A Case against E-Waste: Where One Country's Trash is (Not) Another Country's Treasure:

Developing National E-Waste Legislation to
Regulate E-Waste Exportation

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Abstract

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Over the past decade, the proliferation of electronic devices in the waste stream has caused an increase in exportation of used electronics to third world countries. As a result of this exportation, several health and environmental issues have manifested. A large percentage of these wastes are shipped to third world countries where the devices are improperly disposed of either through burning or open disposal. The result of such improper disposal is the release of toxic constituents in to the environment. This paper delves in to detail about the toxicity of electronic components, and examines the health and environmental effects of improper disposal of e-waste in third world countries. After discussing the negative implications that improper disposal of e-waste, the paper will examine the current state and local laws that the United States has regarding e-waste disposal, and will discuss the inherent inadequacies. Included in this discussion is an analysis of the success of various state programs and how a proper disposal or recycling scheme should look. The paper then will examine the current national legislation on hazardous wastes, the Resource Conservation and Recovery Act (RCRA). Then, this paper examines other nations, and their e-waste legislation including the European WEEE and RoHS schemes, and other countries. Finally, this paper lays out a framework for how national legislation within the United States should look, either by amending RCRA or creating entirely new legislation.

"For the first time in the history of the world, every human being is now subjected to contact with dangerous chemicals, from the moment of conception until death."

-Rachel Carson (1907-1964), Silent Spring, 1962

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I. INTRODUCTION:

Imagine children running among mountains of broken electronics and inhaling the toxic fumes pluming into the air from the burning of these devices. Workers at "recycling" facilities prying apart cellular phones like fishermen pry open oysters to reveal precious commodities. However, instead of revealing a perfect spherical pearl, their hands eagerly grasp at a different kind of treasure, the valuable materials such as copper and printed circuit boards encased within the device.[1] These circuit boards will be melted and the computer chips contained inside reused and regenerated in other electronic devices.[2] So goes the day of a worker for an electronics recycling facility in Guiyu, China.[3]

In 2006 Time Magazine published a report featuring haunting images depicting towers of used electronic devices in Guiyu, evoking worldwide concern over the toxins that are released into the environment by the destruction of these devices.[4] Environmental organizations such as Greenpeace[5] and the Electronics Take Back Coalition[6], to name a few, have information on their internet websites geared at educating the public on the dangers of electronic waste. The situation in Guiyu is hardly unique, as several other

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[1] CBS.com, *Following The Trail of Toxic E-Waste*, http://www.cbsnews.com/stories/2008/11/06/60minutes/main4579229_page3.shtml?tag=contentMain;contentBody.
[2] *Id.*
[3] *Id.*
[4] Time.com China's Electronic Waste Village, http://www.time.com/time/photogallery/0,29307,1870162_1822148,00.html.
[5] *See* generally, http://www.greenpeace.org/international/en/campaigns/toxics/electronics/the-e-waste-problem/ .
[6] *See* generally, http://www.electronicstakeback.com/home/.

electronic waste or e-waste "graveyards" have cropped up worldwide in India, South America, and Africa.[7]

E-waste itself is comprised of broken or obsolete computers, monitors, televisions, cellular phones and other electronic devices. While these wastes may seem perfectly harmless, they are a mounting threat. The scale of the e-waste problem is immense and is only getting worse. A precise figure of the amount of waste varies from source to source, however most sources estimate that 20-50 million metric tons of e-waste was generated in 2010.[8] Of that waste, the United States generated 3.1 million tons, an increase from 2005 where1.9 to 2.2 million tons were generated.[9]

Unlike other industrialized countries, the United States lacks uniform federal legislation that regulates the proper disposal of e-waste or holds the producers accountable for proper disposal. While some states have enacted legislation[10] regarding the proper disposal and treatment of electronic devices, the vast majority of these devices are still shipped to third world countries where they are broken apart and the valuable components are removed.[11] Often, the workers who dismantle these devices are doing so without gloves and other protective equipment, directly handling hazardous constituents of the electronics such as lead and mercury.[12] The discarded parts of the used electronic

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[7] *See* Greenpeace.com, *Where Does E-Waste End Up*?, Feb. 24, 2009, http://www.greenpeace.org/international/en/campaigns/toxics/electronics/the-e-waste-problem/where-does-e-waste-end-up/.
[8] Electronics Take Back Coalition, *Facts and Figures on E-Waste and Recycling*, http://www.electronicstakeback.com/wp-content/uploads/Facts_and_Figures.
[9] *Id.*
[10] *See* Electronics Take Back Coalition, *State Legislation*, http://www.electronicstakeback.com/promote-good-laws/state-legislation/.
[11] *See* The e-Waste Crisis, e-Stewards, http://www.e-stewards.org/ewaste_ crisis.html (Stating that an estimated 70-80% of e-waste is exported to developing countries.).
[12] *Id.*

devices are then left in piles allowing remaining toxic materials to leach into the ground.[13] Federal law mistakenly treats most e-waste as innocuous when, in fact, e-waste is quite dangerous. Toxins in hazardous quantities, such as lead, mercury and cadmium are embedded within electronic devices.[14] When these devices are disposed of improperly these dangerous elements can leach into the soil and pollute the groundwater.[15] Countries in the European Union, several Asian countries, and several states in the United States have adopted legislation to hold producers responsible for the proper disposal of electronic devices to prevent contamination of precious natural resources.[16] Some legislation in Europe has even banned the use of these hazardous substances from the manufacturing process.[17] Given the severity of the problem, something must be done to prevent future contamination of third world countries and our own precious natural resources.

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[13] *Id.*
[14] Greenpeace.com, *The E-Waste Problem*, May 23, 2005, http://www.greenpeace.org/international/campaigns/toxics/electronics/the-e-waste-problem/.
[15] *Id.*
[16] *See* Greenpeace.com, *Where Does E-Waste End Up*?, Feb. 24, 2009, http://www.greenpeace.org/international/en/campaigns/toxics/electronics/the-e-waste-problem/where-does-e-waste-end-up/.
[17] *See* European Parliament and Council Directive 2002/95/EC, 2003 OJ (L 37) 19 (hereinafter RoHS Directive).

II. THESIS SUMMARIZED:

This paper proposes to include e-waste within the environmental regulatory scheme. E-waste can be regulated either by amending current laws or establishing a new set of regulations. The Resource Conservation and Recovery Act (RCRA)[18] currently regulates the proper treatment, disposal, and transportation of hazardous wastes generated by industrial sources.[19] However, electronic waste currently does not fall within RCRA's purview. Instead, e-waste is exempt under the household waste exemption.[20] By amending RCRA to include used electronic devices within the purview of Subtitle C waste, the producers and generators of the electronic devices would be held liable for the proper disposal of these devices. Alternatively, a bill could be proposed by members of Congress, similar to what has been proposed in years past, following in the steps of the European Union to ensure that the producers of electronic devices manufacture devices that are less deadly.[21] Both solutions will be discussed in greater detail below.

In determining what the best solution to address the burgeoning problem of e-waste, this paper examines laws that states have implemented regarding proper disposal of electronic devices and determine the effectiveness of this legislation and whether such legislation can be implemented on a national scale. Then this paper will discuss what other countries do with the used electronic devices, including a discussion on the effectiveness of their programs. This paper will also examine the issue of electronic waste in the context of the Basel Convention and the OECD two international principles

[18] 42 U.S.C. s/s 321 et seq. (P.L. 94-580).
[19] *Id.*
[20] *Id.*
[21] *See* RoHS Directive generally

that discuss the disposal of electronic waste.[22] Finally, the paper will enumerate a national e-waste scheme and discuss what should be included to make the legislation effective and will also discuss pitfalls that will need to be addressed before a national e-waste law is implemented.

III. E-WASTE: THE BASICS:

a. What is e-waste?

Electronic waste encompasses a wide variety of electronic devices that are either discarded, broken, obsolete, surplus or a combination of any of these.[23] The waste is disposed of typically either by being placed in landfills or incinerated.[24] Current information listed by the EPA estimates that electronic waste constitutes approximately one to two percent of the municipal solid waste stream.[25] This figure translates to 220 tons of electronic waste going to an incinerator or landfill for disposal.[26] The EPA estimated that 2.37 million tons of electronic waste was ready for end of life waste management, and of that figure, approximately 25% of that waste was collected for

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[22] Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, art. 4(2), Mar. 22, 1989, 1673 U.N.T.S. 126 [hereinafter Basel Convention].
[23] CAGov.com, Cal Recycle, http://www.calrecycle.ca.gov/electronics/WhatisEWaste/.
[24] E-waste not, e-want not, Educators Guide, http://dnr.wi.gov/org/caer/ce/eek/teacher/pdf/recycle/4-8/E-waste1.pdf.
[25] *Electronics Waste Management in the United States Through 2009*, United States Environmental Protection Agency, Office of Conservation and Recovery. EPA 530-S-11-001, May 2011, *available at* http://www.epa.gov/osw/conserve/materials/ecycling/docs/summarybaselinereport2011.pdf.
[26] *Id.*

recycling purposes.[27] E-waste is the largest growing municipal waste issue with an astonishing twenty to fifty million tons generated per year.[28] That number only increases and escalates with every passing year.[29]

b. Why it is so toxic:

i. Health Effects:

The escalating e-waste problem has proven to cause health problems with those exposed to the toxins contained within the devices.[30] When these devices are disposed of in either a landfill or incinerator they can cause detrimental health effects to humans, which are enumerated below.[31] On May 31, 2011 a study published in Environmental Research Letters determined that computers, televisions, printers and cellular telephones that have been thrown out have harmful effects to human lung epithelial cells.[32] The study looked at the air quality in a Chinese e-waste recycling park, where workers were "recycling" the electronics through dismantling.[33] Air samples were taken from Guiyu province in China demonstrating the detrimental effects of hazardous substances

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[27] *Id.*
[28] Electronics Take Back Coalition, *Facts and Figures on E-Waste and Recycling*, http://www.electronicstakeback.com/wp-content/uploads/Facts_and_Figures..
[29] *Id.*
[30] *Id.*
[31] *E-waste not, e-want not, Educators Guide*, World Resources Institute, http://dnr.wi.gov/org/caer/ce/eek/teacher/pdf/recycle/4-8/E-waste1.pdf .
[32] Environmental Research Web, *E-waste recycling in China is Dangerous to Health*, May 31, 2011, http://environmentalresearchweb.org/cws/article/news/46112 .
[33] *Id.*

contained in electronic waste on lung cells.[34] The results showed that the samples of pollutants caused increased inflammatory responses and oxidative stress.[35] Co-author of the study Dr. Fangxing Yang, of Zhejiang University, said, "Both inflammatory response and oxidative stress may lead to DNA damage, which could induce oncogenesis,[36] or even cancer."[37] Inflammatory response and oxidative stress are associated with cardiovascular diseases as well.[38] Simply stated, breathing the air in this area can cause cancer and other detrimental effects.

