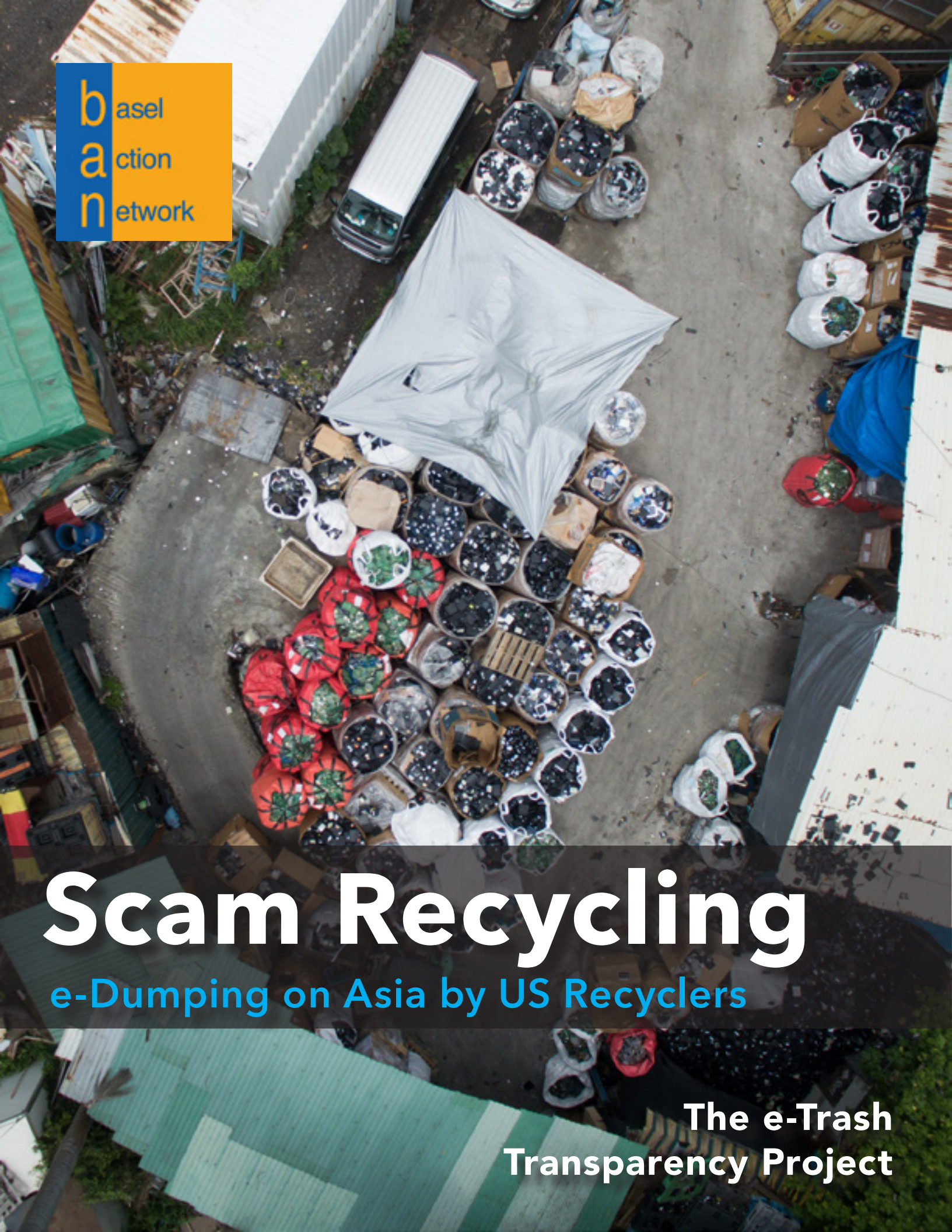

Scam Recycling

e-Dumping on Asia by US Recyclers

The e-Trash Transparency Project

Front Cover:

One of what are believed to be 100's of electronics junkyards in Hong Kong's New Territories region, receiving US e-waste. The junkyards break apart the equipment using dangerous, polluting methods. ©BAN 2016

Back Inside Cover:

KCTS producer Katie Campbell with Jim Puckett on the trail in New Territories, Hong Kong. ©KCTS, Earthfix Program, 2016.

Back Cover:

A pile of broken Cold Cathode Fluorescent Lamps (CCFLs) from flat screen monitors imported from the US. CCFLs contain the toxic element mercury. ©BAN 2016.

Scam Recycling:

e-Dumping on Asia by US Recyclers

Made Possible by a Grant from:
The Body Shop Foundation

Basel Action Network

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Table of Contents

Executive Summary

BAN's e-Trash Transparency Project is the first large-scale e-waste flow study accomplished by observing actual e-waste movement from the United States into the global marketplace. The result has been sobering. At the outset of the project, the question was posed:

> ***Does the public still need to fear that their e-waste, when delivered either to a charity or to a recycler, has a strong likelihood of being exported to a developing country instead of being recycled here in the United States?***

Unfortunately, this has been answered in the affirmative.

Exports continue

Despite years of education, particularly within the recycling industry, as well as national media attention spotlighting the harmful exploitation of developing countries via export, and despite the subsequent development of recycling certification schemes spurred into existence by the revelations of harm done, the exportation of electronic waste from the United States to developing countries continues to occur at an alarming rate.

For the project's tracker installations, BAN chose three waste types -- LCD monitors with mercury backlights, CRT monitors, and printers. Each of these are considered as hazardous waste under international law.

Opposite page: Printers piled up at "Mr. Lai's Farm" electronic junkyard, New Territories, Hong Kong. © BAN 2015

To date, the study has witnessed 34% of the 205 tracker deployments move offshore, with 31% of the total going to developing countries. Looking at those that were exported only, 93% of the exports went to developing countries. 87% have gone to Asia, 3% to Africa, 1% to the Middle East, 1% to Latin America and Caribbean region. 7% moved to the developed countries of Mexico and Canada.

Of the 152 trackers delivered directly to recyclers, the primary subject of this report, 40% were exported -- significantly higher than the 15% export rate for the 53 trackers delivered to charities or retailers.

In the course of the entire pathways (chains) of the 205 tracker movements, the trackers passed through the hands of 168 different identifiable US recyclers. Of these companies delivered to or revealed, over 45% were part of a movement that went offshore (export chain).

LCDs were exported at the highest rate of the three types of equipment deployed: 53% of LCDs studied were exported, 30% of printers, and 18% of CRTs. LCDs containing mercury lamps, as exclusively deployed in this study, are likely the most toxic of the three.

Certifications and export

One of the responses in recent years to the absence of federal government action to the discovery of irresponsible exports has been the advent of electronics recycling certification programs. Relative to exports from the US that likely result in illegal trade,

this study found that R2 certified recyclers had a higher-than-average export rate, uncertified recyclers had a lower-than-average export rate, and e-Stewards had the lowest average export rate of all three categories. With respect to certifications represented as the last holder of e-waste prior to export (apparent exporter), R2 exceeded e-Stewards 9 to 1.

Illegality – foreign and domestic

This study also looked at when and whether these exports are illegal. Compared with much of the rest of the world, the US has been negligent in passing national legislation to control most hazardous waste exports. Despite this deficiency, the hazardous waste exports we documented were still likely to be illegal under existing US law, and almost in every instance are likely to be in violation of the laws of importing countries.

For example, China, including the Special Administrative Region of Hong Kong, has long had a prohibition on the import of hazardous e-waste. More broadly, any of the 184 Basel Convention Parties, under the terms of the Convention, are not allowed to trade in hazardous wastes with a non-Party like the US unless all trading partners are members of the OECD group of developed countries.

BAN's Jim Puckett finding discarded LCD screens in the weeds and waysides of Hong Kong's New Territories. © KCTS, Earthfix Program, 2016.

Thus, many of the importing countries revealed by this study are among 150 countries prohibited from importing Basel listed hazardous wastes from the US. Once the waste has been exported from the US, it is considered "illegal traffic" and is a criminal act for those in Basel Parties to import it.

In the United States, there is one rule that requires companies to pre-notify the US EPA if they wish to export some CRTs (CRT Rule). However, none of the companies found in this study to be involved in a chain of export for CRTs are listed on the EPA website as having provided the necessary notification; this means those CRT shipments are likely to violate US law.

Fraud and false representation

There are also domestic legal questions regarding fraud and false advertising. At least 18 of the 72 (25%) companies with websites found in this study to be in a chain of exporting hazardous electronic waste, make strong claims on their websites that they will only manage it domestically.

A legal review conducted for this report (see Appendix 4) indicates that such misrepresentations can be prosecuted under state and federal consumer protection or fraud laws, and have been.

Green washing

Apart from legal matters, many of the companies in the chain of export also appear to cloak their export behavior with affiliations with reputable organizations and government programs. Many are part of state takeback programs, some claim EPA affiliations such as the WasteWise program, or tout membership in business associations such as the Institute for Scrap Recycling Industries (ISRI).

Our comprehensive table found in Appendix 5 indicates the above-mentioned affiliations which, listed on the "front door" may help to cloak a company's actions with a reputable green aura, while irresponsible and likely illegal exports pass out the "back door".

New Territories, Hong Kong: the next Guiyu?

More than half of the exported trackers made their way to Hong Kong's New Territories. BAN's recent visits there raise significant alarm bells that the area, which for many years had served only as a staging, sorting, and shipping area for e-waste from North America prior to its smuggling into mainland China, may become the next Guiyu, if action is not taken quickly.

BAN's 205 trackers found 48 different electronics junkyards in New Territories and we estimate there are likely between 100 and 200 such sites now involved there smashing and crudely separating commodity and toxic fractions from printers, LCD screens, and other equipment.

Meanwhile, Hong Kong authorities appear to have not been diligently enforcing against such imports and subsequent toxic recycling operations, despite clear signs of illegal importation, damaging pollution, and illegal labor practices.

Key Findings

40% of the 152 deliveries to US Electronics Recyclers went offshore. In all, our 205 tracked devices passed through the hands of 168 different identifiable recyclers and over 45% of those were involved in a chain leading to export.

It is likely that 96% of the exports are illegal. Most countries are Parties to the Basel Convention and imports from US are not legal for them. Further, none of the CRT exporters are listed as required in the EPA CRT Rule exporter lists.

93% of the US e-waste exports moved to Developing Countries. 87% of the exported devices went to Asia, 3% to Africa, 1% to the Middle East, 1% to Latin America and Caribbean region.

Many of the recyclers involved in the export make claims of never exporting on their websites. Such claims, if false, may violate US and state laws regarding consumer protection and fraud.

R2 Certified Recyclers exported more than average, e-Stewards less than average. Electronics recycling certifications are not equal on export. Uncertified companies had lower rates than R2

R2 had more "apparent exporters" than e-Stewards: Out of the 27 unique companies positively identified as "last" holders (apparent exporters): 17 were non-certified, 9 were R2, and 1 was e-Stewards.

Recyclers in the "chain of export" tout participation in EPA and State programs. Despite the widespread illegality of exports, companies involved in export chains are granted legitimacy by our government.

LCDs were exported at the highest rate of the three types of equipment deployed. 53% of LCDs studied were exported, 30% of printers, and 18% of CRTs. LCDs containing mercury lamps (we used exclusively) are likely the most toxic of the three e-waste types.

The majority of exports went to Hong Kong's New Territories area. Informal electronic disassembly operations in New Territories received 54% of the project's total exports. Our trackers directly discovered 48 different junkyards there.

New Territories electronics junkyards expose workers and the environment to toxins. The typical activity of these junkyards consisted of workers smashing printers and LCDs. Inhalation and environmental release of toxic mercury and printer toners is inevitable and unrecycled residue dumping in waysides was common.

Introduction

In 2014, BAN received a generous two-year grant from the Body Shop Foundation[1] for the purpose of conducting a tracking investigation using GPS-based geolocation devices to reveal electronic waste movement within and from the United States. This project was named the e-Trash Transparency Project.

The project was inspired by a disturbing recent trend of export denial in the recycling industry. This trend has been exacerbated by US and Canadian government funded studies that purported conclusive results but failed to use actual e-waste movement data.

These studies, instead, relied on company surveys or surrogate (not actual e-waste) product or waste trade statistics. Such studies belied what BAN and other observers witnessed in the field in Asia and Africa and made conclusions that now appear to have underestimated actual waste flow volumes. This project by BAN is the first of its kind to investigate what happens with actual e-waste in the actual global marketplace in real time.

Central to the project, as suggested by its name, is the belief that the public has a right to know how its hazardous waste is being managed and that all recyclers, manufacturers, and enterprises should not fail to make that information public. Just as we precisely know where our sewage goes, and which landfills our municipality uses, the public should have the right to know how their hazardous e-waste is being handled. Currently, that is not the case, and even companies like Dell, Inc., and Apple still refuse to make this information public for its electronics take-back programs.

The "e-Trash Transparency Project" sought to answer a fundamental question:

Does the public still need to fear that their e-waste, when delivered either to a charity or to a recycler, has a strong likelihood of being exported to a developing country[2] instead of being recycled here in the United States?

To answer this question, we placed 205 small tracking devices (trackers) into used, non-functional electronic equipment that is very commonly discarded by consumers and businesses: printers, flat screens (LCD) monitors, and cathode ray tube (CRT) monitors. These tracker-enabled electronic devices were subsequently hand-delivered by BAN's research team to publicly accessible e-waste recycling drop-off sites or collection events around the country. These deliveries were all made between the dates of July 1, 2014, and February 2, 2016.

The first report released by the project, entitled Disconnect: Goodwill and Dell Exporting the Public's e-Waste to Developing Countries, in May of 2016, focused its attention on the 49 trackers deployed at Goodwill thrift stores, and especially those involved in a recycling

1 The grant was for approximately $55,000. http://the-bodyshopfoundation.org

2 For the purposes of the e-Trash Transparency Project and this report, "developing country" is defined as any country that is not part of the European Union (EU), Organization for Economic Cooperation and Development (OECD) or the European Free Trade Association (EFTA).

partnership program with Dell Inc., known as Reconnect. The Reconnect program had reportedly recycled over 427 million pounds of the public's e-waste since 2004.

However, the e-Trash Transparency Project found that, despite the stated policies of Goodwill and Dell to properly recycle their waste electronics and to never ship it to developing countries, in fact, the trackers demonstrated that their practices fell short of advertised promises, creating a large disconnect between promise and reality. Much of the e-waste collected from the public moved overseas to substandard, environmentally harmful recycling operations in Asia.

We have entitled this second report: *Scam Recycling: e-Dumping on Asia by US Recyclers* because, despite the good and green name of "recycling", much of our so-called recyclers do not recycle but export the public's equipment. In turn, most of this exported e-waste is not responsibly recycled, but rather ends up damaging human health and the environment in Asia or Africa. After a decade of publicity highlighting the problems with exporting e-waste, all US companies should know better; but, based on our findings, the scam continues.

This report looks at what actually happened to the 152 trackers (the majority share of the project's deployments) that were delivered directly to companies calling themselves electronics recyclers. Compared to the trackers delivered to US thrift stores, we found an even higher rate of export with these trackers delivered to recyclers. Where the trackers went, how they got there, and who was directly and indirectly involved in the "chain of export" is revealed.

As we shall explain, equipment moving offshore illegally is a serious problem that warrants careful investigation and remedy. *However, it is important to note, and as we shall explain further, the presence of any particular company being listed as part of an "export chain" by itself is not an indication of irresponsible behavior.*

Further, while 205 trackers are a significant number, and this study is really the first of this scale for electronic waste, it is still a small sample size in view of the vast amount of electronic waste equipment generated in the United States today. It is important, therefore, to resist arriving at sweeping conclusions on the basis of a limited data set (See Methodology, Appendix 3).

Nevertheless, this data does report verified e-waste movement and begins to tell important stories and signal probable trends. This uniquely authentic data, moreover, underscores the need for more such studies that can follow-up and achieve a greater understanding of the initial findings.

Note: To avoid undue repetition and rewriting information published previously, we recommend that readers read each of our reports in sequence. All reports and information are available on our e-Trash-Transparency Project website.[3]

BAN wishes to give special thanks to our project partner organizations which helped us to achieve the success this project has enjoyed: Newspaper and media outlet HK01 in Hong Kong, KCTS, PBS affiliate in Seattle, the Body Shop Foundation in London, and MIT's Sensable City Labs in Cambridge.

3 www.ban.org/trash-transparency

Project Update

There have been a number of updates of note since the release of the first e-Trash Transparency report in May 2016:

A national feature news segment was produced by PBS affiliate KCTS and aired on PBS NewsHour with the release of the *Disconnect Report* on May 9. Reporters filmed tracker drop-offs in Seattle and followed Jim Puckett as he visited dump sites around New Territories.1

- The initial tracking project report was also released at the same time in Wired, The Intercept, and was widely shared on social media and the magazines Huffington Post, Popular Mechanics, Grist, etc.[2]
- Seattle-based electronics recycler Total Reclaim was found through the tracking project to be exporting e-waste to locations in Hong Kong. They subsequently had their e-Stewards certification status suspended, and issued a public apology.[3]
- Five additional trackers were deployed in the Seattle, WA area as part of the PBS reporting efforts. Three of these have already gone offshore after a few months. At the urgent request of WA state officials, BAN did an early release of tracking information on four WA

1 http://kcts9.org/programs/circuit/tracking-down-america%E2%80%99s-electronic-waste

2 Links to all coverage can be seen at http://www.ban.org/trash-transparency

3 http://www.ban.org/news/2016/5/5/total-reclaim-certification-revoked

HK01 News in Hong Kong, viewing electronics junkyards by use of drones. Screenshot.

PBS Newshour segment, The Circuit. Viewable at https://www.youtube.com/watch?v=n6FJJ29k8uc

recyclers caught in an e-waste export chain.[4]

- HK01, one of the largest newspapers in Hong Kong, did an in-depth follow-up investigatory series and three videos on the New Territories dump sites identified by BAN in the course of the project. Additionally, the South China Morning Post, TVB, and RTHK also did TV documentaries.[5]
- The issue has reached the highest level of government in Hong Kong with the Legislative Council calling the Environment Secretary, Mr. Wong to answer to BAN's allegations. BAN, in turn, has rebutted these statements.[6]
- In June of 2016, BAN presented the findings of the report to the 10th Open-ended Working Group of the Basel Convention held in Nairobi, the 21st meeting of Pollution Crime Group of INTERPOL in Glasgow, Scotland, and IMPEL Waste and TSF Conference in Eschborn, Germany.
- Many enterprise companies, recyclers, and governments have expressed interest in BAN assisting in conducting further tracking operations. At a face–to-face meeting, e-Stewards Certified Recyclers agreed to use trackers as part of BAN's performance verification program which until now just involved unannounced inspections.
- There are still 29 trackers considered to be still active and have the potential to move offshore.

4 http://www.ban.org/news/2016/6/20/watchdog-tracker-data-implicates-more-washington-state-recyclers-exporting-the-publics-toxic-electronic-waste-to-china

5 Links to all coverage can be seen at http://www.ban.org/trash-transparency

6 http://www.ban.org/news/2016/7/8/annotated-comments-by-ban-on-mr-wong-kam-sings-remarks

Facts and Figures

BAN deployed a total of 205 used electronic devices containing GPS trackers in the United States, between the dates of July 2014 and February 2016. Of those,152 (74%) were delivered to recyclers, 51 (25%) to charity thrift stores (mostly Goodwill stores), and 2 (1%) to retailers.

Dataset and rates of exportation

The project involved receiving and processing more than 40,000 data points with more than 700 unique defined locations. Those data points accurately identified 168 different electronics recycling companies, 75 (45%) of which were found to be involved in a chain of companies that eventually led to export.

Examining only the 152 devices delivered directly to recyclers...we find an even higher 40% rate of export.

Looking at all of the 205 tracker-enabled devices released, 69 (34%) of these have left the country. By our knowledge of waste trade law, 66 (32%) of those exported devices were likely to be illegal shipments, due to the laws of importing countries and their legal obligations as Parties to the Basel Convention (see Appendix 2: Export and the Law)

Examining only the 152 devices delivered directly to recyclers (the primary subject of this report), we find an even higher 40% (61/152) rate of export.

There are 29 tracker-enabled devices in the United States which are still considered to be active and have the potential to move offshore, 7 of these are reporting regularly.

The actual number of devices exported is likely to be higher than what we are able to report based on available data. This is due to the fact that it's very likely that some of the trackers may have lost their battery life before being exported, may have been damaged in transport, or were not able to transmit a signal once offshore due to technical reasons such as foreign cell phone system incompatibility or irregularity.

Where they ended up

In the following chart and map, the destinations of the 69 exports are revealed.

Most of the exported devices (53) ended up in one of 'three Chinas' – the Special Administrative Region (SAR) of Hong Kong, mainland China, or Taiwan. Because of the predominance of these final destinations, the last stage of the project involved BAN travelling to those locations in December of 2015, and again with PBS in March of 2016. Both times, the actual circumstances of the facilities and environment where the trackers landed were witnessed first-hand with GPS location devices and cameras. In each of the 'Chinas' BAN assembled a small team of local volunteers to assist in the investigation (see acknowledgements) of the tracker end-points.

Table 1. Summary of final tracker destinations

Countries Receiving Trackers (end point)	Printers Exported	CRT Monitors Exported	LCD Monitors Exported	Total Devices Exported	Likely Illegal
Hong Kong	13	1	23	37	37
China (mainland)	6	2	3	11	11
Taiwan	0	1	4	5	5
Pakistan	0	4	0	4	4
Mexico	0	3	0	3	0
Canada	1	1	0	2	2
Thailand	0	0	2	2	2
United Arab Emirates	0	0	1	1	1
Kenya	0	0	1	1	1
Cambodia	0	0	1	1	1
Dominican Republic	0	0	1	1	1
Togo	0	0	1	1	1
TOTAL	20	12	37	69	66

Map showing the relative export paths of the 205 tracker-enabled electronic equipment devices deployed by BAN in the e-Trash Transparency Project. © BAN. 2016.

By far, most of the exportation went to Hong Kong's New Territories area with a distant second destination being mainland China.

These new findings, based on tracking data, have revealed a much different picture than our findings over the past decade where it was observed that the vast majority of e-waste from North America went to mainland China, and most of that to Guiyu, a township and region in Guangdong Province. This previous data was the subject of our first report Exporting Harm (2002) (see History of BAN E-waste Campaign in Appendix 1). This dramatic geographic shift is indicative of China's recently escalated effort to enforce their long-standing e-waste import ban.

...most of the exportation went to Hong Kong's New Territories area with a distant second destination being mainland China.

Ironically, it appears that the Hong Kong (SAR), usually thought of as one of the most technologically and economically advanced areas of China, has not enforced the Chinese import ban as diligently as mainland China has, and appears to have in fact become a new pollution haven. Hong Kong's New Territories region near the mainland border now appears to be a new "ground zero" for e-waste processing.

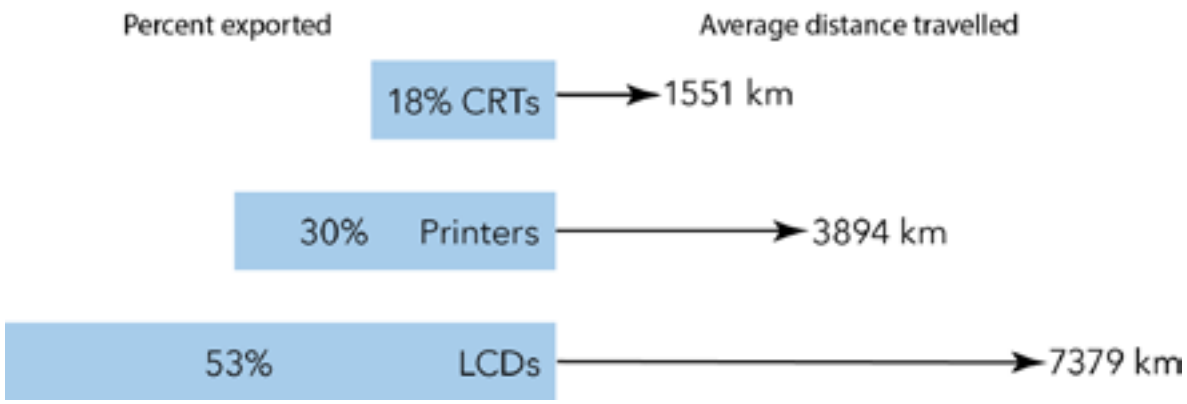
Tracker lifespan

The average lifespan of the tracking devices, from time of first reporting to last reporting, is approximately 98 days (with the lifespan of individual trackers varying wildly). Some stopped signaling immediately after being deployed, and in contrast, there are trackers that are still currently active after more than 600 days in the field. It is likely that the primary cause for trackers to become inactive before their normal battery life is exhausted is due to physical destruction (crushing, shredding, etc.).

Distance travelled

The average distance travelled for each device, as estimated by an analysis of the tracking data by MIT Senseable City Labs, is an amazing 4,220km (2,622 miles), with some of the individual pieces of tracked e-waste having travelled over 25,000km (15,534 miles) as they make their way overseas.

Summary of device movements



Differences by device type

Export statistics were found to vary significantly depending on the type of device being tracked. LCDs were exported nearly 3 times as often as CRTs and travelled nearly 5 times as far.

CRT = 18% (14/76 exported)
PRINTER = 30% (17/57 exported)
LCD = 53% (38/72 exported)

A few factors can be considered that might best explain these numbers:

- Proper LCD destinations in the US are rare and yet waste LCDs are more plentiful now than CRTs.
- LCDs weigh significantly less than CRTs, making them much cheaper to ship.
- The CRT rule in the US requires prior registration with the US EPA in order to ship them, unlike LCD screens, so there is some government control over export.

How is it getting there?

With the exception of a few shipments to Canada, Mexico (by road or rail), and one shipment to the Dominican Republic which behaved as if it were transported by air, all of the exports appeared to utilize intermodal container transit by ship.

As expected from the bulk of e-waste being tracked to Asian destinations, the majority of US e-waste exports left from the West Coast, often after having been moved across the country by rail. The most common ports, by far, were the adjacent ports of Long Beach and Long Angeles in California. East Coast ports see significantly less export occurring, with Port Newark in New Jersey appearing to be the most commonly used port.

Scale and significance

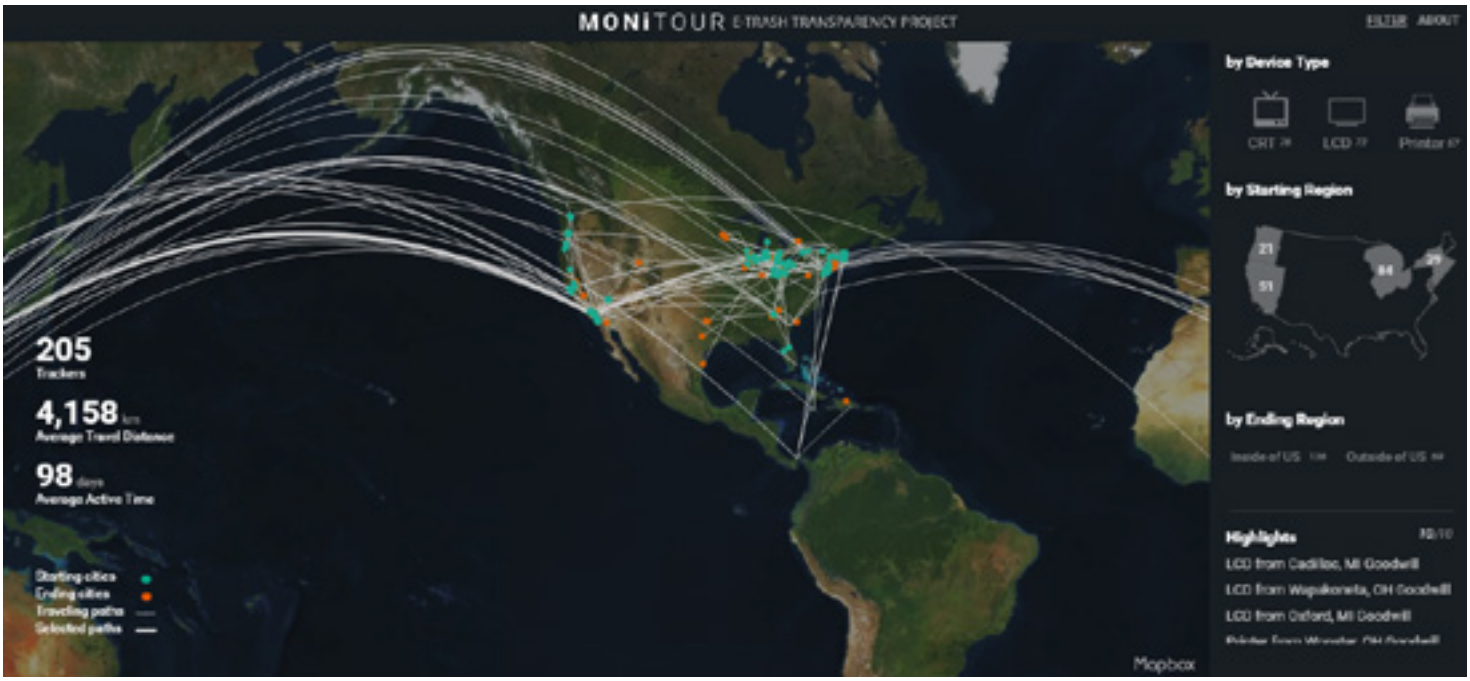
In the United States, according to the United States EPA, 3.14 million tons of e-waste are generated each year. Of that, 40% is thought to be "recycled" (not sent to landfill or to incineration).[1] Doing the math, we arrive at a figure of 1,256,000 tons annually that is handed over to recyclers. While our choices of printers, monitors, and CRTs may be most likely e-waste to be exported, they are also the heaviest items in the e-waste stream. For the sake of understanding the effects of mass scaling, assuming our percentages are roughly representative of total export of e-waste weight and conservatively estimate that just 25% is moving offshore instead of our actual finding of 32.5%, that would mean that about 314,000 tons are exported annually. If we assume a typical 40-foot intermodal container holds on average 20 tons of e-waste[2] that would equate to 15,700 containers per annum or about 43 containers per day being exported.

