



Poverty or Poison? China’s Dire Choice in an Electronic World
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I. INTRODUCTION

Every day millions of electronics are purchased worldwide without a single thought as to what happens to these electronic devices when they become obsolete and are discarded. With recent technological advances in the electronics industry, electronic products have become commonplace worldwide, leaving many unable to bear the thought of living without such items.¹ Currently more than a billion computers have been manufactured and discarded, and in the next five years another billion will be repeating the cycle.² In the United States alone, five - seven million tons of electronics become obsolete every year,³ making electronic waste (E-waste) the fastest growing waste stream in the industrialized world.⁴ It is estimated that every hour four thousand tons of E-waste is discarded worldwide.⁵

E-waste consists of electronic products that are discarded because of malfunction, exhaustion, or obsolescence. This category of waste includes devices such as everyday appliances, computers, televisions, cell phones, and all of the component parts of these products, such as Cathode Ray Tubes (CRTs) in old televisions, and circuit boards in computers.⁶ Considering the numerous electronic appliances in the average American household, it is no

¹ Jason Lewis, *E-Cemeteries: Where Electronic Waste Never Dies*, 13 Pub. Int. L. Rep. 177,177 (2008).

² Joseph Ladou and Sandra Lovegrove, *Export of Electronics Equipment Waste*, Int. J. Occup. Environ. Health, Jan. – March 2008, at 1, 1.

³ Phoenix Pax, *Haste Makes E-waste: A Comparative Analysis of How the United States Should Approach the Growing E-waste Threat*, 16 Cardozo J. Int'l & Comp. L. 241, 247 (2008).

⁴ Nicola J. Templeton, *The Dark Side of Recycling and Reusing Electronics: Is Washington's E-Cycle Program Adequate?*, Seattle J. for Soc. Just. 763, 765 (2009).

⁵ *Id.*

⁶ *Id.*



wonder that, in America alone, 80% of consumers simply throw their used electronics in the trash.⁷

The demand for electronics products continues to surge as the life of these products becomes ever shorter with modern technological advances. Take for instance the cell phone: billions of cell phones are currently in use, and are replaced on average within 18 months.⁸ Everyday more than 350,000 cell phones and 130,000 computers are thrown out⁹ and less than 10% of discarded electronics are recycled.¹⁰ With a lucrative world market of more than \$1 trillion dollars in electronic products each year creating an incentive to increasingly produce and market electronics,¹¹ the E-waste problem will only worsen. Further aggravating the situation, most current products now are unable to be upgraded or repaired, and even if that were a possibility the cost of repair inefficiently balances against the cost of replacement.¹²

E-waste is highly toxic because it contains dangerous levels of lead, mercury, cadmium, hexavalent chromium, beryllium, barium, and nickel, as well as other components that may release toxic fumes into the atmosphere upon incineration.¹³ The production of mobile phones and computers worldwide compromises of 15% of cobalt production, 13% of palladium, and 3% of gold and silver annually.¹⁴ With so many electronics being produced and discarded every year the question arises: How should all of this toxic waste be regulated upon disposal, especially

⁷ Bryan Walsh, *E Waste Not*, Time, January 8, 2009, <http://www.time.com/time/magazine/article/0,9171,1870485,00.html>.

⁸ Templeton, *supra* note 4.

⁹ *Id.*

¹⁰ Ladou, *supra* note 2.

¹¹ *Id.*

¹² Pax, *supra* note 3, at 247.

¹³ Rob Courtney, *Evolving Hazardous Waste Policy for the Digital Era*, 25 Stan. Envtl. L.J. 199, 227 (2006).

¹⁴ Axel Bojanowski, *Recycling Precious Metals: Treasure Trove in World's E-Waste*, Spiegel Online International, February 24, 2010, <http://www.spiegel.de/international/world/0,1518,679871,00.html>.



when it is multiplying at such an exponential rate? Unfortunately, for the enrichment of the U.S. the answer has been to ship toxic E-waste to developing countries for “recycling” and “reuse.” This practice essentially passes on the environmental and health costs to the world’s poorest nations.¹⁵ One of the countries most affected by these toxic exports is China.

The amount of E-waste imported into China from other countries continues to increase dramatically. According to the joint report of Silicon Valley Toxics Coalition and Green Peace in 2002, 90% of E-waste is produced by developed countries and is transported to developing countries in Asia. 80% of all exported E-waste is conveyed to China. According to United Nations Environment Program (UNEP), by 2010 China will produce 2.3 million tons of electrical refuse, including 500,000 tons of refrigerators, 1.3 million tons of televisions, 300,000 tons of computers.¹⁶ This production amount of E-waste comes a close second to the U.S. projections of 3 million tons in 2010.¹⁷

Although the Chinese government has promulgated a series of laws and regulations forbidding the illegal import of E-waste illegal importation remains incessant after repeated prohibition. During the normal course of “business” E-waste is illegally mixed up with normal imported refuse to confuse customs agents, or Hong Kong is used as a shipment station to transport prohibitive E-waste into Mainland, taking advantages of the loopholes of Waste Disposal Ordinance in Hong Kong.

This article takes a comparative look at international conventions dealing with E-waste, with a special emphasis placed on a comparative analysis of the United States and China.

¹⁵ Templeton, *supra* note 4, at 763.

¹⁶ Bojanowski, *supra* note 14.

¹⁷ *Id.*



Section II discusses the environmental and social justice issues surrounding electronic waste such as why is E-waste exported and how is it processed once it reaches its final destination. This paper will look at the adverse environmental and human health effects of E-waste and the toxic waste dump in Guiyu will be used as a case study to exemplify these adverse effects. Lastly, this paper will offer suggestions as to how the U.S. and the Chinese government can move forward with E-waste regulations and improve an ever-worsening toxic situation.

II. INTERNATIONAL CONVENTIONS DEALING WITH E-WASTE

A. The Basel Convention

According to the UN, “The Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal is the most comprehensive global agreement on hazardous and other wastes.”¹⁸ This international agreement regulates the cross-border movement of waste in order to protect human health and the environment from adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.¹⁹ The Basel Convention became effective in 1992 and has 172 signatories.²⁰

The convention applies to 45 categories of “hazardous wastes,” in addition to wastes considered to be hazardous by the domestic legislation of the Party of export, import, or transit.²¹ Per Article two, “‘Wastes’ are substances or objects which are disposed of or are intended to be

¹⁸ The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, <http://www.basel.int/index.html> (last visited April 17, 2010).

¹⁹ *Id.*

²⁰ *Id.*

²¹ The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1992).



disposed of or are required to be disposed of by the provisions of national law.”²² Some of the regulated wastes include waste substances and articles containing, or contaminated with, polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs),²³ most of which can be found in various forms of electronic waste.

The convention lays the framework for controlling the transboundary movement of waste, developed the criteria for environmentally sound management, and has a main goal for minimizing hazardous waste through environmentally sound management: strong controls from generation to disposal.²⁴ The convention seeks to limit trade and encourage in-state generator disposal by recognizing nation’s “sovereign right to ban the entry or disposal of foreign hazardous wastes and other wastes in its territory.”²⁵

However, although the treaty regulates E-waste, it does not ban a country’s right to export it entirely.²⁶ Prior informed consent from the recipient country is required for each import, and exports are prohibited from nation-states that are parties to the convention and have banned the imports under their domestic law.²⁷ Further, the United States is the only industrialized country that has not ratified the Basel Convention (the only other two countries not to sign on are Haiti and Afghanistan).²⁸ This leaves the world’s most wasteful country per

²² *Id.* at art. 2.

²³ *Id.*

²⁴ United Nations Environmental Programme, *Minimizing Hazardous Wastes: A Simplified Guide to the Basel Convention*, http://www.unep.org/DEC/Information_Resources/Simplified_Guides.asp (last visited April 17, 2010).

²⁵ The Basel Convention, *supra* note 17.

²⁶ *Id.*

²⁷ Templeton, *supra* note 4, at 794.

²⁸ *Id.*



capita²⁹ the unlimited ability to export as much waste as they so desire without any international legal ramifications.

B. Waste Electrical and Electronic Equipment Directive (WEEE Directive) and Restrictions of Hazardous and Substance in Electrical and Electronic Equipment Directive (RoHS)

In the wake of the rising accountability for electronic waste several EU nations further improved E-waste regulations by enacting WEEEE and RoHS in 2002.³⁰ The environmental and health effects of these toxic substances are so dire that EU nations do not want these substances crossing their borders. Members to these agreements are Austria, Belgium, Denmark, Germany, Italy, the Netherlands, Sweden, and the United Kingdom.³¹ These directives in combination require signatory European countries to legislate in accordance to the directives frameworks and establish a unified approach to E-waste disposal.³²

1. WEEE Directive

The WEEE Directive governs issues pertaining to product design, collection, treatment, recovery, financing, consumer information, and penalties.³³ In regards to product design, the directive hopes to persuade producers to use better quality materials, improve recycling methods, and increase product life. The collection provision provides for the establishment of E-waste collection centers established by producers (manufacturers, sellers, and distributors) for

²⁹ *Id.*

³⁰ Manasvini Krishna, Pratiksha Kulshrestha, *The Toxic Belt: Perspectives on E-Waste Dumping in Developing Nations*, 15 U.C. Davis J. Int'l L. & Pol'y 71, 77 (2008).