The polluted air in China is just the tip of the health risk iceberg. Exposure to a number of the hazardous substances contained in electronic products can cause serious health problems such as of various types of cancer, endocrine disorders and neurological disorders.[39] Among the harmful and hazardous substances are heavy metals such as lead, cadmium, and mercury.[40] The Center for Disease Control has listed designated these metals high priority hazardous substances.[41]

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[34] *Id.*
[35] *Id.*
[36] The Free Dictionary, http://medical-dictionary.thefreedictionary.com/oncogenesis (Literally meaning "creating tumors or cancer.").
[37] "E-waste recycling in China" http://environmentalresearchweb.org/cws/article/news/46112.
[38] *Id.*
[39] Greenpeace.com, *The E-Waste Problem*, May 23, 2005, http://www.greenpeace.org/international/campaigns/toxics/electronics/the-e-waste-problem/.
[40] *Id.*
[41] Alabama Cooperative Extension System, *Elements of Surprise: Don't Get Caught Off Guard by E-Waste Contaminants,* Alabama A&M and Auburn Universities, *available at* http://www.aces.edu/pubs/docs/U/UNP-0101/UNP-0101.pdf

Lead is found in the glass components of computers and cellar phones such as the screens or displays.[42] The lead is released into the environment when these parts are burned and particles are released into the air.[43] Lead is particularly noxious because it causes interference with red blood cells leading to health impairments.[44] Lead attaches to the red blood cells and prevents the cells from carrying oxygen.[45] Without oxygen, the cells become damaged and are unable to produce new red blood cells.[46] Lead also damages the kidneys, as 65% of lead in blood gets filtered through the kidneys.[47] Lead will cause damage and even kidney failure if there is prolonged exposure.[48] The greatest amount of damage occurs to the nervous system.[49] Lead can damage the brain and destroy brain cells, resulting in learning disabilities, depression, loss of memory and hallucinations.[50]

Cadmium is found in computer batteries, circuit boards and other electronics.[51] Exposure to cadmium occurs through inhalation of air that has been contaminated from

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[42] Greenpeace, *Electronic Waste in China and India*, Greenpeace Report, August 2005, *available at* http://www.greenpeace.org/international/Global/international/planet-2/report/2005/10/recycling-of-electronic-waste.pdf

[43] Binns, Shannon et. al., *S 510: Electronic Waste Recycling Promotion and Consumer Protection Act*, The Workshop in Applied Earth Systems Management, *available at* http://www.columbia.edu/cu/mpaenvironment/pages/projects/summer06/ewastefinalReport.pdf at pg. 7

[44] *Id.*

[45] Health Effects of Lead PowerPoint Presentation available at www.epa.gov/**lead**/training/wkrch2_eng.ppt.

[46] *Id.* at Slide 4

[47] *Id.* at Slide 5

[48] *Id.*

[49] *Id*. at Slide 6

[50] *Id.*

[51] Binns, *S 510: Electronic Waste Recycling* at pg. 7.

industrial process emissions.[52] Cadmium is dangerous because it has been linked to increased occurrence of cancer and developmental problems.[53] When cadmium is burned it releases fumes that are toxic even at low concentrations.[54] Continuous exposure to the fumes can lead to differing types of cancer, stomach disorders, and damage to the immune system.[55] Inhaling cadmium particles from incineration quickly leads to respiratory tract or kidney problems. The kidney damage caused from cadmium poisoning is irreversible, causing muscle weakness and in some instances, coma.[56] Bones become soft when a person is exposed to cadmium, leading to increased incidents of bone fracture.[57] The workers at dismantling facilities who breathe air with high levels of cadmium are more susceptible to lung damage.[58]

Mercury, like lead, is found in the metal components of the electronics.[59] Mercury is a natural metallic element that can be toxic if improperly handled.[60] Mercury poisoning can occur either through direct exposure to mercury or through exposure to a mercury compound, which combination of mercury with other elements to create compounds.[61] These compounds may either be organic, meaning that they contain carbon, or inorganic meaning that they do not contain carbon.[62] Inorganic compounds resulting from the

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[52] *Health Effects of Cadmium available at* http://www.idph.state.il.us/envhealth/factsheets/cadmium.htm .
[53] *Id.*
[54] *Id.*
[55] *Cadmium, available at* http://en.wikipedia.org/wiki/Cadmium .
[56] *Id.*
[57] *Id.*
[58] Binns, *S 510: Electronic Waste Recycling* at 8.
[59] *Id.* at 9
[60] *Id.*
[61] *Mercury,* http://en.wikipedia.org/wiki/Mercury_poisoning#Elemental_mercury
[62] *Id.*

combination of mercury with another element pose serious health complications.[63] The effects of mercury exposure include nausea, coughing, chest pain, and disturbances to the nervous system, such as tremors and impaired thinking or reasoning.[64]

In addition to the heavy metals encased within these devices, the plastics enrobing these devices are highly dangerous. Polybrominated biphenyls are groups of chemicals used commercially in electronic devices as flame-retardants.[65] They are added to electronic devices to ensure that they do not burn during prolonged use.[66] Exposure to PBBs can occur from inhalation during the burning of e-waste. PBBs are released as vapor when the plastics in which the PBBs are encased begin to soften when heated at or above 72 degrees Celsius.[67] PBBs have been linked to immunotoxicity and disorders of the central nervous systems.[68] Additionally, some studies conducted in Michigan where dairy farmers were exposed to PBBs, demonstrated that they have dangerous effects such as nausea, abdominal pain, appetite loss, joint pain, and lethargy.[69] PBBs have been linked to various disorders in the nervous and immune systems as well as detrimental effects on the liver, kidneys and thyroid gland.[70] Moreover, PBBs are possibly carcinogenic.[71]

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[63] *Id.*
[64] *Id.*
[65] *Polybrominated Biphenyls (PBBs),* Agency For Toxic Substances and Disease Registry, *available at* http://www.atsdr.cdc.gov/tfacts68.pdf
[66] *Id.*
[67] *Id.*
[68] *Id.*
[69] Reich M R (1983). *Environmental politics and science: the case of PBB contamination in Michigan*. *Am. J. Public Health* **73** (3): 302–313.
[70] *Id.*
[71] *Polybrominated Biphenyls (PBBs),* Agency For Toxic Substances and Disease Registry, *available at* http://www.atsdr.cdc.gov/tfacts68.pdf

Polybrominated diphenyl ethers (PBDEs) are also used as flame-retardants in e-waste.[72] Humans are exposed to PBDEs in low levels when they eat food contaminated by PBDEs or inhale particles.[73] PBDE's then bio-accumulate in blood, breast milk, and fat tissues.[74] Children in the United States have high levels of PBDE's in their blood streams, due in large part to the contaminated breast milk. These high PBDE levels can later result in thyroid disorders, as well as mental disorders including hyperactivity and decreased mental development.[75] The EU has banned both PBB's and PBDE's in their Restriction of Hazardous Substance (RoHS) directive from being used in electronics.[76] The state of California has prohibited the use of PBDE's in manufacturing since 2006.[77]

ii. Environmental Impacts:

The effects of improper disposal of electronic waste are not only serious to human health, but can have serious consequences for the environment as well. As previously mentioned, Guiyu is a town that is synonymous with electronic recycling. Examinations of the impacts of e-waste recycling on Guiyu have been conducted by scientists, which

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[72] *Polybrominated diphenylethers (PBDEs) available at* http://www.epa.gov/opptintr/pbde/.
[73] Bocio A, et al., *Polybrominated Diphenyl Ehters (PBDEs) in Foodstuffs: Human Exposure Through the Diet*. J.Aric. Food Chem 2003 *available at* http://www.saveva.com/domamAcsa/pub/acsa/html/ca/dir1538/dn1538/pbdes.pdf)
[74] *Id.*
[75] Szabo DT, et al., *Effects of perinatal PBDE exposure on hepatic phase I, phase II, phase III, and deiodinase 1 gene expression involved in thyroid hormone metabolism in male rat pups*. Toxicol. Sci. 107 (1): 27–39.
[76] *See* RoHS Directive
[77] New Rules Project, *Ban on Flame Retardants, available at* http://www.newrules.org/environment/rules/chemical-regulations/ban-flame-retardants-pbdes-ca

demonstrate just how toxic improper disposal of e-waste is to the environment.[78] The water and aquatic systems become contaminated from toxins leaching from dumpsites where the processed or unprocessed e-waste has been deposited.[79] A study conducted of a river near Guiyu demonstrated contamination of the aquatic ecosystems, including increased bioaccumulations of PBBs and PBDEs in the wildlife dependent on the river, such as carp and water snakes.[80] Additionally, lead in the river water was found in increased concentrations.[81] Some of those concentrations exceeded eight times the local drinking water standards.[82]

The soil and air are also heavily contaminated. The air is contaminated largely due to the fact that e-waste toxins are most commonly spread in the air via dust.[83] The dust collected near Guiyu had elevated concentrations of lead and chromium. Soil contamination is also highly prevalent in this area.[84] Chinese agricultural soils near e-waste processing facilities demonstrated elevated concentrations of PBDEs and PCBs.[85] Similarly, in Bangalore, which is another large e-waste processing site, elevated concentrations of lead, cadmium and tin which were a hundred times higher than other locations in the city.[86]

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[78] Robinson, Brett. *E-Waste: An Assessment of Global Production and Environmental Impacts*, Science of Total Enviroment 408 (2009) 183-191, 188. available at http://kiwiscience.com/JournalArticles/STOTEN2009.pdf
[79] *Id.*
[80] *Id.*
[81] *Id.*
[82] *Id.*
[83] *Id.*
[84] *Id.*
[85] *Id.*
[86] *Id.*

c. Treatment and Disposal of E-waste:

Given the highly toxic nature of these substances, the next logical question would be how are these toxins released? Recently it has become slightly more difficult to dispose of e-waste in landfills with the growing number of e-waste laws being enacted by states throughout the country.[87] However, illegal dumping within those states can still occur, and because roughly half the states in the United States are without any e-waste regulation, disposal in landfills is still a major concern. When e-waste is disposed of in landfills the toxins within the waste can leach into the groundwater or nearby water supplies.[88] Solid waste disposal occurs by sending municipal solid waste, which is not hazardous, to a landfill.[89] The landfills that accept municipal solid waste may accept all non-hazardous waste, household waste, industrial solid waste, and demolition debris.[90] The landfills that accept these wastes must meet certain criteria including location restrictions to preserve environmentally protected areas such as wetlands, and having liners to prevent groundwater contamination.[91] Alternatively, hazardous waste has more stringent disposal requirements and is heavily regulated under RCRA, which is discussed in greater detail below. Both types of landfills are designed to have lining to prevent leaking of toxins and other contaminants into groundwater.[92] However, when there is leakage in the lining these contaminants can nevertheless leach. The toxins that that are most likely to leach are lead and mercury.[93]

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[87] See http://www.electronicstakeback.com/promote-good-laws/state-legislation/
[88] Binns, *S 510: Electronic Waste Recycling* at pg. 7.
[89] http://www.epa.gov/osw/nonhaz/municipal/landfill.htm
[90] *Id.*
[91] *Id.*
[92] Binns, *S 510: Electronic Waste Recycling* at pg. 7.
[93] *Id.*

Problems arise in improper dismantling of these electronics.[94] Many of the devices have cathode ray tubes (CRT), which are glass tubes that transmit electrons used to create images on computer or televisions screens.[95] CRT's amplify and focus high-energy electron beams to create the images that appear on screen.[96] These tubes can be dangerous if improperly handled because of the highly toxic hey contain lead and cadmium. The tubes are made up of at least twenty percent lead that protects consumers from the affects of radiation that emanates from the electron beams.[97] Often times, CRT's are crushed in landfills if disposed of improperly, thereby releasing lead directly into the surrounding air and groundwater.[98] The release of these items can result in the serious health problems discussed above. The preferred method of disposing of e-waste is recycling, provided that it is done properly and not a sham to cheaply remove the valuable items within the electronics.[99] However, much of e-waste recycling requires disassembly and destruction of equipment to recover new materials.

i. Domestic Disposal

Domestically, there is a presumption of proper disposal of e-waste through following specified protocols in a recycling facility. An example of proper protocol is found in Sacramento, California's HMR Central Processing Facility, which is one facility

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[94] *Id.*
[95] *Id.*
[96] *Id.*
[97] *Id.*
[98] *Id.*
[99] Kutz, Jennifer, *You've Got Waste: The Exponentially Escalating Problem of Hazardous E-Waste*, 7 Vill, Envtl. L.J. 307, (2006).

that processes the electronic waste for the Bay Area.[100] The process begins on a disassembly line. Workers separate the casing that surrounds the CRT,[101] and sell them for other uses while the CRT's are crushed in a self-contained shipping unit.[102] The shipping unit is outfitted with an air filtration unit and dust filtration system, protecting the surrounding air.[103] Glass particles containing lead are separated from other heavy metals, and the lead laced particles are then shipped to a smelter in Missouri.[104] The smelter will repurpose these particles to be placed in other products such as new CRT's, bullets or batteries.[105] The printed circuit boards of these devices are melted down, and the noxious fumes captured while the metals are sold.[106] Proper disposal of electronics is a painstaking process.

ii. Foreign Exportation:

A large percentage of e-waste is sent to foreign countries, where there may be no regulations requiring proper disposal and dismantling of it.[107] There, the dismantling process may differ significantly.[108] In Guiyu, for example, recycling operations involve burning the plastic coverings of the materials to obtain the metal for scrap.[109] The printed

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[100] http://www.recycleworks.org/ewaste/ewaste_process.html (last visited June 27, 2011).
[101] *Id.*
[102] *Id.*
[103] *Id.*
[104] *Id.*
[105] *Id.*
[106] *Id.*
[107] Luther, Linda, *Managing Electronic Waste: Issues with Exporting E-Waste, Congressional Research Service*, Sep. 27, 2010, p. 15, *available at* http://www.fas.org/sgp/crs/misc/R40850.pdf
[108] *Id.*
[109] *Id.*

circuit boards are then openly burned to remove the soldering.[110] Alternatively, metal recovery occurs when the circuit boards are placed in acid baths to strip them for gold or other metals.[111] The liquid from the acid baths is then dumped onto surface water contaminating nearby water supplies.[112] The primary hazard associated with recycling comes from the chipping, melting and dumping of plastics and other materials that cannot be further processed.[113] Any residues from the aforementioned recycling operations can leach into the groundwater.[114]

Halfway across the world in Africa, similar disposal methods are utilized.[115] Several African nations including Nigeria, Cote d'Ivoire, Benin and Libya are the unlucky recipients of e-waste.[116] However the most recognizable e-waste graveyard is in Ghana.[117] In Agbogbloshie, Ghana shipping containers filled with broken computers, televisions, monitors and other electronic devices are sent from developed nations throughout the world under the guise of "reuse."[118] These devices are sent to scrap yards to be crushed and burned.[119] In a presentation created by John A. Pwamang of the EPA about the e-waste situation in Africa, several photographs depicted the process by which

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[110] *Id.*
[111] *Id.*
[112] Orisakwe, Orish, *Electronic revolution and electronic wasteland: The West/waste Africa Experience*, Journal of Natural and Environmental Sciences, *available at* http://www.asciencejournal.net/asj/index.php/NES/article/view/27/ORISAKWE
[113] *Id*. at 2
[114] *Id.* at 4
[115] *Id.*
[116] *Id.*
[117] *Id.*
[118] *Id.*
[119] *Id.*

e-waste is disposed of.[120] Young men, barely out of childhood, start the disposal process by gathering electronics in heaps.[121] They separate out the precious metals from the plastic casings and wires.[122] Wires are then tangled into large balls and they are ignited into a smoldering ball of smoke and flames.[123] The copper wiring that does not burn off with the plastic enrobing the wire is then recovered.[124] At that juncture, the monitors and other plastic casings that are useless are dumped dangerously close to the banks of the Korle Lagoon in Accra[125] where they pose a threat to the water supplies for the town and region as a whole.[126]

d. How does this waste get shipped?

E-waste gets to undesirable destinations largely through illicit means. The shipment of e-waste falls under the regulation of the Basel Convention, which is an international treaty designed to control the transportation of hazardous waste.[4] Companies use a loophole in the treaty that allows for the shipment of secondhand donations as a way to also ship unusable items that will end up in landfills or scrap yards, accounting for 75% of what is shipped.[3] The Basel Action Network (BAN) conducted an

[120] Pwamang, John, *The E-Waste Situation in Ghana* Presentation at the INECE/US EPA Workshop on E-Waste in West Africa, *available at* http://inece.org/ewaste/03_pwamang.pdf
[121] *Id.* at 9
[122] *Id.*
[123] *Id.* at 10
[124] *Id.*
[125] *Id.*
[126] *Id.*

investigation into this type of "legal" shipment in 2005.[127] The investigative findings were published in a paper published by BAN entitled "The Digital Dump: Exporting Reuse and Abuse to Africa."[128] The investigation exposed the dark side of what initially seemed to be a "win-win" situation for industrialized countries and developing nations.[129] The "win-win" being that the industrialized nations would be able to ship their waste to another country and mitigate environmental harm while the developing nations obtained access to "newer" electronics.[130] In reality, much of the equipment was broken completely beyond repair, and the only people benefitting from the importation of these obsolete devices are the Nigerian computer dealers' business association, who are brokers of e-waste.[131] BAN advocated that proper trade controls should be implemented to ensure that containers are inspected and that their contents therein are tested to ensure that they can indeed be refurbished.[132]BAN determined that Nigeria has the capability to refurbish these devices appropriately, if they could obtain devices that are functioning.[133] Additionally, BAN advocated that all countries, specifically the United States who has yet to become a signatory, should comply with the Basel Convention.[134] Finally, BAN advocated that toxics within these electronic devices should be removed in their entirety.[135]

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[127] Puckett, Jim et al., *The Digital Dump: Exporting Reuse and Abuse to Africa*, The Basel Action Network. October 2005, *available at* http://www.ban.org/library/TheDigitalDump.pdf
[128] *Id.*
[129] *Id.* at 4.
[130] *Id.* at 5.
[131] *Id.* at 8.
[132] *Id.* at 40.
[133] *Id.*
[134] *Id.* at 42.
[135] *Id.*

Domestically, existing EPA regulations focus only on the improper shipment of CRTs, meaning that a large portion of electronics can be shipped without restriction or regulation.[136] Even those restrictions on CRT shipments are easy to evade. In a report issued by the Government Accountability Office in 2008, some companies are willing to openly break the law by directly shipping the CRTs or use alternative means, such as mixing CRTs with non-regulated electronic components.[137] Furthermore, the EPA has thus far been, relatively lax in its enforcement of the CRT rules.[138] The CRT rule was passed in 2006, requiring that exporters of CRTs provide notice to the EPA, who then seeks consent of the importing country.[139] When the EPA receives the consent of the importing country, a written acknowledgement is sent to the exporter, who must include this acknowledgement with the subsequent shipment.[140] It is at this time that the exporter is then given the green light to ship CRTs.

The CRT restrictions are wholly inadequate, as the real crux of the e-waste problem is not addressed. Toxins that are truly hazardous go unchecked.[141] Shipments of these electronics have gone unabated to developing nations for years.[142] China, India, and Africa are the largest examples of the crisis, but other Asian nations such as Vietnam,

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[136] U.S. Gov't Accountability Office, GAO-08-1044, *Electronic Waste: EPA Needs to Better Control Harmful U.S. Exports through Stronger Enforcement and More Comprehensive Regulation* 18 (2008) [hereinafter GAO Report], *available at* http://www.gao.gov/new.items/d081044.pdf.
[137] *Id.*
[138] Burns, Clif, *GAO says EPA CRT Rule is MIA, available at* http://www.exportlawblog.com/archives/395 (last visited June 25, 2011).
[139] GAO Report at 26.
[140] *Id.*
[141] Cheng, Andrew, *Electronic Waste Sent to China Despite Ban*, RecycledPlastic.com, May 5, 2010, *available at* http://www.recycledplastic.com/resource/plastic-recycling/electronic-waste-china-ban/ (last visited June 24, 2011).
[142] *Id.*

Cambodia and Laos have picked up collections that have been banned by China.[143] Despite the Chinese ban[144] on importation of e-waste, it can still be covertly shipped there.[145] Interpol has determined that some fishermen have been supplementing their meager incomes by "ferrying" cargoes of e-waste from port cities such as Hong Kong to mainland China.[146] These entrepreneurial fishermen are merely an example of how the waste gets from the homes of North American citizens to the hands of unprotected workers.

IV. CURRENT REGULATIONS THAT HAVE BEEN IMPLEMENTED OR SUGGESTED:

a. Current Federal Law: RCRA

The Environmental Protection Agency (EPA) is the United States government agency charged with safeguarding the domestic environment.[147] In 2010, Lisa Jackson the Administrator of the EPA stated that one of her six top international priorities was the prevention of improper disposal and management of e-waste.[148] Administrator Jackson stated that the improper disposal of electronic waste in poorer countries was an "urgent

[143] "Electronic Waste and Organized Crime: Assessing the Links" Phase II Report for the Interpol Pollution Crime Working Group, *available at* http://www.interpol.int/public/icpo/factsheets/wastereport.pdf
[144] *Id.* at 29
[145] *Id.*
[146] *Id.* at 31
[147] ww.EPA.gov, *Our Mission and What We D*o, http://www.epa.gov/aboutepa/whatwedo.html.
[148] http://blog.epa.gov/administrator/2010/01/12/seven-priorities-for-epas-future/.

concern."[149] She also articulated that the EPA's near term goals included working on ways to improve design standards, manufacturing, reuse, recycling and exploration of electronic devices.[150] To further emphasize how serious the EPA seemed to be taking the environmentally sound management of e-waste, Administrator Jackson issued a report with the United States Government Accountability Office titled *Electronic Waste: Considerations for Promoting Environmentally Sound Reuse and Recycling*.[151] In that report, Administrator Jackson recognized the shortcomings of the current regulatory status and emphasized environmentally sound management of e-waste.[152] To help identify ways of improving recycling practices the EPA in May 2011 issued a grant to the United Nations for a five year pilot program to track and monitor e-waste shipments.[153]

While Administrator Jackson has made great strides in addressing e-waste, prior to her appointment the EPA had a checkered past with e-waste regulation.[154] The EPA had taken the approach of being more of a resource for consumers on learning how they

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[149] *Id.*
[150] *Id.*
[151] U.S. Government Accountability Office, *Electronic Waste: Considerations for Promoting Environmentally Sound Reuse and Recycling*, Report to the Chairmen, Committee on Science and Technology, House of Representatives, *available a*t http://www.gao.gov/new.items/d10626.pdf
[152] *Id.* at 2.
[153] Kutzer-Rice, Rebecca, *Project Aims to Track and Regulate International E-Waste, Smart Technology*, May 18, 2011, http://www.smartertechnology.com/c/a/Global-Challenges/Project-Aims-to-Track-and-Regulate-International-EWaste-/ (The joint task force will track shipments from North America to African and Asian nations for "recycling." Aside from tracking the shipments themselves, the project will identify the routes commonly used by the exporters of waste.)
[154] Heimbuch, Jaymi, *EPA Provides New E-Waste Guidelines But No New Regulations*, Treehugger, http://www.treehugger.com/files/2008/11/epa-gives-new-ewaste-guidlines-but-no-new-regulations.php

can appropriately reuse and recycle their electronics.[155] The EPA provided a database supplying links and information to state regulations regarding e-waste.[156] In 2007, the EPA issued a document discussing the EPA regulatory program for e-waste.[157] The document emphasized a hierarchy that focused first and foremost on reuse followed by recycling, and finally disposal.[158] The EPA even posited in this presentation that e-waste could be disposed of safely in non-hazardous waste landfills.[159] The document further delineated that "most e-waste is either non-hazardous waste or non-waste."[160] Finally, the document proffered a rather convoluted rational for excluding e-waste from Resource Conservation and Recovery Act (RCRA), [161]stating that the majority of the items are "non-hazardous."[162] This document, which is still prominently listed on the EPA's website, demonstrates that the EPA's response to this problem was, and in some respects still is, inadequate. While the EPA has started to step up its efforts recently, relying solely on the EPA to implement or promote regulations that legitimately address the problem of e-waste will surely lead to disappointment.