The average distance travelled for each device ... is an amazing 4,220km (2,622 miles)...

With respect to the recycling industry (not counting the charities and retailers), if we again conservatively estimate that 30% is moving offshore instead of our actual finding of 40%, that amount would equate

1 "Advancing Sustainable Materials Management. Facts and Figures 2013," published in June 2015. http://www.epa.gov/smm/advancing-sustainable-materials-management-facts-and-figures

2 This estimate is based on an industry insider estimate that a 40' high cube container of LCDs weighs between 30-40,000 lbs. These are not as heavy as CRTs and printers so we will use the figure of 40,000, or 20 tons.



Monitour/e-Trash Transparency Project visualization created by MIT's Senseable City Laboratory, 2016, showing all of the export routes of the project. Note, the solid white band from the Northeast/Midwest part of the country, showing movement by rail to Long Beach/Los Angeles Port and then to Hong Kong.

to 376,800 tons of e-waste and that would equate to about 18,840 containers per annum or about 52 containers per day being exported from the US. Again, these estimates are provided to illustrate the significance of our findings in relation to mass quantities of e-waste generated each year in the United States.

e-Trash transparency online map

After initial tracker deployments had begun, the Massachusetts Institute of Technology's Senseable City Lab (MIT-SCL) was brought on as a collaborative partner in a continuation of the successful Monitour projects which BAN and MIT-SCL had quietly conducted in previous years.

MIT-SCL's primary role for the e-Trash Transparency Project was to provide visualization for all the tracking data by developing a publicly accessible online map. The e-Trash Transparency website http://senseable.mit.edu/monitour is interactive in nature, allowing users to both follow curated storylines and explore individual tracker information at their own pace. For the release of the second report, all the GPS data observable on the map has been set to maximum levels of precision.

Companies Revealed in "Chains of Export"

"Chains of export"

The main subject of this report are the 75 recycling companies identified in the project that were part of what we will call the "chain of export".

The "chain of export" is a chain of waste disposal operations and operators that eventually leads to export and foreign waste handling. The "chain of export" may include several types of actors that may be various combinations of collectors, recyclers, brokers, and end processors. We speak of a chain because rarely does one recycler alone manage all phases of e-waste disposition; they often send certain materials onward to others or engage brokers to do so.

For the purposes of this study, we define and speak of three different potential positions/roles on the export chain, with some recyclers being in multiple positions/roles in the same chain.

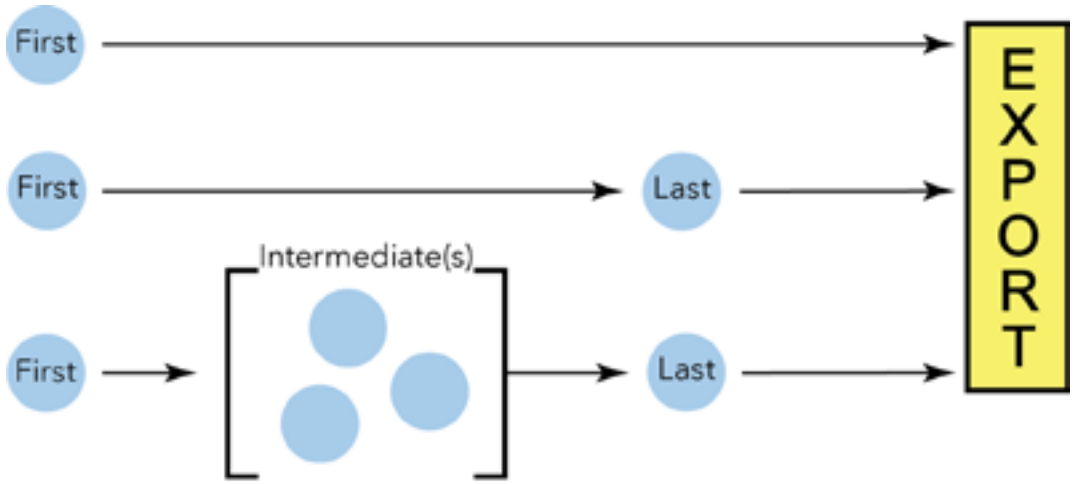
"First" we define as the company to which BAN initially delivered the tracker-enabled device.

"Last" we define as the last company to handle a device prior to export (also known as the **"apparent exporter"**).

"Intermediates" we define as any companies that handled material between the "first" and "last" handlers.

Companies that are the "last" handlers prior to export are most often the exporter and are, therefore, most likely willfully involved in exporting, as they most likely had direct control over the decision to export or not. For this reason, we call these actors "apparent exporters."

Visualizing "chains of export"



BAN operative approaching the Interconnection receiving dock to deliver an LCD monitor. This monitor later was exported to Hong Kong. © KCTS, Earthfix Program 2016.

Downstream due diligence

A company's involvement in a "chain of export", even though they may not be themselves the exporter, is of serious concern. Today, it is an established industry norm and practice that responsibility for waste management does not just extend to the edges of one's property boundaries

> *Of these 168 identified recyclers, 75 (45%) were found to have been involved in a "chain of export"...*

or ownership, but includes the choices and additional steps a company takes to verify that their downstream vendors operate responsibly. This concept is known as "due diligence" and it applies both to upstream supply chains as well as to downstream disposition chains. All recyclers have a responsibility to perform the necessary due diligence to know that their e-waste does not get harmfully or illegally exported after it leaves their operations.

Release of all tracking data

Until now, BAN's public reporting of the project's tracker data has only revealed the identities of a small percentage of recyclers involved in export chains. The first report of the e-Trash Transparency Project focused on the trackers delivered to the Goodwill charity stores and the only recyclers named were those which helped us tell that story. BAN has also revealed some tracking data in Washington State as part of its administrative role in the e-Stewards Certification program and cooperation with State officials.

The online graphic display of the entire project (Monitour/e-Trash Transparency

Project)[1] was also, until now, intentionally presented in low-resolution in order to concentrate on one subject at a time.

Now, however, we are ready to tell the rest of the story. Upon publication of this report, the MIT map will show coordinates in their original full resolution and all of the chains can be followed as accurately as possible from that interactive tool. We are also publishing detailed data of the companies found to be participants in a chain of export revealed by our project.

Through the analysis of more than 40,000 data points with more than 700 unique locations, the identities of 168 different electronic recyclers were definitively established. Of these 168 identified recyclers, 75 (45%) were found to have been involved in a "chain of export" and are listed in summary table 2.

A company's involvement in a "chain of export", even though they may not be themselves the exporter, is of serious concern.

Some companies are identified as being in multiple chains of export, and are noted with a), b), etc. A more comprehensive table detailing each export chain in full, along with additional information about the companies involved, can be found in Appendix 5.

1 senseable.mit.edu/monitour-app/

BAN operative approaching the Interconnection receiving dock to deliver an LCD monitor. This monitor later was exported to Hong Kong. © KCTS, Earthfix Program 2016.

Table 2: Summary Data of All Recyclers in "Chains of Export"

Note: Appearance on this table does not indicate or infer culpability. See page 23 for an understanding of a "Chain of Export". Shaded rows indicate recyclers who were found to be the last US handler of a device prior to export.

#	Company Name	Recycler location(s)	Position in export chain(s)	Device(s) exported	Cert at time of possession	Last reported location(s)
1	1 Green Planet	Renton, WA	First	LCD	None	Hong Kong, New Territories
2	Accurate IT	Columbus, OH	First & Last	CRT	R2	Pakistan
3	ACT Secured Recycling	Lawrence, MA	First	Printer	None	Hong Kong, New Territories
4	Advance Trading Corp	Ontario, CA	a) Intermediate b) Last	a) LCD b) LCD	None (No cert at time of export, but became R2 certified ~4 months after handling exported device).	a) Hong Kong, New Territories b) Cambodia
5	Advanced Recovery Inc (ARI)	Newark, NJ	First	LCD	R2	Hong Kong, New Territories
6	AERC Recycling Solutions (formally Com-Cycle)	Hayward, CA	First	LCD	R2	Hong Kong, New Territories
7	All eWaste*	Santa Clarita, CA	First	Printer	e-Stewards*	Hong Kong, New Territories
8	Allied Computer Brokers	Amesbury, MA	First	LCD	None	Hong Kong, New Territories
9	ARCOA	Waukegan, IL	First	LCD	R2	Hong Kong, New Territories
10	Attan Recycling Corp	Chino, CA	a) First & Last b) First	a) CRT b) LCD	None	a) Taiwan b) Cambodia
11	Avnet	Groveport, OH	Intermediate	Printer	R2	China
12	Blind Center of Nevada	Las Vegas, NV	First & Last	CRT	R2	Mexico
13	Blue Star Electronics, LLC (Hayward Ewaste)	Hayward, CA	a) Intermediate b) First & Last	a) LCD b) LCD	None	a) Hong Kong, New Territories b) Hong Kong, New Territories
14	Cal Micro Recycling	Ontario, CA	Intermediate	Printer	R2	Hong Kong, New Territories
15	Cal State Electronic Recycling (CSER, Inc.)	San Marcos, CA	a) First & Last b) Intermediate	a) LCD b) LCD	None	a) Thailand b) Hong Kong, New Territories
16	Chicago Surplus Computer (CSC)	Chicago, IL	a) First b) First c) First & Last d) First & Last	a) CRT b) LCD c) CRT d) LCD	None	a) Pakistan b) UAE c) Pakistan d) Hong Kong, New Territories
17	CRT Recycling	Brockton, MA	First & Last	CRT	R2	Pakistan
18	Earthworm Recycling	Somerville, MA	First	Printer	None	Hong Kong, New Territories
19	Ecobinary LLC	Beaverton, OR	First	LCD	None	Hong Kong, New Territories

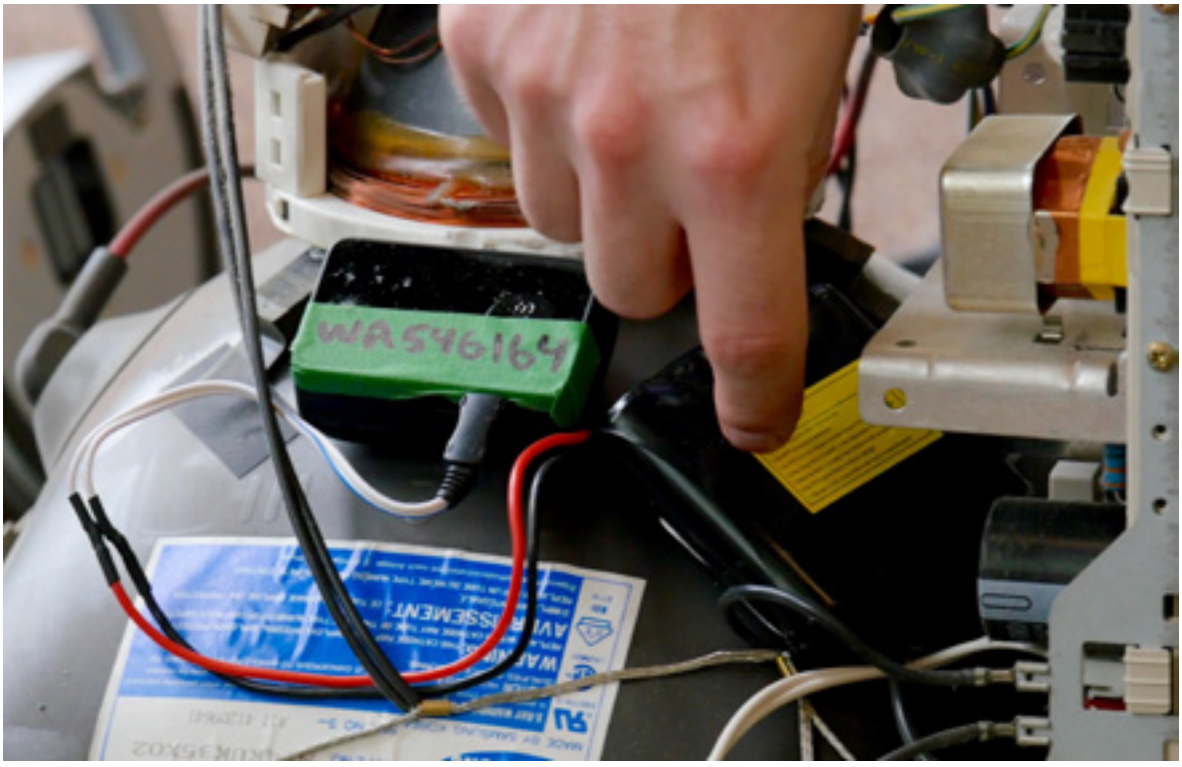
#	Company Name	Recycler location(s)	Position in export chain(s)	Device(s) exported	Cert at time of possession	Last reported location(s)
20	ecoTech Management	Holbrook, NY	Intermediate	Printer	R2	Hong Kong, New Territories
21	ECR World	Chino, CA	Last	LCD	R2	Hong Kong, New Territories
22	Electronics Recycling Services INC dba Green E-Waste Recycling Center	San Jose, CA	First & Last	LCD	None	Hong Kong, New Territories
23	e-Recycling of California*	Irvine, CA	First	LCD	e-Stewards*	Hong Kong, New Territories
24	eRevival LLC	Garfield, NJ	First & Last	CRT	R2	Hong Kong, New Territories
25	E-Scrap Solutions	Cleveland, OH	First	LCD	R2	Hong Kong, New Territories
26	E-Tech Management	Columbus, OH	a) First & Last b) First & Last	a) CRT b) Printer	None	a) Canada b) Hong Kong, New Territories,
27	e-Waste, LLC	Hudson, OH	First	LCD	R2	Hong Kong, New Territories
28	EWC Group Recyclers (eWaste Center)	a) Commerce, CA b) Tukwila, WA	a) First & Last b) Last	a) Printer b) LCD	None	a) Hong Kong, New Territories b) Hong Kong, New Territories
29	EZPC	Santa Ana, CA	First	Printer	None	China
30	Far West Recycling	Portland, OR	First	LCD	None	Taiwan
31	Golden Valley Trading	Chino, CA	a) Last b) Last c) Last d) Last	a) LCD b) LCD c) LCD d) Printer	None	a) Taiwan b) Hong Kong, New Territories c) Hong Kong, New Territories d) Hong Kong, New Territories
32	Good Point Recycling	Middlebury, VT	Intermediate	Printer	R2	Hong Kong, New Territories
33	Great Lakes Recycling	Oak Park, MI	Intermediate	LCD	None (No certification at time of export, but currently R2)	Taiwan
34	Green Earth Electronics Recycling	St Joseph, MI	First	LCD	None	Taiwan
35	Green Network Exchange (H&K E-Cycle International	Woburn, MA	First & Last	CRT	None	China
36	Green Tech Recyclers	Oak Park, MI	First & Last	CRT	None	Canada
37	Growan Inc.	South El Monte, CA	Last	Printer	None	Hong Kong, New Territories
38	IMS Recycling	Poway, CA	First & Last	Printer	R2	China
39	Inline Computer Recycling	Akron, OH	First	LCD	None	China
40	Intercon Solutions	Chicago Heights, IL	Intermediate	CRT	R2	Mexico
41	Interconnection	Seattle, WA	First	LCD	R2	Hong Kong, New Territories
42	IQA Metals	Chino, CA	Last	Printer	None (No certification at time of export, but became R2 certified a few months later)	Hong Kong, New Territories
43	ITAD Solutions	San Francisco, CA	First	Printer	R2	China
44	J&D Recyclers	Sidney, OH	Intermediate	LCD	None	Hong Kong, New Territories

#	Company Name	Recycler location(s)	Position in export chain(s)	Device(s) exported	Cert at time of possession	Last reported location(s)
45	M&K Recovery Group	North Andover, MA	First	Printer	R2	China
46	Maven Technologies	Rochester, NY	First	LCD	R2	Hong Kong, New Territories
47	Miller Recycling	Mansfield, MA	First	Printer	None	Hong Kong, New Territories
48	Monmouth Wire & Computer	Tinton Falls, NJ	First & Last	Printer	R2	Hong Kong, New Territories
49	Mr. E-Waste	Hudson, NY	First	Printer	None	Hong Kong, New Territories
50	Nevada State Recycling	Las Vegas, NV	First	LCD	None	Hong Kong, New Territories
51	Newtech Recycling Inc.	Somerset, NJ	First & Last	LCD	R2	Hong Kong, New Territories
52	PADNOS	Wyoming, MI	Intermediate	LCD	None	Hong Kong, New Territories
53	PCRR	Chicago, IL	First	CRT	R2	Mexico
54	Raw Material Recovery Corporation	Gardner, MA	Intermediate	Printer	None	Port of Hong Kong
55	Recology Oregon Material Recovery	Portland, OR	First	LCD	None	Hong Kong, New Territories
56	Remitek Inc.	Fremont, CA	First	LCD	None	Hong Kong, New Territories
57	RMG Enterprise Inc	Londonderry, NH	First	LCD	R2	Hong Kong, New Territories
58	RS David Recycling	Clackamas, OR	First	CRT	None	Mexico
59	SAMR Inc	Lakewood, NJ	First & Last	LCD	None	Hong Kong, New Territories
60	Sarah's Trading	Doraville, GA	First & Last	LCD	None	Hong Kong, New Territories
61	Schupan and Sons Inc.	Kalamazoo, MI	a) First b) Intermediate	a) LCD b) LCD	R2	a) China b) Hong Kong, New Territories
62	SEER (Secure Environmental Electronics Recycling)	Tampa, FL	First	LCD	R2	Port of Hong Kong
63	Sims Recycling Solutions (Contracted other recycler)	Mahwah, NY	First	LCD	R2	Hong Kong, New Territories
64	T Electronics dba Silicon Valley Recycling	Santa Clara, CA	Last	Printer	None	China
65	TBS Industries	Philadelphia, PA	Last	Printer	R2	Hong Kong, New Territories
66	Techrecyclers LLC	Elizabeth, NJ	Intermediate	Printer	R2	China
67	Total Reclaim*	a) Portland, OR b) Portland, OR c) Seattle, WA	a) Last b) Last c) Last	a) CRT b) LCD c) LCD	e-Stewards*	a) Mexico, b) Hong Kong, New Territories c) Hong Kong, New Territories
68	Tri-Valley Electronic Waste Recycling	Stockton, CA	First	LCD	None	Kenya
69	TW Recycling	Los Angeles, CA	Intermediate	LCD	None	Hong Kong, New Territories
70	UNITEC Recycling Corporation	West Chicago, IL	Intermediate	LCD	None	United Arab Emirates
71	Urban Renewal	Kerney, NY	First	LCD	None	Dominican Republic
72	Valley City Electronic Recycling	Kentwood, MI	First	Printer	R2	China
73	Windfield Alloy*	Lawrence, NH	First	CRT	e-Stewards*	China

#	Company Name	Recycler location(s)	Position in export chain(s)	Device(s) exported	Cert at time of possession	Last reported location(s)
74	WTB Electronics Recycling Import & Export	Santa Ana, CA	Last	LCD	None	Cambodia
75	Yesterday's Business Computers	Hillsborough, NJ	First & Last	Printer	None	Hong Kong, New Territories

** Four e-Stewards Recyclers are subject to investigation by BAN by virtue of its role in administering the e-Stewards Certification program, which has a Critical Non-Conformity policy to address potential violations. Total Reclaim has already been investigated (see box) and has admitted to their violations of the e-Stewards Standard; they have had their certification withdrawn for a minimum of two years. The other three companies, All eWaste, e-Recycling of California, and Windfield Alloy are other e-Stewards companies that were either first deliveries or intermediaries in the respective chains of export. Windfield Alloy states that they sent all of their CRT devices to another e-Stewards recycler during the period of time that a GPS-enabled CRT device was delivered to Windfield's facility. Windfield Alloy has provided evidence that supports their claim, and the downstream e-Steward has provided a detailed record supporting their claim that CRT glass in that shipment was processed in-house. e-Recycling of California has also submitted records in response to tracker data. All eWaste has not yet responded to notice of investigation. At time of publication of this report, BAN is still investigating these three cases and final determinations are pending.*

Tracker deployed on a CRT in Washington State. This device went from 1 Green Planet to e-Waste Center and then was exported to Hong Kong. © KCTS, Earthfix Program, 2016.



Discussion

Interpreting data hotspots

Within our dataset, we have identified two "hotspot" areas through which an above-average number of exported devices have travelled. However, in these locations for one reason or another, the tracker readings available to us were not always definitive direct GPS readings, but rather more ambiguous cell tower readings.

One such example of a hotspot area appears to be the city of Chino, CA, east of Los Angeles. This area is home to a number of companies that have been shown in the past to be either the last holders in an export chain, or were involved previously in exports of containers photographed in their yards and traced offshore. These apparent exporters include Golden Valley Trading, IQA Metals (formerly ECR World), and Attan Recycling. This Chino area had approximately 10 unique stops confirmed by GPS coordinates and at least 3 unique stops shown by cell tower hits which we cannot assign to any specific recycler.

Another hotspot is the Groveport, Ohio area. While we have 1 instance of a confirmed GPS reading that went through the Avnet Inc. company, at least 5 other exported devices travelled through the nearby area but were giving less accurate readings in the vicinity. Thus, we cannot definitively ascribe these 5 trackers to Avnet in this report, but we find no other recyclers of note in the vicinity.

Reasons for appearance in "chain of export"

There are many reasons that a recycler might be found in a chain of export, all with varying degrees of culpability from willful violations to complete innocence. Virtually everyone in the electronic recycling trade knows that export is harmful or illegal; given this fact, it is useful to discuss three primary categories of companies:

- First, there are those that *willfully export,* and are well aware that they are doing so, despite the legality, and harm this practice may cause.
- Second, there are those that are *not aware of the export* taking place downstream of their operation. But this ignorance may be more due to the fact that they do not want to know, or do enough to find out. For example, they might just have the attitude that they like the way business is going and what one does not know they believe can't hurt them. Another way to see this this form of willful ignorance is simply not applying the appropriate levels of due diligence.
- And third, there are those that have taken all steps and have made *great effort to ensure against export* in their in-house business operations and in their downstream chain of disposition, even when this costs them significantly more. They actively seek customers that care about the issue and are willing to pay the ethical price. However, this ethical actor may nevertheless be an innocent victim of fraud by a downstream actor they trusted.

For the reasons laid out above, it is impossible to assert definitively that mere

appearance within the chain of export means that the company is irresponsible or responsible. Usually, more information and investigation over who made the decision to export will be required. However, what is clear is that these exports are almost all resulting in illegal, unsustainable, harmful toxic exposure. The exports do not happen without somebody in the chain deciding to export, and by so doing have impugned the integrity of every actor in the chain. The appearance, therefore, of any company in the "chain of export" should be a cause for serious alarm, further investigation, and corrective measures as necessary.

Recycler data notes

The summary table identifies 54 companies with 61 devices as being the first receivers of e-waste getting it directly from BAN volunteers, 16 companies were identified as being intermediate handlers of devices which eventually got exported, and 28 (indicated by shading) companies as being "Last" handlers (apparent exporters).

Among the apparent exporters, two companies identified, stand out as being the most prolific: Golden Valley Trading (GVT) in Chino, CA, and Chicago Surplus Computers (CSC) in Chicago, IL. Both of these "recyclers" were found to have exported all 4 devices that passed through their facilities. However, again the small sample size and the multiple deliveries to CSC can lead to false conclusions if compared to the rest.

Three of the devices exported by GVT actually originated at Goodwill stores which were part of the Dell Reconnect recycling program.[1] All three of these devices initially travelled from Goodwill locations in the Midwest through the noted hotspot of Groveport, Ohio mentioned above, where Avnet is located.

1 See: www.ban.org/trash-transparency Report: Disconnect: Goodwill and Dell Exporting the Public's e-Waste to Developing Countries

BAN's Jim Puckett on the trail in New Territories, Hong Kong, using GPS reader and Google Earth to navigate to location identified by tracker. © KCTS, Earthfix Program, 2016.

Export and Certifications

Performance Comparison

The e-Trash Transparency Project's device delivery methodology was agnostic in regards to electronics recycler certifications. This fact was reflected in delivery rates that were representative of the actual certification landscape: 47 trackers were delivered to R2 facilities, and 9 to e-Stewards, resulting in a ratio of approximately 5.2:1). This ratio appears to be representative of the approximately 532 R2 facilities and 101 total e-Stewards facilities currently in the United States — a ratio of 5.3:1.

Providing ratios on uncertified companies would be challenging due to the lack of reliable data on the actual numbers in the country; however, as expected, our study deliveries based on likely consumer choices found many more uncertified companies than certified companies.

In the interest of comparing the performance of certified recyclers with respect to what are likely to be illegal exports, one must first understand the small sample size of the entire study, and then understand the even further reduced sample size of certified participants. There is a real danger, as we have noted before, in extrapolation of small samples to arrive at reliable conclusions. Having said that, and bearing that firmly in mind, it is important to report on the findings of this study and what we believe they may indicate.

At the outset, we must iterate that of the 205 trackers in the study, 152 of these were, in fact, delivered directly to recyclers and not to charities or retailers. Below, we look at the question of exports relative to certifications through 3 different lenses.

Table 3. First, we examine the question with each and every tracker-enabled device (152) delivered by BAN to a recycler. (top table opposite)

Table 4. Next, we acknowledge the fact that some of the recyclers received more than one delivery. If we wish to eliminate the data from multiple deliveries to one facility, in order to better understand certified versus non-certified practices, we are left with a list of 128 unique recycler deliveries. (middle table opposite)

Table 5. If we take the entire set of data of unique electronics recyclers involved anywhere in the tracking chains (168), including the trackers discovered after delivering to Goodwill Industries and other charities and retailers and intermediate companies etc. but later sent on to recyclers, we see a slightly different picture. (bottom table opposite)

Performance of certification with apparent exporters

As indicated above, the last holder in a chain of export is likely to be the exporter, otherwise, our tracker would have likely shown another intermediate holder prior to arrival on a foreign shore. For this reason, we take a special look at these "apparent exporters." Out of all of the 69 export chains our trackers have identified, we were able to positively identify 27 unique companies that acted as the "last" holders of the devices prior to export. Of those apparent exporters, 17 were non-certified, 9 were R2, and 1 (Total Reclaim) was e-Stewards.

Table 3: All trackers delivered to recyclers	Uncertified	R2	e-Stewards	Total
Trackers Delivered to Recyclers	95	48	10	152*
Exported	35	23	3	61
Percent Exported somewhere in the chain	37%	48%	30%	40%

**One company was dual-certified to both the R2 & e-Stewards standards and so is counted under both certification columns. However, we did not alter the total for this exercise.*

Table 4: Unique recyclers recieving initial delivery	Uncertified	R2	e-Stewards	Total
Total Unique Recyclers Receiving Initial Delivery	79	41	9	128*
Exported	30	23	3	56
Percent Exported	38%	56%	33%	44%

**One company was dual-certified to both the R2 & e-Stewards standards and so is counted under both certification columns. However, we did not alter the total for this exercise.*

Table 5: All recyclers who posessed trackers	Uncertified	R2	e-Stewards	Total
Total Unique Recyclers Found in Project	100	58	13	168*
Involved in Export Chain	40	31	4	75
Percent in Export Chain	40%	53%	31%	45%

**Three companies were certified to both the R2 and e-Stewards standards and so are counted under both certification columns. However, we did not alter the total for this exercise.*

What Do These Figures Tell Us?

Looking at each of the three lenses in the tables above we can see that R2 had higher rates of export than e-Stewards and

> *...R2 had higher rates of export than e-Stewards and even higher rates than uncertified companies.*

even higher rates than uncertified companies had. Uncertified companies also had rates lower than average but not as low as e-Stewards. No exports were found among the three companies which were dual certified to both the R2 and e-Stewards standards.

> *...there were nine times as many apparent exporters.... certified to R2 than were certified as e-Stewards.*

When uniquely looking just at the" last" holders, we can see that these apparent exporters were mostly uncertified. Among those that were certified, there were nine times as many apparent exporters (9 to 1) certified to R2 than were certified as e-Stewards.

In accordance with our previously reported data in Table 1 and discussion, almost all of the exports were likely to be illegal.

Uncertified recyclers (below average export rate)

It is hard to understand precisely why uncertified recyclers would have lower export rates than R2 Certified recyclers. If it is not due to the anomaly created by a small sample size, it could be that due to the increased costs of certification, many uncertified recyclers are likely to be smaller revenue-generating firms that have shorter disposal chains to simplify operations. Shorter chains would mean less likelihood that at least one of the operators was exporting.

Another possibility is that R2 has acted as a magnet for exporters, as recyclers know it can be done under R2's relaxed export restrictions which don't implement Basel Convention rules,[1] while still sending positive messages to potential customers with a certification in hand — and one which the US EPA has supported despite identified loopholes that allow exportation.