³¹ *Id.*

³² *Id.*

³³ *Id.*



collection of E-waste from the last holding consumer free of charge. Pursuant to this scheme, producers must absorb the cost of collection, treatment, and disposal of products, including products placed on the market before August 1, 2005.³⁴ Producers are also forced to label their electronic products to discourage consumers from disposing of them in the trash.

2. RoHS Directive

The main focus of the RoHS directive is to discontinue the use of certain hazardous materials that are found in electronics products.³⁵ Since July 1, 2006, the E.U. RoHS has banned the use of lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (Cr6+), PBBs (polybrominated biphenyls), and PBDEs (polybrominated diphenyl ethers) and has banned the placement of any electrical and electronic equipment (EEE) in the market that contains any of those contaminants.³⁶ One key regulatory tool of the RoHS is exemptions, such as large household appliances, consumer equipment, and electrical and electronic tools.³⁷ These exemptions are created through a twenty-five member (one from each E.U. nation) Technical Adaptation Committee (TAC) charged with the responsibility of providing technical changes and interpreting regulations within the directive.³⁸

Although WEEE and RoHS regulate many of the same products, they use different means to accomplish the regulation of such toxics. The WEEE directive is prescriptive in nature,

³⁴ *Id.*

³⁵ Council Directive 2002/95/EC, Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment, 2003 O.J. (L 37) 19 (EC) [hereafter RoHS Directive]. Art. 4.

³⁶ John H. Lau et. al, *Key Differences Between EU RoHS and China RoHS (as of August 7, 2006)*, Global SMT & Packaging, www.trafalgar2.com/documents/Technical_Articles/6.09-lau.pdf (last visited April 17, 2009).

³⁷ *Id.* For a complete list of exemptions see The European Parliament and the Council of the European Union, 'Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE)', Official Journal of the European Union, February 13, 2003, pp. L37/24-38. Annex 6.

³⁸ *Id.*



establishing minimum standards to be followed and general producer compliance.³⁹

Contrastingly, the RoHS approach is pure prohibition⁴⁰ of certain substances are so harmful that they are completely banned in EEE production. Furthermore, where WEEE focuses on waste management and environmental protection, RoHS addresses international trade interests.⁴¹

These two directives effectively compliment each other by minimizing the harmful effects of toxic electronics through both prohibition and regulatory/management schemes.

C. The United States

Currently, there are no U.S. federal laws that deal exclusively with E-waste.⁴² This has resulted in a patchwork of electronic waste regulation throughout the country. There are twenty states thus far that have passed some form of regulations mandating state-wide E-waste recycling, and several more states are considering E-waste regulations in 2009.⁴³ At least twenty states and cities have producer responsibility laws, and California is currently the only state that has a consumer fee law.⁴⁴

In California, consumers pay a fee which then goes to a fund for collecting and recycling electronic wastes. The state also puts an emphasis on Extended Producer Responsibility (EPR). California state legislation defines EPR as, “a policy approach that seeks to shift the primary responsibility for developing and/or participating in product stewardship programs that address the end-of-life (EOL) management of discarded products and materials from the general public

³⁹ Krishna, *supra* note 29, at 79.

⁴⁰ *Id.*

⁴¹ *Id.*

⁴² *Id.* at 82.

⁴³ Electronics Take Back Coalition: State Legislation, http://www.electronicstakeback.com/legislation/state_legislation.htm (last visited April 17, 2010).

⁴⁴ *Id.* Other states are also considering E-waste recycling legislation in 2010.



and local government to producers.”⁴⁵ Much like the EU’s WEEE directive, California’s EPR focuses on encouraging greener product design, source reduction, and the reusing of materials so as to have a reduced impact on the environment and human health. The legislation also forces EPR by incorporating the costs of product collection, recycling, and/or disposal into the product price.⁴⁶

In general, U.S. environmental law regarding products only focuses on toxic emissions created during the manufacturing phase of the products life cycle.⁴⁷ The only federal law addressing the management of solid waste is the Resource Conservation and Recovery Act (RCRA).⁴⁸ RCRA establishes strict guidelines and requirements for the disposal, transport, storage, and treatment of hazardous wastes.⁴⁹ Under RCRA the material must first be a waste in order to be considered a hazardous waste.⁵⁰ Under EPA regulations of RCRA there are exclusions (the product is not waste) and there are exemptions (the product is a waste but it is not hazardous).⁵¹ Additionally, equipment for potential reuse is not a waste and waste can be made a non-waste through processing.⁵²

Further, EPA specifically exempts household wastes, including any household electronics, scrap metal for recycling, whole circuit boards for recycling, and precious metals for

⁴⁵ Extended Producer Responsibility and Stewardship, <http://www.calrecycle.ca.gov/EPR/Activities/default.htm>: (last visited April 17, 2010).

⁴⁶ *Id.*

⁴⁷ Pak, *supra* note 3, at 268.

⁴⁸ *Id.* (citing Resource Conservation and Recovery Act, 42 U.S.C. § 6902 (1976) (RCRA’s objective and national policies)).

⁴⁹ *Id.* at 268.

⁵⁰ EPA’s Regulatory Program for E-waste, <http://www.epa.gov/waste/consERVE/materials/eycling/rules.htm#present> (last visited November 23, 2009)

⁵¹ *Id.*

⁵² *Id.*



recycling as hazardous wastes.⁵³ Products such as materials or equipment for reuse, processed scrap metal for recycling, shredded circuit boards for recycling, processed CRT glass, intact CRTs, and partially processed CRTs are not even considered wastes. Small-scale generators of such wastes are also exempt under RCRA.⁵⁴ The diverging regulation of small-scale and household generators of waste versus mid- to large-scale waste generators reflects the U.S. policy choice to focus primarily on the environmental impact of industrial contributors rather than individuals.⁵⁵ However, ignoring small-scale and individual contributions of E-waste allows these products and all of their toxicity to find their way into American landfills where the effects will be felt for years to come.⁵⁶

Since RCRA is thus far the only statutory scheme Congress has enacted regarding toxic materials, the EPA does not have the authority to promulgate regulations banning the use of certain toxic materials in manufacturing (like RoHS), or to force producers into establishing recycling systems for their products (like EPR). Rather, the EPA has established voluntary programs that mirror the environmental goals of the EU's RoHS and WEEE Directives.⁵⁷ Through a collaboration between government, industry, and consumer stakeholders⁵⁸ these programs are designed to “foster environmentally conscious design and manufacturing;

⁵³ *Id.*

⁵⁴ See 40 C.F.R. § 261.5(f)(3) (2004) (exempting small-scale generators producing 2.2 pounds of acute hazardous waste or 220 pounds or less of residue or material contaminated by acute hazardous waste per month); 40 C.F.R. § 261.4(b)(1) (2004) (exempting households).

⁵⁵ Pak, *supra* note 3, at 268.

⁵⁶ *Id.* See also U.S. E.P.A. Household Hazardous Wastes, <http://www.epa.gov/osw/consERVE/materials/hhw.htm> (last visited April 17, 2010). (American households generate an estimated 1.6 million tons of hazardous waste annually.)

⁵⁷ Pak, *supra* note 3, at 269.

⁵⁸ *Id.*



[i]ncrease purchasing and use of more environmentally sustainable electronics; [and i]ncrease safe, environmentally sound reuse and recycling of used electronics.”⁵⁹

These programs, however, have neither binding nor legal authority. EPA may only take actions to encourage all parties to develop responsible management and production practices.⁶⁰ With only four states enacting legislations similar to the RoHS and WEEE directive (California, Maine, Maryland, and Washington),⁶¹ increased public awareness of the magnitude of this situation is needed in order for electoral pressure to drive more states to either tighten their already existing regulations or realize the dire need for their initial enactment.

D. China

China’s Constitution stipulates that the National People’s Congress is, “the highest organ of state power.”⁶² Realistically however, the NPC operates more as a “rubber stamp” legislature and is subservient to the Communist Party’s wishes.⁶³ The primary administrative functions of the Chinese government are carried out through the State Council.⁶⁴ It is the State Council who executes laws and supervises the government.⁶⁵ Per the Constitution, the State Council has the power to “adopt administrative measures, enact administrative rules and regulations, and issue decisions and orders in accordance with the Constitution and statutes.”⁶⁶ Subordinate to the

⁵⁹ *Id.* (citing United States Environmental Protection Agency, Product Stewardship, <http://www.epa.gov/epaoswer/non-hw/reduce/epr/products/electronics.htm> (last visited November 23, 2009)).