Currently, hazardous waste management is regulated under RCRA, which is a "comprehensive environmental statute that empowers the EPA to regulate hazardous wastes from cradle to grave in accordance with rigorous safeguards and waste

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[155] See generally *E-Cycling*, Environmental Protection Agency http://www.epa.gov/osw/conserve/materials/ecycling/
[156] *Id.*
[157] Tonetti, Robert, *EPA's Regulatory Program for E-Waste*, EPA Office of Solid Waste, *available at* http://www.epa.gov/osw/conserve/materials/ecycling/docs/e-wasteregs.pdf
[158] *Id.*
[159] *Id.*
[160] *Id.*
[161] 42 U.S.C. §6901 et seq.
[162] *Id.*

management procedures."[163] Additionally, the statute requires the EPA to regulate the identification, disposal, and treatment of hazardous waste.[164] Before a waste is characterized as hazardous, it must first be determined to be solid waste.[165] Solid waste has been defined by RCRA as any "garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and *other discarded material."*[166] Subtitle C of RCRA addresses the transportation, treatment, storage and disposal of hazardous waste. Hazardous waste is defined as:

> [a] solid waste or combination of solid wastes, which because of its … physical, chemical, or infectious characteristics may a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating illness or b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.[167]

The EPA may determine a waste is hazardous in one of two ways: by determining that a specific waste stream is hazardous through a rulemaking process or by determining that a waste exhibits at least one of four "characteristics that make a waste hazardous.[168] A waste stream must be listed as hazardous when is the EPA determines that the solid wastes (1) exhibits any of the characteristics of hazardous waste identified in subtitle C, (2) has been found to be fatal to humans in low doses, or (3) contains any of the toxic constituents listed in the statute's appendix. [169] A waste is a "characteristic" waste if it exhibits one of the following (1) ignitability; (2) corrosivity; (3) reactivity; or (4)

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[163] *City of Chicago v. E.D.F.*, 511 U.S. at 331.
[164] *Id.*
[165] *Id.*
[166] *Am. Mining Cong. v. EPA*, 824 F.2d 1177, 1179 (D.C. Cir. 1987) (citing 42 U.S.C § 6903(27)) (emphasis added).
[167] 42 U.S.C. §6903(5).
[168] *Chem. Waste Mgmt., Inc. v. EPA*, 976, F.2d. 2, 7-8 (D.C. Cir. 1992).
[169] 40 C.F.R. 261.11.

toxicity.[170] For a waste to be considered hazardous, it need only exhibit one of these four characteristics.[171] The EPA determines the toxicity characteristics of hazardous waste through the Toxicity Characteristic Leaching Procedure Test.[172] The TCLP test is intended to simulate conditions that would likely occur at a landfill, and measures the toxic constituents that "leach" into the water.[173] The leachate is analyzed to ascertain the concentrations of the contaminants.[174] If the contaminant concentrations exceed established regulatory thresholds, the waste is considered hazardous.[175] The EPA has already determined that CRT's and printed circuit boards meet the regulatory definition of hazardous waste, and have the potential of exceeding toxicity limits.[176] Indeed, cellular phones have been tested and the following results were found: the average lead concentration in the leachate was 20 mg/L with 28 of the 38 samples exceeding the TC limit for lead.[177] Pursuant to 40 C.F.R. 261.24, the regulatory threshold level permissible for lead is 5.0 and for mercury is 0.2.

However, there are arguments that e-waste would not be subject to Subtitle C as a hazardous waste because they could be deemed household wastes. Household wastes are explicitly exempt from RCRA Subtitle C regulation under the Household Waste

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[170] 40 C.F.R. 261.3(a)(2)(i).
[171] *Id.*
[172] The EPA TCLP: Toxicity Characteristic Leaching Procedure and Characteristic Wastes http://www.ehso.com/cssepa/TCLP.html.
[173] *Id.*
[174] *Id.*
[175] *Id.*
[176] Timothy G. Townsend, Dept. of Envir. Engineering Sciences, *RCRA Toxicity Characteristic Leaching Procedures for Computers CPU and Other Discarded Electronic Device*s, 61 (2004), *available at* http://www.ees.ufl.edu/homepp/townsend/Research/ElectronicLeaching/UF%20EWaste%20TC%20Report%20July%2004%20v1.pdf.
[177] *Id.*

("HHW") Exemption.[178] Household waste means, quite generally, any material (including garbage, trash and sanitary wastes in septic tanks) derived from households (including single and multiple residences, hotels and motels, bunkhouses, ranger stations, crew quarters, campgrounds, picnic grounds and day-use recreation areas).[179] This means that everything, including materials that could be deemed hazardous normally, would fall within this exemption so long as they came solely from a "household." [180] In order for a waste to meet the HHW exemption, it has to meet two criteria: the waste must be generated by individuals on the premises of a temporary or permanent residence, and it must be composed primarily of materials found in the wastes generated by consumers in their homes.[181] It can be, and should be, argued that at the time the exemption was enacted that the prolific use of electronic devices was not contemplated, thus there is no proper regulation on how to dispose of electronics. The EPA does have a way of regulating household waste pursuant to the mixture rule, 40 C.F.R. §261.3(a)(2)(ii) "when household waste is mixed with other hazardous wastes…the entire mixture will be deemed hazardous." It can be argued that the mixture rule can and should be applied to electronic wastes.[182] Additionally, included in a reasonable interpretation of hazardous waste by the Supreme Court, hazardous waste also includes mixtures and derivatives of hazardous waste.[183] It is in the manner that e-waste could be regulated, should

[178] 40 C.F.R. §261.4(b)(1).
[179] *Id.*
[180] *Id*.
[181] 49 Fed. Reg 44978: November 13, 1984.
[182] *Chicago v. EDF*, 511 U.S. at 342 (dissenting opinion of Justices Stevens and O'Connor).
[183] In *Am. Chemistry Council v. EPA*, 337 F.3d. 1060, 1063 (D.C. Cir. 2003), the Supreme Court found that RCRA's definition of hazardous waste was not limited to those wastes that are listed or characterized as hazardous waste, but can include mixtures.

b. State Imposed Regulations:

Several states have implemented electronics recycling laws to curb or eliminate the disposal of electronic waste in landfills within state boundaries.[184] To date, twenty-five states have regulations relating to the recycling of electronics.[185] Thus far, the most successful of these regulations seem to be those that have an aggressive fee requirement for the producers or consumers of these products to pay for the recycling costs. There are two methods of collecting the costs of recycling: an advance recycling fee (ARF)[186] system or extended producer responsibility (EPR).[187] In an ARF program consumers pay an advance collection deposit fee when they initially purchase the electronic device.[188] Alternatively, ERP programs assign the ultimate end of life disposal responsibility to the producer or manufacturer of these items, by requiring that they pay for the disposal of the e-waste.[189] The costs are internalized in the purchase price of the electronic item.[190]

Under *Chemical Waste Management*, the court found that a hazardous waste does no cease to be a hazardous waste simply because it changes form or is combined with other substances. 976 F.2d. at 8.

[184] *See generally* www.electronicstakeback.com

[185] *Id.*

[186] *An Advanced Recycling (ARF) System for Electronic Product Reuse & Recycling*, The Electronic Manufacturers Coalition for Responsible Recycling, *available at* http://www.csgeast.org/pdfs/Electronic_Manufacturers_Coalition.pdf (hereinafter ARF System).

[187] Sierra Club, *Producer Responsibility Recycling*, Zero Waste Campaign, *available at* http://www.sierraclub.org/committees/zerowaste/producerresponsibility/index.asp. (hereinafter "Producer Responsibility")(EPR is also known as "product stewardship," and uses financial incentives to encourage manufacturers to design environmentally-friendly products by holding producers liable for the costs of managing their products at end of life).

[188] *See generally* ARF System.

[189] *See generally* Producer Responsibility.

[190] *The Business Case for Product Stewardship*, ProductPolicy.org, 2009, *available at* http://www.productpolicy.org/ppi/BusinessCase-2009.pdf.

Examples of these programs include states mostly in the Northeast or on the West Coast. In the Northeast, states like Connecticut, Maine, New York and Vermont have implemented stringent standards. In Connecticut, for example manufacturers of electronics must register with the Connecticut Department of Environmental Protection and maintain and renew their registration every two years after initially registering.[191] Registration includes a one $5,000 fee plus renewal fees yearly.[192] Various municipalities within Connecticut's borders are required to collect electronic waste and if they fail to do so they will be subject to hefty penalties and fines.[193] In Maine, the electronic waste recycling system is slightly modified so that the municipality, the state, the manufacturers and consolidators share the cost of recycling.[194] Once proper transfer of the electronic items is secured through a consolidator, the producers receive a certificate of appropriate dismantling from the recycling facility or the facility that processes the goods.[195] Additionally, aside from covering the recycling costs of the current computers on the market sold to consumers, manufacturers must also pay a pro rata share of the cost of disposing of orphan electronic waste.[196] New York has one of the more extensive laws, with a wide variety of electronics included in collection and pick up efforts including VCR's, DVD players and other electronic devices that are not automatically included within the scheme of electronic waste.[197] Within New York's electronic waste scheme, the producer pays for the collection, transportation and recycling according to the size of

[191] CONN. PUB. ACTS 08-35 (2007).
[192] *Id.*
[193] *Id.*
[194] ME. REV. STAT ANN. TIT. 38, §1610 (2009).
[195] *Id.*
[196] *Id.*
[197] N.Y. ENVTL. CONSERV. ART. 27 § 26 (2009).

their market share.[198] New York has established a statewide goal of reducing electronic waste and the share that a producer must pay is in accordance of that market share.[199] Additionally, New York has implemented pro rated collection goals: starting with three pounds per person in 2011 and climbing progressively.[200] On the other end of the producer pays spectrum is California. California requires that consumers who purchase electronic goods pay a fee at the time of purchase.[201] That money is then set aside by the state for the recycling of the goods at the end of their life.[202]

With twenty-five states having some kind of electronic waste regulation it would appear that the problem has been curbed. Unfortunately, these laws by and large are mostly underdeveloped and lack the ability to penalize violators. Violations of these laws are still occurring, and some shipments of these wastes are still occurring in contravention to state laws. Without a stringent national law to prevent the shipments of these wastes to foreign nations, companies will flout laws. On September 15, 2011, a federal grand jury in the U.S. District Court for the District of Colorado filed a complaint charging an electronic recycling firm with unlawful exportation of cathode ray tubes to China.[203] The company presented itself as a "green" company that would recycle the e-waste directly within the borders of the United States rather ship the waste to a third party

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[198] *Id.*
[199] *Id.* at §2603.
[200] *Id.*
[201] *Id.*
[202] Electronic Waste Recycling Act of 2003 *available at* http://www.calrecycle.ca.gov/electronics/act2003/.
[203] *United States v. Environmental Recycling Company*, Case 1:11-cr-00376-WJM Document 1 Filed 09/15/11 USDC Colorado. Indictment *available at* http://op.bna.com/env.nsf/id/jsun-8lupzm/$File/Baltzindictt.pdf

overseas.[204] False representations were made to their customers that the e-waste was being completely destroyed and recycled properly.[205] Contrary to these representations, Electronic Recycling Company sold the waste to third party brokers who would ship the waste to China.[206] Another case filed in California in the Superior Court of California in San Jose made similar allegations against the Tung Tai Group.[207] *In the People of the State of California v. Tung Tai Group*, the Tung Tai Group doctored shipment records of their electronic waste so that it did not appear that they had shipped CRT's and other electronic waste devices to China in contravention to California law. The Tung Tai Group offered these falsified records to the state of California to prove their compliance with the state laws. Ultimately, these state laws seem to fall short of ensuring that electronic waste is not improperly disposed of within our borders or borders in an improper manner.

c. Companies That Assume Some Responsibility:

Some progressive companies such as Dell, Hewlett-Packard (HP) and Apple have implemented electronic waste policies. According to a press release dated May 12, 2009, Dell has banned the exportation of electronic waste, including all non-working products or devices regardless of their composition.[208] Dell states that all exports and imports of electronic waste handled by Dell comply with existing international waste trade agreements and Dell does not permit electronic waste to be exported from OECD

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[204] *Id.* at 4
[205] *Id.*
[206] *Id.*
[207] *The People of the State of California v. Tung Tai Group,* complaint available at http://ag.ca.gov/cms_attachments/press/pdfs/n1983_tung_tai_complaint.pdf
[208] Dell.com, *Dell Takes a Strong Stance Against Exporting E-Waste,* http://content.dell.com/us/en/corp/d/press-releases/2009-05-12-export-policy.aspx.

member countries to non-OECD member states.[209] Similarly, HP has banned the exportation of hazardous or regulated electronic waste to developing countries pursuant to the Basel Convention.[210] Dell's computer recycling program is incredibly accessible to consumers, as they have a partnership with FedEx that enables users to ship their end of life computers directly to Dell. Additionally, Dell has partnerships with Staples and Goodwill where an individual can drop their computers off at those locations. HP goes further than Dell in promising that no child labor will be used to process hazardous electronic waste and HP will make reasonable efforts to assure that electronic waste not be placed in incinerators for disposal.[211] HP also claims that they follow electronic waste that is shipped for recycling throughout its chain of custody.[212]