R2 certification (higher than average export rate)

As has been explained in previous BAN publications,[2] R2 deliberately provides, in many aspects, a departure from the established norms of the Basel Convention– the international treaty governing trade in wastes. This has been possible because R2 was originally negotiated in the United States and under the guidance of the US EPA. The US government is not a Party

1 See R2: Non-Compliance by Design, http://wiki.ban.org/images/2/23/R2_Non-Compliance_by_Design.pdf

2 Ibid.

to the Basel Convention and has always been antagonistic to waste trade restrictions posed by it, such as the Basel Ban Amendment. Indeed, as was dramatically pointed out when all of the environmental groups walked out of the R2 negotiations, R2 allows exports to proceed in ways that are likely to be illegal under the Basel Convention and the national laws implementing it.

The problems singled out include:

- R2 does not require the written consent of an importing or transit country's Competent Authority, as required by law in 184 countries.
- R2 does not cover all of the toxic substances covered by the Basel Convention hazardous waste definitions. For example, they refuse to regulate arsenic, selenium, cadmium, beryllium, asbestos, and flammable solvents found in e-wastes, all covered by Basel definitions of regulated waste.
- R2 creates its own definition of 'key functions' which allows an end-user to decide if a subset of originally intended functions will serve their purpose (of any kind). This is not compliant with the Basel Convention definition.
- R2 does not discuss the 150 countries[3] that cannot accept any form of hazardous e-waste from the United States for any reason.
- R2 does not require all of a multi-site company's facilities to conform to the R2 Standard. Thus a single facility of a company can fly the R2 flag while its other facilities or ancillary sites do all of its exporting.
- R2 does not implement the Basel Ban Amendment, which is not yet in force internationally but has been adopted by many countries including all 28 member states of the European Union. (This is the consensus decision by Basel Parties to disallow hazardous waste to go from developed to developing countries for any reason.)

With the above loopholes built into the R2 standard, it is relatively easy to find an avenue for illegal export and still remain in compliance with R2. Thus, export that would be illegal under the Basel Convention is possible but will not be exposed or found to be a non-conformity by an R2 auditor. This provides recyclers with the opportunity to 'have their cake and eat it too' as they can export while claiming they follow an EPA-recognized standard with 'tough-sounding' export language.

With the above loopholes built into the R2 standard, it is relatively easy to find an avenue for illegal export and still remain in compliance with R2.

BAN reached out to SERI/R2 far in advance of this report, in the spirit of perceived common interest of improving electronics recycling practices. We offered to provide R2 with names and detailed tracking information on all of their recyclers observed in this project. The offer was declined, with their statement that the information was not necessary. It remains unclear how SERI plans to police their program without

3 These are the Basel Parties that are not OECD member states. The Basel Convention (184 Parties) does not allow trade between Parties and non-Parties (such as the US) unless a special agreement is signed. The only special agreement signed is between the 34 OECD member states.

knowledge of potential bad actors. But the offer stands for any details this report and the updated MIT Monitour has not already supplied.

e-Stewards certification (lower than average export rate)

The e-Stewards program was largely created to rectify the fact that R2 did not conform to the Basel Convention and the Basel Ban Amendment. It strictly adheres to the Basel definitions and requires US (and other) companies to follow the obligations of the Convention and the amendment, even while the US government remains a non-Party to the Convention.

Imports of any hazardous electronic waste are not permitted at all from the US in any non-OECD country and the e-Stewards Standard makes this clear. In the e-Stewards Standard, non-functional or untested material is defined as waste and, if hazardous, is forbidden to be exported anywhere in the recycling chain to developing countries. Non-functional means 'not able to perform the original functions of the equipment', regardless of what purpose any buyer might have for the e-waste. Due to concerns of waste dumping, seriously deficient batteries are required to be removed from otherwise functional equipment prior to export if moving to a developing country, from a developed one.

Additionally, the e-Stewards program requires an entire multi-sited company to become certified to the e-Stewards Standard, even requiring all related storage, collection, and administrative facilities to be managed under their environmental, health and safety management systems. All e-Stewards requirements apply to e-waste that the recycler controls but does not bring into their processing facilities. These and many other controls are important steps in ensuring waste is not being diverted to non-conforming facilities with lower standards.

Further, the e-Stewards program has pioneered performance verification techniques and was the first to adopt unannounced inspections of recycler facilities, and most recently has incorporated electronic tracking devices to ensure accountability for its certified recyclers. As a result of these measures, one company – Total Reclaim — has had its certification withdrawn for two years for secretly and directly exporting LCD screens to Hong Kong, as discovered by the use of tracking devices.

The routine use of trackers has now been uniquely instituted by e-Stewards as part of its Performance Verification.

For the above reasons, it is not surprising that e-Stewards Recyclers in our study are below the average for exports. What is still surprising is that four out of thirteen e-Stewards companies involved in our study were, in fact, in some way involved in a chain of export, either by exporting themselves (as was the case with Total Reclaim), or perhaps by not providing enough careful vetting of a downstream vendor as is required by the standard. Of course, as mentioned earlier, it is possible that they were victims of willful deceit on the part of trusted vendors. Investigations on three of the e-Stewards Recyclers (the others besides Total Reclaim) are pending.

One of the three junkyard locations BAN visited where the LCD tracker from Total Reclaim ended up. Many CCFL tubes were broken and tossed into this pile. © BAN. March 2016.

High rates of export despite standards

While some of the R2 exports can be explained by a weaker standard that allows exports as discussed above, others including the e-Stewards exports speak to the flaws of a system that is largely held accountable through audits alone. Audits are an excellent method of verification of onsite activities but audits are not very helpful when it comes to matters of trade, when shipments can be loaded at night or at a partner's location. When greater profits result from such cheating, that behavior could be incentivized in the absence of other effective conformity assurance techniques in place.

The e-Stewards certification was the first to perform unannounced inspections and now R2 is doing the same. The technique that is proving to be most effective to counter export violations, however, is clearly through the use of GPS tracking devices. Had the trackers been employed earlier and the word was out that such trackers were being employed, it is highly likely the export rates would be substantially reduced in both programs. The routine use of trackers has now been uniquely instituted by e-Stewards as part of its Performance Verification program along with unannounced audits. BAN/e-Stewards is also offering this service to enterprises, governments, recyclers, and other civil society watchdog groups wishing to maintain the highest levels of accountability and risk reduction.

Misrepresentation: From Greenwashing to Fraud

While looking at the facts of where devices have actually ended up after being in the hands of certain companies, it is important to also look at the initial promises made by these same companies to handle them appropriately. It is clear, that by comparing the data from our trackers and the company website statements, that deception and fraud are commonplace in the electronics recycling industry. Many electronics recyclers are misrepresenting themselves to the public and their customers on how the e-waste they handle will actually be managed.

Check the website of almost any company claiming to be an electronics recycler or refurbisher and you'll be bathed in green imagery, words, and affiliations without any real proof to back up those claims. BAN archived and examined the websites of all of the companies found to be in a chain of exporting e-waste and found most to be covered with "greenwash", and many of them included statements that were false or highly misleading.

Sometimes, the dishonesty comes in the form of environmentally-friendly buzzwords and imagery, or by citing positive affiliations with other organizations. These tactics are often referred to as "greenwashing" in view of what is projected versus reality. But in other cases, we see actual false statements made, constituting false advertising, and misrepresentation, which if violating contracts could represent fraud. We explore each of these, greenwashing and false representation in turn.

Screenshot from Tri-Valley Electronic Waste Recycling website: www.trivalleyrecycling.com

Screenshot from Green Earth Electronics Recycling website: www.greenearth1.com

Much of the greenwashing is accomplished with feel-good green imagery drawing associations between nature, happy people, globes in caring hands, leaves growing out of electronics etc. We see a painfully ironic example of this in the images we have drawn from IQA metals website and images we took in New Territories where one of their old printers they were supposed to recycle ended up (see page 40 and 41).

We also read many examples of repeated turns of positive phrases: "zero waste to landfill," "diversion from landfill," "closed loop," "urban mining," and more recently, "circular economy." All of these are misleading in the context of exportation.

We observed some companies involved in the export chain seeking an aura of credibility by noting affiliations with business associations such as the Institute of Scrap Recycling Industries (ISRI), or electronics recycling certification schemes (including R2 that fails to fully prohibit the export of electronic waste by design), or state and federal government programs. On some websites, the US Environmental Protection Agency (EPA) is mentioned, either as giving approvals or permits even when none are necessary, or claiming membership in EPA's Wastewise program (which does not concern itself with offshore export). Companies also cite their affiliations with State programs which cannot legally concern themselves with offshore export.[1] It is shameful that our government agencies are affiliated in this way with violations of international law.

It is shameful that our government agencies are affiliated in this way with violations of international law.

Certainly the rampant misrepresentation makes matters very difficult for consumers trying to find an ethical recycler when all are making the same "green" statements – lies or not. Currently, this false advertising/misrepresentation to clients has not received much legal attention, but this could soon change.

1 Due to the commerce clause in the US Constitution, states cannot interfere in foreign commerce.

Green Imagery

Example of typical "green imagery" commonly used by many recyclers to paint their activities as benign and sustainable. This is from the "Sustainability" section of the IQA Metals website:

http://www.iqametal.com/sustainability

Their website has the following text: "Strict control of exportation of hazardous electronic wastes to conform to the Amendment to the Basel Convention and other existing laws. Exporting of hazardous e-waste from developed to developing countries is not permitted."

Grim Reality

Example of the reality for many exported devices. Photo taken at an abandoned New Territories processing yard. IQA metals was found to have handled a device that was exported to a similar New Territories location down the road from here.

As a part of this tracking investigation BAN commissioned professional legal research (see Appendix 4) regarding fraudulent recycler claims and e-waste export. We have learned that even in circumstances where the export may not be technically illegal under US environmental or trade laws, there are a number of possible claims that can brought in the United States against recyclers who falsely advertise that they do not export electronic waste:

"The companies and their officers could be charged or sued under a number of statutes, including: state laws for consumer protection and false advertising, federal unfair practices (15 U.S.C. § 45) or false advertising (15 U.S.C. § 52), and a number of statutes in connection with government contracts, such as criminal false claims (18 U.S.C. § 287), civil false claims (31 U.S.C. § 3729), false statements (18 U.S.C. § 1001), mail fraud (18 U.S.C. § 1341), and wire fraud (18 U.S.C. § 1343)." (see Appendix 4 for full summary assessment)

In the cases of United States v. Executive Recycling, Inc., and United States v. Richter, a recycling company and its officers were charged and convicted for multiple counts of fraud for falsely claiming to government and other contractors that they responsibly recycled their e-waste and would not export it. The defendants were convicted for using the postal service and internet to transmit these claims comprising multiple counts of fraud. In 2013, Executive Recycling received a $4,500,000 fine and owner Brandon Richter was sentenced to 30 months in prison. This story was originally brought to light by the work of BAN and 60 Minutes back in 2008.[1]

The public must realize that the claims written on a website or in an advertisement may very well be baseless or outright lies.

...a recycler involved in misrepresentation can be subject to immense civil and criminal penalties under state and federal statutes.

Until our tracking devices were deployed, it was very difficult for unethical companies to be caught and punished for false representation, as the government was only enforcing environmental laws on the books, and auditors could be gamed by keeping double books. Now, however, trackers can spotlight fraudulent activity.

It is abundantly clear that a recycler involved in misrepresentation can be subject to immense civil and criminal penalties under state and federal statutes. With new tracking technology that can be employed by a customer, a government agency, or by an NGO, new evidence of fraud or false representation is suddenly available.

In the Comprehensive Table on Appendix 5, we indicate where a company caught in a chain of export has made false statements on their website promising no e-waste export or discussing related environmental laws. The table also notes if a company is a member of the industry lobbying group ISRI, if the EPA is mentioned, or if they actively participate in a state recycling program.

1 The Wasteland, CBS 60 Minutes, 2008, https://www.youtube.com/watch?v=cVORBbZBbOk

Selection of screenshots from different electronic recycler websites with green imagery.

New Territories: Home of Hong Kong's Electronic Junkyards

Readers may be surprised to learn that the global center for e-waste importation is now Hong Kong. In the past, this dubious honor belonged to the Guiyu area of Guangdong Province in mainland China which BAN first publicized in its report Exporting Harm in 2002.

...the global center for e-waste importation is now Hong Kong.

Unlike Guiyu or other areas of the world that have seen a flood of e-waste importation, Hong Kong has the global reputation and image of being one of the most highly developed, sophisticated, and modern regions in the world. But there is an entirely different side of Hong Kong, an area known as New Territories.

All of the trackers that arrived in Hong Kong and stayed in Hong Kong moved from the port to this New Territories area– the broad swath of largely rural land abutting the mainland Chinese border on the North, the Kowloon commercial area to the South, and surrounded by the sea on the East and West. To drive from one end of New Territories to the other takes about two hours without traffic.

It is in New Territories that many informal and largely unregulated makeshift business operations have been allowed to thrive. Many of the businesses we observed in this area are ones that need a bit more land to operate: furniture factories, scaffolding vendors, large metal fabrication, auto and bus body workshops, illegal gasoline vendors, a great deal of general import and export staging, and a very high percentage of electronics junkyards – the subject of this report. Most of these operations take place in leased plots whose property lines are defined by tall steel fences, locked gates, and dogs. They use old intermodal containers as offices. New Territories is also a region of many residences and is also Hong Kong's primary agricultural area with significant vegetable production, pig farms, and fish farms dotted around the landscape.

It is not precisely known how many electronics junkyards currently operate in New Territories. BAN's tracking found 48 unique sites in New Territorites but it was very clear after several visits that this was not near the totality as we kept finding different sites our trackers had not discovered as we drove through the region. We estimate there are between 100 and 200 sites currently, with most of these concentrated around an area known as Ping Che, not far from Fanling in the east and Yuen Long (and areas to the west of Yuen Long), on the western side of New Territories. Some of the electronic junkyards are adjacent to

BAN's tracking found 48 unique sites in New Territories...

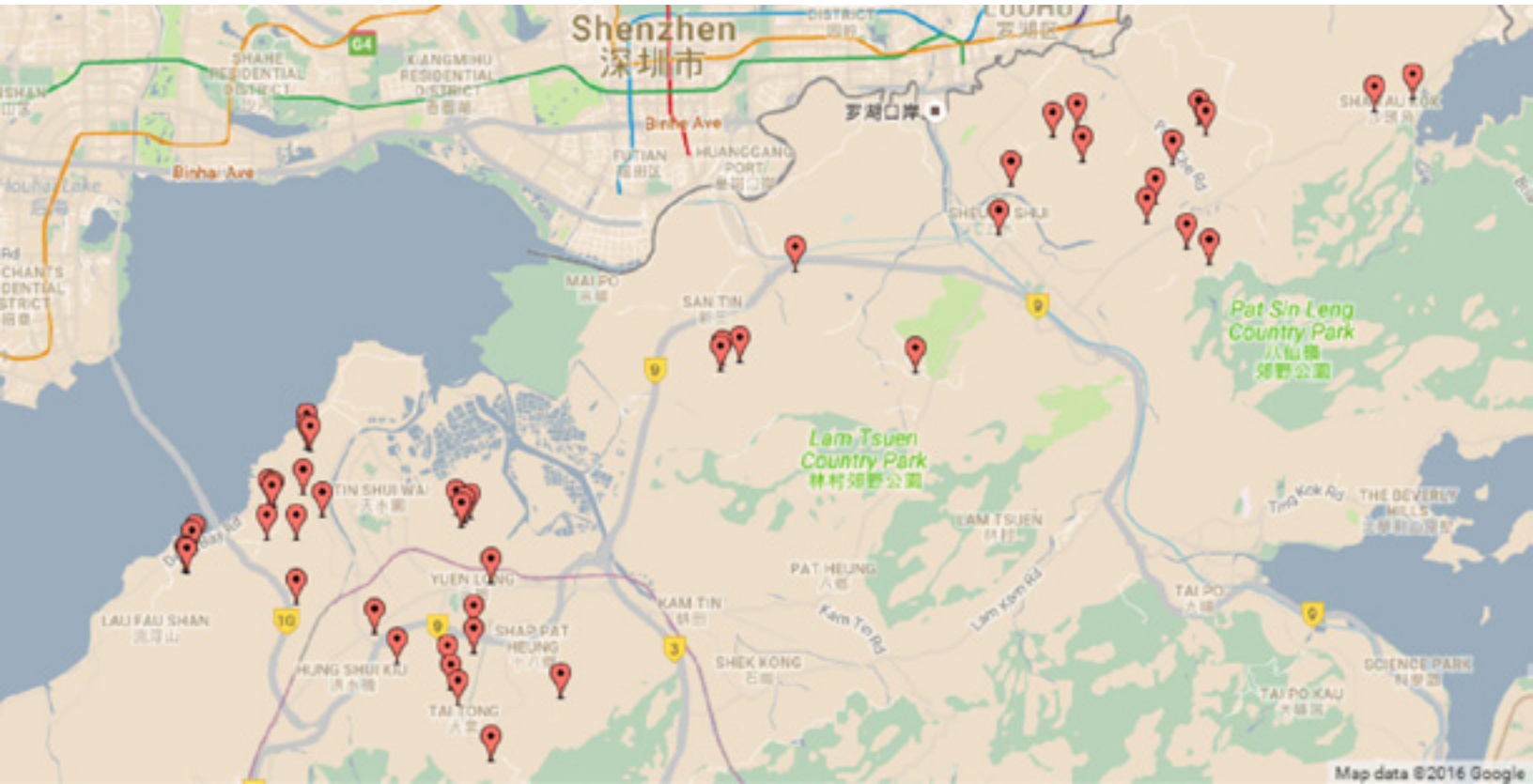
other factory or staging operations, while others are in more rural areas, abutting open fields, farms, and especially cemeteries. These sites close down frequently and move from one plot to another, leaving a trail of electronic refuse in their wake.

We estimate there are between 100 and 200 sites...

Without the benefit of a tracker, it's often difficult to spot the sites unless a view is available over the top of the tall steel fences. In such cases, the sites can be identified by a glimpse of large "gaylord" boxes, super-sacks, or haphazard piles of electronics, sitting in the sun and rain. But most often there is no view, not even through a nail hole in the fencing. In this case the only telltale signs might be an intermodal container parked outside or the whine of electronic screwdrivers, followed by the sound of smashing electronic equipment such as printers, or LCD screens.

One of many asset tags from US agencies and businesses found in New Territories scrapyards confirming the origins of the e-waste. See Appendix 7 for a more comprehensive list of asset tags and gaylord tables found. © KCTS, Earthfix Program, 2016.

48 GPS-confirmed destinations of US e-waste in the New Territories region of Hong Kong



Pile of difficult-to-recycle printers dumped on the ground outside of an electronics junkyard in New Territories. Many piles of e-waste are left in various waysides in the area. © BAN, 2016.

Owners, workers, and profits

According to the investigations undertaken by the Newspaper HK01[1] to follow-up on the work done by BAN, most of the owners of the yards are from mainland China. This information was difficult to investigate, as the records of ownership were usually not available from Hong Kong sources, so the reporters had to stake out the sites and read the license plates on the cars coming and going. This begs the question of why the owners are not registered with the government. Do they not pay taxes? Do they not have their businesses licensed?

Most of the workers are also not from Hong Kong. Many workers are from mainland China, but a good contingent are from South Asia, especially from Sri Lanka. Many of the workers are believed to be undocumented. When approaching, and knocking on the doors of the yards, the workers would often run and hide as they believed the BAN investigators were immigration police.

Despite the decline in commodity prices of late, workers are still paid 4 yuan (about 60 US cents) for each LCD screen they dismantle. They told reporters that if they work fast they can break down 200 LCD screens per day. At this rate, they can make $120US per day. According to the findings of HK01, a normal sized recycling yard can break down 25,000 LCD monitors and earn $30,000US every month. The going price for the LCD screens buying them from US brokers is around $3.50 for a 15" monitor and $7 for a 17" monitor.[2] Sadly, as discussed later in this report, this does

1 The HK01 Series (in chinese) is available on the BAN website at http://www.ban.org/trash-transparency. BAN obtained an English translation of key parts of these articles (available upon request).

2 Peony Inc., Newsletter, June 2016.

not factor the additional costs to a worker's health and longevity.

As an exercise in trying to determine how much volume might be arriving in New Territories every day using the information reported by HK01, we can take a figure of 100 operational yards and for the sake of argument assume they are all processing LCDs with each doing 25,000 LCD monitors. As each 15" monitor weighs on average of about 10 pounds we are talking about 250,000 pounds of monitors for each yard per month. Multiplying that by an estimated 100 electronics junkyards operational in Hong Kong at a time, and we arrive at 25,000,000 pounds, or 833 containers per month,[3] or about 34 containers per working day (6 days a week). Multiply by 12 to arrive at the amount per year and we get 300,000,000 pounds per year. That is the equivalent of about 10,000 containers per year.

From smuggling to dismantling

As early as 2006, BAN was aware of the electronics junkyards of New Territories which were discovered as we followed containers from the port while tracing the routes of e-waste exports to the Guiyu region. We highlighted these in a 2008 CBS 60 Minutes episode called "The Wasteland". At the time, many of these junkyards were receiving massive quantities of cathode ray tubes (CRTs) from the US. From 2006-2015 these facilities were observed operating only as staging areas to bring the intermodal containers from the port, empty them, sort the imported contraband, load it onto smaller trucks, which

3 This estimate is based on an industry insider estimate that a 40' high cube container of LCDs weighs between 30-40,000 lbs. We will use the estimate of 30,000lbs.

Shot of Mr. Lai's Farm a printer junkyard in New Territories as seen from a drone flying high above. © HK01 News, 2016.

would then be driven across the border into mainland China.

Insiders have told us that the only way this could have happened all of these years is with some form of corruption in play, as the importation of e-waste has been illegal in mainland China since the year 2000.

When we asked the Hong Kong Environmental Protection Department at the time why they did not simply go up into New Territories, stake out the locations, and arrest the companies as the contraband arrived, they reported to us that "it was not so easy." They stated that prosecution was normally not possible but if they caught a container at the port they could simply turn the containers back to the US. It was not explained why enforcing the smuggling laws other than at the port was "not so easy".

Over half our trackers ended up in New Territories and stayed there.

LCD monitors dumped in the weeds near New Territories junkyards. © KCTS, Earthfix, 2016

These electronics junkyards were operational as smuggling depots for at least a decade. However, from 2012-2015, mainland China progressively began to enforce their border controls against e-waste trafficking. Their heightened customs operations in this regard, collectively known as the "Green Fence", was very successful at reigning in smuggling.

In 2015, China took an even more dramatic step when they finally, after a decade of promises to do so, closed Guiyu to importation and moreover closed it physically by forcing all e-waste processors in the Guiyu area to either quit or relocate inside a massive new-built industrial park. Guiyu is now fundamentally transformed and a BAN unannounced inspection in December of 2015 confirmed that no imported waste is allowed through the gates of the industrial park.[1]

With the closing of the Guiyu major informal sector arena and the closing of the borders to imports, the US to China e-waste smugglers had few other places to turn to process their usual flows of North American e-waste. It appears that they simply turned to New Territories.

Over half our trackers ended up in New Territories and stayed there. From site

1 http://www.ban.org/news/2015/12/17/chinas-notorious-e-waste-village-disappears-almost-overnight, http://www.ban.org/news/2015/12/16/infamous-chinese-e-waste-town-finally-closes-doors-to-imports, http://www.ban.org/news/2015/12/17/chinas-guiyu-shifts-away-from-crude-processing

Computer parts lie scattered in puddles at a typical New Territories electronics junkyard. © KCTS, Earthfix Program, 2016.

visits, BAN estimates that between 60-90% of material at these locations is imported material. And our visits also estimated that the majority of waste observed originated

...New Territories may become the next Guiyu.

from the US. Indeed, it was challenging to find evidence of non-US waste; though we did find some imports from the United Kingdom and Denmark. Close visual inspections easily revealed asset tags linking e-waste as previously belonging to US schools, police departments, jails, hospitals, libraries, and numerous government institutions. See Appendix 7 to see a list of some of the asset tags or gaylord labels we photographed.

With China cracking down on importation, it's not surprising that the former smuggling stations of New Territories have simply been transformed to dismantling operations. With mainland China suddenly refusing entry to the whole equipment and only allowing the importing of "commodity" scrap, these junkyards became the obvious place to break the equipment down. The infrastructure and property had already existed for years and the government had already demonstrated a lack of will to enforce against the operations. The only thing that appears to have changed in this global e-waste trade route is that the actual environmental harm of breakdown has moved across the border

...the damage to the Hong Kong environment and population has begun.

from mainland China to New Territories.

This transformation is all fairly recent, likely beginning in 2015. The severe long-term damage to Guiyu is well-documented, but to date, New Territories has not yet reached that fate.

The Damage Being Done

Nevertheless, the damage to the Hong Kong environment and population has begun. While the informal recycling methods currently employed are not as dangerous as those observed for so long in Guiyu, they are still harmful and have the potential to devolve into wider types of operations. If the government does not get more active in environmental and occupational health, safety protection, and conducting enforcement operations that will close yards that do not meet high standards of operations, New Territories may become the next Guiyu.

We have not yet seen the use of chemical and acid baths to leach precious metals out of circuitry or wash plastics. We also have not seen the cooking or burning of components releasing toxic fumes, gasses, and particulates that were so common in Guiyu for years. What is taking place currently is the crude dismantlement of primarily printers and LCD screens through hammering, breaking, and pulling apart of different fractions. These operations do release harmful emissions. We have also observed the grinding of circuit boards and the use of water floatation and vibrations tables to separate the copper bearing fractions from the brominated flame retardant laden plastic fractions. Workers told HK01 reporters that there were about 10 such copper refining shred and separate operations in New Territories that produce water pollution as part of their operations.

The dangers from e-waste operations in New Territories can be summarized as follows:

- The breaking of CCFL (cold cathode fluorescent lamps) tubes from LCD monitors releasing toxic elemental mercury phosphors.
- The breaking of printers and their cartridges, releasing toxic toners including those containing carbon black and colored toners of unknown toxicity.
- The release into the environment and workplace of harmful off-gassed organic chemicals such as brominated flame retardants.
- The release into the environment of dumped equipment and residues that are difficult to recycle – these are often found dumped in bushes, creeks, and waysides.
- Run-off and residues from circuit board shredding and floatation separation operations. It is reported that there are 10 such sites
- The release of extremely toxic ashes, fumes, gases, and particulates including by-products of incomplete destruction from accidental fires. Because the equipment is stored outside and the sites have minimal fire abatement equipment, fires are all too common.

Woman washing and sorting scrap electronics parts in waterway. Screenshot from HK01 broadcast.

Close-up of ground outside of the Deep Bay Road site in New Territories, Hong Kong. Dumped mercury-containing cold cathode fluorescent lamps (CCFLs). ©BAN December 2015

Mercury

The vast majority of LCD screens currently being broken down in New Territories are the pre-LED lighting type that use small cold cathode fluorescent lamp (CCFL) tubes as backlights. These tubes each contain small amounts of mercury as a phosphor that illuminates when charged with electricity. Mercury is one of the most toxic metals known and can easily

These tubes each contain small amounts of mercury ... one of the most toxic metals known...

migrate as vapor in warm temperatures or by clinging in globule form to dust particulate. These globules can then be inhaled and poison workers or be absorbed later by contaminating agricultural products or water resources. Once released into the environment, elemental mercury can be transformed into methyl mercury which is extremely toxic and notorious for contaminating fisheries (Minimata Disease). BAN observed hundreds of broken CCFL tubes

BAN observed hundreds of broken CCFL tubes on the ground about 200 yards from fish ponds...

on the ground about 200 yards from fish ponds in western New Territories.

Of most immediate concern, however, are the impacts on the workforce. The workers we interviewed were completely unaware of the hazards arising from their intentional breakage of the CCFL tubes and the release of mercury directly in their direct breathing zone. No effort was made to prevent breakage. To the contrary, the method after opening usually involved strongly

The workers we interviewed were completely unaware of the hazards...

hitting the entire unit on a workbench. The particle masks used only by some of the workers are ineffective at preventing acute

Sprawling piles of American printer waste at a typical New Territories electronics junkyard. © KCTS, Earthfix Program, 2016.

or chronic mercury poisoning. Further, there was no methodology or precaution to further contain the CCFLs, broken or not, for onward mercury recycling or proper disposal. These lamps were clearly not a recycling target and were thus simply broken and then dumped in and out of the grounds of the junkyards.

Toners

Carbon black, commonly used in toners has been classified as an IARC 2B (possible human) carcinogen (it causes cancer in animals).[1] It also causes respiratory tract or skin irritation, and forms flammable or explosive dust-air mixtures.

Colored toners – magenta, cyan, and yellow, contain proprietary ingredients of unknown toxicity. In the yards that dismantle printers these toners are found spread over the ground and workers breaking the devices open are forced to breathe these potentially toxic toner dusts. The full impacts of toner to human health and in the environment are unknown.

> *...toners are found spread over the ground and workers breaking the devices open ... breathe these potentially toxic toner dusts.*

Recent sampling conducted by Hong Kong Baptist University

BAN worked with newspaper HK01 to further investigate the situation in Hong Kong. They engaged Ms. Shanshan Chung, the Director of the Environment and Public Health Management Program and Mr. Jinshu Zheng, lab technician, both of the Hong Kong Baptist University, to collect and test samples from three sites identified by BAN's trackers.