⁶⁰ *Id.*

⁶¹ See Cal. Pub. Res. Code §§ 42460-42486 (2003); Me. Rev. Stat. Ann. tit. 38, § 1610 (2005); Md. Code Ann., Envir. §§ 9-1727-1730 (2007); Wash. Rev. Code §§ 70.95N.010-.340, 70.95N.900-.902 (2007) (Washington).

⁶² Constitution of the People’s Republic of China, Chap. III, § 1 art. 57 (1982).

⁶³ China’s State Organizational Structure, Congressional Executive Commission on China, <http://www.cecc.gov/pages/virtualAcad/gov/statestruct.php> (last visited April 20, 2010).

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ *Id.* (citing Constitution of the People’s Republic of China, Chap. III, § 3 art. 89 (1982)).



State Council are ministries, commissions, and direct offices.⁶⁷ While the constitution lays the framework for the government structure, the Party is at the top of the chain of command and Party influences tend to permeate through every governmental level.

1. China's RoHS-type law — "Administrative Measures for the Control of Pollution from Electronic Information Products"

The EU'S WEEE and RoHS Directives and their strict regulations, have created much anxiety in the Chinese electronics manufacturing community. Currently, the EU is China's biggest electronic information products exporter and it has caused industry-wide disruptions trying to ensure that products exported to the EU do not contain the dangerous toxics that are banned under the RoHS. Despite these concerns however, the pollution generated by E-waste has been so severe that it has imposed great pressure on the Chinese government. As a result, the Administrative Measures for the Control of Pollution Prevention from Electronics Information Products (an RoHS type law) was enacted on February 28, 2006, and took effect on March 1, 2007.

Per Article 1, the purpose of this regulation is to, "contro[l] and reduc[e] the pollution caused by the wasted electronic information products to the environment, promoting the production and sale of low-pollution electronic information products, and protec[t] the environment and human health."⁶⁸ This ordinance focuses on two major aspects of controlling the pollution caused by electronics products. The regulation's first major focus is labeling and

⁶⁷ *Id.*

⁶⁸ Measures for the Control of Pollution from Electronic Information Products, art. I (2007). Per Article 3, The term "electronic information products" shall refer to the products produced with electronic information technologies, including electronic radar products, electronic communication products, radio and television products, computer products, home electronic products, electronic measurement devices products, special electronic products, electronic element and component products, electronic application products, electronic material products, etc., as well as the parts and components thereof."



information disclosure mandates. The regulation's second major focus involves creating a Management Catalogue of substance restrictions and associated pre-market compliance certifications (Management Catalogue of Key Control of Pollution from Electronic Information Products).

For products and their packages that are released into the market, manufacturers and importers of electronic information products must explicitly indicate relative environmental information, such as the product's designated period for safe use, and the names and content of the toxic and harmful substances contained therein. The safety period labeling contains information such as how long a product is expected to last and how long it is safe to keep a product within consumer possession.⁶⁹ Per Article 11, manufacturers and importers should determine the safety period for electronic information products. While, the Ministry of Information Industry (MII) and other relevant State agencies mandate the styles and methods for displaying these safety periods, they do not mandate actual safety period criteria or require the application of uniform formulas to determine such. Without the government creating standards to determine the safety period, there is no doubt that the manufacturers and importers will keep their own interests in mind while developing these criteria.

Per Article 18, the electronic information products that are to be listed in the Management Catalogue are those which contain highly toxic substances and thus should be strictly regulated.⁷⁰ The catalogue is comprised of, "various categories of electronic

⁶⁹ "The term 'environmental protection use life of electronic information products' shall refer to the time period within which the toxic or noxious substances or elements contained in electronic information products will not leak or suddenly change, and the users of the electronic information products will not cause serious pollution to the environment or serious personal or property damages." *Id.* at art. 3 § 5 (2007).

⁷⁰ *Id.* at art. 18.



information products, the kinds of toxic or noxious substances or elements restricted from use, and the limited use life thereof.”⁷¹ Further, the catalogue must be adjusted annually in light of scientific and technological developments. Before these products are released into market, the toxic and harmful substances contained in them must be replaced or limited to a required standard.⁷² Additionally, the products must pass the China Compulsory Certification (3C) before entering the market place.

Much like the EU’s RoHS, this regulation puts an emphasis on pollution prevention instead of dealing with hazardous waste management. One of the reasons this regulation is so unsuccessful is that several administrative agencies are charged with its implementation⁷³ without official protocols or procedures for how to do so. Rather, these various agencies are simply told to “set up a work coordination mechanism to resolve the major matters and problems in the control of pollution from electronic information products.”⁷⁴ This results in a lack of inter-agency cooperation. Either various agency branches compete for power and profits from enforcement, or they constantly pass inter-agency responsibilities amongst the various branches if they do not want to be concerned with a certain matter or the pay-off is not great enough.

⁷¹ *Id.*

⁷² *Id.* at art. 14.

⁷³ “The Ministry of Information Industry of the People's Republic of China (hereinafter referred to as "MII"), the State Development and Reform Commission of the People's Republic of China (hereinafter referred to as "SDRC"), the Ministry of Commerce of the People's Republic of China (hereinafter referred to as "MOC"), the General Administration of Customs of the People's Republic of China (hereinafter referred to as "the General Administration of Customs"), the State Administration for Industry and Commerce (hereinafter referred to as "SAIC"), the State Administration of Quality Supervision, Inspection and Quarantine (hereinafter referred to as "SAQSIQ"), and the State Environmental Protection Administration (hereinafter referred to as "SEPA") shall, within the scope of their respective duties, administer and supervise the control of pollution from the electronic information products. They shall, when necessary, set up a work coordination mechanism to resolve the major matters and problems in the control of pollution from electronic information products.” *Id.* at art. 4.

⁷⁴ *Id.*



With such broad regulatory language, various departments are given a scope of responsibility and are authorized to penalize the designers, manufacturers, importers and sellers who violate these laws. Since many times department responsibilities overlap, the lack of streamlined procedure and inter-agency protocol may lead to either a party completely evading penalties or suffering from multiple penalties from a single behavior or infraction.

Article 18 perfectly demonstrates this extreme overlap in inter-agency responsibility. The Management Catalogue of Key Control of Pollution from Electronic Information Products is to be formulated and revised by the MII, the Development and Reform Committee, the Ministry of Commerce, the General Administration of Customs, the General Administration of Quality Supervision, Inspection and Quarantine, the State Environmental Protection Administration and the State Administration for Industry and Commerce. However, the Management Catalogue has yet to be formulated! The various departments assigned to do the same task, a general lack of cooperation, and no official protocols to delegate responsibilities, inevitably create a long-lasting impediments to creating this catalogue. This multi-agency delegation will not only hinder the catalogue's creation but also the entire regulation as a whole.

Further, these Catalogue regulations differ from the EU's RoHS restriction methods. Although the catalogue regulates the same six toxics (Pb, Hg, Cd, Cr6+, PBBs, and PBDEs) as the EU's RoHS, China's regulations differ in management. First, the Management Catalogue controls the actual products that contain the toxics instead of regulating the substances themselves. Second, the Management Catalogue eventually phases-out products containing toxic substances as opposed to enforcing an immediate ban.



To accomplish this goal, the statute stipulates that products containing toxic substances which can be replaced by non-toxic substances, without technical obstacles, and in a commercially feasible way, shall be put in the Management Catalogue and undergo 3C procedures. Products that contain toxic substances, which cannot eliminate or replace those toxic substances, but can minimize the use of such substances in a *technologically feasible manner*, shall also be listed and undergo the same procedures. This sort of statutory language results in products outside the Management Catalogue being temporarily exempt from the Catalogue restrictions.

Further problematic, Chinese exporters of electronic information products are exempted from this regulation since the ordinance focuses on pollution prevention within China itself. This regulation is only aimed at trying to prevent the adverse influences on *domestic* human health and the environment caused by the toxic or hazardous substances in electronic information products, but it does not address E-waste management. A critical point of concern is that the exemptions on exports will lead to different production standards in different enterprises or different departments within one enterprise.

For profits' sake, producers will not apply the strict domestic standard to exported products when the country has either a weaker or no RoHS-type standard at all. As a result, these exempted exports will continue to perpetuate harm to human health and the environments of foreign countries. Not only does this practice incentivize passing on the toxics to the next country willing to accept it but China itself will suffer irreparable harm when the unwanted products return to the domestic Chinese "recycling" centers. While the legislators' original



intent was to protect China through these standards the country's willingness to accept these exported waste products renders the strict standards on exports irrelevant.