While HP and Dell appear to be making strides in assuring that their products are not improperly disposed of at the end of use, Apple has made the largest strides to prevent any toxic exposure to these goods. On Apple's main website, there is a subsection titled "A Greener Apple."[213] On this webpage, Apple touts its many environmental efforts toward creating a greener company.[214] Included is information regarding Apple's efforts to eliminate the toxic and hazardous substances that comprise electronics, such as lead, mercury, cadmium, hexavalent chromium and arsenic.[215] Apple has completely overhauled its design of Mac computers, reducing the plastics used and

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[209] *Id.*
[210] *HP Clarifies Policy on Export of Electronic Waste to Developing Nations*, HP, Feb. 11, 2010, *available at* http://www.hp.com/hpinfo/newsroom/press/2010/100211b.html.
[211] *Id.*
[212] *Id.*
[213] *A Greener Apple*, Apple.com, *available at* http://www.apple.com/hotnews/agreenerapple/.
[214] *Id.*
[215] *Id.*

the overall bulk.[216] Additionally, Apple contends that it started recycling Apple products beginning in 1994 and that has recycled to date 28 percent of its past sales. Apple also does not ship any waste abroad for recycling, and processes all waste in the United States. Additionally, Apple takes back the popular music device iPod at any of its retail locations for the company to properly dispose of and process the electronics.[217] Apple's website provides extensive information and even links to product reports and energy efficiency audits.[218] As for recycling figures, Apple states that they have recycled 84,853 metric tons of their products to date and that they have diverted approximately 66.4% of their products from ending up in landfills.[219] For Apple, it appears from the abundance of statistics and information that is readily available that recycling and providing "green" products is much more about maintaining their reputation as one of the more environmentally conscious companies in the consumer marketplace.

These companies provide excellent examples of what companies should be doing to prevent electronic waste from being sent abroad for illegal processing. However, given that the companies are writing these statements, one is still left wondering how effective these programs are. The success of these programs varies and precise figures detailing their efficacy are difficult to find, and the company not independent third parties provide the figures. Audits of the success of the companies in relation to the state e-waste laws are few and far between, however, one report was issued by the Texas Campaign for the

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[216] *Id.*
[217] *Three Top Economist Agree 2009 Worst Financial Crisis Since Great Depression*, Reuters, Feb., 29, 2009, http://www.reuters.com/article/pressRelease/idUS193520+27-Feb-2009+BW20090227
[218] *Apple Recycling, available at* http://www.apple.com/environment/#recycling.
[219] *Id.*

Environment Fund in February 2011.[220] The report detailed the success of various companies in complying with Texas' e-waste legislation.[221] Since 2008, Texas has had electronics take back legislation that requires computer manufacturers conducting business in Texas to provide individuals and home businesses with recycling options for used desktops, laptops and monitors.[222] The law also requires that the recycling options must be free and "reasonably convenient." Exponential growth between 2009 and 2010 was experienced with 60% more waste collected.[223] The report found that 92% of the electronic waste collected in Texas in 2010 was collected by only four manufacturers: Dell, Samsung, Altex Electronics (a small Texas based company), and Sony.[224] In total there are 78 computer companies based in Texas. It appears that these four companies are shouldering the bulk of the recycling burden.[225] The remaining 8% was collected by 38 manufacturers in varying quantities, while the remaining 36 manufacturers collected zero pounds.[226] It appears from these figures that absent national legislation that would require the producer to assume responsibility these companies are not going to take the initiative to accept their products voluntarily.

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[220] Texas Campaign for the Environment Fund, *Making Takeback Work Better in Texas*, Feb. 23, 2011, *available at* http://www.texasenvironment.org/pr_story.cfm?IID=1025.
[221] *Id.*
[222] *Id*. at 4.
[223] *Id.* at 5.
[224] *Id*. at 7.
[225] *Id*.
[226] *Id*.

V. OTHER NATIONS AND THEIR SUCCESSES:

a. International Treaties and Conventions

The international community has two methods to curb the growing threat that e-waste poses: The Basel Convention on the Control of Transboundary Movements of Hazardous waste and Their Disposal[227] and the Organization of Economic Cooperation and Development Convention ban on shipments of hazardous wastes.[228] The Basel Convention is an international treaty enacted in 1992 to prevent the shipment of hazardous waste from industrialized countries to developing countries.[229] The objective of the Basel Convention is "to ensure that management of hazardous wastes and other wastes including their transboundary movement and disposal is consistent with the protection of human health and the environment whatever the place of disposal."[230] To date, 175 of the signatory countries have ratified the Basel Convention, and only three countries refuse to sign.[231] Those three countries are Afghanistan, Haiti and the United States.[232] The Basel Convention places an obligation on those nations that have ratified the amendment to ensure that e-waste generation is reduced to a minimum, and to ensure that e-waste is disposed of in an environmentally sound manner through the

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[227] *Basel Convention On the Control of Transboundary Movement of Hazardous Wastes and Their Disposal*, *available at* http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf.
[228] *Guidance Manual for the Control of Transboundary Movement of Hazardous Wastes* pg. 9 *available at* http://www.oecd.org/dataoecd/57/1/42262259.pdf.
[229] *See* Basel Convention preamble
[230] *Id.*
[231] *Id.*
[232] *Id.*

establishment of adequate disposal facilities.[233] In 1994 the Basel Convention went a step further in preventing the transboundary shipment of e-waste when the Ban Amendment was adopted.[234] The Ban Amendment is a total ban on hazardous waste exports from developed to developing countries.[235] The Basel Ban applies to all exports, including recycling.[236] Approximately three fourths of the countries that have ratified the Basel Convention had adopted the Ban Amendment, with full compliance from the European Union.[237] Indeed, the EU has integrated the Basel ban in its Waste Shipment Regulation (EWSR) making the Ban Amendment legally binding on all EU member states.[238]

Pursuant to the Basel Convention, regional agreements may be enacted that have more stringent enforcement.[239] In 1994 The Organization for Economic Co-Operative Development ("OECD") council decision placed a ban on countries that are members of the OECD from shipping to Non-OECD countries.[240] The OECD is a forum where governments come together to "address economic, social and environmental globalization." Under the established ban, any shipments conducted between OECD members and Non-OECD members of solid hazardous wastes are expressly forbidden.[241]

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[233] *Id.*
[234] *available at* http://www.basel.int/pub/baselban.html.
[235] *Id.*
[236] *Id.*
[237] *Id.*
[238] *Id.*
[239] *The International Hazardous Waste Trade Through Seaports*, International Network for Environmental Compliance and Enforcement, *available at* http://www.inece.org/seaport/SeaportWorkingPaper_24November.pdf
[240] *International and United States Controls on Transboundary Shipments of Hazardous and Other Wastes*, American Law Institute, International Environmental Law pg. 77-78 (1995).
[241] *Id.* at 79.

Compared to the Basel Convention, the OECD ban gave more explicit means of controlling the movements of hazardous wastes.[242] However, the two bans are meant to work harmoniously to combat the growing issue of e-waste, and the Basel Convention has adopted the OECD ban.[243] OECD has defined wastes as materials intended for disposal for specified reasons.[244] Some of those reasons include the fact that the products are no longer useable, as in this instance.[245]

In countries where e-waste is regulated, producers are required to establish systems for collection and treatment of items generated, however, much of the waste goes unaccounted for.[246] Some of the e-waste that is deemed obsolete by developed countries is still of use to nations in the developing world which accept e-waste items as second-hand donations.[247] Despite the large number of countries that have signed on to prevent trans-boundary shipments, a recent article published about the shipment of e-waste to Nigeria revealed that the Basel Convention and OECD ban have actually done very little in the way of actually discouraging illegal shipments.[248] To remedy the deficiencies in enforcement efforts, agencies in Nigeria have met with other parties to the Convention to check trans-shipment of disused electronic materials and other toxic wastes to Nigeria.[249]

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[242] *Guidance Manual* at 10.
[243] *Id.*
[244] *Id.*
[245] *Id.*
[246] Caravanos, Jack, *Assessing Worker and Environmental Chemical Exposure Risks at an E-Waste Disposal Site in Accra, Ghana*, Blacksmith Institute Journal of Health and Pollution, Vol 1, No 1 (2001) *available at*, http://www.blacksmithjournal.org/ojs/ojs-2.2.4/index.php/journalhealthpollution/article/view/22/31. (Citing a study by Brigden, Labunska, Santillo and Johnston that as much as 75% of items produced in the EU and 80% in the US go unaccounted.).
[247] *Id.*
[248] *Id.*
[249] *Id.*

However, it appears that e-waste shipments to African nations are on-going. In late September 2011, Australian news reporters for SBS Dateline discovered that shipments of e-waste were arriving in Ghana, despite the Basel Convention and Australian bans prohibiting the shipment.[250] The report discovered that the waste was generated largely from Holland, the United States and Canada.[251] These countries are shipping roughly 500 container loads worth of electronic waste monthly to Ghana.[252]

b. E-Waste Policies in Europe:

i. The WEEE Directive

The Waste Electrical and Electronic Equipment (WEEE)[253] Directive and the Restricting Certain Hazardous Substances (RoHS)[254] Directive were adopted by the European Union to combat the burgeoning e-waste crisis. WEEE advances the EU's environmental policy goals to "preserve, protect and improve the quality of the environment, protect human health and utilize natural resources prudently and rationally."[255] WEEE is based on a precautionary principle that preventative action should be taken to prevent environmental damage from occurring, and that the best preventative measure should be to hold the manufacturer liable from the onset of the

[250] Giovana Vitola, *E-Waste Anger*, SBS Dateline, Sep. 25, 2011, *available at* http://www.sbs.com.au/dateline/story/related/aid/485/id/601347/n/E-Waste-Anger
[251] *Id*.
[252] *Id*.
[253] European Parliament and Council Directive2002/96/EC 175, 2003 OJ (L 37) 34 (hereinafter WEEE directive).
[254] RoHS Directive, 2002/95/EC, 2003 OJ (L 37) 19
[255] WEEE Directive at Preamble

manufacture of potential pollution.[256] WEEE covers a broad spectrum of e-waste, aside from computers, cell phones, and printers, including large household appliances, lighting equipment, medical devices, automatic dispensers, toys and sports equipment.[257] WEEE requires the EU member states to set up e-waste collection systems so that consumers can dispose of the e-waste without being charged.[258] The financial burden of collecting the e-waste is set squarely on the shoulders of the manufacturers or distributors.[259] This form of extended producer responsibility was discussed above in regards to state laws. As previously mentioned, EPR theory adopts the polluter pays principle for costs associated with the pollution of the waste.[260] WEEE's similar polluter pays principle is successful on many fronts, including providing the incentive to promote green design.[261] Producers who have to pay to collect and process the subsequent e-waste will have the incentive to create better designs to assure that the processing of the electronics is as easy and cost effective as possible.[262] An example of this is seen in HP products that are sold in Europe.[263] HP released information regarding its compliance with WEEE in 2005.[264] HP posits that as a result of the passage of WEEE, it has taken measures to "ensure that the

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[256] *Id.*
[257] *Id.* at Annex 1A
[258] *Id.* at supra note 16, art. 5
[259] *Id.*
[260] *See* Producer Responsibility
[261] Ezroj, Aaron, *How The European Union's WEEE & ROHS Directives Can Help the Untied States Develop a Successful Natioanle E-Waste Strategy*, 28 Va. Envtl L.J. 45, 62 (2010).
[262] *Id.*
[263] HP and WEEE Compliance p. 1 *available at* http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/hpweeecompliance.pdf.
[264] *Id.*

design and production of HP branded technical and electronic equipment takes into account dismantling."[265]