They first collected water samples from just outside the fence line of an e-waste site

1 http://monographs.iarc.fr/ENG/Monographs/vol93/mono93-6.pdf

Table 6: Water test results from yards close to the Coastal Protection Area

	Copper extract yard - Front of workshop	Copper extract yard – Side of workshop	Dismantle yard – Upper Course	Acceptable standards
Parameters	**mg/L**	**mg/L**	**mg/L**	**mg/L**
Arsenic	<0.025	0.14	<0.025	0.1
Cadmium	0.011	0.068	<0.0005	0.005
Chromium	25	25	<0.002	0.05
Copper	12	69	<0.015	1
Lead	0.52	4.5	<0.008	0.05
Zinc	2.6	6.8	0.047	2

The shaded areas show levels exceeding acceptable standards. © HK01 News, 2016.

where water had pooled up after rainfall. They also collected soil samples there. The results of these tests were alarming — showing very high levels of copper (69mg/liter), chromium (25 mg/liter) and lead (4.5 mg/liter) (See Table 6).

> *"The water is, of course, toxic. It is very dangerous to drink it or even to touch it."*

Hong Kong does not have a related legal standard but according to China's National Environmental Quality Standards for Surface Water, the chromium concentration exceeded the standard by a factor of 499. The copper concentration exceeded the standard 68 times and the lead concentration 89 times.

Ms. Chung concluded: "The water is, of course, toxic. It is very dangerous to drink it or even to touch it."

The team from Baptist University also tested the soil around the circuit board shredding and copper extraction operation. These tests showed levels of copper (120000 mg/kg) that exceeded the Hong Kong Soil Contamination Remediation Standards set by the Hong Kong Environmental Protection Department (EPD) by 11 times. Additionally, the levels of tin and antimony exceeded the established limits. (see Table 7)[2]

2 English translation of HK01 newspaper articles found at www.ban.org/trash-transparency.

Table 7: Soil STC heavy metal test results from copper extract yard in Yuen Long and yard which experienced an e-waste fire in Ping Che.

	Copper extract yard	Copper extract yard	Yard in Ping Che	Acceptable standards
Parameters	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
Copper	120000	1300	230000	10000
Tin	16000	43	100	10000
Antimony	530	950	170	261
Barium	1200	1200	8500	10000
Mercury	0.21	<0.20	<0.20	38.4
Lead	250	740	250	2290

The shaded areas show levels exceeding acceptable standards. © HK01 News 2016.

Fires

Over the years there have been many fires at the electronics junkyards in New Territories. It is reported that in the Hung Lung Hang area alone, 13 cases of electronics junkyard fires occurred just last year (2015). The high rate of fires is easily understood given the high flammability of piles of electronic equipment usually stored in closely stacked cardboard boxes, the lack of site security, the lack of fire abatement equipment, the constant outdoor storage under the tropical sun, improperly stored lithium ion batteries, and the fact that many workers smoke cigarettes.

Sunlight focused through the lenses found in projection TVs and cameras is prone to start fires. Lithium Ion batteries are also known to self-ignite. Arson becomes extremely easy when there is no security except dogs around the yards. Once a fire is started they are very difficult to put out and most of the yards do not have adequate fire abatement equipment.

It is reported that in the Hung Lung Hang area alone, 13 cases of electronics junkyard fires occurred just last year.

The consequences of a fire can be severe. What most local residents and businesses don't realize is that fires involving electronic equipment create a host of extremely toxic compounds that are emitted as plumes of smoke and ash. Some of the world's most carcinogenic substances are polycyclic aromatic hydrocarbons (PAHs), which can be created by the combustion of hydrocarbons. Another highly toxic class of chemicals created by the incomplete combustion of halogenated substances, such as brominated flame retardants or PVC, present in

Sample of fire debris being taken by Hong Kong Baptist University labs. © HK01 News, 2016.

electronic waste are the dioxins and furans, and in addition, many of the heavy metals become smoke-born in the event of a fire. Thus, those downwind of a fire, the firefighters, and those that must clean up after a fire face extremely hazardous exposure to some of the most toxic substances on earth.

Lack of Enforcement

One of the greatest mysteries regarding the Hong Kong electronics junkyards is why the Hong Kong authorities have not shut them down? They did not shut them down during the 10-year period when they were smuggling massive quantities into mainland China, and they seem very reluctant to shut them down or prosecute them now. And yet, it is very clear that each of these is involved to some degree – if not in the daily operations, in the illegal trafficking in hazardous waste. Hong Kong, as part of China, is a Party to the Basel Convention and must consider all illegal traffic as a criminal act, and the United States, not being a Party to the Convention cannot legally export its waste to a Party of the Convention such as China. This means that it is criminal for any entity in Hong Kong to accept e-waste defined as hazardous by the Basel Convention and China from the United States.

One of the greatest mysteries regarding the Hong Kong electronics junkyards is why the Hong Kong authorities have not shut them down?

Even if smuggling were not a constant issue with respect to these businesses, visits there reveal many other violations. These include lack of occupational safety and health equipment and precautions; soil and water contamination from toners, mercury, and other residues; land-use violations; lack of precautions against fire; waste dumping outside of property lines; and undocumented laborers.

The Environmental Protection Department (EPD) claims they have conducted many inspections in the last five years and in that time there have been only 16 prosecutions.[1] All of these prosecutions resulted in relatively small fines – not jail time and not closures. As reported in the testimony of Environment Secretary Mr. Wong, the average fine for e-waste smugglers was 33,166 Hong Kong Dollars (about $4,016 USD).[2] Realizing that according to the interviews conducted by HK01, a typical LCD breakdown yard makes a profit of about $30,000USD per month, such fines are more of a tax than a punishment for the operators.

...Hong Kong must fulfill its vital role to protect its own territory...

Clearly, Hong Kong must fulfill its vital role to protect its own territory against the scourge of global e-waste dumping.

1 HK01 Newspaper series published June http://www.ban.org/trash-transparency

2 http://www.ban.org/news/2016/7/8/annotated-comments-by-ban-on-mr-wong-kam-sings-remarks

One Tracker, One Story:
Earthworm Recycling to Mr. Lai's Farm via Goodpoint

As our study began to wind up in early December 2015, BAN's Jim Puckett flew to Hong Kong to bear witness to the end-points of the trackers' journeys. Taking with him a GPS reader and the coordinates of about 30 New Territories sites acquired by our trackers, he was joined in New Territories by Ms. Dongxia Su (interpreter and fixer) Ali Khan (trader and driver).

Over the course of the next three days, the team documented about 20 informal electronics junkyards across the expanse of New Territories. The one site that left the most lasting impression was found down a windy rural road beneath a cemetery. Behind a tall green steel fence, and according to a sign painted on that fence, was Mr. Lai's farm.

Approaching the site, the team could hear the sound of a forklift. Looking through a hole in the fence they could see a large container being unloaded. For almost a quarter of an hour, the team knocked and banged on the gate and yelled loudly to see if they could visit. This set the dogs inside howling and finally they opened up and let Puckett's team in.

A shocking site was found beyond the gate. A massive assembly of printers and fax machines of all kinds lay jumbled in a long pile about 15 feet high and stretching about 150 feet in length, from one end of the property to another. The parts of the yard not covered in printers were sooty mud, made black from the constant dumping and release of toners. At one end of this pile were the workstations where printers were broken open and the component parts separated as to whether they were circuitry, steel, or plastic. The separated plastic printer housings were being baled; a good deal of the yard consisted of these bales, streaked with the black of toner.

While Puckett's team stared in amazement at this site, they knew that one of the printers in that pile in front of them was still providing tracking signals every 24 hours. Puckett also knew that this printer had come via one of the more outspoken American recyclers and fierce critic of the Basel Action Network and of the Basel Convention's efforts to prohibit the export of hazardous electronic waste to developing countries; that printer came to New Territories via Mr. Robin Ingenthron's Vermont company — Goodpoint Recycling.

A few months earlier, on August 27, 2015, a BAN volunteer, as part of BAN's tracker deployment in the

BAN interpreter and fixer Dongxia Su, translating "Mr. Lai's Farm" for the team. © BAN 2016.

Inside Mr. Lai's farm, a dump of printers from the United States. Somewhere in this pile was a printer handled by Goodpoint Recycling of Middlebury, Vermont. © BAN 2016

New England region, delivered an HP All-in-one Q1660A printer to Earthworm Recycling, a small recycler in Somerset, Massachusetts. The toners had been removed and the internal cables cut. A few days later the signal BAN received from the device implanted in that printer showed that it had moved to Middlebury, Vermont, home of Goodpoint Recycling. A review of the Earthworm Recycling website revealed statements that they sent their electronic waste to an R2 Certified recycler in Vermont; Goodpoint is the only R2 member in the state.

Just a few days after arrival, the printer left Vermont and travelled to the Chicago area and then onwards to the port of Long Beach, California. It next pinged off of the coast of mainland China before arriving at the port of Hong Kong. Two days later it was in Mr. Lai's Farm.

Upon the release of BAN's first report on May 9th, along with the MIT's interactive map website, and despite GPS coordinates being temporarily obscured, the pathway described above became clear to Mr. Ingenthron. In a letter written to MIT's Senseable City Labs, he admitted that he used another R2 Certified Recycler, ARCOA, as a downstream vendor, and that ARCOA in turn reportedly exported the printer to the Li Tong company of Hong Kong. The problem with this story though is that the printer never went to Li Tong. Li Tong is a highly reputable company used by Apple, Amazon, and others. Li Tong is not Mr. Lai's Farm.

We then contacted Robin Ingenthron, gave him the coordinates of the tracker and asked him how it was that his printer found its way, in seeming violation of the R2 Standard, if not Hong Kong law, to an unpermitted facility in New Territories, Hong Kong. He said that in fact he may have sent it onward to one of three Chicago-area recyclers, and made the following statement:

> *"Our small business manages the most sensitive scrap - PCs and displays - in house. We do subcontract non-hazardous printer scrap to several world-class, audited facilities who meet the highest environmental standards. We are aware of the alleged diversion of material from one subcontractor's downstream market and are reviewing it with the partner accordingly. As with any certified company, continual improvement is the goal."*

Of course, BAN is certain that a plain reading of the Basel Convention's Annexes defines printers containing leaded circuit boards as hazardous waste. Certainly, the R2 standard considers them a "focus material". And we are certain that Mr. Lai's Farm was not a "world-class, audited facility meeting the highest environmental standards."

Domestic Dumping:
Uncovering Buried E-Waste With Trackers

In late 2014, BAN uncovered an e-waste dumping scheme involving a recycler with many government and major corporate contracts. After initially hearing from a whistleblower, BAN conducted site investigations and deployed tracking devices. These methods allowed us to discover a federal crime that led to federal prosecution and subsequent bankruptcy of the company. The case was described in BAN's evidentiary report and press release[1] released in February 2015.

At the time, Diversified Recycling was a growing Florida and Georgia-based electronics recycler with an exclusive contract with the State of Georgia and with many other southeastern electronics disposition contracts. The company was certified to the R2 standard and in the process of applying for e-Stewards certification when a whistleblower encouraged us to look closer. Our stakeout, and subsequent use of tracking devices placed in equipment, made it apparent that the company was discreetly and fraudulently transferring multiple large truckloads of CRTs each week to a nearby small "recycler" known as Sarah's Trading in a small strip mall a few miles away. A visit to the non-descript business found a working environment with a complete disregard for human and environmental health. Workers at Sarah's Trading were observed manually smashing CRT monitors during early morning hours, exposing themselves to silica dust, toxic phosphors, and leaded glass dust in a tiny building crammed with towers of heavy electronic scrap stacked dangerously high.

An area inside Sarah's Trading where the manual smashing of Diversified's CRT monitors was taking place. Leaded glass and debris litter the floor. © BAN 2014.

We were able to use hidden cameras to document the operation and trackers to confirm that the resulting toxic CRT scrap was being discreetly loaded at night into waste skips, covered up by wood pallets and cardboard waste, and snuck off every morning to a landfill designed to only handle non-toxic construction materials (wood, concrete, etc.). When BAN informed the landfill operator of the illegal dumping, they arranged with local

1 http://www.ban.org/news/2015/02/19/georgiaflorida-electronics-recyclers-caught-in-scheme-to-smash-dump-and-export-toxic-tvs-and-computer-monitors

authorities to seize the next such shipment, isolate it, and document the load of smashed CRT glass.

A few months later, another tracker indicated that Sarah's Trading had also allowed the exportation of an LCD monitor to Hong Kong.

BAN and the landfill operator provided the incriminating data to the US Environmental Protection Agency (EPA) and to the Occupational Safety and Health Administration (OSHA). The EPA enforcers thanked us for the case "tied up nicely with a bow." The owner of Sarah's Trading was subsequently sentenced to six months in prison on one count of conspiracy to unlawfully dispose of hazardous waste. It is our understanding that the sentence was significantly reduced by virtue of a plea bargain as the defendant was cooperative in providing the authorities with information regarding the companies that originally supplied the e-waste material, including Diversified Recycling. Additional legal actions against Diversified Recycling, its executives, and perhaps other Atlanta area "recyclers" are expected in the near future.

Map of tracking device as it travelled from Diversified Recycling in Norcross (0), to Sarah's Trading in Doraville (1), to Safeguard Landfill in Fairburn (2).

This case illustrates how the use of tracking devices was able to likely save the government many expensive hours of surveillance, allowing them to better enforce our environmental laws. It also demonstrates how, civil society, the private sector, and government can use the technology not only for uncovering overseas exports but for determining domestic flows as well.

CRT glass from Diversified/Sarah's Trading smashing operation ground into the soil at the Safeguard Construction material landfill — a pathway discovered by a tracking device. © BAN 2014.

Total Reclaim:
Caught in the Act of Exporting Harm

On September 1, 2016, Total Reclaim, one of the oldest and most respected recyclers in the Pacific Northwest, was fined $444,000 by the Department of Ecology (DOE) for illegally disposing of flat-screen televisions and monitors with fluorescent tubes containing toxic mercury.[1] The DOE press release explained that the violation came to light only after BAN's e-Trash Transparency Project identified Total Reclaim's export to Hong Kong via the port of Seattle.

Indeed, the DOE announcement followed BAN's May 5, 2016 release of the investigation, admission and public apology by Total Reclaim, and a two-year suspension from the e-Stewards Certification program.

BAN's first indication of a problem was when our tracking devices followed two different LCD screens deployed at small recyclers in the State of Oregon, via a McKinney trucking depot in Portland, to Total Reclaim in Seattle, then to a location leased by Total Reclaim at the Port of Seattle, and then onward to Hong Kong's New Territories region.

When confronted with the tracker data, Total Reclaim at first denied that this was possible. They tried to explain it away by saying the trackers must have become dislodged from the LCD monitor and been exported as black plastic to Hong Kong.

This explanation was fraught with holes, but BAN's Jim Puckett had a trip planned to Hong Kong with the documentary crew from the Public Broadcasting Service's (PBS) KCTS station in Seattle. BAN decided to use this trip to visit the three locations where the Total Reclaim LCD trackers had ended up. BAN did not at first intend to reveal to the PBS crew the Total Reclaim concern, but, once we arrived at the locations and talked our way in, we were confronted with many large cardboard boxes known as "gaylords" labeled as being from the State of Oregon and Washington — the Tacoma Public Library, a Bellingham Hospital, among others. Before long the team then found labels that had clearly been applied by Total Reclaim. We even found one gaylord that had been labeled as part of a Total Reclaim Earth Day public collection event.

1 http://www.ecy.wa.gov/news/2016/114.html

Location in New Territories where one of the LCDs from Total Reclaim ended up after being exported out of the Port of Seattle. © KCTS, Earthfix Program, 2016.

BAN's Jim Puckett documenting Total Reclaim Earth Day event label on their e-waste exports at New Territories electronics junkyard. After showing Total Reclaim this and more evidence, they changed their story and admitted to the exportation. © KCTS, Earthfix Program, March 2016.

Once back home and confronted with the overwhelming evidence, Total Reclaim agreed to make a public statement of admission and apology[2] issued on 3 May in exchange for a two-year suspension from the e-Stewards program. At the time, Total Reclaim refused to tell BAN how long they had been violating the e-Stewards Standard. However, the State of Washington's later investigation revealed that they had been exporting to China for 7 years.

The discovery of Total Reclaim's exports was a shock to BAN and its e-Stewards program. Total Reclaim appeared as an expert on our first film on global e-waste dumping shot in 2002. They have been an e-Stewards founder and long-time member. They have appeared in many documentary films and spoken from behind many podiums extolling the virtues of processing waste domestically and responsibly. Our trackers tore away this mask, and the revelation that their irresponsible exporting had been going on for 7 years, predating the e-Stewards Certification (launched in 2010), has been difficult to accept. All during this time they had been acting fraudulently, lying to us, to their auditors and to the public.

As an editorial stated in the Everett Herald, "The fine is a stiff one, but one where the punishment fits the willful abuse of trust."[3]

From this experience, we have learned that when it comes to trade activity, auditing and even unannounced inspections alone cannot police actors bent on cheating. In order to maintain its place as the gold standard in the electronics recycling industry, e-Stewards is now the only electronics recycling certification that uses GPS trackers as a routine part of its Performance Verification system. This tracking service is also being offered to enterprise customers, governments, and other civil society groups who want to ensure that e-waste is being handled responsibly. If the industry had been able to use this technology sooner, it's likely that the findings of this report would have been far different.

2 http://e-stewards.org/wp-content/uploads/2016/05/Total-Reclaim-Public-Statement-2016_05_03.pdf

3 http://www.heraldnet.com/opinion/editorial-hefty-fine-for-electronics-recycler-fits-abuse-of-trust/

Port of Seattle location on Harbor Island where material arrived from Portland and before export to Hong Kong. Google Earth, screen shot made April 26, 2016.

Conclusion

The roots of all pollution and exploitation lie in the possibility for entities to externalize the real costs of their activities to others. When a business does this they in effect distort their ledger sheets by ignoring the true costs of harmful impacts downstream, and thus reducing their own expenses and enhancing their own profits — at the expense of others. By not paying the true cost of responsible business upfront, they make others "pay" the expense (often with their health) of inadequate environmental, community, and labor protections.

...harmful, exploitive exportation of hazardous electronic waste to developing countries from US-based recyclers is continuing at an alarming rate.

Waste trade is a prime example of this phenomenon. Nations, such as the US, that fail to ratify or enforce international waste trade agreements and their businesses actually profit from the illegal and detrimental transfer of their hazardous waste to other countries least able to properly manage it, rather than paying the true cost of proper waste management. Workers and communities in importing countries are irreparably damaged because of this cost externalization.

Despite widespread condemnation of this practice, with past media attention showing the harm caused, as well as international laws violated, the e-Trash

Workers and communities in importing countries are irreparably damaged because of this cost externalization.

Transparency Project has revealed that this harmful, exploitive exportation of hazardous electronic waste to developing countries from US-based recyclers is continuing at an alarming rate.

Many companies identified in this report appear to be, either directly or indirectly (e.g. through poor due diligence), contributing to serious violations of international trade law, potentially culpable under domestic trade and fraud laws, and most importantly, highly likely to be contributing to very real harm to workers and the environment.

This false economic system has meant that export of wastes to developing countries

Until now, it has been easy to export without anybody being aware of it.

is a substantially cheaper option still very available to US recyclers, at least for the low-value, high-volume electronic scrap we studied.

Factors which allow this false economy to thrive include:

1. Unlike all other developed countries in the world, the US government has failed to ratify the international hazardous waste treaty (Basel Convention and its Ban Amendment) and has failed to any significant degree to legislate controls on exports of US wastes to developing countries, leaving US businesses free to export US hazardous waste regardless of the illegality of that trade in importing countries.

2. States cannot legislate on foreign commerce (Commerce clause in US Constitution forbids this).

3. The economics of the e-recycling industry have dramatically changed in recent years:

- A decrease in commodity prices has increased pressure on recyclers to cut corners and engage in unethical behavior.
- Reuse values are diminishing as manufacturers design cheaper and cheaper products that cannot be repaired.
- Recycler customers are used to having recycling services done at no cost when commodity prices were high; consequently, they are balking at paying true costs for responsible management.

4. Until now, it has been easy to export without anybody being aware of it.

5. Too few customers/waste generators (e.g. enterprises, governments, and consumers) are demanding full transparency and performing rigorous due diligence on their recyclers, refurbishers, leasing companies, brokers, and in turn, their downstream processors.

6. Manufacturers continue to design and produce toxic and unrepairable products that come without guarantees or adequate funding for their end-of-life phase, and most have failed to take steps to ensure that their pricing and controls on the downstream recyclers are adequate to prevent cost externalization via export.

7. Industry associations (e.g. ISRI actively lobby to defeat legislation to control exports in hazardous wastes.

8. One of the largest electronics recycling certifications – R2 — is actually designed to facilitate e-waste exports that are likely to be in violation of the international law.1

9. The e-Stewards certification, which directly forbids the export of toxic e-wastes to developing countries for any reasons, is often incorrectly identified as being "equivalent" to R2.

10. Foreign governments (e.g. Hong Kong) are not doing enough to prosecute illegal and harmful importation.

Looking at the list above, we can clearly see a role for consumers, businesses, and governments, both foreign and domestic, to take actions to halt this pernicious trade.

These urgently needed actions are highlighted below as key recommendations.

1 See R2: Non-Compliance by Design: http://wiki.ban.org/images/2/23/R2_Non-Compliance_by_Design.pdf

Recommendations:

1. **Trash Transparency:** Transparency needs to become an industry standard. Consumers and enterprise customers have a right to know how their hazardous waste is being handled all the way to final disposition. BAN calls on all recyclers, electronics manufacturers, enterprises, and governments handling electronic waste from any source to publicly divulge via their websites where they send their e-waste, who will manage it, and how. Information provided should include all downstream recyclers, refurbishers, facilities involved, and the countries in which they are located.

2. **Federal e-waste export ban:** We call on the Obama Administration, via executive order, to prohibit any export to non-OECD countries of any federal e-waste considered hazardous under the definitions of the Basel Convention. The US federal government is the world's single largest generator of electronic waste, yet it continues to ignore internationally-accepted trade law governing where and how this waste should be managed. We are far behind most of Europe and many other countries in this regard and remain the only developed country in the world that is not a Party to the Basel Convention. Until Congress is capable of ratifying international agreements again, the Executive Branch deciding to properly handle the federal government's own e-waste would be an important first step to catching up with the rest of the world. By making this move, not only would we begin to protect the global environment but we would also provide thousands of recycling jobs here at home.[1] BAN has launched a petition to ask Obama to take this action. It is available at https://www.change.org/p/federal-agencies-must-stop-exporting-their-toxic-e-waste-to-developing-countries.

3. **All e-waste should be considered Universal Waste:** Another US administrative fix which would not require legislation, but rather rulemaking, is to ensure that all e-waste is considered a Universal Waste under the Resource Conservation and Recovery Act (RCRA). Universal Waste is a designation used for post-consumer waste which contains hazardous substances. Federally-designated Universal Waste falls under the export control procedures of RCRA, which requires consent from the importing country government. As most of these countries are forbidden to import hazardous e-waste from the United States, the mere act of requiring consent will erect a dam against the flood of e-waste from our shores to developing countries.

4. **Hong Kong should properly enforce the Basel Convention:** With US e-waste exportation largely ending up in Hong Kong's New Territories, the HK government is well positioned to encourage a more responsible US industry by enforcing against the illegal trade. They have so far failed to control the mass importation of e-waste coming through their port and going to what appears to be hundreds of

1 A report commissioned by the Coalition for American Electronics Recycling (CAER) concluded that the prohibition of e-waste exports would equate to around 42,000 jobs. See: http://www.electronicstakeback.com/2013/02/05/2594

informal operations in New Territories. Enforcement actions on their part would not only ensure that they don't suffer more pollution and occupational exposure but will also be instrumental in internalizing costs to the exporters. Such actions could result in an increase in responsible recycling and green jobs in the US.

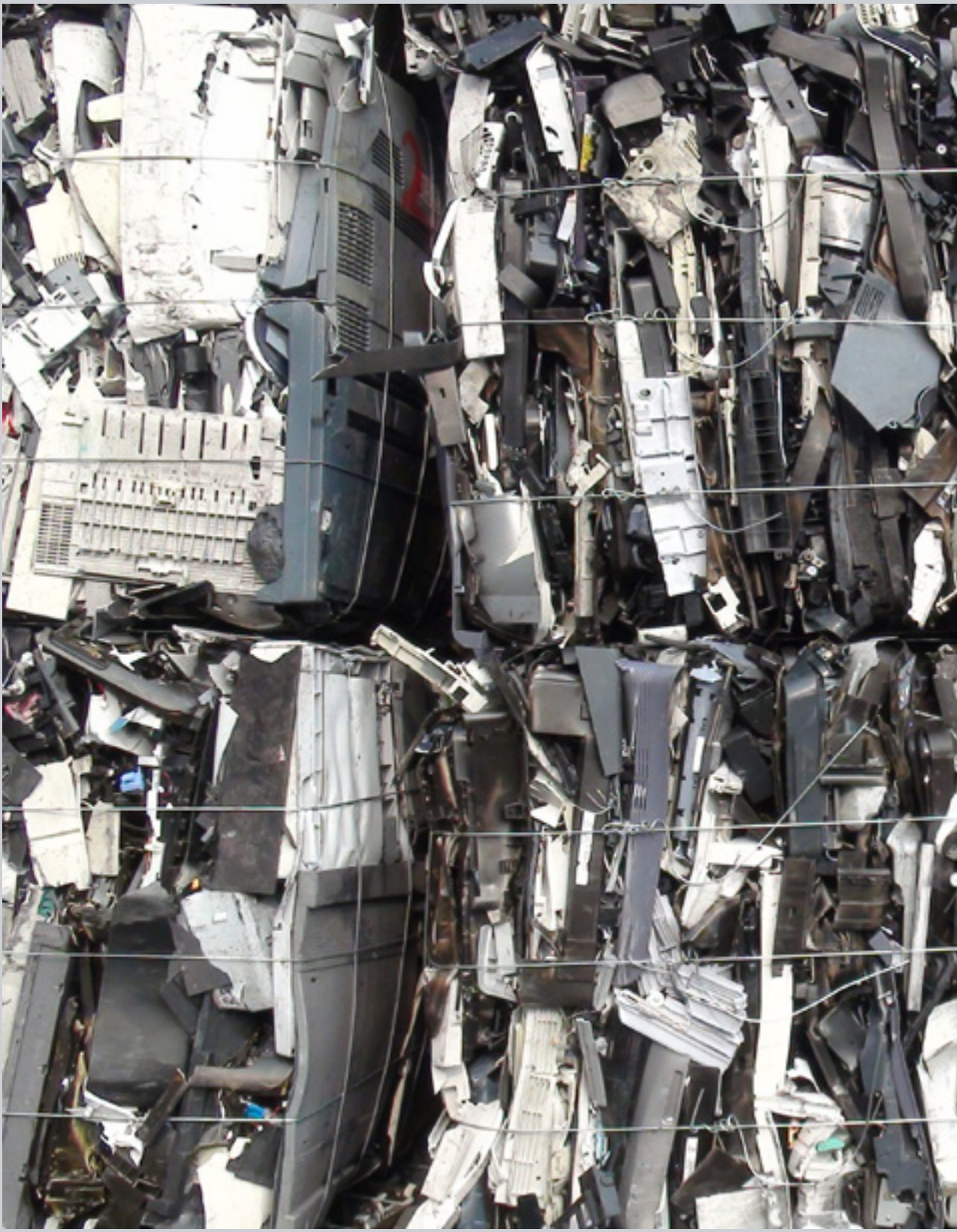
5. **Use only ethical recyclers that abide by the Basel Convention and Basel Ban Amendment:** Hazardous waste should only be handled by the most ethically responsible recyclers available. This can be accomplished by using only e-Stewards Certified Recyclers (www.e-stewards.org). It was precisely due to the problem of unethical and unsustainable exportation of hazardous electronics to developing countries that the e-Stewards Certification was developed. It differs markedly from the R2 standard in fully implementing the Basel Convention and its Ban Amendment. The e-Stewards Certification is also unique in that it now randomly releases tracking devices into the streams of e-Stewards Recyclers as part of its Performance Verification Program.

6. **Recyclers, cities, and institutions are urged to join the e-Stewards program:** Those companies involved in recycling or refurbishing e-waste or used electronic equipment are urged to become e-Stewards Certified Recyclers and show the world that they are always willing to be held accountable. All other companies and institutions are urged to become e-Stewards Enterprises and commit to making best efforts to use e-Stewards Recyclers for e-waste disposition. For more information on these programs visit: www.e-stewards.org.

7. **Manufacturer and state-mandated producer responsibility schemes must review their price structure and due diligence programs:** Following the crash in commodity prices for plastics and metals, prices paid to recyclers must be increased to ensure sustainable profitability for recyclers. Price setting in extended producer responsibility (EPR) takeback schemes cannot be under the sole control of OEMs, but rather must be set by a fair, multi-stakeholder-advised and state-run process. Meanwhile, all such programs should review their policies and their compliance mechanisms to ensure their partners are not exporting electronic waste in contravention of international law and best ethical and environmental practice.

8. **Electronic tracking to become an expected verification mechanism:** BAN urges all enterprises and institutions to include the practice of using electronic tracking devices into their electronic waste. Contractual agreements should be written with this expectation to ensure downstream due diligence to final disposition of hazardous materials. It is the right and indeed responsibility of waste generators to be able to affirm where their hazardous waste goes. BAN's e-Stewards program will uniquely use trackers in our e-Stewards Certification Program going forward, and we are offering this service to enterprises, governments, and others.

Plastics derived from printer break-down, containing brominated flame retardants and contaminated with toners, crudely baled from a New Territories, Hong Kong electronics junkyard, readied for export to mainland China. © BAN, 2016.