2. China's WEEE-type laws — "Administrative Measures for Prevention and Control of Environmental Pollution by Electronic Waste" and "Regulations for the Administration of the Recovery and Disposal of Waste Electronic and Electronic Products"

i. "Administrative Measures for Pollution Prevention of E-waste"

Until recently, there was no clear standard for market admittance of E-waste recycling facilities in China. This lack of industry regulation resulted in a boom of unqualified enterprises or self-employed households taking matters into their own hands and creating their own E-waste recycling businesses. Most of the unqualified enterprises and self-employed households apply obsolete methods in the recycling process, causing tremendous damage to human health and the environment. The utter lack of regulation on these e-cycling facilities led not only to extremely hazardous consequences but also to the rapid emergence of E-waste Villages or E-waste Towns, drawing large amounts of public attention in the process. To address these issues, the Administrative Measures for Pollution Prevention of E-waste was enacted by the State Environmental Protection Administration on September 7, 2007, and took effect on February 1, 2008.

Article I was enacted for the purpose of, "preventing and controlling the environmental pollution by electronic waste and strengthening the environmental administration of electronic waste."⁷⁵ This regulation focuses on preventing pollution caused by disassembling, recycling and disposing E-waste. "E-waste" includes not only the wastes generated from

⁷⁵ Administrative Measures for the Prevention and Control of Environmental Pollution by Electronic Waste, art. I (2008).



electronic information products, but also the wastes generated from the industrial production process.⁷⁶

The environmental protection administrative department in the government above the county level utilizes a List Management System of entities (including self-employed households) that engage in dismantling, utilizing, and disposing of E-waste by putting qualified entities into a provisional list which gives them permits to deal with E-waste.⁷⁷ After an entity completes an “environmental impact assessment document,” and its permit application is complete, its name is added to the list and it is admitted to the E-waste recycling market under supervision of Environmental Protection Administrative Departments.⁷⁸ Those not on the list are prohibited from disassembling, recycling and disposing E-waste.

This regulation also mentions the obligations of relative parties in pollution prevention. Some of these terms are very similar to China’s RoHS-type law — Administrative Measures for Pollution Prevention and Control of Electronic Information Products. For example, Chapter III Article 14 (1) requires manufacturers of electronic and electrical products and equipments shall limit or eliminate the application of toxic and harmful substances in those products and equipments according to the relative laws, administrative regulations and ordinances. Article 14 (2) demands that manufacturers, importers and sellers of electronic and electrical products and equipments shall publicize the information of toxic and harmful substances like lead, mercury, hexavalent chromium, PBB and PBDE in those products and equipments, and the information of potential influence on human health and environment under

⁷⁶ *Id.* at art. 10.

⁷⁷ Administrative Measures for the Prevention and Control of Environmental Pollution by Electronic Waste, Art. II and II.

⁷⁸ *Id.* at Ch. II Art. 5-7.



inappropriate use or disposal. They shall also label the products warning people to recycle and dispose of electronics products in an environmentally sound way.

Although some of the regulation's terms are related to manufacturers and closely resemble those of the EU's RoHS directive, importers and sellers also have E-waste recycling obligations similar to the EU's WEEE Directive. This is especially true regarding the provision requiring the establishment of an E-waste recovery system. Thus, this regulation is more like a hybrid of the two EU directives, combining merits from the both regulations. Article 14 (3) requires manufacturers, importers, and sellers of electronic and electrical products and equipment, to establish a recovery system according to the relative laws for recycling, storing, and using and disposing of discarded products and equipment in an environmentally sound way.

Although this regulation is mainly concerned with preventing pollution caused by E-waste in the process of disassembling, recycling and disposing, it barely mentions the relative parties' obligations or consequences of regulatory violations. What makes this regulation most problematic however, is that this regulation only gives an abstract consideration of relative parties' obligations without defining the legal consequences of violating these obligations. For example, Article 12 stipulates,

“Where the environmental protection administrative department under the people's government at or above the county level finds that any condition for check and acceptance of environmental protection measures is not met, and the circumstance is minor, it may order the rectification within a time limit; and where the rectification has been made timely and no harmful consequence has not been caused, the environmental protection administrative department may not impose any punishment.”

Realistically, all this provision says is that if the administrative department finds an unacceptable condition it can give an entity an unlimited amount of time to fix it. There is no



legally binding time period of how long a company has to come into compliance. Further, there is no legal definition of a “harmful consequence.” With such ill-defined regulations, the administrative department has lots of discretion and freedom of interpretation, and the chances of enterprises avoiding penalties are greatly increased. While certain regulations do in fact impose penalties, these penalties are again not imposed until after they refuse to correct the violation within, “the time period.”⁷⁹

ii. “Regulations for the Administration of the Recovery and Disposal of Waste Electronic and Electric Products” — China’s new WEEE Directive

Although the government is devoting significant attention to the repercussions of E-waste on human health and the environment and has promulgated many regulations on this issue, much work remains to be done. Most of the regulations focus on pollution prevention instead of E-waste management, including the Administrative Measures for Pollution Prevention of E-waste mentioned above. The qualifications and obligations of disposing enterprises (including self-employed households) are clarified in detail in the Administrative Measures for Pollution Prevention of E-waste. However, the obligations of relative parties, such as manufacturers, importers, sellers and customers, still need to be more clearly defined. The State Council approved these regulations on August 20, 2008. However, because of the economic downturn the Premier Wen Jiabao did not sign them until January 25, 2009. They will not go into effect until January 1, 2011.

These regulations govern the recovery, disposal and other relevant activities of electronic waste products listed in the Catalogue of Waste Electrical and Electronic Products for Disposal (the “Catalogue), which has yet to be decreed. The State implements a system of

⁷⁹ *Id.* at art. 19.



recovery by multiple channels and centralized disposal with respect to electronic waste and electric products. Besides regulating disposal enterprises, these regulations define the responsibilities of other parties such as manufacturers, importers, sellers, repair organs and after-sales service organs.

Under the new WEEE directive, manufacturers, sellers, and importers have three main responsibilities. The first responsibility is green manufacturing. Manufacturers of electronic and electric products, consignees of imported electronic and electric products or their agents must manufacture or import electric and electronic products that comply with the State regulations on electric and electronic products pollution control, must apply design plans that are conducive to comprehensive resource utilization and harmless recovery treatment, and must utilize materials that are nontoxic, non-hazardous or of low toxicity or low hazard or that are convenient for recovery.⁸⁰ The second responsibility is information disclosure. Information concerning toxic or hazardous substance content, appropriate methods with respect to recovery and disposal, etc shall be stated on electric and electronic products or products manuals.⁸¹ The third responsibility is recycling. A fund will be established for the disposal of waste electric and electronic products to provide subsidies for the expenses for recovering and disposing of waste electrical and electronic products.⁸² Manufacturers of electronic and electric products, consignees of imported electronic and electric products or their agents must contribute to the fund for waste electric and electronic product disposal.⁸³

⁸⁰ Regulations for the Administration of the Recovery and Disposal of Waste Electronic and Electronic Products, art. 10 ,§ 2 (2009).

⁸¹ *Id.* at art. 10,§ 2

⁸² *Id.*, art. 7.

⁸³ *Id.*



Furthermore, electric and electronic product sellers, repair entities and after-sale service organs shall set forth information that indicates electric and electronic product recovery in prominent locations on their premises.⁸⁴ Additionally, any waste electric and electronic products recovered shall be disposed by qualified disposal enterprises. These qualified disposal enterprises shall dispose electric and electronic product waste in a way the government permits. These enterprises must also establish a regular environmental monitoring system and an information data management system.⁸⁵

Unlike a paper tiger, (something which appears to impose great liability but is actually harmless), these regulations impose legal liabilities on parties that violate the regulations. In addition to ordering violation corrections, the regulations establish penalties for illegal WEEE-related activities, including failing to label products (fines of up to 50,000 Yuan [\$7,315])⁸⁶, carrying out WEEE disposal without proper qualifications (the business will be shut down, fines of between 50,000 and 500,000 Yuan [73,154] and confiscation of illegal proceeds from WEEE disposal), and failing to report to local authorities (fines of up to 50,000).⁸⁷ These regulations are the first laws to actually deal with electronic disposal.

These regulations have been put into legislation agenda in 2006. However, they were approved in 2009, and they will not take affect until 2011. There are three purposes behind the two-year lapse between enactment in 2009 and enforcement in 2011. The first purpose is to inform the public about the economic advantage of comprehensively utilizing E-waste resources and protecting the environment. The second is formulating and enacting the Catalogue of Waste

⁸⁴ *Id.* art 11, § 1.

⁸⁵ *Id.* at art. 16, 17.

⁸⁶ *Id.* at art. 27.

⁸⁷ *Id.* art. 27, 28, 31, 32



Electric and Electronic Products for Disposal, Administrative Measures for Collection and Use of the Fund for the Disposal of Waste Electric and Electronic Products which are standards for the collection of the fund for the disposal of waste electric and electronic products, and the allowance in connections therewithin. The third is implementing supervisory management, manufacturers, recycling and disposing enterprises.