Despite the headway that WEEE seems to be making in reducing the impact of e-waste, there are some drawbacks to the system. Producers are only required to take financial responsibility for the e-waste generated by their own products, and the EU gives the member states leeway on how they can process wastes.[266] Additionally the cost of compliance could drive producers and recyclers to illegally ship the wastes abroad thereby adding to the problem of e-waste in poorer countries.[267] This is demonstrated by the difficulty of enforcement of WEEE policies and the Basel Convention ban on trans-boundary shipment of waste.[268] Enforcement efforts require many pieces to be perfectly aligned such as having transportation controls, checks and inspections of facilities and shipments.[269] The WEEE collections in larger European cities such as London are processed through a variety of companies, some with very clever monikers.[270] Some companies will pick up large appliances, while others will be focused solely on IT equipment. The sites all seem to offer strikingly similar services and all seem to tout the importance of following WEEE's stringent regulations. However, these companies are not always acting in compliance with the EU laws. For example Environmental Waste Controls (EWC) a leading UK E-waste disposal and recycling company, which was

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[265] *Id.*
[266] Erjoz at 63.
[267] *Id.*
[268] *Enforcement of the Basel Convention, available at* http://www.basel.int/pub/enforcementreqs.pdf.
[269] *Id.*
[270] An internet search yielded such company names as chuckit.co.uk or junkclear.co.uk.

recently caught shipping e-waste to Africa.[271] EWC was caught by campaigners from the Environmental Investigation Agency who then conducted an eighteen month long investigation on EWC and similar companies.[272] The investigated yielded the startling finding that most e-waste being shipped was broken.[273] While shipment of functioning devices is permissible under WEEE, some items were beyond repair and could only be shipped for disposal.[274] Naturally, EWC has blamed the illegal shipments on subcontractors who disregarded the WEEE Directive.[275] Aside from fraudulent practices in England, a recent scandal struck Spain.[276] Investigations about E-waste disposal in Spain yielded nearly nationwide flouting of the WEEE directives.[277] Approximately seventy percent of e-waste generated in Spain is unaccounted for, escaping official and proper channels.[278] In lieu of being sent to recycling facilities, the waste is sent abroad to developing nations for sham recycling.[279] These widespread violations have lead to prosecution of more than sixty people in Madrid during 2010.[280]

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[271] Wasley, *Andrew UK Company Implicated in Toxic Waste Trail from London to West Africa*, The Ecologist, May 14, 2011, http://www.theecologist.org/News/news_analysis/886532/uk_company_implicated_in_toxic_ewaste_trail_from_london_to_west_africa.html.
[272] *Id.*
[273] *Id.*
[274] *Id.*
[275] *Id.*
[276] ENDS Europe Daily Report Reveals Massive WEEE Fraud in Spain, WEEE Forum, http://www.weee-forum.org/news/ends-europe-daily-report-reveals-massive-weee-fraud-in-spain.
[277] *Id.*
[278] *Id.*
[279] *Id.*
[280] *Id.*

In light of the fact that WEEE has failed to adequately abate illegal shipments of e-waste to developing nations, some reforms have been suggested.[281] The European Parliament convened in early October 2011 and voted in favor of a new set of rules designed to "increase e-waste recycling rates and crack down on electronics and waste management firms guilty of illegally exporting old equipment to developing nations."[282] The new rules will set more demanding targets for e-waste collection and increase the obligations on the retailers of electronics and the manufacturers to ensure that waste is collected and recycled properly.[283] The EU council has stated that it desires a 65% collection target to be phased in to most EU countries by 2020.[284] Additionally, the new rules would encourage the reuse of "at least five percent of the old computers and cellular phones that are collected."[285] These rules are merely in the proposal phase, and will move to a full European Parliament vote next year before they are added to the WEEE directive. [286]

[281] Murray, James, *EU Seeks 85 percent e-waste recycling target*, Business Green, Oct. 5, 2011, http://www.businessgreen.com/bg/news/2114594/eu-demand-85-cent-ewaste-recycled-reused.
[282] Id.
[283] Id.
[284] Id.
[285] *Id*.
[286] *Id*.

ii. The RoHS Directive

The RoHS Directive is the other side of the EU's regulatory coin aimed at curbing hazardous waste at the producer level by having the producers reduce or eliminate toxins such as lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers in environmental goods.[287] RoHS is different from WEEE in that RoHS requires that producers alter the content of their goods, whereas WEEE relies on peer pressure to make goods as green and environmentally sound as possible.[288] Member States' RoHS laws ensure that after July 1, 2006 most new electrical and electronic equipment cannot be sold in the EU if it contains more than specified concentrations of lead, cadmium, hexavalent chromium, Polybrominated biphenyls (PBB) and/or Polybrominated diphenyl ethers (PBDE).[289] These limits apply to any of these elements that could be separated manually from the electronic device.[290] Everything that can be identified as a homogeneous material must meet the limit.[291] So if it turns out that a radio case was made of plastic with 2,300 ppm (0.23%) PBB used as a flame retardant, then the entire radio would fail the requirements of the directive because the concentrations would be too great.[292]

The RoHS has been subject to numerous criticisms regarding its effectiveness and feasibility. When the RoHS was passed in 2006 initial concerns were expressed that

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[287] RoHS Directive preamble
[288] Ezroj at 63.
[289] RoHS Directive article IV (Those levels are: Lead (0.1%); Mercury (0.1%); Cadmium (0.01%); Hexavalent chromium (0.1%); Polybrominated biphenyls (PBB) (0.1%) and Polybrominated diphenyl ethers (PBDE) (0.1%). The maximum permitted concentrations are 0.1% or 1000 ppm (except for cadmium, which is limited to 0.01% or 100 ppm) by weight of homogeneous material).
[290] *Id.*
[291] *Id.*
[292] *Id.*

changing the components of devices would alter product reliability, making it likely that the products would not last as long.[293] Specifically, the concern was that without lead soldering, the products would break easier.[294] However, lead free soldering proved to be just as effective and durable.[295] The success of compliance and enforcement efforts has been mixed.[296] Companies have two choices: either comply and redesign their products or face the risk of penalties related to non-compliance.[297] Governments of the European Union have enforcement measures such as the imposition of fines and implementing bans on products from companies in violation of RoHS.[298]

The Nordic European Countries of Denmark, Sweden and Norway implemented a more coordinated RoHS monitoring and enforcement program.[299] Authorities in this region "split the load" of monitoring across the different product types and industry sectors in an effort to achieve better and more efficient monitoring.[300] When a company within the purview of Nordic authorities demonstrates that they have a thorough system of RoHS monitoring in place and were able to quickly and effectively track, recall or fix the non-compliant products, authorities will be more lenient if there is an incident of

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[293] Lasky, Ron, RoHS *One Year Later: The Good News is…The Bad News Was Wrong*, http://www.ventureoutsource.com/contract-manufacturing/benchmarks-best-practices/rohs-environment/rohs-one-year-later-the-good-news-is-the-bad-news-was-wrong.
[294] *Id.*
[295] *Id.*
[296] Overbeek, Ruud, *The Impact of RoHS Now and in the Future, EE Times*, Oct. 27, 2008, *available at* http://www.eetimes.com/design/smart-energy-design/4013553/The-impact-of-RoHS-now-and-in-the-future.
[297] *Id.*
[298] *Id.*
[299] *Id.*
[300] *Id.*

non-compliance that is discovered.[301] Alternatively, showing a failure through recklessness or a lack of due diligence are less likely to have the same treatment. Thus, it appears that RoHS has been somewhat successful in encouraging businesses to transition their materials.[302]

c. E-Waste in Asia

Japan is another country that has developed a strategy for addressing e-waste. In 2000, Japan adopted the Japan Electronics and Information Technology Association (JEITA) to reduce the amount of lead in manufacturing.[303] Japan also has its own WEEE legislation that is based upon EPR strategies to encourage recycling and green design to enhance recyclability.[304] However, Japan differs from the EU in that Japan promotes a sense of shared responsibility.[305] Responsibility is shared between producers, retailers, consumers and the government.[306] To target bulky and larger appliances that cannot be feasibly collected, such as large televisions, air conditioners, refrigerators, The Home Appliance Recycling Law (SHAR) was enacted.[307] Under SHAR these items must be

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[301] *Id.*
[302] *Id.*
[303] Technical Standardization Committee on Semi Conduct Devices, *Standard of Japan Electronics and Information Technology Industries Association,* 2001, *available at* http://home.jeita.or.jp/tsc/std-pdf/ED-4704-1.pdf.
[304] Pak, Phoenix, *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. 241, 272 (2008).
[305] *Id.* at 273
[306] *Id.*
[307] *Id.*

disposed of at specified collection points.[308] The producers of those items must work together with recyclers to develop a means to transport and recycle these items responsibly.[309] Retailers and the government are responsible for collecting discarded appliances, and the consumer pays an end of life fee, which is collected when the producer drops the items off for recycling.[310]

According to an article entitled *E-Waste: Environmental Problems and Current Management*, which compared Asian e-waste programs, the Japanese program is successful because the e-waste recycling system success in Japan is based on social responsibility and environmental sensitivity.[311] The producers of electronic devices in Japan have their own recycling facilities or collaborate with other producers who do have facilities.[312] E-waste is collected before it becomes a problem in a landfill, either through collection when the user is done with the item or when they buy a new item.[313] When new electronics are purchased, the old electronic device is traded in. The cost of recycling is built into the purchase of a new device, as a recycling tax.[314]

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[308] *Id.* at 274
[309] *Id.*
[310] (The end of life fee provides funding for disposal).
[311] Gaidajis, G., at 198.
[312] *Id.*
[313] *Id.*
[314] *Id.*

d. Fighting Back: What these "developing nations" are doing to combat e-waste:

i. The Bamako Convention

As previously mentioned with concerns in Nigeria, some African nations were moved to act by the inefficacy of the Basel Convention in appropriately addressing the Transboundary movement of these noxious substances. Therefore, the members of the Organization for African Unity joined forces and adopted the Bamako Convention. Fifty-one African countries are members of the Convention, which bans the import and trafficking of hazardous wastes into Africa and controls the movement of such wastes within Africa. Similar to WEEE and RoHS, the Bamako Convention aligns itself with the precautionary principle, with an emphasis on adopting clean production methods. Similar to the Basel Convention, the Bamako Convention has definitions of both waste and hazardous wastes, but does not exclude radioactive materials from the definition of hazardous waste like the Basel Convention does.[315] To prevent shipments of e-waste to Africa, The Bamako Convention imposes very stringent liability upon generators.[316]

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[315] Article 1 of the Bamako Convention defines "waste" as "substances or materials which are disposed of, or are intended to be disposed of, or are required to be disposed of by the provisions of national law."
Article 2 (1) defines "hazardous wastes" as:
(a) Wastes that belong to any category contained in Annex I of the Convention;
(b) Wastes that are defined as, or are considered to be, hazardous wastes by the domestic legislation of the State of import or transit;
(c) Wastes which possess any of the characteristics contained in Annex II of the Convention;
(d) Hazardous substances which have been banned, cancelled or refused registration by government regulatory action, or voluntarily withdrawn from registration in the country of manufacture, for human health or environmental reasons.

[316] *Id.* (Specifically, strict, unlimited liability, as well as joint and several liability on hazardous waste generators).

These exporters of hazardous waste are also required under the Bamako convention to take back their own waste.[317] These examples of imposing stringent liability and penalties for shipments of e-waste should be incorporated into a federal standard that is implemented in the United States.

ii. "Developing" Nations New E-Waste Legislation

China has also become taken an affirmative stance in developing e-waste laws. China's e-waste policy is mainly focused on eradicating the importation of e-waste for sham recycling.[318] In 2007 the Chinese legal system enacted the China Restriction of Hazardous Substances in Electrical and Electronic Equipment.[319].[320] The RoHS law in China was meant to be implemented in phases. To date, Phase I is the only phase that has been implemented. The first phase focuses on labeling and disclosure requirements. The second phase requires that certain materials such as lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated Diphenyl Ethers are controlled and restricted when they are in quantities deemed environmentally unsafe.