Appendix 1: A Short History of BAN's E-Waste Campaign

Basel Action Network (BAN) was founded in 1997 to continue the mission and work of Greenpeace International's Toxic Trade Campaign that ended in 1996. BAN's mission is "to champion global environmental health and justice by ending toxic trade, catalyzing a toxic-free future and campaigning for everyone's right to a clean environment."

BAN serves as a watchdog of the Basel Convention on the Transboundary Movement of Hazardous and Other Wastes and their Disposal (Basel Convention 1989), a United Nations (UN) treaty designed to control or prohibit export of hazardous wastes to developing countries from developed countries. BAN seeks to enforce the Basel Convention and the Basel Ban Amendment (1995). The Basel Ban Amendment was passed as a decision and proposed amendment to the Basel Convention itself, which when in full force will effectively prohibit the export of all hazardous wastes including most electronic wastes from being exported from developed to developing countries.

Exporting Harm: Discovering Guiyu

In 2002, BAN published the report and film Exporting Harm: The High-Tech Trashing of Asia, the documentary that revealed for the first time to a Western audience the fate of their old computers, TVs, and other types of techno-trash or "e-waste."

What BAN discovered during our December 2001 visit was a cluster of villages in the township

Figure A1: *Boy on Guiyu e-waste dump from the report "Exporting Harm." This lad came to symbolize the newly discovered e-waste crisis. ©BAN 2001.*

area known as Guiyu in Guangdong province, China.

This area had been unknown up to that point, quietly become a hidden dumping ground for massive volumes of the world's toxic e-waste. In the course of three days, BAN's founder, Jim Puckett, working with Chinese interpreter and activist Clement Lam, captured the previously unknown horror of informal recycling of foreign e-waste as it was being practiced in China.

Technology's Toxic Trash Is Sent to Poor Nations

By JOHN MARKOFF

SAN FRANCISCO, Feb. 24 — The global export of electronics waste, including consumer devices, computer monitors and circuit boards, is creating environmental and health problems in the third world, a report to be issued on Monday by five environmental organizations says.

The report says that 50 to 80 percent of electronics waste collected for recycling in the United States is placed on container ships and sent to China, India, Pakistan or other developing countries, where it is reused or recycled under largely unregulated conditions, often with toxic results.

The groups said there were no precise estimates of the amount of such waste currently created by the disposal of obsolete consumer electronic and computing gear. The Environmental Protection Agency estimated last year, however, that in 1997 as many as 3.2 million tons of "e-waste" ended up in United States landfills and that the amount might increase fourfold in several years.

The groups also cited National Safety Council estimates that as many as 315 million computers have or will become obsolete from 1997 to 2004, generating a wide range of potentially toxic wastes.

For example, each color computer monitor or television display contains an average of four to eight pounds of lead, which can enter the environment when the moni-

Figure A2: *First article based on BAN's Exporting Harm report on Guiyu discovery– the story that started it all. ©New York Times 2002.*

BAN's cameras and chemical analyses revealed highly polluting and harmful methods of "recycling" involving: burning, smashing, melting, and chemical stripping… all conducted without adequate personal protection of the workers, their children, and the surrounding community.

Exporting Harm placed a spotlight on a new form of corporate and personal irresponsibility. Suddenly everyone involved in manufacturing, consuming, or disposing of an electronic device became suddenly aware of their role in a grand scheme of globalized environmental injustice.

The revelation became pivotal for the Parties (ratifying countries) of the Basel Convention. Policymakers and activists working at the nexus of human rights and the environment were suddenly sensitized to a new form of exploitation, but the discovery had the greatest implications for the electronics manufacturing and recycling industries. These industries, along with large institutional generators of electronic waste such as major corporations and governments, were suddenly thrust into the spotlight as BAN brought back photos not only of gross pollution and toxic exposure, but of asset tags identifying the corporate and institutional origins of individual devices, as well as the brand logos of electronic devices openly burning and melting. The photographs showed beyond a doubt where the toxic e-waste had come from and who was responsible for this new environmental concern.

Upon publication, BAN interviewed many US electronics recyclers and was unable to find a single company that was not exporting hazardous electronic equipment or fractions to developing countries. Virtually everyone who was involved in the manufacturing, use, and disposal of electronics was caught in the act of "exporting harm", all carried out in order to avoid the higher costs of more carefully and safely recycling the material at home.

Re-Use Abuse in Africa: The Digital Dump

A few years later in 2005 BAN travelled to Lagos, Nigeria and, after discovering similar conditions, released another report and film entitled "The Digital Dump: Exporting Reuse and Abuse in Africa." This time the exports were done under the name of reuse – that is the exports went first to the vibrant repair and refurbishment market in Lagos supposedly for resale, but in fact much of the imported scrap material was actually non-repairable and simply dumped in waysides outside of the marketplace.

Figure A3: *Scavenger boy on the e-waste dump outside of the Alaba Market in Lagos, Nigeria ©BAN 2005.*

Much of the discarded electronics found in Lagos was identifiable by asset tags and by the forensic examination of hard drives, revealing not only the former users but their private data as well. The Digital Dump report and film were also responsible for prompting a team of Danish journalists to visit neighboring Ghana and their markets for the first time. There the now infamous Agbogbloshie e-waste dump outside of Ghana's capital city of Accra was discovered.

The Digital Dump provided an impetus for the 8th Conference of the Parties of the Basel Convention, held in Nairobi, Kenya in 2006 and resulted in an outpouring of concern for waste dumping in Africa and e-waste in general. At that meeting, the Nairobi Declaration on the Environmentally Sound Management of Electronic Waste[1] was established, and the European Commission announced that they would contribute one million euros to assist in addressing the e-waste crisis in Africa. That donation spawned the Basel Convention's

Figure A4: *Melted imported CRT from the routine burning of e-waste behind the Alaba market in Lagos, Nigeria. ©BAN 2005.*

1 http://archive.basel.int/meetings/cop/cop8/docs/16eREISSUED.pdf (see annex IV)

E-waste Africa Program.[2] The Digital Dump is also said to have been instrumental in the European Union's (EU) decision to prevent the export of any e-waste that has not been declared functional prior to export. This policy guidance eventually became law in the 2012 update (recast) of the EU Directive on Waste from Electronic and Electrical Equipment (WEEE).

2 http://www.basel.int/Implementation/TechnicalAssistance/EWaste/EwasteAfricaProject/tabid/2546/Default.aspx

Shining the Spotlight

From the years 2008 to 2010, BAN was instrumental in harnessing mainstream media outlets and government investigations to spread the word about the global dumping of e-waste and the need for developed nations to be more responsible in controlling indiscriminate exportation, especially in the United States which has never ratified the Basel Convention. BAN assisted the US Government Accountability Office (GAO) in creating a critique of the US Environmental Protection Agency's (EPA) lack of attention to these harmful exports entitled, "EPA Needs to Better Control Harmful US Exports through Stronger Enforcement and More Comprehensive Regulation".[3] BAN also appeared in numerous major media programs and journals, including CBS's 60 Minutes ("The Wasteland"), 20/20 on ABC, Marketplace on CBC, Frontline on PBS ("Ghana: Digital Dumping Ground"), Fresh Air on National Public Radio, and also featured in National Geographic Magazine.

3 http://www.gao.gov/products/GAO-08-1044

Figure A5: *BAN's Jim Puckett with Mr. Scott Pelley of CBS's 60 Minutes, in Guiyu,filming "The Wasteland". ©CBS 2008.*

Birth of e-Stewards Certification

Instead of focusing its attention on more exposés of a problem that clearly had global dimensions, and due to the particular problem of the United States, BAN decided in 2008 to create a market-based solution to address the global e-waste crisis. The biggest volume of the e-waste trafficking was that which was pouring out of the United States. This source was due largely to the fact that the US was not a Party to the Basel Convention and had no national legislation to prevent the export of hazardous electronic waste to developing countries. However, we believed that in the United States and around the world there was a market for responsible recyclers, and once the public and enterprise companies knew of the problem of the dumping of e-waste in developing countries, they would seek out recyclers that would not engage in such irresponsible behavior. BAN began work on creating a new standard (best practices) which could be used as requirements in a third-party audited Certification program. However, when the US EPA decided to convene a multi-stakeholder process to create a best-practices document, we decided to put our effort on hold and work hard to make the EPA effort a success.

BAN with the Electronics Take Back Coalition worked diligently in that effort which came to be called R2. However, when the EPA agreed with some of the industry participants to allow in R2 exports of e-waste that would actually violate international law contrary to what was agreed at the outset, the participating environmental groups chose to walk away. Not to be discouraged in achieving true reform, leaders in the electronics recycling industry urged BAN to get back to work to create its own truly responsible standard that would correct the shortcomings of R2 and embrace the Basel Convention.

In April of 2010, the e-Stewards Standard and Certification Program was launched by BAN. Today, it provides the most robust standard in the world for responsible recycling and re-use of electronic waste. The e-Stewards program is supported by major corporations and institutions such as: Samsung, LG, Alcoa, Boeing, Wells Fargo Bank, Bank of America, along with many American cities, including Kansas City, San Francisco, and Seattle. It also has the support of over 70 environmental groups, including: the Electronics TakeBack Coalition (ETBC), Greenpeace, and the Natural Resources Defense Council (NRDC). For more information on e-Stewards, visit the program website at www.e-stewards.org.

Container Tracking – Citizen Enforcement

During the years of development of the e-Stewards program, BAN continued to monitor global dumping sites around the world as well as begin to watch the loading docks of US and Canadian electronics recyclers, photographing intermodal[1] sea-going containers and the container numbers, which allowed them to be traced across the world.

BAN alerted authorities, particularly in Hong Kong, to more than 100 exports, most of which proved to be illegal. This container tracking proved to be very useful in determining overall flows of e-waste from North America. We were surprised to see so little moving to Africa from the US but attributed that to the fact that West African nations, since our release of the Digital Dump, had made a serious effort to prevent imports.

For the first time, BAN was able to identify Hong Kong as the major port of entry for North American e-waste. A long-time e-waste broker in a Kowloon warehouse, on hidden camera while filming the PBS Frontline documentary, corroborated our findings by stating that the port of Hong Kong alone received about 50 – 100 containers each a day of e-waste depending on whether commodity prices were low or high.

This container tracking by BAN enabled the US government to prosecute its first major e-waste export indictment against Executive Recycling of Denver, Colorado. That company was eventually charged with multiple counts of criminal acts of fraud and violations of the Resource Conservation and Recovery Act (RCRA),

1 Intermodal containers are the seagoing containers designed to be trailered on trucks, carried on trains and loaded onto container vessels for foreign ports. Figure A6 shows an example of an intermodal container.

Table A1: BAN Container Tracking from North American Ports to Foreign Destinations 2008 – 2013

Country	2008	2009	2010	2011	2012-13	Total	%
Hong Kong	58	32	32	26	28	176	62
China	5	5	10	5	2	27	10
Pakistan	1	4	0	2	8	15	5
Vietnam	6	2	5	1	0	14	5
Indonesia	1	1	10	0	0	12	4
Malaysia	8	0	0	0	0	8	3
Taiwan	1	5	0	1	0	7	2
Thailand	1	1	2	0	0	4	1
South Korea	3	0	0	0	0	3	1
Macau	0	0	0	3	0	3	1
Singapore	0	1	1	0	0	2	1
Countries receiving one container: Belgium, Côte d'Ivoire, Dubai, Egypt, Honduras, India, Japan, Nigeria, Peru, Saudi Arabia, South Africa, Uruguay.	12	5					
TOTAL	**283**						

resulting in with sentences including seven-figure fines and jail sentences.[1]

BAN also exposed a Chicago area recycler named Intercon Solutions that wanted to become an e-Stewards Certified recycler. At the same time, they were undergoing certification in the e-Stewards program, we happened to have volunteers photographing intermodal containers around Chicago.

At Intercon they spotted two containers, one of which was exported to Hong Kong. We subsequently informed the authorities there and in Hong Kong, customs and Environmental Protection Department officials opened the containers and declared them to be full of cathode ray tubes (CRTs) and batteries – both illegal to import into Hong Kong or Mainland China.

We announced Intercon's illegal export publicly and barred them from becoming an e-Stewards Certified recycler for two years. One year later after losing substantial business, Intercon sued BAN for defamation. In the meantime, whistleblowers who heard about the lawsuit sent us hundreds of internal documents on the extensive exporting practices of Intercon -- enough to make Executive Recycling look like amateurs.[2] Intercon subsequently went out of business before our defense case could go to trial.[3]

1 http://www.justice.gov/usao-co/pr/executive-recycling-company-and-executives-sentenced-fraud-and-international

2 http://wiki.ban.org/Intercon_Solutions - Evidence_.26_Supporting_Documents

3 http://www.ban.org/news/2015/10/22/e-waste-recycler-lawsuit-against-environmental-group-dismissed

Figure A6. (Left) *Photograph taken by BAN volunteers of the infamous TGHU 950672 container at Intercon Solutions, a Chicago area recycler.*

The container was subsequently exported to Hong Kong and determined to be contraband after BAN notified Hong Kong authorities. Intercon later sued BAN for defamation. ©BAN 2011.

Figure A7. (Below) *E-mail correspondence with Hong Kong authorities regarding the 5 Intercon containers they inspected.*

Container No.	Date of container inspection	Hazardous Waste Found
YMLU4866029	28/4/2011	No
MSKU1228602	26/4/2011	CRTs & Batteries
TGHU9606276	5/5/2011	CRTs & Batteries
SEAU8674369	29/4/2011	No
MVIU0015156	11/5/2011	Batteries

From: Jim Puckett
To: Yuka Takamiya
Cc: 'Jim Puckett'
Cc:
Cc:
Subject: RE: Containers of e-waste arriving in Hong Kong in April

Dear Yuka,

Thank you for your e-mails.

All the five containers were intercepted and inspected in Hong Kong. The results are as follow:
(Embedded image moved to file: pic25620.jpg)
The three containers with hazardous waste would be returned to the US.

Gary Tam
HKEPD - 16 May 2011

Figure A8. *Sampan boats being loaded at the riverbank with US CRTs, in a massive smuggling operation that went on for years at Mong Cai, Vietnam near the Chinese border. ©BAN 2010.*

CRT Flood at the Vietnam-Chinese Border

In the course of investigating the destinations of American e-waste including that from Intercon Solutions, BAN discovered a massive flow of hundreds of intermodal containers a week going to Haiphong, Vietnam. The e-waste was not destined for Vietnam, but rather it was being taken off of the ships in Haiphong, loaded onto trucks, and then quickly driven up the highway 260 kilometers due north to the Vietnamese border town of Mong Cai, an entry point to southern China via the border town of Dongxing and one of the most notorious smuggling routes in the world.

There, BAN's volunteers witnessed an amazing sight of about 30-60 intermodal containers a day being backed up to the Beilun River (in Chinese) / Ka Long River (in Vietnamese) where they were opened and unloaded piece-by-piece by a small army of temporary workers.

Under the watchful eye of Chinese dealers and the Vietnamese army, the workers

Figure A9: *Containers from the US opened at the banks of the Ka Long River, Mong Cai, Vietnam. ©BAN 2010.*

would carry the equipment by hand from the containers to open sampan boats lined up on the banks to take the American CRTs and computer waste up the river and across to the Chinese side. Once upriver, BAN investigators witnessed Chinese smugglers offloading the American e-waste from the boats and placing it on small trucks that had driven down dirt roads, which laced miles of the riverbanks on the Chinese side.

BAN's best estimates conclude that this activity took place, weather permitting (approximately 200 days each year) for the 8 years between 2007 and 2014 and averaged about 30 containers per day. Such an estimate would equate to 48,000 containers (1,200,000 tons) passing this way, in a slow-motion tsunami which carried a very significant volume of North American televisions and computer monitors into China during these years.

It was this flood of e-waste that prompted BAN's interest in tracking technology. While BAN was able to witness the massive flows of e-waste crossing into China from Vietnam, we could not by ourselves discover where the Chinese trucks finally delivered the CRTs. We needed another way of tracking waste beyond simple shipping container data -- a way that could show us the final endpoint.

Figure A10: *Sampans being loaded at the riverbank with US CRTs, in a massive smuggling operation that went on for years at Mong Cai. ©BAN 2010.*

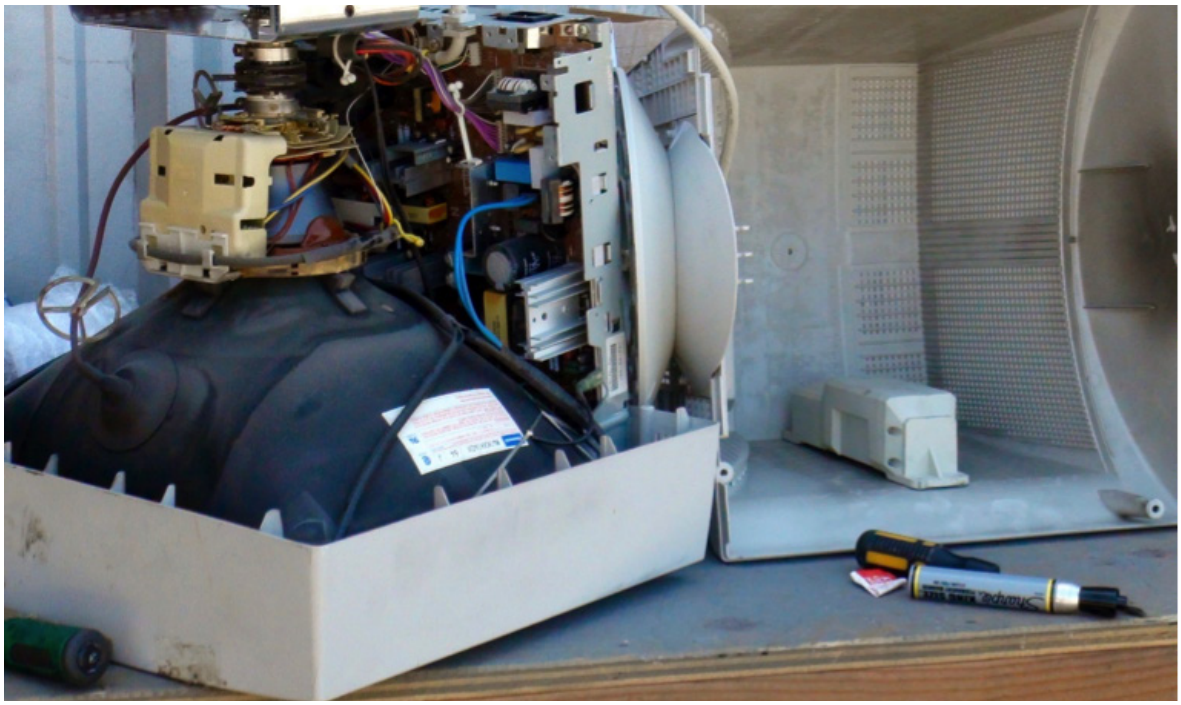


Figure A11: *Tracking device ready to be mounted with epoxy inside the housing of a CRT. Los Angeles, California. ©BAN 2011.*

MIT Senseable City Lab Points the Way: Trash Track

While researching the potential for e-waste tracking, we discovered the Massachusetts Institute of Technology Senseable City Lab's Trash Track program[1] and were intrigued by its success. The core work of the Senseable City Lab at MIT is to combining sensor technology, data analytics, and actuation to improve urban environments.

Over the last 7 years, they have applied this approach to tracking urban waste. By gathering fine-grained location data on the movements of waste and waste collectors, they were able to shine light on the waste management chain with the goal of making stakeholders more accountable.

In 2009 the MIT-SCL launched its first project using geolocation devices to track waste materials disposed after consumption, called "Trash Track". The project was triggered by the question: Why do we know so much about the supply-chain and so little about the 'removal-chain'?

With the help of researchers and volunteers, MIT-SCL tagged waste objects in Seattle, New York, and London. Objects ranged from corrugated cardboard boxes and newspaper to aluminum cans and electronic waste. In the Seattle experiment, tracking sensors showed that household hazardous and electronic waste traveled further and visited more intermediate facilities than other types of waste.[2]

1 http://senseable.mit.edu/trashtrack

2 Offenhuber ***et al***, 2013, p. 150

MoniTour: Tracking CRTs from California to China

BAN watched the progress of the project closely and sure enough, the technology seemed to work well and was able to reveal the destination of trash within a few weeks of deployment.

We contacted MIT-SCL about our special need of learning where the end-points of the border crossing e-waste might be going and finding this out with trackers capable of operating for a much longer period of time. This effort, nicknamed MoniTour, began in 2011 and involved deploying trackers with larger batteries on waste cathode ray tubes (CRTs). It was done quietly as a partnership between BAN and MIT-SCL to solve the Vietnam to China CRT flow riddle.

The first round of ten trackers deployed in Southern California in 2011 saw five exported -- four to China and one to Malaysia. And sure enough, two of these showed their pathways as having moved across the border at the same Mong Cai smuggling site we had previously uncovered. The trackers then moved north and stopped reporting in the area around Guangzhou in Guangdong Province of China.

BAN next travelled to those two Chinese locations -- the GPS end-points of these trackers. However because the trackers themselves were attached to the plastic housings of the CRT monitors and not to the glass, what we discovered were only the destinations for the plastic and not the more hazardous CRT glass or circuit boards. Because the importation of CRTs was highly illegal in China, the plastics recyclers were moreover unwilling to reveal to us where the glass and circuit boards from the imported monitors and TVs ended up.

So BAN and MIT-SCL followed up the project the next year in 2012 with trackers mounted inside the CRT glass tubes, but that experiment likewise failed to lead us to the glass importation locations in China. Very soon thereafter in 2013, the Chinese government swept into the border area of Dongxin, conducting a major enforcement operation with smugglers apprehended. Barriers were erected and border agencies restructured, effectively ending the smuggling we had witnessed along the river for so many years.

This initial collaboration with MIT-SCL led BAN to realize the efficacy of tracker technology. We soon began to envisage doing tracking on a much larger scale.

Figure A12 (above): *Graham Kaplan and Colin Groark, readying a tracker battery. Los Angeles, CA. ©BAN 2012.*

Figure A13 (left): *Graham Kaplan (BAN) and Dietmar Offenhumber (MIT-SCL) in Los Angeles after a day of delivering CRTs with trackers. ©BAN 2011.*

Waste Trade Denial

Over the past few years, there have appeared several studies and academic articles asserting that groups condemning e-waste export have their facts wrong and that in fact very little e-waste is really being exported from countries like the United States.

Unfortunately, these articles were not based on field studies actually observing real trade and movement, but rather on generic trade data of proxy commodities and by conducting voluntary surveys. Neither of these techniques accurately can determine true flows of e-waste trade. Following these misleading studies, some have written opinion articles in trade journals that have even gone so far as to suggest that environmental groups have perpetuated a myth in their photographic documentaries. In August of 2015, BAN published an article in e-Scrap News magazine entitled "Exporting Deception: The Disturbing Trend of Waste Trade Denial."[1]

We asserted in that article that asking industry to describe

1 http://www.resource-recycling.com/site-content/publications/articles/Puckett0815ESN.pdf

Figure A14 (above): *BAN Researchers Colin Groark and Graham Kaplan delivering a CRT monitor to a recycler In Los Angeles. ©New York Times 2012.*

Figure A15 (above): *Computer plastics sorting operation from where a tracker sent its last signal. Guangdong Province, China. ©BAN 2012.*

Figure A16 (right): *Another computer plastics sorting operation from where a tracker sent its last signal. Quangdong Province, China. ©BAN 2012.*

Figures A17, A18: *Where another CRT tracker ended up in Monitour Project. Penang, Malaysia recycler with dumpsite. ©BAN 2012.*

their own export activity was inherently biased. Likewise, using trade data, which actually has no defined categories for e-waste, is also fatally flawed.[1] What was needed instead was precisely what was recommended at a stakeholders' workshop held on June 21, 2011 at the United States Environmental Protection Agency in Washington, D.C.

As can be seen in the following chart published from the summary report[2], participants rated the use of electronic tracking as being the most promising and effective way to determine actual waste flows. Unfortunately, the government chose to ignore the advice of the stakeholder group, citing high costs and difficulty.

Rather than continue to rely on dubious studies based on poor data, BAN decided to do what the government said was too difficult. We sought the funds necessary to conduct a study using real data -- something the stakeholders called on the government to do with taxpayer money in the first place.

1 On January 20, 2016, BAN published the following critique of an academic article by Josh Lepawsky regarding use of tariff codes to characterize e-waste trade flows: http://wiki.ban.org/images/9/93/Lepawsky_Issues.pdf

2 http://msl.mit.edu/publications/CharacterizingTransboundaryFlowsofUsedElectronicsWorkshopSummaryReport%201-2012.pdf

Figure A19. (Right) *Chart from 2011 EPA workshop.*

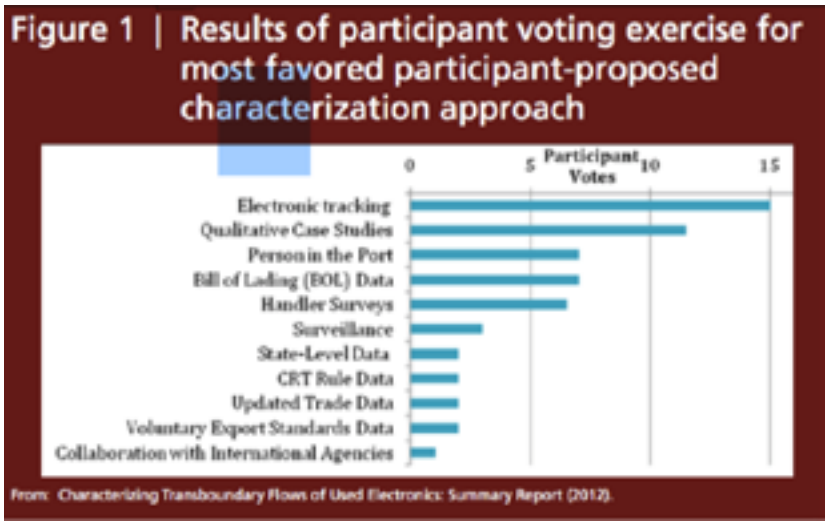


Figure A20. (Below) *Cartoon criticizing the absurdity of the e-waste export denial campaign. By Monica Huang. ©BAN 2015.*

The Body Shop Grant

The Body Shop Foundation charity exists to "fund charitable organizations or projects that are changing the world for the better"[3]. In 2013 BAN contacted the Body Shop Foundation about the need to do a revolutionary tracking project to uncover the truth of the global waste trade and help make the world more just and sustainable. We are very grateful to have received their generous grant to begin our work. The resulting e-Trash Transparency Project is the first comprehensive examination of e-waste flows using electronic tracking ever conducted.

3 http://thebodyshopfoundation.org

Appendix 2: Export and the Law

The export of hazardous e-waste to developing countries is not only damaging to people and the environment, as revealed in BAN's reports Exporting Harm (2002) and The Digital Dump (2005), and in numerous articles by scholars and journalists, it is also likely to be illegal under international and national laws.

While possessing a strong understanding of the law with respect to the international trade in hazardous waste, BAN nevertheless will never characterize any particular shipment as being illegal, as that is a determination that must be made by the government in any jurisdiction. Rather we will state that the export is "likely" to be illegal based on known prohibitions found in legislation and international law.

The Basel Convention (1992 entry into force)1 from which BAN takes its name, is an international treaty designed to prevent the uncontrolled export of hazardous wastes, in particular to developing countries. In 1995, the Basel Convention adopted a decision to amend the Convention to prohibit all exports of hazardous wastes moving from Annex VII countries (EU, OECD member countries and Liechtenstein) to non-Annex VII countries.2 This special agreement, known as the Basel Ban Amendment, is not yet in legal force internationally, but is implemented into national laws already by many European and developing countries, including China.

The Basel Convention defines hazardous electronic wastes as whole equipment or parts that are non-functional, and that possess listed hazardous constituents in quantities that possess listed hazardous characteristics. It is widely considered based on these lists that equipment or parts containing lead-soldered circuit boards, mercury-bearing LCDs or switches, cathode ray tubes, and batteries (containing lead, cadmium, or mercury) are among the commonly found hazardous e-waste.

The e-Trash Transparency Project placed trackers into printers (containing leaded circuit boards), mercury-bearing LCD screens, and cathode ray tube (CRT) monitors containing lead and sometimes cadmium compounds. Each of these devices are then considered to be hazardous waste under the Basel Convention (international law) when non-functional. Each of the deployed devices was rendered non-functional and non-economically repairable.

Most countries in the world, including Thailand, China, and its Special Administrative Region – Hong Kong – are Parties to the Basel Convention.3 The United States and Taiwan, however, are not. The Basel Convention does not allow any hazardous wastes to move between non-Party and Party countries unless there is a special bilateral or multilateral agreement in place.4 The U.S. has only entered into one such an agreement with the member states of the Organization for Economic

1 http://www.basel.int

2 http://www.basel.int/Implementation/LegalMatters/BanAmendment/Overview/tabid/1484/Default.aspx

3 https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-3&chapter=27&lang=en

4 Party to non-Party Ban, found in the Basel Convention at: Article 4, para. 5; Exception found at Article 11.

Cooperation and Development (OECD). Taiwan is not considered a legal nation state under the United Nations so none of the Basel Convention rules apply to them.

What follows is a quick review of the legal status of waste import and export for the countries / territories involved in this report.

