disposal of e-waste

Most relate to general or mixed waste rather than E waste specifically.

Are shipments disguised? For example, if a container is being used to transport electronic waste, how would the container manifest describe the contents? False headings or labelled as working condition for resale markets?

Predominantly shipped under the guise of recovery and resale exports.

In many cases the shippers will change the means of shipment in the event of an enforcement clampdown e.g. if HMRC intercepts 40ft containers at a particular port, the waste shippers will switch to a smaller container, open-sided lorry etc – or temporarily use a different port. This suggests a combination of premeditation and organisation, as well as the perpetrators' awareness that the waste shipment is illegal (i.e. organized criminal activity).

Notification and consent are required for waste. Do they seek this consent or circumvent it?

Both.

Which specific points in the overall waste system does organized crime target?

Local authority 'municipal sites' accumulate quantities of WEEE which they are contracted to dispose of. Waste companies charge for recycling/disposal at UK rates then unscrupulous companies may sell the waste to a broker who exports it illegally then sells it to receiving sites where recyclables are sold and/or computers stripped for other locally valuable materials.

Brokers play a key role in recycling/disposal of municipal and e-waste, however they are often based offshore so that they are outside of the country of 'offence' and are able to avoid prosecution. The ownership of the waste is transferred to the brokers who arrange for shipping. The brokers also often operate as waste tourists, visiting the UK to purchase waste and then organize exportation.

As the waste is bought before export by the broker, prosecution is difficult. The UK authorities have to prove that the waste company, selling to the broker, knew that the waste was going to be exported. Shipping costs are relatively cheap, therefore large quantities of WEEE are being exported.

Some 'waste' companies who claim to take waste for recycling just get paid to take waste by a local authority then sell straight on to a broker. They thus get paid twice! The industry is purported to have a £2 million turnover.

Do you know to which countries the electronic waste is being shipped? Is there a trend? Non-OECD? Similarly, where does most waste originate?

Generally Africa and the Far East – large volumes of UK business waste.

3. Teleconference 28 March 2007 between representative of the Environment Agency, England and Wales and Bureau Veritas.

Representative manages the Transfrontier Shipment National Service project for the EA.

Confirmed that most exports are via other European ports, in particular Rotterdam, Hamburg, Antwerp and Le Havre. Matt also confirmed that most illegal exports are destined for countries in West and East Africa

WEEE is also exported to East European countries. Much of this is given legitimacy under the European Union umbrella, however how the products are finally disposed of is not always apparent.

There are a few cases of export to China, however the Chinese authorities are thought to have most waste imports under control. Much of what they import is for their legitimate recycling industry.

Confirmed that WEEE is exported, and mixed with other goods, for instance; end-of-life vehicles (ELVs) are charged by the cubic metre. The cars are therefore sometimes filled with waste, allowing it to be exported, effectively, for free.

Quantities of waste exported are estimated by extrapolating from illegal shipments that are discovered in the UK or repatriated after being found at other ports. As discoveries are intelligence led, the hit rate may exaggerate the scale of the problem.

4. Teleconference 28 March 2007 between representative of Bureau Veritas UK and Ireland PIC Manager and Bureau Veritas.

Representative manages Bureau Veritas's contract with the UK Government on the UK co-ordination of pre-shipment inspections for government contracts. Involved with shipments to most African countries.

Most shipments inspected on destination, with more high-tech equipment being used, e.g. X-rays of containers becoming more common.

5. Teleconference 28 March 2007 between Policy Adviser with Her Majesty's Revenue and Customs (HMRC) and Bureau Veritas.

Representative was involved in advising the Department for Environment, Food and Rural Affairs and HMRC on the implementation of the WEEE Directive, however further primary legislation is required to tackle problems of WEEE.

Reg 113/7 section 10 called upon the EA to retain waste.

Appendix III – Michigan State University research team

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