An article by Christian Cutillo entitled *A Toxic Reciprocity: Examining the E-Waste Stream from the United States to China*, discussed pitfalls with the Chinese RoHS system.[321] According to Cutillo, the major hindrance to the success of the Chinese RoHS

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[317] *Id.*
[318] *Id.*
[319] Cutillo, Christian, *A Toxic Reciprocity: Examining the E-Waste Stream from the United States to China* Harvard Law and Policy Review, Dec. 1, 2010, *available at* http://hlpronline.com/2010/12/a-toxic-reciprocity-examining-the-e-waste-stream-from-the-united-states-to-china/
[320] *Id.*
[321] *Id.*

is the fact that the law as it is currently written is extremely vague and confusing.[322] For example, the law does not directly regulate "e-waste." Rather, the law regulates "pollution caused by electronic information products containing toxic, harmful substances or elements, or toxic, harmful substances or elements contained in the electronic information products above the standard of the state or industry which have caused damage, injury, waste or other harmful effects on the environment, resource, human health and property safety."[323] Additionally, Cutillo points out that the RoHS is susceptible to governmental bureaucracy and red tape due to the sheer volume of governmental departments that are involved in the ensuring compliance with the law.[324]

In India, where an estimated 50,000 tons of e-waste is shipped annually and only 11% of that amount is recycled, a new law has been passed.[325] Producers of electrical and electronic equipment will now be responsible for the collection of e-waste generated during the manufacture of the equipment.[326] The producers of e-waste must set up collection centers or take back system either "individually or collectively for all electrical and electronic equipment at the end of life."[327] They will also have to channelize the e-waste for recycling or disposal.[328] The new e-waste (management and handling) rule of 2011 places responsibility on the producers for the entire lifecycle of the product, from

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[322] *Id.*
[323] Id.
[324] Id.
[325] Das, Dipannita, "E-Waste Rule Puts the Onus on Recyclers" http://timesofindia.indiatimes.com/city/pune/E-waste-rule-puts-onus-on-producer/articleshow/8818747.cms.
[326] *Id.*
[327] Part-II, Section-3, Subsection (ii)- Government of India, Ministry of Environment and Forests, September 2010, Modified Draft Notification, *available at* http://www.element14.com/community/docs/DOC-25526/l/india-weee-rohs
[328] Das, "e-waste puts the onus on the owners"

design to disposal.[329] Additionally, the producers of e-waste must educate the public on the hazardous constituents and effects of improper disposal of these devices by issuing publications, advertisements, posters and the like.[330] Specific responsibilities will also be placed on refurbishers and collection centers for e-waste to file certain paperwork and maintain records of e-waste that has been processed and handled.[331] The rule will come into effect from May 1, 2012.[332] Apart from the extended producer responsibility principle, the rule is a significant step towards international standards of Restriction of Hazardous substances in electronics.

e. Additional E-Waste Considerations:

Another potential source of e-waste is the computers that are now fully integrated within our cars. Most new cars have some version of a global position system (GPS) and advanced audio system integrated within the car, far advanced beyond the AM/FM radios of yesteryear. The prevalence of the integration of computers in cars has increased steadily in the last five years.[333] In fact, there are some thirty computers that are utilized

[329] *Id.*
[330] Part-II, Section-3, Subsection (ii)- Government of India, Ministry of Environment and Forests, September 2010, Modified Draft Notification, available at http://www.element14.com/community/docs/DOC-25526/l/india-weee-rohs
[331] *Id.*
[332] *Id.* (The rule ensures proper recycling of e-wastes and in the process will accelerate the commercial introduction of green electronic products in the market)
[333] Motavalli, Jim, *The Dozens of Computers that Make Cars Go and Stop*, New York Times, *available at* http://www.nytimes.com/2010/02/05/technology/05electronics.html.

within vehicles now.[334] Computers control most functions of the car, beyond the entertainment system including the brake systems, cruise control and even entry into the vehicles themselves.[335] For example, in 2002 a top of the line Ford Explorer, Ford's popular Sport Utility Vehicle, had a very basic computer system comprised of computerized mechanisms for keyless entry, braking systems and anti-theft mechanisms.[336] The newer Fords are outfitted with the Sync computer system allowing the driver to control their audio systems with a voice activated command and seamlessly integrates the driver's cellular telephone into the car enabling the driver to make "hands-free" calls.[337] The 2011 model of the Ford Explorer is significantly more cutting-edge. Some of the features of the newer model include a touch screen computer built into the center console of the car that controls the temperature in the car and provides turn-by-turn navigation.[338]

These advances in technology increase concerns about disposal of cars in junkyards or scrap yards. When a car has reached the end of its "life," the parts are salvaged and re-purposed.[339] Dismantling a car is a three-step process. The first phase involves draining the car of fluids such as oil, windshield fluid, coolants and refrigerants as well as removing the battery and tires.[340] The second part involves removing the body of the vehicle and salvaging parts that can be reused from parts that go on to be

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[334] *Id.*
[335] *Id.*
[336] Insurance Institute for Highway Safety study on Ford Explorer Models 2002-2005 *available at* http://www.iihs.org/ratings/rating.aspx?id=144.
[337] Ford Sync Technology, http://www.ford.com/technology/sync/
[338] *Id.*
[339] Car Heaven, *How Does My Old Car Get Recycled*, http://www.carheaven.ca/about/how.aspx#stage1.
[340] *Id.*

recycled.[341] Parts that can be repurposed will be sold. Finally, the car will be taken to the crusher to be flattened and shredded. The components of the car, including the plastics comprising the body and interior, and the metals and battery are all toxic.[342] Additionally, the computer components carry the aforementioned toxins of lead, mercury, cadmium and toxic plastics. The combination of the car itself and the electronic components located within create a deadly toxin cocktail.[343]

Europe has passed laws that relate to the proper disposal of vehicles when they have reached the end of life.[344] The EU's End of Life Vehicles Directive, which is aimed at promoting recycling and provides incentives for environmentally friendly vehicle design.[345] The ELV Directive was enacted into domestic EU law in 2002, and required that manufacturers must reduce the use of hazardous substances in both the design and production of vehicles placed on the market after 2003.[346] Included in the ELV Directive are provisions for the collection of these end-of-life vehicles and deadlines for material recovery dates.[347] The automobile manufacturers must establish programs to meet these deadlines and demonstrate that their vehicles have been collected and transferred to the appropriate recycling responsibilities.[348] This law has prompted car manufacturers in Europe to eliminate toxic and hazardous substances in the production of vehicles.[349] In

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[341] *Id.*
[342] *Id.*
[343] *Id.*
[344] Council Directive 2000/53/EC, art. 4, 2000 O.J. (L 269) 34
[345] *Id.*
[346] Recycling and Reuse- End of Life Vehicles and Producer Responsibility, http://www.epa.gov/oswer/international/factsheets/200811_elv_directive.htm
[347] *Id.*
[348] *Id.*
[349] *Id.*

Sweden car manufacturers have developed recycling methods for dismantling and sorting vehicle components under their Environmental Car Recycling in Scandinavia.[350]

Such sweeping legislation is absent from the United States, however there has been an emphasis on product stewardship in recent years. In 2006 a coalition of Federal, State, industry and environmental nonprofit partners created the National Vehicle Mercury Switch Recovery Program to promote the safe removal of mercury switches before they are shredded in the recycling process.[351] Switches are collected and recycled by automobile manufacturers at no cost to dismantlers and recyclers due to a national not-for-profit corporation called End of Life Vehicle Solutions.[352] The program aims protect public health by reducing mercury emissions, and conserve natural resources by promoting recycling of mercury products.[353] Additionally, in 1992 Ford Motors, General Motors and Chrysler partnered together to form the Vehicle Recycling Partnership to promote sustainable design practices.[354] This partnership has helped reduce toxins in cars and compliance with RoHS by developing a process to eliminate lead based solder from the electrical components of cars.[355]

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[350] *Car Components Re-Use of the Components from the Car Industry, available at* http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.createPage&s_ref=LIFE99%20ENV%2FS%2F000627&area=2&yr=1999&n_proj_id=807&cfid=615886&cftoken=9524bd1657ba64b1-4296ACA0-D094-91A4-87343BEAAEFE045A&mode=print&menu=false

[351] *The National Mercury Switch Program: A Collaborative Approach To Reducing Mercury Air Emissions*, EPA.gov, http://www.epa.gov/mercury/pdfs/switchfactsheet.pdf

[352] *Id.*

[353] *Id.*

[354] Buetow, Mike, *Auto OEMs Complete Pb-Free Solder Validation Test Plan*, Circuits Assembly, *available at* http://www.circuitsassembly.com/cms/news/8783-auto-oems-complete-pb-free-solder-validation-test-plan.

[355] *Id.*

While integrating car computers into the scheme of a national e-waste bill should be considered, the main focal point of a successful law should be in implementing feasible strategies to regulate these devices from their production to eventual destruction. Once these devices have become a part of another manufacturing process it will become more difficult for their manufacturers to regulate them. Therefore, the regulation of computers that go on to secondary manufacturing processes and not into the retail market should not be within the scope of an immediate national e-waste bill. Rather, such regulations should go into consideration later, when determining how to appropriately dismantle and treat cars that will be dismantled.

VI. PROPOSED SOLUTIONS

The United States regulation of e-waste should be approached in two ways: first, addressing the issues that electronic waste poses domestically, through aggressive national legislation that promotes a polluter pays approach supplemented with consumer awareness principle. A second prong should be the criminal sanctions for failure to adhere to the federal standard of diminished exportation and illegal recycling efforts.

States throughout the country are starting to recognize the importance of regulating electronic waste. However, until a federal standard is implemented to establish a floor on electronic waste management here will not be an impetus for states with less stringent standards to properly handle electronic devices. The model federal standard should have stringent requirements for the processing and dismantling of electronic waste

within our borders. The new legislations should completely ban the exportation of electronic waste. The ideal federal standard would be an amalgamation of practices from state and international policies.

A. Federal Standard:

Federal standards have been proposed in the past. On September 29, 2010, Representatives Gene Green a Democrat from Texas and Mike Thompson a Democrat from California, both from the United States Congress put forth a bill to make exportation of e-waste to developing nations illegal.[356] While the Responsible Electronics Recycling Act prohibits illegal export of e-waste, the bill does permit the shipment of tested and working equipment to promote reuse. Other consumer electronic equipment, parts, and material derived from them (such as shredded material) that contain toxic chemicals could not be exported to developing nations.[357] There are three exceptions to the export restriction: products subject to a recall; processed leaded glass cullet, which has been cleaned and prepared as feedstock into a glass-to-glass recycling plant in a country that does not classify it as a hazardous waste; and Products covered by manufacturer warranties that are being returned to the manufacturer.[358] Additionally, The Act proposes an amendment of Subtitle C of RCRA to permit RCRA to regulate the waste.[359] Despite the great strides that this bill represents in having a working federal standard to address the e-waste crisis, the bill has since floundered and has not been adopted. In June 2011 a reboot of the Responsible Electronics Recycling act was

[356] H.R. 6252, 111th Cong. §2
[357] *Id.*
[358] *Id.*
[359] *Id.*

sponsored by Representative Raymond Green (D-TX). [360] The new H.R. 2284 is substantially similar to the old national e-waste bill and to date, has not been passed either. As it stands, the bill has been introduced and on June 29, 2011 it was referred to the Subcommittee on Energy and the Environment.[361]

b. Domestic Regulation of E-Waste:

Taking off from the proposed federal standard, a combination of ARF and EPR systems should be used to fashion the best response towards environmental waste. Both will work to address waste that is currently in the waste stream and promote clean design and development in the future. EPR systems are crucial. Simply relying on the industry to place internal pressure on competitors to comply with current standards or to promote the adoption of greener design standards is not a workable solution. As discussed earlier, with so few companies actually engaging in taking back their products compared to the number of companies that are on the market, waiting for the companies themselves to accept responsibility seems to be futile. Instead, a system that has both incentives for adopting cleaner technology and disincentives for failure to adhere to federal standards would be best.