The United States

The United States is the only developed country in the world that is not a Party to the Basel Convention. Indeed, they are one of only two countries, together with Haiti, that signed the Convention in 1989 (signaling intent to become a Party) but never ratified. The United States has also never supported the Basel Ban Amendment despite its widespread global support from European countries and developing countries. In 2008 the Government Accountability Office (GAO), the investigative arm of the U.S. Congress responsible for internal audits and review, released a scathing critique against the U.S. government's failure to control exports of hazardous e-wastes.5

TThe only legislation that has even a small impact on the export of e-waste from the U.S. to developing countries is known as the "CRT Rule" found in the Resource Conservation and Recovery Act of 1976 as amended (RCRA). This rule only governs some limited restrictions on the export of cathode ray tube (CRT) monitors or CRT glass.6 The CRT Rule requires that anyone who exports CRTs for materials recovery or recycling (dismantling) must obtain notification and consent from the receiving foreign government via the U.S. EPA prior to export and pre-register with the EPA. In our project 14 CRTs were exported and those exports involved 13 unique companies involved in a chain of export of CRTs. BAN's review of the EPA pre-approval lists7 however showed that none of these companies were pre-registered, indicating that they were part of an illegal export chain.

Prior notification and consent is also required for the export of what are considered to be "Universal Wastes" by federal statute.8 Universal Wastes are certain post-consumer wastes which would normally be considered hazardous, but are instead designated as Universal Wastes to facilitate their proper recycling and management. However, most electronic waste is not designated by the federal government as Universal Waste. According to the US EPA's Tracy Atagi, even LCD monitors containing mercury-laden cold cathode

The United States is the only developed country in the world that is not a Party to the Basel Convention.

5 http://www.gao.gov/products/GAO-08-1044

6 https://www.epa.gov/hw/final-rule-revisions-export-provisions-cathode-ray-tube-crt-rule

7 https://www.epa.gov/hwgenerators/companies-approved-june-20-2016-export-cathode-ray-tubes-crts-recycling

8 40 CFR part 262, subpart H

fluorescent lamps (CCFLs) are not Universal Waste despite the fact that they contain lamps and mercury-bearing equipment which are two of types of Universal Waste. For some reason, which makes little environmental sense, when these same lamps are inside of an electronic device they are not considered a Universal Waste, but when you remove them they are.

States can designate materials as Universal Wastes beyond the Federal listings. California, for example, considers LCD screens to be a Universal Waste. However, state designated Universal Wastes are not subject to the federal export restrictions under RCRA. This is an unfortunate loophole in the law. As can be seen in our field trips to Asia to investigate tracker endpoint locations, many of the boxes we found were labeled as Universal Waste, presumably these labels are from state programs, like California's.

Even though the US government is well aware that exports leaving US shores are illegal for our trading partners to import, our government does nothing about this.

Unlike all developed countries in the rest of the world, LCDs and printers and many other e-wastes are not subject to any export controls by the United States. Thus it is that even though the U.S. government is well aware that exports leaving U.S. shores are illegal for our trading partners to import, our government does nothing to control their export.

→ In summary, the United States fails to control the export of any of the devices subject to this report. Nevertheless, once these hazardous e-waste devices are exported to a Basel Convention Party these shipments are likely to become criminal traffic under international law.

China

China is a Party to the Basel Convention and was an early supporter and ratifier of the Ban Amendment. As a Party they adhere to the Party-to-non-Party trade prohibition. This means that trade between themselves and a non-Party like the United States for any wastes covered under the Basel Convention is illegal unless a special bilateral or multilateral agreement is formed between the countries. No such agreement is in place between the U.S. and China.

Secondly, China has its own national import ban on a comprehensive list of e-wastes from any country. This list includes any equipment containing circuit boards as well as all forms of display screens. This prohibition list was first established in 2000 and has been updated many times. But even at that early stage included second-hand electronic equipment and e-waste in the "List of Prohibited Goods to be Imported for Processing or Trade."[1]

1 http://archive.ban.org/library/china_list.html

Finally, China has implemented the Ban Amendment into their national legislation, so they cannot accept hazardous e-waste imports from any country listed in Annex VII of the Ban decision (OECD, EU or Liechtenstein) such as the United States.

sector there, a move to supplant it with an industrial park, and the implementation of strict import controls in the region.[2]

In addition to hazardous e-waste, China has also increased import controls on most

…any import of e-waste from the US into China is illegal.

For the reasons cited above, any import of e-waste from the U.S. into China is illegal.

While this has been the case for some time, it has only been in recent years that Chinese authorities have become serious about effectively enforcing their import ban. This new wave of diligent enforcement has been observed in the results of the e-Trash Transparency Project, where far fewer tracker-enabled devices have ended up in mainland China than expected, especially when compared to other Asian destinations such as Hong Kong. This crackdown on electronic waste import and processing was also confirmed by a recent BAN visit to Guiyu in December 2015. We finally witnessed the closure of the informal

forms of scrap, including contaminated plastics and paper. These "Green Fence" policies are well documented in trade press.[3]

→ All forms of hazardous e-waste, including any equipment (e.g. printers, faxes etc.) that contains a circuit board, a display screen, or a battery, is prohibited from importation into China and in accordance with the Basel Convention such imports are likely to be considered criminal.

2 See BAN Press Release: http://www.ban.org/news/2015/12/17/chinas-guiyu-shifts-away-from-crude-processing

3 http://www.resource-recycling.com/node/3679

Hong Kong

We cover Hong Kong separately from We cover Hong Kong separately from China because Hong Kong, while clearly being a part of China and therefore a Basel Convention Party, is nevertheless a Special Administrative Region and possesses some distinct definitions of hazardous waste. In an e-mail to BAN dated March 9, 2016, Patrick Ho of the Territorial Control Office of the Environmental Protection

Department of Hong Kong explained the law as follows:

> *"In Hong Kong, import and export of waste are subject to control under the Waste Disposal Ordinance (WDO) which is modeled on the Basel Convention. Under the control, import or export of any waste requires a permit issued by the Environmental*

Protection Department (EPD) unless the waste is:

i. *listed in the Sixth Schedule of the WDO,*
ii. *uncontaminated as defined under the WDO and*
iii. *imported for a genuine recycling or reuse purpose.*

A WDO control scheme guide including a full list of the schedules are available in our website:

http://www.epd.gov.hk/epd/sites/default/files/epd/english/environmentinhk/waste/guide_ref/files/2015_ie_english.pdf

The EPD has adopted the Basel Ban of the Basel Convention in the WDO, under which import of any hazardous waste from developed countries which are members of OECD, EC and Liechtenstein is not permitted. The banned countries (including the United States) are listed in the Ninth Schedule of the WDO. Accordingly, import of waste electrical or electronic equipment (WEEE) containing hazardous constituents or components are not permitted. Common types of such controlled waste embrace computer monitors, laptops, tablet computers and televisions with various displays technologies such as cathode ray tubes (CRT), liquid crystal displays (LCD), light emitting diodes (LED) and

Figure A21. *Screenshot from Hong Kong Environmental Protection Department website stating that they currently do not accept any hazardous waste imports. Retrieved from: http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/guide_wiec_faq.html*

plasma displays, accumulators, batteries, mercury-switches, transformers and capacitors containing mineral oil or polychlorinated biphenyl. Any article or substance once given up by its original user is considered as waste under the WDO, irrespective whether it is still workable or can be sold for a value."

In addition it is useful to point out that Hong Kong as part of China (Basel Party) implements the Basel Convention's Party to non-Party trade prohibition.[1] The reference to the Party to non-Party ban follows:[2]

Currently, the Hong Kong Waste Disposal Ordinance has unique definitions from the Basel Convention with respect to circuit boards, which they do not necessarily consider hazardous. Thus they may not control some forms of electronic waste (CPUs, printers, faxes, keyboards, mice, etc.) from entering Hong Kong, as long as they are received by a permitted facility. However many of the operations in Hong Kong in the New Territories region are not permitted, licensed recyclers. Thus, the import of these other forms of electronic waste moving to these informal operations are still likely to be illegal.

→ In summary, any import of discarded LCDs, LEDs, plasma screens, CRTs, or battery-containing equipment from the United States into Hong Kong is prohibited, whether or not the devices are functional. Printers and other electronic equipment may be legal to import as long as the receiving facility is licensed and permitted to recycle them.

1 Party to non-Party Ban, found in the Basel Convention at: Article 4, para. 5; Exception found at Article 11.

2 http://www.epd.gov.hk/epd/english/environmentinhk/waste/guide_ref/guide_wiec_faq.html

Taiwan

Taiwan is not a member of the United Nations (UN), nor a Party to the Basel Convention due to UN acceptance of the "One China" policy making the Peoples Republic of China being the legitimate Chinese government. However, in practice, Taiwan acts as a sovereign state and operates as if it were a Party to the Basel Convention. For example, Taiwan's law requires "prior informed consent" rules and employs Basel waste definitions in their legislation and territory.

On October 13, 2015, BAN sent an inquiry to the Taiwan Environmental Protection Administration (EPA) to determine Taiwan's official policy regarding import/export of electronic waste. BAN received a response from Ms. Wen-Huei Yau of the Taiwan EPA on November 4, 2015 stating that:

"Non-functional LCD screens and non-functional CRTs are defined as hazardous waste in Taiwan. And based on "Industrial Wastes and General Wastes Banned from Importation (禁止輸入之事業廢棄物及一般廢棄物種類)", hazardous wastes are not allowed to be imported into Taiwan. Therefore, according to Taiwanese law, such waste computer monitors are forbidden from entry into Taiwan at all times."

BAN followed up this correspondence to clarify the distinction between waste and

non-waste, and received the following from Ms. Yau (see Appendix 2):

> *"Regarding the distinction between waste computer/ monitor and non-waste computer/ monitor, when used electronic devices imported from foreign countries are collected and sorted in the name of recycling, repairing and dismantling by recyclers, and the devices will later be sold nationwide or exported to other countries, they will be considered as wastes. However, when used electronic devices are imported by repair companies for the purpose of repairing and refurbishment, and will be returned to the original owners after repairing, the devices will not be considered as wastes. The repair companies, at the same time, will have to show relevant documents, like repairing certificate, bilateral contract, invoice and so on, to prove that they are not recyclers."*

→ In summary, it is clear that the import of any kind of monitor or display is prohibited under the laws of Taiwan.

Thailand

Thailand is a Party to the Basel Convention. As such, it would be a violation of the Basel Convention's Party to non-Party ban1 for Thailand to accept Basel-listed hazardous waste from the United States absent a special agreement. No such special agreement exists.

Electronic waste is identified as hazardous waste according to Thailand's Notification of Ministry of Industry2 and, in accordance with the Basel Convention, requires import or export permits from any Basel Party. .

→ In summary, the import of any kind of e-waste from the United States is prohibited under Thailand's Basel Convention obligations.

1 Party to non-Party Ban, found in the Basel Convention at: Article 4, para. 5; Exception found at Article 11.

2 Notification of Ministry of Industry "List of Hazardous substance and chemical waste." B.E. 2546.

Appendix 3: Methodology

Tracking Hardware and Software

In order to determine and procure the best equipment for the e-Trash Transparency Project, BAN tested several different subscription-based tracking systems. Based on the findings, it was determined that BAN's case scenario was better served by a customized solution, but one that made use of "off-the-shelf" GSM/GPRS tracking hardware.

BAN chose the hardware on the basis of tested reliability, lower price, and thin profile. For the purposes of this report we will call the tracking device a "tracker." Each tracker is equipped with a SIM card that communicates over a separately purchased machine-to-machine (M2M) subscription service.

The combined cost of a single tracker, external battery, the SIM card, the M2M service rates package was approximately $175 (including shipping and taxes). The project, funded in large part by a grant from the Body Shop Foundation, included the purchase of over 200 trackers.

Free and open source software called OpenGTS was used to collect and display data in a user-friendly manner. Using open source software enabled BAN to customize the display information to suit the unique

Figure A22. *Screen shot of typical installation video, shot for each deployment. Shown here is a tracker being installed inside an LCD before being closed up and deployed. ©BAN, 2015.*

needs of the project and our particular hardware. The software included integration with Google Maps, which allowed for easier interpretation of GPS data.

How the Trackers Work, Capacity and Limitations

TThe tracker is a digital communication device that uses the language of printable ASCII characters. Communications are sent between the tracker and the back-end server via a GSM (mobile phone) data service (via Internet) or SMS (text messages). The trackers can also be remotely configured or adjusted via the same communication methods.

The tracker makes use of the Global Positioning System (GPS), which is a worldwide radio-navigation system formed from the constellation of 24 satellites and their ground stations. GPS satellites provide a signal that is received and processed by the tracker. Using satellite signals the tracker can calculate the latitude and longitude of its location with great accuracy, often within 10 square feet. In the absence of GPS satellite signals, the tracker simply sends the coordinates of the cell tower it calls from, which might be a mile or so away from the tracker itself. Cell tower readings can help to provide reliable updates on general locations (e.g. to which country or region the device has travelled), but will not definitively identify the property where the tracker is signaling from.

The trackers that were used usually had at least a 9-month battery life, with some trackers still able to communicate after 12 months. The battery life varies depending on many factors including signal strength, temperature and sleep mode settings. Prolonged battery life is primarily attributed to the tracker possessing a sleep mode function, which allows the device to hibernate in a power-saving mode for a preset time. Typically, each tracker was set to "wake up" every 24 hours, calculate its position based on the satellite signals it received, send the data to BAN's server via local GSM networks and then re-enter sleep mode function.

In the case of a non-existent or a weak GSM signal that prevents the tracker from being able to communicate with the back end server, the tracker can store 10,000 GPS data points that can be sent to the server the next time a successful connection is made.

Each tracker in the project was given a unique ID number made from the deployment state letter code followed by 6 digits. The ID number is printed clearly on all trackers so as to be visible while on camera during the deployment documentation video.

Additionally, the trackers were each fitted with a label with a message stating "if found, email tracking@ban.org."

Each tracker was adhered to its host device with industrial strength Velcro brand tape. The resulting bond, which is rated to hold 5lbs of weight vertically, made it very difficult for trackers to become dislodged. The tracker external battery packs were also adhered to their host device with the same tape and most often 3 to 6 inches away from the tracker.

In the unlikely situation of a tracker became removed from its host device, it is highly probable that the external battery pack, which was attached to the tracker by a mini USB connector via a 6-inch cable, would have become disconnected from the tracker. The external battery pack, which is the main source of power for the tracker, was not wired to charge the smaller internal battery present inside the tracker.

Therefore, when the external battery pack is disconnected from a tracker, a change in battery charge level is observed with the inbound data. As the observed battery levels did not suddenly drop on any of our data to date, we can say beyond a reasonable doubt that none of the trackers exported became separated from their host equipment prior to export.

Deployment

To establish and maintain a chain of custody, BAN recorded a video of each tracker installation in the e-waste equipment. The delivery of e-waste (usually a walk-up to a loading dock or office) was also captured by covert video. Proof of recycling was also received (e.g. receipt) when provided.

Deployed tracker information was recorded on an on-line database. This information included IMEI number1 of the device, e-waste type, serial number, place deployed (including address, phone numbers, persons of interest, previous export history, and certifications), date deployed, deployment notes/observations, and ongoing tracker status notes.

BAN used three specific types of e-waste hardware as tracker hosts:

- CRT (cathode ray tube) monitors or CRT televisions
- LCD (liquid crystal display) monitors or TVs containing CCFLs (mercury containing cold cathode fluorescent lamp)
- inkjet or laser type printers

These devices were chosen, for logistical reasons (plenty of room inside to place a tracker), and also because each contain components that qualify the equipment as hazardous waste, and thus each is controlled

1 http://www.gsm-security.net/faq/imei-international-mobile-equipment-identity-gsm.shtml

Figure A23. *Screen capture from covert video of CRT deployment by BAN researcher. ©BAN. 2015.*

under international law (e.g. the Basel Convention). All units were made non-functional and not economically repairable prior to deployment in order to make the legality of export issue more certain.

Delivery Locations

The generous project funding obtained from the Body Shop Foundation allowed the deployment of trackers across the mainland United States. With 205 trackers to deploy, as mentioned in the Project Overview, BAN decided to focus on one particular charity (Goodwill) and then to focus most of the rest of the trackers on publicly accessible recyclers. We focused on several highly populated regions of the United States. The regions included:

- Pacific Northwest (Washington and Oregon)
- California and Southern Nevada
- Midwest (Ohio, Indiana, Illinois, Michigan, Wisconsin)
- Northeast (Massachusetts, New Hampshire, New Jersey, New York)

Several trackers were also deployed in Florida and Georgia.

In order to best represent the public's typical recycling habits, e-waste drop off locations were selected from state e-waste program listings found on state ecology or environmental quality agency websites and from Google search results from the phrase "computer recycling [city of deployment]". The resulting locations included recyclers (both for-profit and non-profit), recycler drop-off sites, and charitable thrift stores. Whether or not these locations had industry certifications (e.g. R2 or e-Stewards) was not a factor in choosing the locations.

Some of the locations chosen were of small to medium capacity. The result was that tracker enabled e-waste often moved from these facilities to larger facilities (e.g. equipped with shredders, balers, etc.) allowing one tracker to collect data on multiple companies and different geographic regions.

The charitable organizations in our deployment included Deseret Industries, Goodwill Industries, and the Salvation Army. Particular emphasis was placed on Goodwill Industries because BAN had received a number of whistle-blower calls and emails asserting that Goodwill Industries was allowing export of donated electronic goods contrary to stated policies (see sections of this report dealing with Goodwill Industries). We sought to verify those complaints.

Assumptions and Fair Representation

205 trackers deployed in 205 electronic devices is a relatively small sample size when compared with the vast amount of electronic waste generated in the United States every year. Thus extrapolations must be used with caution. The extrapolations we have done in this study to indicate the potential scale of the export concern for example, must be understood with respect to a vast array of variables, which could deviate from a fair representation of the norm.

Pernicious error is a danger in any study. For example, some might argue that an advocacy organization like BAN will have a built-in bias to seek out high-risk export destinations to make their case. On the other hand, the marketplace, at the time the study was conducted, had historic lows in commodity prices, and along with heightened import controls in China could have skewed the data against a robust export trade to Asia compared to even 3 years ago. The regions we chose could have for some reason not have been nationally representative. The types of devices we chose could have been unrepresentative of the entire scope of what is generally considered e-waste. BAN, choosing to mostly focus on but one charity may have skewed the outcome, as we are not sure whether Goodwill is representative of all charities that process e-waste. Certainly BAN's study did not look into the brokers and traders that buy directly from businesses and do not accept equipment from the general public. Nor did we survey government auction programs, which are legally obliged to seek out the least expensive methods of disposal to save taxpayer expense. There is reason to believe that brokers and government disposal is more prone to export.

As we can see, there are many variables which could skew data one way or the other. For this reason, it is important to understand that the extrapolations made in this report, based as they are on conservative estimates, are provided not as facts but as illustrative of the potentially massive scale of the problem identified.

Appendix 4: Legal Analysis

Confidential and Privileged
Attorney Work Product
Attorney-Client Communication

Davis Wright Tremaine LLP
SEATTLE OFFICE

MEMORANDUM

TO: Jim Puckett
FROM: Caesar Kalinowski
DATE: August 2, 2016
RE: Possible claims against recyclers for false advertisement

I. SUMMARY

This memorandum discusses the possible claims against recyclers who falsely advertise that they do not export electronic waste, even when such export may not be technically illegal under US environmental or trade laws. In brief, the companies and their officers could be charged or sued under a number of statutes, including: state laws for consumer protection and false advertising, federal unfair practices (15 U.S.C. § 45) or false advertising (15 U.S.C. § 52), and multiple statutes in connection with government contracts, such as criminal false claims (18 U.S.C. § 287), civil false claims (31 U.S.C. § 3729), false statements (18 U.S.C. § 1001), mail fraud (18 U.S.C. § 1341), and wire fraud (18 U.S.C. § 1343).

II. ANALYSIS

Besides the possible civil and criminal penalties for the actual exportation of electronic waste under 18 U.S.C. § 554 (addresses illegally exporting hazardous waste)[1] and 42 U.S.C. § 6928(d)(4) (addresses failures to file a Notification of Intent to Export with the Environmental Protection Agency)[2], recycling companies and their associates can be held liable for merely advertising or claiming that they manage e-waste properly domestically, when in fact, they improperly export their waste overseas. Possible claims, which can result in severe civil fines and criminal sentences, include: state law consumer protection act and false advertising claims, Federal Trade Commission Act ("FTCA") unfair practices or false advertising claims, and numerous claims regarding false statements in connection with government contracts.

A. FTCA Claims

Under federal law, the United States[3] can bring claims against businesses that use unfair or deceptive practices to sell goods and services. Specifically, 15 U.S.C. § 45 prohibits "[u]nfair

1 "Whoever fraudulently or knowingly exports or sends from the United States, or attempts to export or send from the United States, any merchandise, article, or object contrary to any law or regulation of the United States . . . shall be fined under this title, imprisoned not more than 10 years, or both." 18 U.S.C. § 554.

2 The Resource Conversation and Recovery Act provides criminal penalties for "[a]ny person who knowingly generates, stores, treats, transports, disposes of, exports, or otherwise handles any hazardous waste . . . and who . . . conceals, or fails to file any record, application, manifest, report, or other document required to be maintained or filed for purposes of compliance with regulations[.]" 42 U.S.C. § 6928(d)(4)

3 The FTCA does not create a federal private cause of action for consumers. *Carlson v. Coca-Cola Co.*, 483 F.2d 279 (9th Cir. 1973).

9.8.16
DWT 30122357v1 0200958-000001

or deceptive acts or practices in or affecting commerce." Additionally, "disseminat[ing], or caus[ing] to be disseminated, any false advertisement . . . in or having an effect upon commerce . . . for the purpose of inducing, or which is likely to induce, directly or indirectly the purchase of . . . services" is unlawful. 15 U.S.C. § 52(a)(1). Often, these charges are brought in tandem by the Federal Trade Commission when a business uses "an advertisement, other than labeling, which is misleading in a material respect[.]" *F.T.C. v. Direct Mktg. Concepts, Inc.*, 624 F.3d 1, 7–8 (1st Cir. 2010) (quoting 15 U.S.C. § 55).[4] Following a successful FTCA claim, defendants can expect injunctions (15 U.S.C. § 53) and penalties (15 U.S.C. § 54), to include substantial monetary fines and prison sentences.

B. State Law Claims

Apart from federal statutes, private individuals and local governments can bring state claims against businesses that deceptively advertise their products or services. For example, individuals in California can bring claims under the Consumer Legal Remedies Act ("CLRA"), Cal. Civ. Code § 1750 *et seq.*, and the False Advertising Law ("FAL"), Cal. Bus. & Prof. Code § 17500 *et seq*. The CLRA provides a right of action against "unfair or deceptive acts or practices undertaken by any person in a transaction intended to result or which results in the sale or lease of . . . services to any consumer." § 1770(a). Such acts and practices include, "[r]epresenting that goods or services have . . . characteristics, ingredients, uses, benefits, or qualities which they do not have," § 1770(a)(5), and "[r]epresenting that goods or services are of a particular standard, quality or grade . . . if they are of another." § 1770(a)(7). The FAL similarly makes it unlawful, in connection with the sale of services, to make or disseminate "any statement . . . which is untrue or misleading, and which is known, or which by the exercise of reasonable care should be known, to be untrue or misleading." § 17500. Explicit infractions include misrepresenting the environmental impact of a service, § 17580, and making "any untruthful, deceptive, or misleading environmental marketing claim," § 17580.5.[5] Other states have similar or identical statutes that can result in actual and punitive damages for offending businesses. *See* New York's General Business Law §§ 349[6], 350[7], and Washington's RCW 19.86.020[8].

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4 *See also Belfiore v. Procter & Gamble Co.*, 311 F.R.D. 29, 78 (E.D.N.Y. 2015) (recognizing authority of the Federal Trade Commission to investigate and bring claims against company that deceptively labeled their product as "flushable").

5 *See Oxina v. Lands' End, Inc.*, No. 14-CV-2577-MMA NLS, 2015 WL 4272058, at *4 (S.D. Cal. June 19, 2015) (plaintiff sufficiently alleged standing for FAL claim when she argued the defendant claimed a product was made in the U.S.A. but it was not, and she believed "that being made in the U.S.A. made the Necktie a superior quality product.").

6 "The elements of a violation of General Business Law § 349 are (1) proof that the practice was deceptive or misleading in a material respect and (2) proof that plaintiff was injured [.]" *BNI New York Ltd. v. DeSanto*, 177 Misc. 2d 9, 14, 675 N.Y.S. 2d 753 (1998).

7 "False advertising . . . in the furnishing of any service in this state is . . . unlawful." N.Y. Gen. Bus. Law § 350. *See also People by Vacco v. Lipsitz*, 174 Misc. 2d 571, 663 N.Y.S.2d 468 (Sup. Ct. 1997) (finding liability for violations of § 349 and § 350 when defendant made deceptive claims on his internet website).

8 "Unfair methods of competition and unfair or deceptive acts or practices in the conduct of any trade or commerce are . . . unlawful." RCW 19.86.020.

C. Claims Involving Government Contracts

When recyclers and associated businesses make false claims, statements, or representations to the government, in connection with government contracts, they can also face stiff criminal penalties. Under 18 U.S.C. § 287, any person who makes a claim to a department or agency of the United States, "knowing such claim to be false, fictitious, or fraudulent," will be imprisoned and fined. A similar civil statute allows a private citizen to bring a civil claim on behalf of the United States.[9] Additionally, a person that "in any matter within the jurisdiction" of the government,"[f]alsifies . . . a material fact[,] makes any materially false, fictitious, or fraudulent statement or representation[,] or makes or uses any false writing or document knowing the same to contain any materially false, fictitious, or fraudulent statement or entry[,]" will be imprisoned and fined. 18 U.S.C. § 1001. In addition to these crimes, a business or individual that uses the mail, a telephone, or the internet to transmit the false claims or statements can be charged under the mail and wire fraud statutes.[10] Accordingly, in *United States v. Executive Recycling, Inc.*, a recycling company and its officers were charged and convicted under various statutes for their illegal exportation of e-waste. *United States v. Richter*, 796 F.3d 1173, 1179–80 (10th Cir. 2015). In addition to falsely claiming that they responsibly recycled their e-waste, the defendants were also convicted for using the postal service and internet to transmit these claims. *Id.* Additionally, 31 states have enacted statutes that penalize the filing of false claims in connection with government contracts.[11]

III. CONCLUSION

Due to the known harm caused to the environment and human health by substandard recycling in developing countries, many customers of recycling companies want to be assured that their e-waste will only be processed domestically or in developed countries. Any recycling company that falsely advertises or claims, through websites and other means, that they responsibly recycle their electronic waste domestically, when in fact they export the electronic waste to developing countries, even when such export itself might be legal, can be subject to immense civil and criminal penalties under state and federal statutes. Furthermore, companies engaged in government contracts for the recycling of these goods are even more susceptible to criminal sentences in connection with any false statements made regarding the nature of their recycling programs.

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9 "[A]ny person who . . . knowingly makes, uses, or causes to be made or used, a false record or statement material to a false or fraudulent claim . . . is liable to the United States Government for a civil penalty[.]" 31 U.S.C. § 3729(1)(B). *See also U.S. ex rel. Am. Textile Mfrs. Inst., Inc. v. The Ltd., Inc.*, 20 ITRD 2380 (S.D. Ohio 1997) ("any entry in any business record of any business subject to the environmental laws of the United States which did not accurately report . . . the unlawful transportation of hazardous waste, or some other type of activity which violated the environmental laws, could give rise to the filing of a False Claims Act case.").

10 "The mail and wire fraud statutes require []: (1) a scheme or artifice to defraud or obtain money or property by false or fraudulent pretenses, representations, or promises; (2) an intent to defraud; and (3) use of the mails ([18 U.S.C.] § 1341) or interstate wires ([18 U.S.C.] § 1343) in connection with the scheme." *United States v. Richter*, 796 F.3d 1173, 1191 (10th Cir. 2015).

11 S*ee, e.g.* N.Y. State Fin. Law §187 *et seq.*; Cal. Gov't Code §§ 12650-12656.

Appendix 5: Comprehensive Table of All Discovered Export Chains

Note: Appearance in the table on the following pages does not indicate or infer culpability. See " Companies Revealed in 'Chains of Export'" section on page 23 for an understanding of a “Chain of Export”. Shaded rows indicate instances of the recycler being found to be the last US handler of a device prior to export.

The summary table presented on page 26 of the report identifies the 75 unique recyclers found in a "chain of export", this comprehensive table takes a detailed look at every one of those 90 "chains of export".