These regulations are promulgated by the State Council, which means that they are more authoritative than prior regulations specializing in E-waste disposal that appeared as department regulations issued by ministries and commissions directly under the State Council. Those departmental rules and regulations had lower force and effect compared with administrative regulations issued by the State Council, resulting in limitations in setting up administrative licensing and penalties. Since the new regulations for the Administration of the Recovery and Disposal of Waste Electronic and Electronic Products are enacted by the State Council, they will have a higher force and effect than the previous departmental rules and regulations.

Though these regulations attempt to establish a system of legal responsibilities for the parties concerned, they have not completely succeeded. These new regulations still lack mandatory legal responsibilities for sellers when they fail to meet the regulations. Much like the previous regulations, the competent environmental department still has authority to permit violators to correct violations, “within a prescribed time limit.”⁸⁸ Yet again, there is no pre-determined time period and the regulation still fails to define a “serious” violation. These new regulations also completely lack any customer obligations for E-waste recycling.

⁸⁸ *Id* at chapt. IV art. 29.



Additionally, these regulations are not completely consistent with previous laws. For example, regarding disassembly, use, and disposal of E-waste without business certificates, Article 69 of Law of the PRC on the Prevention of Environmental Pollution Caused by Solid Waste allocates punishment responsibility to the administrative department in charge of environmental protection at or above the county level, while the Article 24 of Administrative Measures for the Prevention and Control of Environmental Pollution by Electronic Waste allocated punishment responsibility to the administrative department of industry and commerce or the public security organ. However, Article 28 of the Management Regulation on Recycling and Disposal of Obsolete Electric and Electronic Equipments that becomes effective in 2011 stipulates that a violator shall be penalized by the administrative organ for industry and commerce according to the Measures for Investigating, Punishing and Banning Unlicensed Business Operations, unless discovered by the competent department of environmental protection of the people's government at or above the county level.

III. GLOBAL INCENTIVES TO EXPORT

The primary driving factor encouraging the export of E-waste is global economics. Because developing countries lack environmental and occupational health protections, the cost of handling E-waste is automatically lower.⁸⁹ Hence, as regulations on hazardous waste disposal in industrialized countries tightened, industry sought to outsource disposal of their waste to nations

⁸⁹ Templeton, *supra* note 4, at 770.



without such restrictions.⁹⁰ Shipping E-waste to China is 10 times cheaper than handling it in the U.S.⁹¹ Thus, strict domestic processing and environmental regulations inevitably incentivize even those who wish to recycle to resort to exporting E-waste.⁹² Knowing that the toxic import stream will be endless, entrepreneurs in developing nations continuously buy E-waste, effectively choosing between “poverty or poison.”⁹³

Another factor fueling E-waste exports is the growing demand for technology in developing nations.⁹⁴ People of developing nations understand the importance of computer literacy, and though lacking the funds to buy the latest technology, are more than willing to acquire used electronic products. By 2010, there will be 715 million new computers in use and 178 million new computer users in China alone.⁹⁵ This rising demand leads to E-waste brokers paying for obsolete electronics just so they can be repaired, refurbished, or used as-is.⁹⁶

One of the biggest problems is that even when Americans think they are doing the right thing by “recycling” their E-waste, the truth of the matter is nobody can really be sure what happens to the products once they are turned in.⁹⁷ With E-waste being the world’s fastest-growing component of the municipal waste stream, the economic reasons previously discussed

⁹⁰ Lewis, *supra* note 1, at 180.

⁹¹ Zhang Ying, et al., *Toxic Octabromodiphenyl Ether Is Being Transported from Rich to Poor via Electronic Waste*, 38 *Ambio* 115, 117 (2009).

⁹² *Id.* at 769.

⁹³ *Id.* at 770.

⁹⁴ *Id.*

⁹⁵ Greenpeace China, *The E-waste Problem*, <http://www.greenpeace.org/china/en/campaigns/toxics/E-waste/the-E-waste-problem>, (last visited November 24, 2009).

⁹⁶ Templeton, *supra* note 4, at 770.

⁹⁷ 60 Minutes, *Following the Toxic Trail of E-waste*, CBS News, August 30, 2009, <http://www.cbsnews.com/stories/2008/11/06/60minutes/main4579229.shtml>.



cause companies to advertise themselves as “recyclers” when in fact they are simply shipping the products overseas and leaving the locals to unsafely extract the precious metals.⁹⁸

Recently, 60 Minutes decided to investigate an E-waste recycling event held in Denver, Colorado. Executive Recycling of Englewood, Colorado, sponsored an E-waste collection drive with a promise right from its own website that, “Your E-waste is recycled properly, right here in the U.S. - not simply dumped on somebody else.”⁹⁹ Thousand of well-intentioned Americans waited in bumper-to-bumper traffic that lasted for hours just to dispose of their computers, PDAs, T.V.s, and other electronic devices.

Skeptical about what would happen to this waste upon collection, 60 Minutes followed one of Executive Recycling’s shipping containers filled with computer monitors.¹⁰⁰ 60 Minutes was able to track the container from the Colorado plant, to Tacoma, Washington where it was loaded on a shipped 7,459 miles to Victoria Harbor, Hong Kong. From Hong Kong, the container traveled to what has been called the “Chernobyl of E-waste,” the town of Guiyu, China¹⁰¹ (more on this specific site to be discussed later).

Because the container possessed large amounts of lead from the CRTs in the computer monitors (as well as other toxics), the entire trip was in violation of Hong Kong, Chinese, and U.S. law.¹⁰² Remember, China technically banned the import of E-waste in 2000.¹⁰³ However, these toxics are still making their way out of the U.S. and into Chinese territory. A Government

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.*

¹⁰³ Greenpeace China, The E-waste Problem, <http://www.greenpeace.org/china/en/campaigns/toxics/E-waste/the-E-waste-problem>, (last visited November 24, 2009).



Accountability Report in August 2008 revealed that even though the U.S. is required to monitor the export of CRTs, a sting operation unveiled 43 U.S. recycling companies willing to ship broken monitors containing CRTs without EPA permission.¹⁰⁴ What makes this more unconscionable is the fact that at least three of those same companies held 2008 Earth Day electronics-recycling events,¹⁰⁵ misleading Americans as to where their electronic waste was going.¹⁰⁶

A. The Absence of Social Justice in Exporting

Without the U.S. adhering to strict exportation regulations, their E-waste exports result in devastating environmental and human health degradation in the receiving countries. Instead of the U.S. adopting regulations that force manufacturers, producers, and consumers to deal with the externalities of E-waste, the U.S. instead passes the environmental and health costs onto countries such as China who accept the waste in desperation for jobs, income, and foreign currency.¹⁰⁷ These “recycling” jobs expose workers in toxic dumps to dangerous levels of lead, mercury, cadmium, hexavalent chromium, beryllium, barium, nickel, PCBs, and various other toxics.¹⁰⁸ All of these items listed are known to cause serious human health effects and are ranked on the Center for Disease Control’s Priority List of Hazardous Substances.¹⁰⁹ This

¹⁰⁴ Walsh, *supra* note 7; See also GAO: Electronic Waste: EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation, <http://www.gao.gov/new.items/d081044.pdf>, last visited (November 24, 2009).

¹⁰⁵ *Id.*

¹⁰⁶ If you are interested in ensuring the proper disposal of your E-waste there are some options available. If you have a cell phone that is still in good working condition you may sell it at www.greenphone.com who then in turn sells the phones to actual customers overseas. The Basel Action Network (the world's only organization focused on confronting the global environmental injustice and economic inefficiency of toxic trade (toxic wastes, products and technologies) and its devastating impacts) has also compiled a list of accredited U.S. E-waste recyclers. This list, as well as additional information about proper E-waste recycling can be found at www.e-stewards.org.

¹⁰⁷ *Id.*

¹⁰⁸ *Id.*

¹⁰⁹ Pak, *supra* note 3, at 248.



exporting exploits China's desperation and its lack of environmental and occupational health regulations.

Lead is contained in Cathode Ray Tubes and computer circuit boards.¹¹⁰ Until recently, lead was used as solder to glue together pieces of electronic components.¹¹¹ An astounding four to eight pounds of lead can be found in CRTs, which are used in non-flat screen computers monitors and televisions.¹¹² Lead is known to damage the nervous and endocrine systems and causes blood, kidney, and brain disorders, especially in children who are affected at very low-level doses.¹¹³ In adults, high lead-level exposure can lead to infertility, high blood pressure, and nerve disorders.¹¹⁴

Mercury, another E-waste component, is utilized in manufacturing electronic devices such as thermostats, cell phones, batteries, and flat panel monitors.¹¹⁵ These products alone make up for approximately 22% of the world's annual mercury use.¹¹⁶ High-level exposures to mercury cause problems with the brain, heart, kidneys, lungs, and immune system of people of all ages.¹¹⁷ When the mercury contained in the electronics comes into contact with water, methylmercury is created. Methylmercury is particularly hazardous to children and fetuses and affects their thinking, memory, language, fine motor skills, and kidneys.¹¹⁸ Methylmercury also

¹¹⁰ *Id.*

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ Templeton, *supra* note 4, at 766 (citing Omni Technics Inc. discussion of the California Electronic Waste Recycling Act of 2003, <http://www.ca-recycle.com/>), (last visited November 23, 2009).