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
1	1 Green Planet	Renton, WA	First	LCD WA546164	None	No	No	Yes	No	Hong Kong, New Territories	1. 1 Green Planet 2. EWC Group Recyclers/eWaste Center 3. Canada, Vancouver Port area 4. Hong Kong, Port of Hong Kong 5. Hong Kong. Unverified location (New Territories)
2	Accurate IT	Columbus, OH	First and Last	CRT OH157467	R2	No	N/A – No state program	No (But discusses BAN's findings of pollution occurring in developing countries)	Yes	Pakistan, Multan	1. Accurate IT 2. Pakistan, Port Qasim 3. Pakistan, Multan 30.188337, 71.456527
3	ACT Secured Recycling	Lawrence, MA	First	Printer MA352894	None	No	N/A – No state program	No	Yes	Hong Kong, New Territories	1. ACT Secured Recycling 2. TBS Industries 3. Hong Kong, Port of Hong Kong 4. Hong Kong. New Territories 22.453303, 113.981538
4	Advance Trading Corp	Ontario, CA 34.059492, -117.659313	Last	LCD NV353413	None (No certification at time of export, but became R2 certified ~4 months after handling exported device).	No	Yes – Active collector	Yes	No	Hong Kong, New Territories	1. Nevada State Recycling 2. TW Recycling 3. Advance Trading Corp 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.423244, 114.019274
5	Advance Trading Corp	Ontario, CA 34.059311, -117.659305	Intermediate	LCD CA549390	None (No certification at time of export, but became R2 certified ~4 months after handling exported device).	No	Yes – Active collector	Yes	No	Cambodia, Phnom Penh area	1. Recycling Event at Eliot Middle School, Altadena, CA 2. Attan Recycling Corp 3. Advance Trading Corp 4. WTB Electronics Recycling Import & Export 5. Port of Long Beach 6. Cambodia, Unverified location (Krong Preah Sihnaouk port area) 7. Cambodia, Unverified location (Phnom Penh area)
6	Advanced Recovery Inc (ARI)	Newark, NJ	First	LCD NJ614731	R2	No	Yes – Large Quantity Universal Waste Handler	No	Yes	Hong Kong, New Territories	1. Advanced Recovery Inc (ARI) 2. Unverified location, Middletown, NJ 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.526796, 114.166662

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
7	AERC Recycling Solutions	Hayward, CA	First	LCD CA552709	R2	Yes	No – Inactive collector	No	Yes	Hong Kong, New Territories	1. AERC Recycling Solutions 2. Unverified location, Stockton, CA 3. Unverified location, Chino, CA area 4. Hong Kong – Port of Hong Kong 5. Hong Kong – Pillar Point port area 6. Hong Kong, New Territories 22.48509, 114.071367 7. Hong Kong, New Territories 22.455738, 114.01992 8. Hong Kong, New Territories 22.485871, 114.003833
8	All eWaste*	Santa Clarita, CA	First	Printer CCA545745	e-Stewards*	No	Yes – Active collector & recycler	No	No	Hong Kong, New Territories	1. All eWaste collection event in Santa Clarita, CA 2. All eWaste HQ, Sun Valley, CA (34.228201, -118.385998) 3. IQA Metals 4. Port of Long Beach 5. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.447456, 113.9652
9	Allied Computer Brokers	Amesbury, MA	First	LCD MA616330	None	No	N/A – No state program	Yes	No	Hong Kong, New Territories	1. Allied Computer Brokers 2. Unverified location, North Billerica, MA 3. Unverified location in Boston, MA 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories (unverified location) 6. Hong Kong, New Territories 22.453112, 113.987362
10	ARCOA	Waukegan, IL	First	LCD IL163523	R2	Yes	Yes – State EPA list	No	No	Hong Kong, New Territories	1. ARCOA 2. ECR World 3. Port of Long Beach, CA 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.436384, 114.002787
11	Attan Recycling Corp	Chino, CA	First and Last	CRT CA551248	None	No	Yes – Active collector & recycler	No	No	Taiwan, Taoyuan City	1. Attan Recycling Corp 2. Port of Long Beach, CA 3. Taiwan, Unverified location, Port area in New Taipei City, Bali District 4. Taiwan, Unverified location. Taoyuan City, Guanyin District

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
12	Attan Recycling Corp	Chino, CA 34.000353, -117.709278	First	LCD CA549390	None	No	Yes – Active collector & recycler	No	No	Cambodia, Phnom Penh area	1. Recycling Event at Eliot Middle School, Altadena, CA 2. Attan Recycling Corp 3. Advance Trading Corp 4. WTB Electronics Recycling Import & Export 5. Port of Long Beach, CA 6. Cambodia, Unverified location, Krong Preah Sihnaouk port area 7. Cambodia, Unverified location, Phnom Penh area
13	Avnet	Groveport, OH 39.854467, -82.918673	Intermediate	Printer OH166039	R2	Yes	N/A – No state program	Yes	No	China, Guiyu area	1. Goodwill – Wooster, OH (Dell Reconnect Location) 2. Avnet 3. Unverified location, Columbus, OH 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. China, Unverified location, Dongguan, Guangdong 7. China, Unverified location, Near Guiyu
14	Blind Center of Nevada	Las Vegas, NV	First and Last	CRT NV353470	R2	No	N/A – No state program	No	No	Mexico, Mexicali area.	1. Blind Center of Nevada 2. Mexico - Unverified location, Mexicali
15	Blue Star Electronics, LLC (Hayward Ewaste)	Hayward, CA 37.620382, -122.054587	Intermediate	LCD CA542981	None	No	No – Inactive collector	No	No	Hong Kong, New Territories	1. Remitek Inc 2. Blue Star Electronics 3. Unverified location, Fremont, CA area 4. San Francisco/Oakland ports, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.429514, 114.016853
16	Blue Star Electronics, LLC (Hayward Ewaste)	Hayward, CA 37.620368, -122.054698	First	LCD CA540894	None	No	No – Inactive collector	No	No	Hong Kong, New Territories	1. Blue Star Electronics 2. Warehouse in Business Park at 48016 Fremont Blvd., Fremont, CA 3. Unverified Location, San Jose, CA area 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories, Unverified location
17	Cal Micro Recycling	Ontario, CA 34.061649, -117.680484	First	Printer CA530101	R2	No	Yes – Active collector & recycler	Yes	Yes	Hong Kong, New Territories	1. Cal Micro Recycling 2. Growan Inc. 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.511, 114.155034
18	Cal State Electronic Recycling (CSER, Inc.)	San Marcos, CA	First and Last	LCD CA544961	None	No	No	No	No	Thailand, Bangkok area	1. Cal State Electronic Recycling 2. Port of Long Beach, CA 3. Thailand, Port area near Bangkok 4. Thailand, Unverified location (Chon Buri, near Bangkok)

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
19	Cal State Electronic Recycling (CSER, Inc.)	San Marcos, CA 33.159699, -117.202282	Interme-diate	LCD CA552287	None	No	No	No	No	Hong Kong, New Territories	1. e-Recycling of California 2. Cal State Electronic Recycling 3. Unverified location, City of Industry, CA 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.455844, 114.020101
20	Chicago Surplus Com-puter (CSC)	Chicago, IL	First	CRT IL162640	None	No	No	No	No	Pakistan, Faisal-abad	1. Chicago Surplus Computer 2. Unverified location, West Chicago, IL 3. Unverified location, possibly trainyard, Chicago, IL 4. Pakistan in Faisalabad, unverified location
21	Chicago Surplus Com-puter (CSC)	Chicago, IL	First	LCD IL163424	None	No	No	No	No	United Arab Emir-ates, Dubai	1. Chicago Surplus Computer 2. UNITEC Recycling Corporation 3. Chicago Surplus Computer 4. Unknown warehouse/field, Lombard, IL, GPS 5. UAE, Dubai
22	Chicago Surplus Computers (CSC)	Chicago, IL	First and Last	CRT IL616231	None	No	No	No	No	Pakistan, Faisal-abad	1. Chicago Surplus Computers 2. Port Newark. NJ 3. Pakistan, Port Muhammard Bin Qasim, Karachi 4. Pakistan, Faisalabad. 31.417952, 73.077023
23	Chicago Surplus Computers (CSC)	Chicago, IL	First and Last	LCD IL616371	None	No	No	No	No	Hong Kong, New Territories	1. Chicago Surplus Computers 2. Unverified locations: Travels along train route from Chicago to Gila Bend, AZ 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.528651, 114.166338
24	CRT Recycling	Brockton, MA	First and Last	CRT MA353454	R2	No	No state program	No	Yes	Pakistan, Samundri	1. CRT Recycling 2. Unverified location (potentially in transit, one cell tower reading in Leominster, MA before export) 3. Pakistan, Faisalabad 31.412861, 73.126515 4. Pakistan, Samundri 31.057368, 72.973192
25	Earthworm Recycling	Somerville, MA	First	Printer MA616041	None	No	No state program	No	No	Hong Kong, New Territories	1. Earthworm Recycling 2. Good Point Recycling 3. Unverified location (Chicago, IL) 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.453373, 113.981578

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
26	Ecobinary LLC* Ecobinary passed the device to Total Reclaim, an e-Stewards Certified Recycler. Total Reclaim admitted to being culpable for the export.	Beaverton, OR	First	LCD OR356028	None	No	Yes – Registered collection site	No	No	Hong Kong, New Territories	1. Ecobinary, LLC 2. Unverified location (Portland, OR) 3. Trailer Yard used by Total Reclaim, Portland, OR 4. Trailer Yard, Seattle, WA – used by Total Reclaim 5. Total Reclaim, Seattle, WA 6. Hong Kong, Port of Hong Kong 7. Hong Kong, New Territories 22.450503, 113.966656 8. Hong Kong, New Territories 22.485588, 114.074766
27	ecoTech Management	Holbrook, NY 40.774097, -73.083087	Intermediate	Printer NY615597	R2	No	No	No	No	Hong Kong, New Territories	1. Mr. E-Waste 2. ecoTech Management 3. Unverified location, Willingboro, NJ 4. Hong Kong, New Territories 22.447177, 113.965548
28	ECR World	Chino, CA 33.99196, -117.694784	Last	LCD IL163523	R2	No	No – Inactive collector	N/A No website	N/A no website	Hong Kong, New Territories	1. ARCOA 2. ECR World 3. Port of Long Beach, CA 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.436384, 114.002787
29	Electronics Recycling Services INC dba Green E-Waste Recycling Center	San Jose, CA	First and Last	LCD CA356242	None	No	Yes – Active collector	No	No	Hong Kong, New Territories	1. Electronics Recycling Services Inc. 2. Port of Oakland, CA 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.429382, 114.016906 5. Hong Kong – Kowloon near port 22.327304, 114.16024 6. Hong Kong, New Territories 22.534432, 114.207566 7. Hong Kong, New Territories 22.48053, 114.05527
30	e-Recycling of California*	Irvine, CA	First	LCD CA552287	e-Stewards*	Yes	Yes – Active collector & recycler	Yes	No	Hong Kong, New Territories	1. e-Recycling of California 2. Cal State Electronic Recycling (CSER, Inc.) 3. Unverified location, City of Industry, CA 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.455844, 114.020101

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
31	eRevival LLC	Garfield, NJ	First and Last	CRT NJ616173	R2	No	Yes - Large Quantity Universal Waste Handler & Refurbisher	Yes	Yes	Hong Kong, New Territories	1. eRevival LLC 2. Hong Kong, Unverified location 3. Hong Kong, New Territories 22.424206, 114.039361
32	E-Scrap Solutions	Cleveland, OH	First	LCD OH160248	R2	No	N/A – No state program	No	No	Hong Kong, New Territories	1. E-Scrap Solutions 2. Unverified location, Greensburg, PA 3. Unverified location, Columbus, OH 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.441442, 113.987396
33	E-Tech Management	Columbus, OH	First and Last	Printer Geo-Force3039211	None	No	N/A – No state program	No	No	Hong Kong, New Territories	1. E-Tech Management 2. Hong Kong, New Territories 22.52876, 114.13932
34	E-Tech Management	Columbus, OH	First and Last	CRT OH154449	None	No	N/A – No state program	No	No	Canada, Barrie	1. E-Tech Management 2. Canada, Unknown warehouse in Toronto 43.83054, -79.26873 3. GEEP, Barrie, Ontario. Found our tracker and sent it back to us.
35	e-Waste, LLC	Hudson, OH	First	LCD OH356309	R2	No	N/A – No state program	No	Yes	Hong Kong, New Territories	1. e-Waste, LLC 2. Unverified location, Cleveland, OH) 3. Unverified location, likely in transit through Atlanta, GA 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.484294, 114.110072
36	EWC Group Recyclers (eWaste Center)	Commerce, CA	First and Last	Printer CA543948	None	No	Yes – Active collector and recycler	Yes	No	Hong Kong, New Territories	1. EWC Group Recyclers (eWaste Center), Los Angeles, California 2. Port of Long Beach, CA 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.471585, 113.989428 5. Hong Kong, New Territories 22.457417, 113.992414
37	EWC Group Recyclers (eWaste Center)	Tukwila, WA 47.451982, -122.250146	Last	LCD WA546164	None (Last certified to R2 standard in 2014)	No	Yes – Registered transporter & processor	Yes	No	Hong Kong, New Territories	1. 1 Green Planet 2. EWC Group Recyclers/eWaste Center, Tukwila, Washington 3. Canada, Vancouver Port area 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories, Unverified location

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
38	EZPC	Santa Ana, CA	First	Printer CA551412	None	No	Yes – Active collector	Yes	Yes	China, Guiyu area (via Hong Kong, New Territories)	1. EZPC 2. Unknown warehouse at 2370 E Artesia Blvd, Long Beach, CA 3. Port of Long Beach, CA 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.471612, 113.989588 6. Hong Kong, Unverified location 7. China, Fos-han, Guangdong 23.150815, 113.107867 8. China, Guiyu area, Unverified area)
39	Far West Recycling	Portland, OR	First	LCD OR350062	None	Yes	Yes – Reg-istered collection site	No	No	Taiwan, Longling (via Hong Kong, New Territories)	1. Far West Recycling 2. Unverified location, Vancouver, WA 3. Golden Valley Trading 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.45147, 113.967598 7. Taiwan, Keelung City area, Unverified location 8. Taiwan, Longjing District 24.177561, 120.549028 9. Taiwan, Liuying District 23.284257, 120.352853 10. Taiwan, Longling District, 24.177365, 120.549053
40	Golden Valley Trading	Chino, CA 34.001151, -117.690472	Last	LCD OR350062	None	No	No	No	No	Taiwan, Logngling	1. Far West Recycling 2. Unverified location, Vancouver, WA 3. Golden Valley Trading 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.45147, 113.967598 7. Taiwan, Keelung area, Unverified location 8. Taiwan, Longjing District 24.177561, 120.549028 9. Taiwan, Liuying District 23.284257, 120.352853 10. Taiwan, Longjing District 24.177365, 120.549053

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
41	Golden Valley Trading	Chino, CA 34.001573, -117.690708	Last	Printer NV356143	None	No	No	No	No	Hong Kong, New Territories	1. Goodwill – Las Vegas (Dell Reconnect location) 2. Goodwill – North Las Vegas (Dell Reconnect location) 3. Unverified location, Poway, CA 4. Golden Valley Trading 5. Port of Long Beach, CA 6. Hong Kong, Port of Hong Kong 7. Hong Kong, New Territories, Unverified location, Un 8. Hong Kong, New Territories 22.451292, 113.967369
42	Golden Valley Trading	Chino, CA 34.001796, -117.690033	Last	LCD OH161584	None	No	No	No	No	Hong Kong, New Territories	1. Goodwill Easterseals – Wapakoneta (Dell Reconnect location) 2. J&D Recyclers 3. Unverified location, Dayton, OH 4. Goodwill Auto Auction site, Dayton, OH 5. Unverified location, Groveport, OH 6. Unverified location, Commerce, CA 7. Unverified location, San Diego, CA) 8. Golden Valley Trading 9. Port of Long Beach, CA 10. Hong Kong, Port of Hong Kong 11. Hong Kong, New Territories 22.469679, 113.990091 12. Hong Kong, New Territories 22.445332, 114.025677
43	Golden Valley Trading	Chino, CA 34.001799, -117.689918	Last	LCD MI163325	None	No	No	No	No	Taiwan, Houlong Township	1. Goodwill – Oxford, MI (Dell Reconnect location) 2. Goodwill – Flint, MI (Dell Reconnect location) 3. Unverified location, Warren, MI 4. Unverified location, Groveport, OH 5. Unverified location, Commerce City, CA 6. Unverified location, San Diego, CA 7. Unverified location, City of Industry, CA 8. Golden Valley Trading 9. Hong Kong, Port of Hong Kong 10. Hong Kong, New Territories 22.502218, 114.08558 11. Hong Kong, Port of Hong Kong 12. Taiwan, Port of Keelung 13. Taiwan, Miaoli County, Farm location 24.663495, 120.884154 14. Taiwan, MRTI Corporation, 24.632225120.820892 15. Taiwan, Houlong Township, Unverified location)

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
44	Good Point Recycling* *Good Point Recycling admitted to receiving the device from Earthworm Recycling.	Middlebury, VT	Interme-diate	Printer MA616041	R2	No	N/A – No state pro-gram	No	Yes	Hong Kong, New Territories	1. Earthworm Recycling 2. Good Point Recycling 3. Unverified location (Chicago, IL) 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.453373, 113.981578
45	Great Lakes Recycling	Oak Park, MI	Interme-diate	LCD MI163960	None (No certifica-tion at time of export, but currently R2)	Yes	Yes – Reg-istered recycler	No	Yes	Taiwan (via Hong Kong, New Territories)	1. Great Lakes Recycling 2. Unverified location, Minneapolis, MN 3. Unknown warehouse, St. Paul, MN 44.964379, -93.071178 4. Port Newark, NJ 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.484895, 114.07212 7. Hong Kong, New Territories 22.412814, 114.02571 8. Taiwan, Kaohsiung City Port, Unverified location 9. Taiwan, Keelung City, Unverified location 10. Taiwan, Zhunan Township, Unverified location 11. Taiwan, Full AFC Technology Co. LTD 24.632458, 120.820191
46	Green Earth Electronics Recycling	St Joseph, MI	First	LCD MI158911	None	No	Yes – Reg-istered recycler	No	No	Taiwan (via Hong Kong, New Territories)	1. Green Earth Electronics Recycling 2. Unverified location, South Bend, IN 3. Unverified location, Groveport, OH 4. Unverified location, City of Industry, CA 5. Hong Kong, New Territories 22.502381, 114.085639 6. Hong Kong, Port of Hong Kong 7. Taiwan, Port of Keelung 8. Taiwan, Miaoli County, Farm 24.664352, 120.88265
47	Green Network Exchange (H&K E-Cycle International	Woburn, MA	First and Last	CRT MA348371	None	No	N/A – No state pro-gram	No	Yes	China - Guang-zhou	1. Green Network Exchange 2. Canada, Kingston, Unverified location 3. Can-ada, Brampton, Unverified location 4. Canada, Barrie, Unverified location 5. Canada, Port of Vancouver 6. Hong Kong, Port of Hong Kong 7. China, Foshan, Guangdong, Unverified location

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
48	Green Tech Recyclers	Oak Park, MI	First and Last	CRT MI167110	None	No	No	No (Said they wouldn't export to developing country but did not, as Canada in this case is not a developing country.)	No	Canada	1. Green Tech Recyclers 2. Canada , Toronto Recycling 43.85819, -79.389702 3. Canada, Lawrence Metal Recycling 43.758087, -79.270952 4. Canada, Barrie, Unverified location
49	Growan Inc	South El Monte, CA 34.046738, -118.05439	Last	Printer CA530101	None	No	No – Inactive collector, but claims to be a state collector	No,	Yes	Hong Kong, New Territories	1. Cal Micro Recycling 2. Growan Inc. 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.511, 114.155034
50	IMS Recycling	Poway, CA	First and Last	Printer CA545349	R2	Yes	Yes – Active collector & recycler	Yes	No	China, Guiyu area	1. IMS Recycling 2. Port of Long Beach, CA 3. Hong Kong, Port of Hong Kong 4. China, Guangzhou, Guangdong port area 5. China, Guiyu area, Guangdong
51	Inline Computer Recycling	Akron, OH	First	LCD OH160545	None	No	N/A – No state program	N/A No website	N/A no website	China - Guanyaochong area (via Hong Kong, New Territories)	1. Inline Computer Recycling 2. Unverified location, Oakwood, OH 3. Port of Long Beach, CA 4. Hong Kong, Port of Hong Kong 5. Hong Kong , New Territories 22.521313, 114.160157 6. Hong Kong, New Territories 22.533514, 114.207772 7. Hong Kong, Port of Hong Kong 8. China, Guanyaochong area 23.255857, 113.079272
52	Intercon Solutions	Chicago Heights, IL 41.512197, -87.62373	Intermediate	CRT IL166286	R2	Yes	Yes – State EPA list	No, (Not in most recent version of website, however previous versions of site mentioned no export a to developing countries.)	Yes	Mexico, Matamoros	1. PCRR 2. Intercon Solutions 3. Unverified location, Brownsville, TX 4. Mexico, Matamoros, MexTek Company.
53	Interconnection	Seattle, WA	First	LCD WA551396	R2	No	Yes – Registered collector & transporter	Yes	No	Hong Kong, New Territories	1. Interconnection 2. Unverified location, Chino, CA 3. Port of Long Beach, CA 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories, Unverified location 6. Hong Kong, New Territories, Unverified location

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
54	IQA Metals	Chino, CA 34.003262, -117.709722	Last	Printer CCA545745	None (No certification at time of export, but became R2 certified a few months later)	No	No	Yes	Yes	Hong Kong, New Territories	1. All eWaste collection event 2. All eWaste warehouse, Sun Valley, CA 34.228201, -118.385998 3. IQA Metals 4. Port of Long Beach, CA 5. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.447456, 113.9652
55	ITAD Solutions	San Francisco, CA 37.644729, -122.399794	First	Printer CA540910	R2	No	Yes – Registered collector	Yes	Yes	China – Guangdong (via Hong Kong, New Territories & Vietntionam)	1. ITAD Solutions 2. T Electronics dba Silicon Valley Recycling 3. Unverified location, Port of Oakland area 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.503568, 114.167515 6. Hong Kong, New Territories 22.43878, 114.01718 7. Hong Kong, New Territories, (Unverified location) 8. Hong Kong, Port of Hong Kong 9. Vietnam, Hai Phong Port 10. Vietnam, Border crossing area to China, Unverified location 11. China, Guangzhou , Guangdong, Unverified location
56	J&D Recyclers	Sidney, OH 40.280712, -84.197861	Intermediate	LCD OH161584	None	No	No state program	No	No	Hong Kong, New Territories	1. Goodwill Easterseals – Wapakoneta (Dell Reconnect location) 2. J&D Recyclers 3. Unverified location, Dayton, OH 4. Goodwill Auto Auction site, Dayton, OH 5. Unverified location, Groveport, OH 6. Unverified location, Commerce, CA 7. Unverified location, San Diego, CA 8. Golden Valley Trading 9. Port of Long Beach, CA 10. Hong Kong, Port of Hong Kong 11. Hong Kong, New Territories 22.469679, 113.990091 12. Hong Kong, New Territories 22.445332, 114.025677

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
57	M&K Recovery Group	North Andover, MA	First	Printer MA353728	R2	No	N/A – No state program	Yes	Yes	China – Guangdong (via Hong Kong, New Territories)	1. M&K Recovery Group 2. Unverified location, Riverside, RI 3. Techrecyclers LLC 4. Unverified location, Delran, NJ 5. Port Newark, NJ 6. Hong Kong, New Territories 22.461697, 113.988408 7. China, Zhaoqing, Guangdong 23.102667, 112.802711 8. China, Outdoor processing yard in Qingyuan, Guangdong 23.646378, 113.015697
58	Maven Technologies	Rochester, NY	First	LCD NY616561	R2	Yes	Yes – E-waste collection site	No	No	Hong Kong, New Territories	1. Maven Technologies 2. Unverified location, Chicago, IL 3. Port of Long Beach, CA 4. Hong Kong, Unverified location 5. Hong Kong, New Territories 22.459235, 113.982868
59	Miller Recycling	Mansfield, MA	First	Printer MA356275	None	Yes	N/A – No state program	Yes	No	Hong Kong, New Territories	1. Miller Recycling 2. Raw Material Recovery Corporation 3. Unverified Location, Upstate NY 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.456996, 114.021468 6. Hong Kong, New Territories 22.430843, 114.007242 7. Hong Kong, Port of Hong Kong
60	Monmouth Wire & Computer	Tinton Falls, NJ	First and Last	Printer NJ613527	R2	No	Yes – Recycler	No	No	Hong Kong, New Territories	1. Monmouth Wire & Computer 2. Hong Kong, Port of Hong Kong 3. Hong Kong, New Territories 22.456461, 114.02057 4. Hong Kong, New Territories, Unverified location
61	Mr. E-Waste	Hudson, NY	First	Printer NY615597	None	No	Yes – E-waste collection site	No	No	Hong Kong, New Territories	1. Mr. E-Waste 2. ecoTech Management 3. Unverified location, Willingboro, NJ,. 4. Hong Kong, New Territories 22.447177, 113.965548
62	Nevada State Recycling	Las Vegas, NV	First	LCD NV353413	None	No	N/A – No state program	No	Yes	Hong Kong, New Territories	1. Nevada State Recycling 2. TW Recycling 3. Advance Trading Corp 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.423244, 114.019274

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
63	Newtech Recycling Inc	Somerset, NJ	First and Last	LCD NJ616264	R2	No	Yes - Recycler	No	Yes	Hong Kong, New Territories	1. Newtech Recycling Inc. 2. Hong Kong, Port of Hong Kong 3. Hong Kong, New Territories 22.514392, 114.15673 4. Hong Kong, New Territories 22.528042, 114.141363 5. Hong Kong – New Territories 22.528586, 114.16553
64	PADNOS	Wyoming, MI 42.880538, -85.677538	Intermediate	LCD MI163531	None	Yes	Yes – Registered recycler	No	No	Hong Kong, New Territories	1. Goodwill –North Cadillac, MI 2. Goodwill – Traverse, MI 3. PADNOS 4. Schupan and Sons Inc 5. Unverified location, Morris, IL 6. Hong Kong, New Territories
65	PCRR	Chicago, IL	First	CRT IL166286	R2	No	No	No	No	Mexico, Matamoros	1. PCRR 2. Intercon Solutions 3. Unverified location, Brownsville, TX 4. MexTek (now out of business) Company, Mexico Matamoros 25.881682, -97.544914
66	Raw Material Recovery Corporation	Gardner, MA 42.564766, -71.998457	Intermediate	Printer MA356275	None	No	N/A – No state program	No	No	Hong Kong, New Territories (but returned to Port of Hong Kong)	1. Miller Recycling 2. Raw Material Recovery Corporation 3. Unverified Location, Upstate NY 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.456996, 114.021468 6. Hong Kong, New Territories22.430843, 114.007242 7. Hong Kong, Port of Hong Kong
67	Recology Oregon Material Recovery	Portland, OR	First	LCD OR349759	None	No	Yes – Registered collection site	No	No	Hong Kong, New Territories	1. Recology Oregon Material Recovery 2. Total Reclaim, Portland, OR 3. Trailer Yard, Portland, OR, leased by Total Reclaim 45.562104, -122.538029 4. Trailer Yard, Seattle, WA leased by Total Reclaim 47.578592, -122.356476 5. Unverified location, South Seattle, WA, (presumed Total Reclaim) 6. Hong Kong, Port of Hong Kong 7. Hong Kong, New Territories, unverified location 8. Hong Kong, New Territories 22.458612, 113.982363

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
68	Remitek Inc	Fremont, CA 37.49396, -121.93065	First	LCD CA542981	None	No	No	No	Yes	Hong Kong, New Territories	1. Remitek Inc 2. Blue Star Electronics 3. Unverified location, Fremont, CA 4. San Francisco/Oakland port area 5. Hong Kong, Port of Hong Kong 6. Hong Kong, New Territories 22.429514, 114.016853
69	RMG Enterprise Incorporated	Londonderry, NH	First	LCD NH353504	R2	No	N/A – No state program	No	No	Hong Kong, New Territories	1. RMG Enterprise Incorporated 2. Unverified location, Wilmington, MA 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.458503, 113.982363
70	RS David Recycling	Clackamas, OR	First	CRT OR356457	None	Yes	Yes – Registered collection site	No	No	Mexico, Mexicali	1. RS David Recycling 2. Total Reclaim, Portland, OR 3. Mexico , Mexicali, TDM Facility, 32.567901, -115.414334
71	SAMR Inc	Lakewood, NJ	First and Last	LCD NJ613543	None (Previously R2)	No	No	No	No	Hong Kong, New Territories	1. SAMR Inc 2. Unverified location, Middletown, NJ 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.522354, 114.142596
72	Sarah's Trading	Doraville, GA	First and Last	LCD GA161576	None	No	N/A – No state program	N/A No website	Yes	Hong Kong, New Territories	1. Sarah's Trading 2. Unverified location, Charleston, SC port area 3. Hong Kong, New Territories 22.526614, 114.136601 4. Hong Kong, New Territories 22.511108, 114.155149
73	Schupan and Sons Inc	Kalamazoo, MI	First	LCD MI156857	R2	Yes	Yes – Registered recycler	Yes	No	China, Guiyu area	1. Schupan and Sons Inc. 2. Unverified location, Kalamazoo, MI 3. Unverified Location, Cleveland, OH 4. China, Guiyu area
74	Schupan and Sons Inc	Kalamazoo, MI 42.272238, -85.534863	Intermediate	LCD MI163531	R2	Yes	Yes – Registered recycler	Yes	No	Hong Kong, New Territories	1. Goodwill – North Cadillac, MI 2. Goodwill – Traverse, MI 3. PADNOS 4. Schupan and Sons Inc. 5. Unverified location, Morris, IL 6. Hong Kong, New Territories
75	SEER (Secure Environmental Electronics Recycling)	Tampa, FL	First	LCD FL353546	R2	No	N/A – No state program	No	No	Returned to Port of Hong Kong (via Hong Kong New Territories)	1. SEER 2. Unverified location, St. Petersburg, FL 3. Unverified location, Port of Miami, FL area 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.517703, 114.128421 6. Hong Kong, Return to Port of Hong Kong