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ *Id.*

¹¹⁷ U.S. EPA, Mercury Health Effects, <http://www.epa.gov/mercury/about.htm>, (last visited November 23, 2009).

¹¹⁸ Templeton, *supra* note 4, at 766.



affects other living organisms, such as fish, and its toxicity magnifies as it travels up through the food chain.¹¹⁹

Cadmium is a heavy metal that is highly used in computer batteries, circuit boards, semiconductor chips, and CRTs, it is highly toxic in low concentrations.¹²⁰ Ingestion of high amounts of cadmium leads to immediate liver, kidney, and respiratory tract problems and it is also carcinogenic.¹²¹ Stomach irritation after ingestion of contaminated food or water, may also occur immediately or shortly after exposure to high levels of cadmium.¹²²

Hexavalent chromium, used as a hardener of steel housings, is highly toxic if ingested or inhaled. Hexavalent chromium compounds irritate the eyes, skin, and mucous membranes. They are also potential DNA damaging carcinogens and a mere half teaspoonful can prove lethal.¹²³

Beryllium, barium, and nickel, and toner from improperly disposed printer cartridges are additional toxic hazards. Exposure to beryllium, which is used in many electronics including circuit boards, can result in berylliosis, a pulmonary and systemic disease, and is potentially carcinogenic.¹²⁴ Even more dangerous, “short-term exposure to barium—commonly found in CRTs—may cause brain swelling; muscle weakness; and heart, liver, and spleen damage.”¹²⁵ Animal testing has also shown to result in increased blood pressure and changes in the heart after long-term ingestion. Nickel sulfide fumes and dust are believed to be carcinogenic, and

¹¹⁹ *Id.* See also U.S. EPA, Mercury Health Effects, <http://www.epa.gov/mercury/about.htm>, (last visited November 23, 2009).

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² Wisconsin Department of Health Services: Cadmium, <http://dhs.wi.gov/eh/ChemFS/fs/cadmium.htm>, (last visited November 23, 2009)

¹²³ Templeton, *supra* note 4, at 767.

¹²⁴ *Id.* at 768.

¹²⁵ *Id.*



inhalation of black toners used in printer cartridges may lead to respiratory tract infections and may be carcinogenic.¹²⁶

Lastly, brominated flame-retardants (BFR's) and polychlorinated biphenyls (PCBs) are other toxins found in E-waste. BFRs are used in circuit boards, cables, and plastic computer casings.¹²⁷ They are neurological and developmental reproductive toxicants that negatively affect proper thyroid function.¹²⁸ Incinerating BFRs and polyvinyl chloride (PVC) (used in coating copper cables and computer casings making up 13.8 lbs. of the average computer) releases high levels of toxics and carcinogens into the atmosphere.¹²⁹ PCBs were commonly used before the 1980's in electrical capacitors and transformers, and as plasticizers in paint and rubber sealant. Large quantities of PCBs have since entered the environment through leakage, disposal, and evaporation.¹³⁰ PCBs are known carcinogens and can effect the immune, reproductive, endocrine, and nervous systems as well as cause other serious health effects.¹³¹

When electronics containing this toxic waste arrive in importing countries, people desperate for work come by the thousands¹³² without protective gear to work in these recycling plants. Immediately, they begin dismantling products without protective gear, acid stripping, and burning the electronics.¹³³ With the typical wage for this scavenger-like work being between \$2 and \$4 U.S. dollars a day,¹³⁴ all health concerns are set aside for the hopes of putting food on the

¹²⁶ *Id.*

¹²⁷ *Id.*

¹²⁸ *Id.*

¹²⁹ *Id.*

¹³⁰ Gaofeng Shao et al, *Biotransfer of persistent organic pollutants from a large site in China used for the disassembly of electronic and electrical waste*, 28 *Environmental Geochemistry and Health* 431, 342 (2006).

¹³¹ U.S. EPA, Health Effects of PCBs, <http://www.epa.gov/waste/hazard/tsd/pcbs/pubs/effects.htm#Other>, (last visited November 24, 2009).

¹³² Walsh, *supra* note 7.

¹³³ Ying, *supra* note 91, at 115.

¹³⁴ World and Comment, *Toxic E-waste pouring into Third World*, *Toronto Star* (Canada), April 21, 2008, at AA02.



table and providing for other basic needs.

One type of E-waste disposal in China is the domestic workshop, the average home turned into an E-waste “recycling” facility. Domestic workshops not only lack required equipment and technologies, but also the capital to ensure pollution reduction. There are three methods for domestic workshops to dispose of E-waste: 1) broiling circuit boards which contain electronic components for the purpose of picking up the components, 2) incinerating plastic garbage in the open air, 3) using acid baths aiming at extracting gold and other precious metals.

Currently, there are only a few professional enterprises that specialize in recycling E-waste in China. Most of them have a small scale and unitary scope of operation but distinct business channel, which will make them become the leading force in this industry in the future. Some of these enterprises specialize in decomposing and reusing of electronic components, some of them specialize in reclaiming metals like copper, others specialize in retrieving electronic circuit boards by separating all of its components to collect scrap gold, silver and precious metals. However, a majority of these enterprises are too small to compete with the larger E-waste recyclers in the area and thus lack a long-term and stable source of E-waste. Moreover, long-term health and safety considerations are not taken into account while these workshops are making a quick dime. One place that has been hit the hardest by all of this toxic trade is the Chinese town of Guiyu.

IV. GUIYU: A MODERN DAY CHERNBOYL



Guiyu, located a few hours drive north east of Hong Kong, is China's largest E-waste dump site.¹³⁵ This town lies west of the Chaoyang District in Shantou City in Guangdong Province, and captures the international community's attention for its typical domestic-workshop E-waste disposal industry. About 150,000 people are employed by the E-waste industry in Guiyu.¹³⁶ This city comprises 21 villages with 5,500 family workshops that handle 1.5 million tons of E-waste per year.¹³⁷ Its unsafe methods of E-waste disposal have caused tremendous adverse influences on the local health and environment. Given that this industry yearly produces \$148.27 million in Guiyu alone,¹³⁸ it is no wonder that toxic imports continue.

This town and these workers, however, pay a huge price to keep up with the waste stream. Reports released by nearby Shantou University reveal that Guiyu has the highest level of cancer-causing dioxins in the world and, consequently, elevated rates of miscarriages.¹³⁹ Pregnancies are six times more likely to end in miscarriage, and seven out of ten kids have excessive lead in their blood.¹⁴⁰ Pollution has ruined the town to the point where drinking water needs to be trucked in for consumption.¹⁴¹

Here, similar to many other developing countries in Asia, "recycling" consists of burning, acid baths, and dumping toxic waters into rice patties, irrigation canals, and other water supplies.¹⁴² Six of Guiyu's villages specialize in circuit board disassembly, seven in plastics and

¹³⁵ Tim Johnson, *Chinese City is World's Digital Scrap Heap*, Knight Ridder Tribune Washington Bureau (DC) April 5, 2006.

¹³⁶ *Id.*

¹³⁷ *Id.*

¹³⁸ Mark Chisholm, *Recycling becomes deadly business in China*, *The Australian*, July 31, 2007, 32.

¹³⁹ Walsh, *supra* note 7.

¹⁴⁰ 60 Minutes, *supra* note 62.

¹⁴¹ *Id.*

¹⁴² Templeton, *supra* note 4 at 773.



metals reprocessing, and two in wire and cable disassembly.¹⁴³ Workers rip apart the E-waste with their bare hands using hammers, screwdrivers, and electric drills.¹⁴⁴ Circuit boards and cell phones are taken apart by electrothermal machines which in themselves create environmental and human health risks, acid baths are used to extract precious metals such as microchips, wires and cables are simply burnt to recover the metals, and all plastic scraps that cannot be used are simply burnt with no regard as to the consequences.¹⁴⁵ Furthermore, this high-risk labor is done to acquire a mere \$1.50 to \$2 worth of commodities such as shredded plastic, copper, and aluminum.¹⁴⁶

These primitive recycling processes, subject Guiyu residents to a high risk of skin damage, headaches, vertigo, nausea, chronic gastritis, and gastric and duodenal ulcers.¹⁴⁷ One particularly alarming study conducted by Shantou University Medical College revealed that E-waste recycling in Guiyu contributed to highly elevated lead levels in children who had never even worked with E-waste.¹⁴⁸ Lead is the most widely used toxic in the electronics industry and the United States CDC defines an elevated blood lead level (BLL) as ≥ 10 ug/DL in children under the age of 6.¹⁴⁹

The sample population for this study compared the lead levels in the blood of 165 Guiyu children, from four separate villages, all < 6 to 61 children < 6 living in Chendian.¹⁵⁰ Expectedly, the BLL levels from the Guiyu children were higher than those children living in Chendian.¹⁵¹

¹⁴³ Johnson, *supra* note 132.

¹⁴⁴ Xia Huo et al., *Elevated Blood Levels of Children in Guiyu, an Electronic Waste Recycling Town in China*, 115 *Environmental Health Perspectives* 1113, 1114 (2007).

¹⁴⁵ *Id.*

¹⁴⁶ Johnson, *supra* note 99.

¹⁴⁷ Huo, *supra* note 133.

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.* at 1114.

¹⁵¹ *Id.* at 1115.



“Among Guiyu children, 135 (81.8%) had BLLs > 10 µg/dL, whereas 23 (37.7%) in Chendian ($p < 0.01$) had high levels. Among 135 (81.8%) Guiyu children with elevated BLLs, 61.8% and 20% had BLLs > 10 µg/dL and 20 µg/dL respectively.”¹⁵² Additionally, all Guiyu children’s BLL levels increased with age and older children tended to have higher BLLs than younger ones.¹⁵³ The BLLs in Guiyu children are also higher than the mean level in China, and are double than children’s levels in nearby Shantou City.¹⁵⁴

These startling results demonstrate that the levels of lead as a result of the E-waste industry currently pose an acute threat to the health of the town’s children. Importantly, when doctors test for the BLL the results only reveal the most recent lead exposures.¹⁵⁵ However, lead accumulates in the body; only by examining a person’s bones will long-term lead exposure be determined.¹⁵⁶ Bone-lead levels are measured via X-ray fluorescence (XRF) but the most common method of testing for lead levels is to simply take a blood test.¹⁵⁷ Thus, the actual BLL is most likely significantly higher than the results from the one blood test.

Further, statistical data shows that more than 80% of children in Guiyu have respiratory disease in varying degrees; more than 88% of migrant workers have diseases in skin, nervous system, respiratory system and digestive system; and the percentage of leukemia is rising.¹⁵⁸ Without more E-waste regulation and management, the situation in Guiyu will deteriorate even further.

In addition to the human health consequences of collecting E-waste, the industry also

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ *Id.* at 1116.

¹⁵⁵ Lead How it Affects Your Body and Your Health, The Baltimore Memory Study, www.niehs.nih.gov/health/docs/lead-body-health.pdf (last visited April 18, 2010).

¹⁵⁶ *Id.*

¹⁵⁷ *Id.*

¹⁵⁸ Huo, *supra* note 133, at 1116.



poses a grave danger to the environment. The massive amounts of E-waste in the Guiyu area is rendering the water undrinkable and the air unbreathable. Furthermore, persistent organic pollutants (POPs), which pose a serious danger to human health and the environment, are ravaging the landscape through leakage, evaporation, runoff, and leaching.¹⁵⁹ A study done in Zhejiang, China demonstrates that in 17 various river samples the mean level of total PCBs was 0.6 Å } 0.3 lg L)1 in river water, nearly 30 times greater than the allowable maximum limit of 0.02 lg L)1 recommended in the Chinese Surface Water Guideline (SEPA of China 2002).¹⁶⁰ High levels of PCBs were also found in samples of silver carp muscles, rice seed samples, and hen eggs,¹⁶¹ indicating that all of these toxins are moving up the food chain. Anywhere E-waste dumps are located, PCBs are potentially released from the wastes and damage the surrounding water supplies through runoff and leaching.¹⁶²

According to a detection result from dust from various workshops, roads, and paved areas in public places in Guiyu, the content of heavy metal pollutants like lead, chromium, copper and tin, exceeds the hazard pollution standard by several hundred to one thousand times.¹⁶³ The lead concentration exceeded the New Dutch List optimum value by 269-2426 times.¹⁶⁴ Copper and Zinc exceeded the acceptable limit by 31-994 and 7-73 times. Even at an open-air food market in Guiyu, values for Cu, Ni, Pb, and Zn, were exceeded by 10, 5.4, 16, and 4.5 times the optimum value.¹⁶⁵ Further, concentrations found in Lead and Cu in road dust were 371 and 155

¹⁵⁹ Zhao, *supra* note 130, at 342.

¹⁶⁰ *Id.* at 344.

¹⁶¹ *Id.*

¹⁶² *Id.* at 347.

¹⁶³ Anna O.W. Leung, et al., *Heavy Metals Concentrations of Surface Dust from e-Waste Recycling and Its Human Health Implication in Southeast China*, 42 *Environ. Sci. Technol.* 2674, 2677 (2008).

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*



times higher than at non e-waste sites located 8 to 30 km away.¹⁶⁶ The content of dioxins in Guiyu was also discovered to be 37 to 133 times more than nearby Guangzhou, 450 km away.¹⁶⁷

Not only do these E-waste disposal methods lead to a high exposure of heavy metals and POPs in air, but also impact on the regional atmospheric environment. Additionally, heavy metals and POPs cause severe pollution of aquatic systems. Sediments and soil in local places and surrounding areas, when transferred to the aquatic system form potential highly concentrated areas of heavy metals and POPs.

Another environmental risk created by E-waste is the creation of hot spots, a higher level of toxics contained in a single area. One specific toxin that plagues China, and especially Guiyu, is polybrominated diphenyl ethers (PBDEs), a flame retardant structurally similar to PCBs.¹⁶⁸ Sources from environmental PBDE contamination come from leakage from consumer products, industrial manufacturing facilities, and E-waste disposal sites.¹⁶⁹ One particularly harmful component of PBDE is octabromo-dyphenyl (BDE-183).¹⁷⁰ BDE-183 levels in Guiyu E-waste workers were 17 times higher than white collar workers in Sweden, and there was a 21% difference in BDE-183 levels of those who work with E-waste in Guiyu versus those who live in the area.¹⁷¹ With the amount of electronic waste rapidly increasing, and with 80% of that waste being sent to China, the harmful levels of these chemicals in human bodies will increase dramatically. Furthermore, since there are PBDE hot spots already found in China there is a high likelihood that other toxics will become just as concentrated, leaving China's atmosphere deadly.

¹⁶⁶ *Id.* at 2674.

¹⁶⁷ *E-waste Recycling Spews Dioxin into the Air*, <http://ewasteguide.info/node/3618> (last visited May 10, 2010).

¹⁶⁸ Ying, *supra* note 91, at 115.

¹⁶⁹ Z.Z. Yang, et al, *Polybrominated Diphenyl Ethers in Leaves and Soil from Typical Electronic Waste Polluted Area in South China*, 80 *Bull. Environ. Contam. Toxicol.* 340 (2008).

¹⁷⁰ *Id.* at 116

¹⁷¹ *Id.*



Even more concerning is that it is virtually impossible to inspect these toxic dumps. Gang members who run the areas physically attack anybody who is there to investigate and attempt to confiscate any environmental samples or pictures that were taken.¹⁷² Guiyu is proud of its E-waste industry and actively tries to ward off any bad images about smuggled wastes and labor rights.¹⁷³ Regularly the police or local thugs, detain journalists immediately upon arrival at the waste sites¹⁷⁴ to prevent E-waste horror stories from reaching the outside world.

When the aforementioned 60 Minutes crew arrived from Colorado, it became intimately familiar with such scare tactics and concealment. Within minutes, the crew was detained by police and taken to the City Hall. When they informed the Mayor they were there to do a story on recycling the Mayor escorted them to a pre-selected, government regulated shop where computers were being dismantled. The Mayor then informed them that if they wanted to view the rest of the town they would have to return when the town was ready for them, in one year. After a final cup of tea, and the façade of cordialness quickly dissipated as the police escorted the entire 60 Minutes crew to the city limits.¹⁷⁵

These tactics are so successful as to conceal from the rest of the country proof of the toxic dumps scattered throughout the country. My recent trip to Guangzhou, China this past winter demonstrated that even today average city-dwellers do not believe that this sort of recycling system exists within the country. Students at Sun Yat-Sen University, presented with our research results were stunned by the deplorable conditions at these sites and that these toxic dumps continue to exist.

¹⁷² 60 Minutes, *supra* note 62.

¹⁷³ Johnson, *supra* note 132.

¹⁷⁴ *Id.*

¹⁷⁵ *Id.*



V. WAYS TO IMPROVE THE E-WASTE INDUSTRY IN BOTH THE U.S. AND CHINA

A. The United States

The first step the United States should take is to pass federal legislation similar to the WEEE and RoHS directives. Congress must pass federal legislation so that EPA can take a more proactive approach in E-waste regulation and expand the current regulations to more than just CRTs. A national scheme is important not only for cost efficiency but also for nation wide cohesiveness. Permitting E-waste regulation on a state-by-state basis will lead to substantial inconsistency; the detriment to human and environmental health is so grave that Congress should legislate at the national level. Additionally, establishing E-waste infrastructure could bolster the national economy. By consolidating and creating both larger and specialized recycling centers, “a national system could realize economies of scale in many areas.”¹⁷⁶

Similar to the EU’s directives, the U.S. should adopt a policy that regulates electronic products from cradle-to-grave, thereby sharing responsibility between both producers and consumers. This shared responsibility properly distributes costs to not only encourage industry from coming up with newer “green” designs, but also to force consumers to face a portion of the true cost of what it takes to manufacture and properly dispose of the electronics they so desperately crave.