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
76	Sims Recycling Solutions (Had contracted another recycler)	Mahwah, NY	First	LCD NY615795	R2	Yes	Yes – E-waste collection site	No	No	Hong Kong, New Territories	1. Town of Mahwah Recycling Center (SIMS Recycling Solutions Drop Off Center), Mahwah, NJ 2. Unverified location, Newark, NJ 3. Hong Kong, New Territories 22.531212, 114.20025
77	T Electronics dba Silicon Valley Recycling	Santa Clara, CA 37.381723, -121.947667	Last	Printer CA540910	None	No	No	No	No	China , Guangzhou	1. ITAD Solutions 2. T Electronics dba Silicon Valley Recycling 3. Unverified location, near Port of Oakland, CA 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.503568, 114.167515 6. Hong Kong, New Territories 22.43878, 114.01718 7. Hong Kong, New Territories, Unconfirmed location 8. Hong Kong, Port of Hong Kong 9. Vietnam, Hai Phong Port 10. Vietnam, Border crossing area to China, Unverified location 11. China, Guangzhou , Guangdong, Unverified location
78	TBS Industries	Philadelphia, PA 40.021471, -75.065575	Last	Printer MA352894	R2	No	N/A – No state program	No	No	Hong Kong, New Territories	1. ACT Secured Recycling 2. TBS Industries 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.453303, 113.981538
79	Techrecyclers LLC	Elizabeth, NJ 40.665948, -74.202343	Intermediate	Printer MA353728	R2	No	N/A – No state program	No	Yes	China , Qingyuan	1. M&K Recovery Group 2. Unverified location, Riverside, RI 3. Techrecyclers LLC 4. Unverified location, Delran, NJ5. Port Newark area 6. Hong Kong – New Territories 22.461697, 113.988408 7. China – Shipping yard in Zhaoqing, Guangdong 23.102667, 112.802711 8. China - Outdoor processing yard in Qingyuan, Guangdong 23.646378, 113.015697

#	Company Name	Location	Position on Chain of Export	Device Exported, Device Number	Certi at time of possession	ISRI Member	State Program1	Misrepresentation Concern2	EPA Mentions3	Last location	Chain of Export Summary
80	Total Reclaim*	Portland, OR 45.570506, -122.601684	Last	CRT OR356457	e-Stewards* (Subsequently removed from e-Stewards program after investigation) Discussed in Press Release found here	Yes	Yes – Registered collection site	Yes	No	Mexico, Mexicali	1. RS David Recycling 2. Total Reclaim, Portland, OR 3. Mexico , Mexicali, TDM Facility, 32.567901, -115.414334
81	Total Reclaim*	Portland, OR 45.572143, -122.601445	Last	LCD OR349759	e-Stewards* (Subsequently removed from e-Stewards program after investigation) Discussed in Press Release found here	Yes	Yes – Registered collection site	Yes	No	Hong Kong, New Territories	1. Recology Oregon Material Recovery 2. Total Reclaim, Portland, OR 3. Trailer Yard, Portland, OR, leased by Total Reclaim 45.562104, -122.538029 4. Trailer Yard, Seattle, WA leased by Total Reclaim 47.578592, -122.356476 5. Unverified location, South Seattle, WA, (presumed Total Reclaim) 6. Hong Kong, Port of Hong Kong 7. Hong Kong, New Territories, unverified location 8. Hong Kong, New Territories 22.458612, 113.982363
82	Total Reclaim*	Seattle, WA 47.584434, -122.325529	Last	LCD OR356028	e-Stewards*(-Subsequently removed from e-Stewards program after investigation) Discussed in Press Release found here	Yes	Yes – Registered collector, transporter, and processor	Yes	No	Hong Kong, New Territories	1. Ecobinary, LLC 2. Unverified location, Portland, OR 3. Trailer Yard leased by Total Reclaim, Portland, OR 45.56183, -122.538103 4. Trailer Yard leased by Total Reclaim, Seattle, 47.577749 , -122.355865 5. Total Reclaim, Seattle 6. Hong Kong, Port of Hong Kong 7. Hong Kong, New Territories 22.450503, 113.966656 8. Hong Kong, New Territories 22.485588, 114.074766
83	Tri-Valley Electronic Waste Recycling	Stockton, CA	First	LCD CA551321	None	No	Yes – Active collector	Yes	No	Kenya	1. Tri-Valley Electronic Waste Recycling 2. Self-storage unit in Oakland, CA 37.74847, -122.19603 3. Kenya – Port at Mombasa 4. Warehouse in Kenya - -1.317222, 36.855495
84	TW Recycling	Los Angeles, CA 34.06082, -118.178885	Intermediate	LCD NV353413	None	No	No – Inactive collector	No	No	Hong Kong, New Territories	1. Nevada State Recycling 2. TW Recycling 3. Advance Trading Corp 4. Hong Kong, Port of Hong Kong 5. Hong Kong, New Territories 22.423244, 114.019274

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85	UNITEC Recycling Corporation	West Chicago, IL	Interme-diate	LCD IL163424	None	No	Yes – State EPA list	No	No	United Arab Emir-ates, Dubai	1. Chicago Surplus Computer 2. UNITEC Recycling Corporation 3. Chicago Surplus Computer 4. Unverified field or warehouse, Lombard, IL 41.913026, -88.023229 5. UAE, Dubai 25.29782, 55.418836
86	Urban Renewal	Kerney, NY	First	LCD NJ615555	None (Previously R2)	No	Yes – Small Quantity Universal Waste Handler	No	No	Dominican Republic, Santiago de los Caballeros	1. Urban Renewal 2. East Orange, NJ area 40.768829, -74.183524 3. Port Newark, NJ 4. Dominican Republic, Port of Rio Haina 5. Dominican Republic, Unverified location, Santi-ago De Los Caballeros area.
87	Valley City Electronic Recycling	Kentwood, MI	First	Printer MI157079	R2	No	Yes – Reg-istered recycler	Yes (R2 PDF saying they comply with all inter-national laws.)	No	China, Shangqiu	1. Valley City Electronic Recycling 2. Unverified location, San Bernadino, CA. 3. China, Tianjin Port 4. China, Tianjin Shi warehouse 39.284632, 117.789698 5. China, Shangqiu, Henan 34.433973, 115.410953
88	Windfield Alloy*	Lawrence, NH	First	CRT NH356259	e-Stewards*	No	N/A – No state pro-gram	No	Yes	China, Foshan	1. Windfield Alloy 2. Unverified location, Dover, NH 3. Unverified location, Northwood, NH 4. Unverified location, Worcester, MA 5. Hong Kong, Port of Hong Kong 6. China, Unverified location, Foshan, Guangdong area 7. China – Another unverified location (Foshan, Guangdong)
89	WTB Elec-tronics Recy-cling Import & Export	Santa Ana, CA 33.747121, -117.897295	Last	LCD CA549390	None	No	Yes – Active collector	No	No	Cambodia, Phnom Penh area	1. Recycling Event at Eliot Middle School, Alta-dena, CA 2. Attan Recycling Corp 3. Advance Trading Corp 4. WTB Electronics Recycling Import & Export 5. Port of Long Beach, CA 6. Cambodia – Unverified location, Krong Preah Sihnaouk port area 7. Cambodia, Unverified location, Phnom Penh area
90	Yesterday's Business Computers	Hillsborough, NJ	First and Last	Printer NJ615662	None (Previously R2)	No	No	No	No	Hong Kong, New Territories	1. Yesterday's Business Computers 2. Port Newark 3. Hong Kong, Port of Hong Kong 4. Hong Kong, New Territories 22.4531, 113.987466

Footnotes

1. Yes indicates that website implies or states approval by, or association with, a State or State program.

2. Yes indicates that the company was involved in the chain of export but makes claims on their website that indicate that they do not allow export to developing countries of e-waste or hazardous e-waste that passes through their control

3. Yes indicates that website implies or states approval by, or association with, the EPA or an EPA program

The recyclers identified in this table only include locations which were able to be positively identified with GPS satellite coordinates. Each row in the table is a unique stop at a domestic recycler. A "stop" is defined as any unique location we can reasonably confirm that a device spent time at. We assume that if a device remains at an unknown location for more than 4 days it is considered a unique stop rather than just "in transit".

In instances where the tracking data provided cell tower resolution and not more precise satellite readings, we have labelled it as an "unverified location".

Each of these tracker routes can be individually viewed on the MIT website by manually entering the device number into the URL http://senseable.mit.edu/monitour-app/#_____. For example, if you wish to view the route for device number GA161576, the resulting URL would be http://senseable.mit.edu/monitour-app/#GA161576

** Four e-Stewards Recyclers are subject to investigation by BAN by virtue of its role in administering the e-Stewards Certification program, which has a Critical Non-Conformity policy to address potential violations. Total Reclaim has already been investigated (see box) and has admitted to their violations of the e-Stewards Standard; they have had their certification withdrawn for a minimum of two years. The other three companies, All eWaste, e-Recycling of California, and Windfield Alloy are other e-Stewards companies that were either first deliveries or intermediaries in the respective chains of export. Windfield Alloy states that they sent all of their CRT devices to another e-Stewards recycler during the period of time that a GPS-enabled CRT device was delivered to Windfield's facility. Windfield Alloy has provided evidence that supports their claim, and the downstream e-Steward has provided a detailed record supporting their claim that CRT glass in that shipment was processed in-house. e-Recycling of California has also submitted records in response to tracker data. All eWaste has not yet responded to notice of investigation. At time of publication of this report, BAN is still investigating these three cases and final determinations are pending.*

Appendix 6: All Initial Program Deployment Locations

This table shows in alphabetical order all of our program delivery sites where we handed over the tracker enable equipment to a recycler, charity, event or retailer in the continental United States. Each delivery was documented by video and often with a receipt.

Shaded rows are deliveries that followed an "export chain" resulting in export from the territory of the United States. Unshaded deliveries were not found in this particular exercise to have been found to be part of a "chain of export."

Appearance on a shaded row does not necessarily indicate culpability, irresponsibility or illegality by the company so listed despite our findings. Likewise, appearance on an unshaded row does not necessarily indicate innocence, responsibility, or fully legal trade activities by the company so listed, in particular because our findings were based on an extremely small sample size (usually one delivery).

#	Business Name	City	State	Device Type	Tracker Number
1	1 Green Planet	Renton	WA	CRT	WA546164
2	1 Green State Inc (aka State Recycle or TW Electronics Recycling)	Los Angeles	CA	CRT	CA546024
3	3R Network	Chino	CA	LCD	CA552659
4	3R Technology	Seattle	WA	Printer	WA551594
5	5R Processors Ltd	Detroit	MI	CRT	MI167524
6	Access Project Inc	Trotwood	OH	Printer	OH158846
7	Accurate IT	Columbus	OH	CRT	OH157467
8	Accurate IT	Columbus	OH	CRT	OH613964
9	AccuShred	Toledo	OH	CRT	OH163929
10	ACT Secured Recycling	Lawrence	MA	Printer	MA352894
11	Advanced Recovery Inc (ARI)	Newark	NJ	LCD	NJ614731
12	Advanced Technology Recycling (ATR)	Grand Rapid	MI	CRT	MI154233
13	AER Worldwide	Fremont	CA	LCD	CA552733
14	AERC Recycling Solutions	Hayward	CA	LCD	CA552709
15	AIM eCycling	Toledo	OH	CRT	OH154670
16	AIM eCycling	Toledo	OH	LCD	OH155727
17	AIM eCycling	Toledo	OH	Printer	OH164646
18	All American Recycling	Leominster	MA	LCD	MA616652
19	All eWaste (Event at Elks Lodge)	Santa Clarita	CA	Printer	CCA545745

#	Business Name	City	State	Device Type	Tracker Number
20	Allied Computer Brokers	Amesbury	MA	LCD	MA616330
21	AllShred	Maumee	OH	LCD	OH163937
22	Alltech Electronics Recycling	Eastlake	OH	CRT	OH157988
23	American Asset Recovery	Columbus	OH	Printer	OH356234
24	AnythingIT Inc	Fair Lawn	NJ	CRT	NJ614657
25	Apple Recycling	Sunnyvale	CA	Printer	CA545539
26	ARCOA	Waukegan	IL	LCD	IL163523
27	Arion Global	Commerce	CA	CRT	CA545521
28	Attan Recycling Corp	Chino	CA	CRT	CA551248
29	Attan Recycling Corp (Event at Eliot Middle School)	Altadena	CA	LCD	CA549390
30	AVR-Recycling	San Diego	CA	LCD	CA549580
31	Blind Center of Nevada	Las Vegas	NV	CRT	NV353470
32	Blue Star Electronics, LLC (aka Hayward Ewaste)	Hayward	CA	LCD	CA540894
33	Cactus Recycling Inc	San Diego	CA	LCD	CA550653
34	Cal Micro Recycling	Ontario	CA	Printer	CA530101
35	Cal State Electronic Recycling (CSER, Inc.)	San Marcos	CA	LCD	CA544961
36	Cascade Asset Management	Madison	WI	LCD	WI158796
37	Chicago Surplus Computer CSC	Chicago	IL	CRT	IL162640
38	Chicago Surplus Computer CSC	Chicago	IL	LCD	IL163424
39	Chicago Surplus Computer CSC	Chicago	IL	CRT	IL616231
40	Chicago Surplus Computer CSC	Chicago	IL	LCD	IL616371
41	City Of Chicago Depot	Chicago	IL	LCD	IL162608
42	City Recycle	Portland	OR	CRT	OR355145
43	Computer Connection of CNY	Utica	NY	Printer	NY613014
44	Crown Computer Recycling	San Carlos	CA	CRT	CA551446
45	CRT Recycling	Brockton	MA	CRT	MA353454
46	Deseret Industries Thrift Store	Chula VIsta	CA	LCD	CA552741
47	Deseret Industries Thrift Store	Happy Valley	OR	CRT	OR348470
48	DiVanti	Cleveland	OH	LCD	OH614863
49	Diversified Recycling	Orlando	FL	LCD	FL356218
50	Diversified Recycling	Orlando	FL	CRT	FL356283
51	Diversified Recycling	Norcross	GA	CRT	GA153292
52	Diversified Recycling	Norcross	GA	LCD	MI163457
53	DP Electronics Recycling	Elkhorn	WI	LCD	WI160305
54	Earthworm Recycling	Somerville	MA	Printer	MA616041
55	Ecobinary LLC	Beaverton	OR	LCD	OR356028
56	ElectroCycle LLC	Livonia	MI	CRT	MI154555
57	Electronic Recycling Technology (Lancaster Recycling and Sales Co.)	Lancaster	NY	Printer	NY617064
58	Electronics Recycling Services Inc (dba Green E-Waste Recycling Center)	San Jose	CA	LCD	CA356242

#	Business Name	City	State	Device Type	Tracker Number
59	e-Recycling of California	Irvine	CA	LCD	CA552287
60	eRevival LLC	Garfield	NJ	CRT	NJ616173
61	ERS	Buffalo Grove	IL	CRT	IL163416
62	E-Scrap Solutions	Cleveland	OH	LCD	OH160248
63	E-Tech Management	Columbus	OH	Printer	GeoForce3039211
64	E-Tech Management	Columbus	OH	CRT	OH154449
65	EWaste Wiz	Chatsworth	CA	Printer	CA540928
66	e-Waste, LLC (Ohio)	Hudson	OH	LCD	OH356309
67	EWC Group Recyclers (eWaste Center)	Commerce	CA	Printer	CA543948
68	eWorks Electronic Services (ARC of Rockland)	Congers	NY	Printer	NY613196
69	E-World Recyclers	Vista	CA	CRT	CA552600
70	EZPC	Santa Ana	CA	Printer	CA551412
71	Far West Recycling	Portland	OR	LCD	OR350062
72	Gold'n West Surplus Inc	Corona	CA	Printer	CA551494
73	Goodwill Central MI - Battle Creek	Battle Creek	MI	Printer	MI159455
74	Goodwill Chicago	Chicago	IL	CRT	IL1154357
75	Goodwill Columbus	Columbus	OH	Printer	GeoForce3035672
76	Goodwill Columbus	Columbus	OH	CRT	OH353322
77	Goodwill Easterseals Miami Valley - Wapakoneta store	Wapakoneta	OH	LCD	OH161584
78	Goodwill Eugene - GW Lane & South Coast Region	Eugene	OR	LCD	OR348603
79	Goodwill Gd Rapids Area - Byron Center MI	Byron Center	MI	CRT	MI165460
80	Goodwill Greater Detroit - Detroit	Dearborn	MI	CRT	mi161568
81	Goodwill Henderson	Henderson	NV	LCD	NV352175
82	Goodwill Industries of Akron	Akron	OH	CRT	OH165940
83	Goodwill Industries of Erie, Huron, Ottawa and Sandusky Counties, Inc	Willard	OH	LCD	OH165882
84	Goodwill Industries of Greater Cleveland and East Central Ohio, Inc.	Cleveland	OH	Printer	OH165924
85	Goodwill Industries of Greater New York and Northern New Jersey (Hudson Store)	Hudson	NY	LCD	NY617478
86	Goodwill Industries of NW Ohio - Toledo Cherry Street Store	Toledo	OH	Printer	OH156261
87	Goodwill Industries of Ohio Valley	Cincinnati	OH	CRT	OH158051
88	Goodwill Industries of Southern New Jersey and Philadelphia (Ocean NJ Store)	Ocean	NJ	Printer	NJ614780
89	Goodwill Industries of The Berkshires, Inc.	Pittsfield	MA	LCD	MA356325
90	Goodwill Industries Of the Pioneer Valley	Palmer	MA	LCD	MA348355
91	Goodwill Industries of Wayne and Holmes Counties, Inc - DELL Reconnect Location	Wooster	OH	Printer	OH166039
92	Goodwill Industries of Western New York, Inc (Buffalo)	Depew	NY	CRT	NY614871
93	Goodwill Las Vegas	Las Vegas	NV	CRT	NV353991
94	Goodwill Las Vegas - Dell Reconnect	Las Vegas	NV	Printer	NV356143
95	Goodwill Licking/Knox	Pataskala	OH	CRT	OH165411
96	Goodwill Marion	Delaware	OH	LCD	OH158135

#	Business Name	City	State	Device Type	Tracker Number
97	Goodwill Mid MI - Oxford	Oxford	MI	LCD	MI163325
98	Goodwill NE Fremont	Portland	OR	Printer	OR349734
99	Goodwill North MI - Cadillac MI	Cadillac	MI	LCD	MI163531
100	Goodwill OC - Irvine	Irvine	CA	LCD	CA550992
101	Goodwill OC - Orange	Orange	CA	LCD	CA529251
102	Goodwill of South Central Ohio	Chillicothe	OH	CRT	OH158069
103	Goodwill of the Finger Lakes (Rochester)	Rochester	NY	LCD	NY613287
104	Goodwill Ottawa	Ottawa	IL	CRT	IL163507
105	Goodwill Peru	Peru	IL	Printer	IL163465
106	Goodwill SacValley and NV - Redding CA	Redding	CA	CRT	CA552956
107	Goodwill SacValley and NV - W. Sacramento	West Sacramento	CA	Printer	CA547220
108	Goodwill San Diego	San Diego	CA	Printer	CA552444
109	Goodwill San Diego	San Diego	CA	CRT	CA552626
110	Goodwill San Fran	San Francisco	CA	Printer	CA545745
111	Goodwill SE MI - Monroe	Monroe	MI	Printer	MI165569
112	Goodwill Seattle	Seattle	WA	LCD	WA545570
113	Goodwill So-Cal - Downey	Downey	CA	Printer	CA553004
114	Goodwill So-Cal - USC Store - LA	Los Angeles	CA	Printer	CA546933
115	Goodwill South San Fran - Dell Reconnect	San Francisco	CA	CRT	CA528667
116	Goodwill Sutherlin - Southern Oregon Region	Sutherlin	OR	CRT	OR355871
117	Goodwill SW MI - Kalamazoo	Kalamazoo	MI	CRT	MI163127
118	Goodwill Western MI - Zeeland	Zeeland	MI	Printer	MI162780
119	Great Lakes Electronics	Warren	MI	LCD	MI158002
120	Great Lakes Recycling - GLR	Oak Park	MI	CRT	MI163978
121	Great Lakes Recycling - GLR	Oak Park	MI	LCD	MI163960
122	Green Earth Electronics Recycling	St Joseph	MI	LCD	MI158911
123	Green Lights LLC	Canton	OH	CRT	OH613600
124	Green Network Exchange (H&K E-Cycle International, LLC)	Woburn	MA	CRT	MA348371
125	Green Tech Recyclers	Oak Park	MI	CRT	MI167110
126	Guardian Data Destruction	Hackensack	NJ	CRT	NJ615548
127	High Tech Recycling (aka Todd Quick)	Auburn Hills	MI	Printer	MI160354
128	ICT Company	Malden	MA	CRT	MA617015
129	IMS Recycling - CA	Poway	CA	Printer	CA545349
130	IMS Recycling - GA	Decatur	GA	Printer	GA167250
131	IMS Recycling - OH	Columbus	OH	Printer	OH158119
132	Inline Computer Recycling	Akron	OH	LCD	OH160545
133	Interconnection	Seattle	WA	LCD	WA551396
134	ITAD Solutions	San Francisco	CA	Printer	CA540910
135	KB Recycling	Clackamas	OR	LCD	OR356192
136	Lynswell Technologies Inc	Camden	NJ	CRT	NJ615589

#	Business Name	City	State	Device Type	Tracker Number
137	M & K Recovery Group	North Andover	MA	Printer	MA353728
138	Maven Technologies	Rochester	NY	LCD	NY616561
139	Michigan Computer Supplies	Ann Arbor	MI	CRT	MI165320
140	Miller Recycling	Mansfield	MA	Printer	MA356275
141	Monmouth Wire & Computer	Tinton Falls	NJ	Printer	NJ613527
142	Mr. E-Waste	Hudson	NY	Printer	NY615597
143	Nevada State Recycling	Las Vegas	NV	LCD	NV353413
144	Newtech Recycling Inc	Somerset	NJ	LCD	NJ616264
145	NextStep Recycling	Eugene	OR	LCD	OR352589
146	Ohio Drop Off	Columbus	OH	Printer	OH156063
147	Ohio Drop Off	Columbus	OH	LCD	OH348884
148	Ohio Drop-Off	Columbus	OH	CRT	OH155073
149	Ohio Surplus	Youngstown	OH	CRT	OH613469
150	Padnos - Benton Harbor Recycling	Benton Harbor	MI	CRT	MI165064
151	Padnos - Benton Harbor Recycling	Benton Harbor	MI	LCD	MI165304
152	PC Recycle	Newbury Park	CA	CRT	CA545984
153	PCRR	Chicago	IL	CRT	IL166286
154	Pride Recycling	Sherwood	OR	CRT	OR349825
155	ReCell One	Toledo	OH	Printer	OH163226
156	Recology Oregon Material Recovery	Portland	OR	LCD	OR349759
157	Recycle Ann Arbor Drop Off Station	Ann Arbor	MI	CRT	MI154480
158	Recycle I.T. USA	Waterville	OH	Printer	OH157996
159	Remitek Inc	Fremont	CA	LCD	CA542981
160	Re-Source Partners	Troy	MI	CRT	MI161501
161	RMG Enterprise Incorporated	Londonderry	NH	LCD	NH353504
162	RS Davis Recycling - Clackamas	Clackamas	OR	CRT	OR356457
163	Ryan Bloom Inc (dba OC Recycling - Orange County)	Santa Anna	CA	CRT	CA546057
164	Salvation Army Happy Valley	Happy Valley	OR	Printer	OR353611
165	Salvation Army Shoreline	Shoreline	WA	LCD	WA540944
166	SAMR INC	Lakewood	NJ	LCD	NJ613543
167	SAMR INC	Lakewood	NY	CRT	NY615878
168	Sarah's Trading	Doraville	GA	LCD	GA161576
169	Sarah's Trading	Doraville	GA	CRT	GA163283
170	Sarah's Trading	Doraville	GA	CRT	GA163945
171	Sarah's Trading	Doraville	GA	CRT	GA165403
172	Schupan and Sons Inc	Kalamazoo	MI	LCD	MI156857
173	Second Time Around	Toledo	OH	CRT	OH158820
174	Secure Environmental Electronics Recycling (SEER)	Tampa, FL	FL	LCD	FL353546
175	Silicon Alley	Warren	MI	Printer	MI160297
176	Simple eWaste (aka Tech Waste Recycling)	Santa Ana	CA	LCD	CA549432

#	Business Name	City	State	Device Type	Tracker Number
177	Sims Recycling Solutions (Town of Mahwah Recycling Center)	Mahwah	NY	LCD	NY615795
178	South Eastern Data	Columbus	OH	Printer	OH356184
179	Spohn Disposal Service Inc.	Mohawk	NY	Printer	NY616496
180	State Paper & Metal Company, Inc.	Toledo	OH	CRT	OH158044
181	Surplus Service	Fremont	CA	CRT	CA543034
182	T.D.R LLC (Total Computer Recyclers)	Pataskala	OH	CRT	OH164315
183	TDR Electronic Recycling	Fremont	CA	CRT	CA543518
184	Techused Asset Recovery Recycling	Columbus	OH	CRT	OH356226
185	Tekovery Inc - NY	Mt Vernon	NY	CRT	NY616447
186	Thanks for Being Green LLC dba Magnum Computer Recycling	Pennsauken	NJ	CRT	NJ616298
187	Total Reclaim	Portland	OR	Printer	OR355202
188	Tri-Valley Electronic Waste Recycling	Stockton	CA	LCD	CA551321
189	Tycoon Materials Inc recycling event at Cal State Fullerton (dba Happy Recycler)	Fullerton	CA	CRT	CA551487
190	United Radio	Syracuse	NY	CRT	NY613220
191	Urban Renewal	Kerney	NJ	LCD	NJ615555
192	URT - Universal Recycling Technologies	Clackamas	OR	Printer	OR350013
193	URT - Universal Recycling Technologies	Janesville	WI	LCD	WI165932
194	User Friendly Recycling	Taunton	MA	Printer	MA615522
195	USMe	Alsip	IL	LCD	IL154423
196	USMe	Alsip	IL	CRT	IL163408
197	Valley City Electronic Recycling	Kentwood	MI	Printer	MI157079
198	Valley City Electronic Recycling	Kentwood	MI	LCD	MI162772
199	Walmart - E. Imperial Hwy, Brea	Brea	CA	Printer	CA540951
200	Walmart - Orangethorpe Ave, Anaheim	Anaheim	CA	Printer	CA551172
201	Windfield Alloy, LLC	Lawrence	NH	CRT	NH356259
202	Y Not Recycle	Sacremento	CA	LCD	CA356176
203	Yager Reycling	Cottage Grove	OR	LCD	OR351631
204	Yesterday's Business Computers Inc	Hillsborough Township	NJ	Printer	NJ615662
205	Zanesville Welfare Organization and Goodwill Industries, Inc.	Zanesville	OH	Printer	OH158861

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Appendix 7: Asset Tags & Gaylord Labels

Asset Tags found on Equipment in New Territories Hong Kong

December 2015 - March 2016

#	Name of Company	What	Other	Location	Country
1	Ricoh	Printer	Service Phone number indicates Brooke area northeast of London, UK. Service Number: 0508 456-456		United Kingdom
2	Ricoh UK LTD	Printer	Service Phone number: 0845 300-0750		United Kingdom
3	Eckington Junior School	Printer		Eckington, Derbyshire S21 4FL	United Kingdom
4	Los Angeles Unified School District	Laptop		Los Angeles, California	USA
5	Royal Bank of Canada	Printer		Miami, Florida	USA
6	MetroLaser	Printer	Phone number with area code of Atlanta, GA area. Phone number: (770) 938-1500	Atlanta, GA	USA
7	Medent Practice Management Software		"provided by Community Computer Service", Service number: (315) 255-0900	Syracuse, NY	USA
8	Privelege Club		Number: 04-7013288 Ext. 3954, believed to be a UK phone number		United Kingdom
9	Beacon Health Strategies		Service number: (781) 994-7555	Boston, MA	USA
10	Tyverisikret, Vordingborg Kommune	Laptop	Skolevaesenet, (school in the Vordingborg Municipality)	Vordingborg	Denmark
11	Property of North Carolina State Department of Corrections	LCD Monitor	Asset number: 8012265300	North Carolina	USA
12	Pamlico Correctional Institution, Department of Public Safety	LCD Monitor		North Carolina	USA
13	Dilliard's Inc.	LCD Monitor	(007) 93525 US Department store in 33 states		USA
14	St. Joseph's Hospital			Bellingham, WA	USA
15	Southern Illinois University			Illinois	USA

Labels Found on Gaylord Boxes in New Territories Hong Kong

December 2015 - March 2016

#	Name of Company	Marked as Contents	Other	Location	Country
1	Wintech Assets Recovery Inc.	Toner Cartridges	1691 E. Gale Ave., Phone: (626) 606-0018	California	USA
2	Service Management Solutions (SMS)	LCDs			Taiwan
3	Physio-Control Inc.	Mixed electronic waste	Possibly part of Total Reclaim export batch	Washington	USA
4	Tacoma Public Library	Mixed plastics	Possibly part of Total Reclaim export batch	Washington	USA
5	Safety Kleen	LCDs	Believed to be from Clackamas, Oregon. Possibly part of Total Reclaim export batch	Oregon	USA
6	Clean Harbors (collector), Total Reclaim (recycler), St. Joseph's Hospital (generator), all listed on same label	electronic equipment for recycling		Washington	USA
9	City of Rancho Cucamonga	Electronic devices		California	USA
10	C2 Management (R2 Certified company)	power supplies		Virginia	USA
11	Ecolights (subsidiary of Total Reclaim, e-Stewards certified company)	CFL bases		Washington	USA
12	Golden West Surplus	LCDs		California	USA
13	Blue Ridge Plastics	HPDE	contained electronic devices	North Carolina	USA

KCTS producer Katie Campbell with Jim Puckett on the trail in New Territories, Hong Kong. © KCTS, Earthfix Program, 2016.