First, there should be a free national E-waste recycling system and a small tax placed on all electronics products. People should be able to dispose of their electronics free of charge to ensure that these highly toxic substances are properly disposed of and to prevent the likely increase in “midnight dumping” that a disposal fee would produce.¹⁷⁷ Convincing the average

¹⁷⁶ See Templeton, *supra* note 4, at 274.

¹⁷⁷ *Id.* at 275.



American to make the effort to recycle is a difficult enough task; a fee at the end of life stage would likely deter any recycling efforts. Initially, local waste stations could handle E-waste collection until municipal E-waste facilities are established through producer and consumer fees.¹⁷⁸ Having free and accessible E-waste recycling centers should easily reduce the 80% of E-waste that enters into nation's municipal solid waste stream.¹⁷⁹

Although most consumers will likely be opposed to an electronics tax, it is necessary to ensure that these products are properly disposed of. There will always be a demand for electronics and a small tax paid during the initial purchase is a small price to pay for proper disposal which in turn leads to cleaner air, water, and general health. This tax will not be so great as to hinder the electronics industry, rather it will simply assist in establishing and perpetuating environmentally sound management (ESM) of E-waste.

Second, to deal with producers, the new national regulations should impose RoHS restrictions on the most toxic substances and impose a production fee similar to the WEEE directive. The U.S. must recognize that certain substances are so toxic that they should be banned from use in manufacturing. Absent a ban, we are perpetuating the most highly toxic chemicals to be circulated throughout the country and abroad. Like most other national environmental restrictions, these substances will likely be phased out over time, and similar to RoHS there will be certain exemptions for scientific progress. However, exemptions should be decided administratively on a case-by-case basis to avoid wholesale exemptions and to keep a tight lid on the most hazardous substances.¹⁸⁰ Additionally, there is an industry-wide financial incentive for the U.S. to ban these hazardous substances. Since most other countries already ban

¹⁷⁸ *Id.*

¹⁷⁹ Walsh, *supra* note 7.

¹⁸⁰ See *Id.* at 276.



these hazardous substances, companies that serve multi-national markets will no longer have to worry about violating these new compliance requirements, and thus can streamline their production processes. Production would become more efficient by having a uniform world-wide standard.

Given that these substances are already banned in other countries, manufacturers should have little problem manufacturing toxic-free substances within the United States. Two companies that have been extremely successful in creating greener electronics are Apple and Sony Ericson. By mid 2006, due to the significant amount of lead, Apple completely eliminated the use of CRTs.¹⁸¹ This company is also completely compliant with RoHS standards, and they run recycling companies in 93% of the countries where Apple products are sold.¹⁸² Apple was also the first company to introduce the world's first supply of BFR-free computers and handheld products and the world's first supply of PVC-free products.¹⁸³

Sony Ericsson has been committed to sustainability issues with their cell phones since 2001.¹⁸⁴ In 1999, the company produced the first BFR-free phone and the company was the first in the industry to be RoHS compliant in 2004. The company also places a lot of emphasis on environmentally conscious designs and they maintain a company-wide banned and restricted substances list.¹⁸⁵ Based on the model of these two companies, it is time for more companies to work towards manufacturing toxics-free products, and for the United States to implement the

¹⁸¹ A Greener Apple, <http://www.apple.com/hotnews/agreenerapple/> (last visited April 17, 2010).

¹⁸² *Id.*

¹⁸³ *Greening Consumer Electronics – Moving Away from Bromine and Chlorine*, Clean Production Action, www.cleanproduction.org/pdf/Greening_Consumer_Electronics.pdf (last visited April 17, 2010).

¹⁸⁴ *Id.*

¹⁸⁵ *Id.*



same substance restrictions that are already in place in the E.U.¹⁸⁶

The earlier mentioned WEEE-type production fee would force any producer who places an electronic product “on the market” in the U.S. to pay into a fund for managing the national recycling system.¹⁸⁷ This fee would directly correlate to the costs of recycling the product being produced, thus encouraging greener and more recyclable product designs. This sort of fee structure creates a market incentive between competitors to invent the greenest products and to reduce the actual recycling costs of the product.¹⁸⁸

There should also be an additional industry-wide fee paid by all producers participating in the U.S. market. This fee will require paying per the number of units placed on the market and will be based on the recycling cost of similar products.¹⁸⁹ This fee would encourage industry collaboration on green product manufacturing. If one company discovers a more ecologically sound design, it would be in their best interests to share that design with competitors in order to cut down on the industry-wide fee they have to pay that is calculated by the product’s recycling costs. As more producers incorporate greener features and decrease the products average recycling costs the industry-wide fee will drastically decrease.¹⁹⁰

Lastly, the United States’ ultimate goal should be to sign the Basel Convention. As the only industrialized country that has not signed the Basel Convention, and one of the largest consumers of electronics, the time has come to take responsibility. By signing the convention, we will end the exploitation of developing countries and will further achieve ESM of E-waste by

¹⁸⁶ For more information on companies that are making the effort to go Green check out Greenpeace’s Guide to Greener Electronics, <http://www.greenpeace.org/international/campaigns/toxics/electronics/how-the-companies-line-up> (last updated January 2010).

¹⁸⁷ *Id.*

¹⁸⁸ *Id.* at 277.

¹⁸⁹ *Id.*

¹⁹⁰ *Id.*



(a) minimizing hazardous waste generation, (b) managing hazardous wastes to prevent pollution, (c) promoting national self-sufficiency in hazardous waste management by dealing with the wastes closest to the source of their generation, and (d) minimizing transboundary movement of hazardous wastes.¹⁹¹ Ratifying the Basel Convention would prohibit the U.S. from passing the environmental and health costs on to developing countries like China, and would send a message to the world that humanistically living in the electronics age requires paying the true price for caring and disposing of the luxury of electronic technologies.

The U.S. will never have an effective way of dealing with E-waste without implementing a national recycling system, distributing the costs of electronics between the producers and consumers, and ratifying the Basel Convention. Hopefully through a combination of these mechanisms, ESM E-waste management will be established and we can ameliorate China's heavy toxic burden.

B. China

One of the first things that China needs to do is to centralize authority as to which ministry will control/enforce electronic waste. Currently, the Ministry of Environmental Protection, Ministry of Science and Technology, Ministry of Finance, Ministry of Construction, Ministry of Public Security, Ministry of Information Technology and Telecommunications, Department of Commerce, Customs Department, State Administration of Taxation, State Administration for Industry and Commerce, and State Quality Inspection Administration, all

¹⁹¹ Templeton, *supra* note 4, at 794.



have jurisdiction over various aspects of E-waste. This leads to inefficient oversight, regulations so complex that it is hard to track and enforce violations, and governmental departments passing the buck as to who is going to address various E-waste concerns. Centralized authority high up in the Chinese government will assure greater accountability and enforcement.

Second, China cannot exempt exports from the RoHS hazardous substance bans. Exempting exports utterly destroys the effectiveness of hazardous waste regulation and does nothing to alleviate the environmental injustices the Chinese people daily face. China should should take a hard stance and explicitly ban the six hazardous wastes prohibited by the EU's RoHS.

Lastly, the Chinese government needs to quickly create a WEEE-like toxics catalogue establishing what products are to be regulated pursuant to China's new WEEE-type directive. Until this catalog is created, the new WEEE regulations will not go into effect and there needs to be some sort of pressure put on the government from preventing them from dragging their feet.

VI. CONCLUSION

The booming electronics industry will only produce more E-waste, disposal needs, and pose greater risks to the human health and the environment. More effective world-wide solutions must be enacted to prevent this toxics perpetuation. The United States needs to establish national legislation that effectively curbs overconsumption and stop making China and other third world countries their trash dump. By forcing producers and consumers to pay a



percentage of the true environmental and health costs of these products, and by signing the Basel Convention there may be a glimmer of hope on the horizon.

In order for China to benefit from E-waste recycling it must begin strictly regulating all aspects of its E-waste industry. China must enforce the banning of harmful imports and must make progress in solidifying and its own RoHS and WEEE-type directives. More laws are needed to actually regulate the disposal of E-waste and a single high-level ministry position (similar to U.S. E.P.A.) should be charged with enacting/enforcing all E-waste regulations. Until both the U.S. and China understand the consequences of irresponsibly managing E-waste, both populations will potentially forever be exposed to devastating human/environmental health effects of improper disposal of the toxic byproducts of the burgeoning electronics industry.

DISCLAIMER

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.