The EPR system should be fully implemented by 2013. First and foremost there should be a broad definition of e-waste that is delineated. Currently, states define e-waste in a variety of different ways. Some states, such as New York and Minnesota have very extensive lists on what waste is regulated. Minnesota's e-waste law covers computers,

[360] H.R. 2284, 112th Cong. §1
[361] http://www.govtrack.us/congress/bill.xpd?bill=h112-2284

peripherals, facsimile machines, DVD players, video-cassette recorders, and video display devices.[362] New York regulates the aforementioned materials plus other devices such as cable boxes, cable and satellite receivers and video game consoles.[363] However, some states have very sparse definitions such as computers and computer accessories but not televisions or other electronics. A broad and all-inclusive definition similar to New York would be advisable to incorporate as much e-waste as possible.

Next, after determining what waste is included, producers must work with states and municipalities to collect discarded electronics. Looking at the EU's WEEE directive, the U.S. should establish a system of separating e-waste from the general municipal waste scheme by collecting e-waste at certain collection points, transporting it to licensed facilities that can appropriately dispose of the waste through sound recycling or dismantling process. In this country, people are going to prefer that collections of these wastes occur from their homes at little to no cost. Therefore, a household collection scheme is recommended. At a minimum, monthly collections should be held for electronic devices that weigh less than ten pounds. This system will resemble what New York City implemented where manufacturers are required to provide free door-to-door pick up of old electronics.[364]

While New York City is much smaller in geographic size and population that the nation as a whole, as the largest city in the United States, its legislation should serve as a model for the nation as a whole. More rural areas would have collections more infrequently, for example every other month rather than every month. The collectors will

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[362] Chart comparing State Laws *available at* http://www.electronicstakeback.com/wp-content/uploads/Compare_state_laws_chart.pdf (last visited July 12, 2011).
[363] *Id.*
[364] N.Y. ENVTL. CONSERV. ART. 27 § 26 (2009).

provide the citizenry with special bins in which to place the electronic waste. In addition to the bins, forms that permit the consumers to specify what waste is included in the bin should also be issued. When the waste is placed in the bin, the homeowner should complete a form identifying the electronics. When the waste is collected, the collectors should sign the document verifying that they have received the waste for further processing. Additionally, states should place receptacles to collect waste in various jurisdictions. These receptacles should be located near recycling facilities if at all possible to maximize the efficacy of getting these items to a recycler. Furthermore, states should set up recycling facilities based on population density; however, no state should have fewer than two recycling facilities or one for every hundred miles. Finally, collection trucks should collect larger items, those that exceed 10 pounds or cannot feasibly be brought by the consumer to receptacles, when consumers call a collection number.

To determine how much producers should pay into the system, several factors should be examined including the producer's market share of electronic devices and the actual cost of breaking down the goods. The individual manufacturers of goods within the United States should register their company with a federal database and report their sales figures for each quarter. However, relying on a company to fairly and accurately report their figures could be dangerous so companies should also be periodically monitored to determine what each producer has sold in the market place and how much of the market share the companies have. If a company decides to "fudge" their numbers, they should be assessed a hefty civil penalty and/or be subject to criminal sanctions. Additionally, recyclers should determine the cost of recycling the waste and work with producers to

obtain the funding necessary to cover the recycling costs. Orphan wastes, wastes that do not have a solvent producer or manufacturer in existence to deal with the recycling costs, shall be handled by splitting the costs among the producers.

The ARP portion of the legislation should be a tax on goods that will be used to pay for state and federal funding for the collection of e-waste and the accreditation of recycling facilities. To discourage individuals from purchasing electronics abroad to avoid paying the retail tax, goods would then be subject to a tax for importation. The idea is that if people pay taxes for these electronics they will be more apt to promote green design and this will create more informed consumers. Also, consumers who provide proof, through collection tickets or other receipts demonstrating that they have properly recycled goods, should be eligible for tax deductions.

These ideas for proposed legislation are merely a jumping off point. There will be strong opposition by both consumers and industry. Consumers will not want to pay a higher price for their electronic devices. Manufacturers of electronic devices will not want to foot the bill for the proper disposal costs. However, given the ever growing problem that e-waste is, ignoring the reality is no longer an option. Ultimately, companies who manufacture these devices are in the best economic position to take back their items and pay for their proper treatment and recycling. To assist in recycling efforts, these companies should redesign their products to make them less toxic. Criminal sanctions will have to be imposed, as will be delineated below, to ensure that e-waste is not shipped to foreign countries for disposal. The cost of disposing of these goods is inexpensive in the monetary sense but ends up costing receiving countries a great deal environmentally.

c. Criminal Sanctions

Implementing stringent criminal sanctions for the improper handling and disposing of e-waste is necessary both to prevent exportation of e-waste to other countries and to ensure that violations of domestic regulations have repercussions. The ideal criminal sanctions would go further than civil liability and compensation for damage arising from illegal disposal or treatment of waste. Criminal sanctions should focus primarily on the imposition of criminal convictions and incarceration in addition to monetary penalties. The ideal length of incarceration would be of a length that would be a deter violations of the law, such as one to three years per violation. It frustrating that the EPA has done very little in the way of assuring that electronic waste does not get exported illegally. Indeed, the enforcement of such shipments is lacking entirely. The first step in implementing criminal penalties for the illegal traffic of e-waste would be for the United States to ratify the Basel Convention. After adopting the Basel Convention, criminal penalties should be appended to any federal legislation. One way to achieve criminalization of e-waste would be to add electronic waste under the umbrella of RCRA, as a form of illegal disposal of hazardous waste and thus subject e-waste to RCRA criminal sanctions. Alternatively, a separate criminal section could be formulated that would punish the violators of the new federal standard. Ultimately, the purpose of having more stringent rules and regulations will act as a disincentive to ship e-waste.

First and foremost, the United States should adopt the Basel Convention to curb transnational shipment of environmental waste. Under the Basel Convention illegal traffic in hazardous waste is considered a crime. The Convention, however, does not have

a separate set of criminal sanctions to punish illegal shipments. Rather, the Convention encourages that each member nation adopt its own legislation to punish and prevent illegal traffic.[365] Basel provides model national legislation as a template for what countries can adopt to prevent transboundary movements of such e-waste.[366] The United States should integrate what the Convention suggests by either incorporating it within RCRA or by blending these prohibitions with new criminal penalties.

RCRA, as previously mentioned, is the regulation that addresses the treatment, storage and disposal of hazardous wastes.[367] Of primary concern is the export of hazardous waste. RCRA should be amended to have e-waste removed from its current exempted status. As previously mentioned, e-waste is generated largely on the household level. As such, it falls under the household waste exception. Once e-waste is removed from the household waste exemption it will be treated as any other hazardous waste. E-waste should be removed entirely from the household waste exemption category, by specifically listing and placing it in the RCRA hazardous waste category. Alternatively, Subtitle C of RCRA could be amended instead of its exception. One way to accomplish an amendment of RCRA would be to revise the definition of hazardous waste to include used products such as computers, printers, and cell phones. Once these items are subject to RCRA's purview then the export provisions will apply to allow the federal government to punish violations.

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[365] Model National Legislation on the Management of Hazardous Wastes as well as on the Control of Transboundary Movements of Wastes and Other Wastes at their Disposal, *available at* http://cop10.basel.int/Portals/4/Basel%20Convention/docs/pub/modlegis.pdf.
[366] *Id.*
[367] 42 U.S.C. § 6901, et seq. (1976).

The United States regulates the export of hazardous waste under RCRA § 3017. Pursuant to 42 U.S.C. § 6938(2) the United States must enter into an agreement with the receiving country establishing notice, export, and enforcement provisions. Waste cannot be exported until notification requirements have been satisfied, including consent from the receiving country. [368] The exporter must have (1) provided the EPA with proper notification of intent to export, (2) the United States requests and receives the consent of the importing country, (3) the importing country's consent is attached to the manifest accompanying the shipment, and (4) the shipment conforms to the terms of the consent by the receiving country or to terms of an agreement entered into by the United States and the importing country.[369] RCRA § 3008(d)(1) penalizes "any person who ... *knowingly* transports or causes to be transported any hazardous waste identified or listed under this subchapter to a facility which does not have a permit under this subchapter...."[370] For violations of RCRA, criminal liability can be imposed.[371] These criminal penalties are necessary as the criminal practice of shipping waste grows.

The use of criminal penalties as illegal shipment grows will be a useful deterrence only if the fines and incarceration terms are severe enough.[372] Most countries that have

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[368] 42 U.S.C.§ 6938.
[369] 42 U.S.C. § 6938(a).
[370] *Id.* (emphasis supplied)
[371] . *United States v. Dee*, 912 Fd. 741 (4th Cir. 1990). (In *Dee* the court found that the defendants "knowingly" violated criminal provisions of RCRA, even if they did not know that violation of RCRA was a crime or that regulations existed listing and identifying chemical wastes as hazardous wastes under RCRA. The court found that ignorance of the law was not a claim on which the defendants could reasonably rely and there was evidence that defendants were aware that they were dealing with hazardous chemicals subject to RCRA regulation).
[372] van Zieben, Gisele, *Criminal Enforcement in the Environment*, Fourth International Convention on Environmental Enforcement, *available at* http://www.inece.org/3rdvol2/cerews.pdf.

developed environmental legislation use a combination of fines, penalties, jail terms, or other forms of punishment such as shutting down facilities or factories.[373] The use of criminal sanctions in conjunction with environmental laws rose to predominance in the 1970's when the EPA and the Department of Justice (DOJ) partnered together to impose civil fines and penalties for violations of RCRA.[374] Increased public awareness and publicity on these civil actions prompted increased funding and resources to focus on criminal penalties.[375] The publicity associated with the jailing or fining of corporations or the high-ranking officers seems to be the most effective deterrent.[376]

In what hardly comes as a shock, a study conducted by Michigan State University published in an Interpol report demonstrates that higher cost is associated with processing waste domestically is a disincentive to actually processing that waste domestically.[377] Because the issue of e-waste is international in nature, there must be collaboration between countries that are parties to the Basel Convention. The prevention of illegal shipments could and should be monitored through Interpol's environmental pollution crimes working group.[378] Domestically, interagency work groups between the Department of Justice and the Environmental Protection Agency should work with state and local governments to ensure that waste is being managed properly in the United States.

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[373] *Id.* at 186
[374] McMurray, Robert I. and Steven D. Ramsey, *Environmental Crime: The Use of Criminal Sanctions in Enforcing Environmental Laws*, 19 Loy. L.A. L. Rev. 1133, 1136 (1986).
[375] *Id*. at 1187
[376] van Zieben at 186
[377] *Electronic Waste and Organized Crime* at 33.
[378] *Id.*

It appears that recently the EPA and DOJ have started to prosecute violations of state e-waste laws. In the Colorado case previously mentioned, where the DOJ charged Colorado e-waste recyclers with illegally shipping e-waste, the company's two officers who actively participated in the scam, could face up to twenty years in prison and hefty civil penalties.[379] It should be noted, that criminal prosecution has been rather rare to date, and that the best way to ensure that e-waste violations are punished is to create a national e-waste scheme. A national e-waste scheme will allow violations not only on a state level but will allow prosecutions for violations of RCRA, as discussed above.

d. E-Waste Economics Could Hinder Implementation:

Before such sweeping legislation is enacted, serious economic hurdles must be addressed both to regulate the waste domestically and to prevent its exportation. Economically, it is cheaper to ship the waste abroad for dismantling than to recycle the waste properly domestically. Proper recycling is costly and labor intensive because the devices themselves are often designed to be difficult to pull apart. A recycler in Michigan estimated that it costs $18 per computer to remove the lead and other toxins. The cost of recycling similar electronics in Ohio varies, depending on the size of the computer or

[379] *United States v. Environmental Recycling Company*, Case 1:11-cr-00376-WJM Document 1 Filed 09/15/11 USDC Colorado. Indictment *available at* http://op.bna.com/env.nsf/id/jsun-8lupzm/$File/Baltzindictt.pdf

television.[380] For example, a 42" TV costs $45.00 to recycle while a 10" monitor costs $10.[381] The cost of exporting waste to developing countries like China is estimated to be ten times cheaper than the cost of domestically treating the waste. This is largely due to the cheap labor that abundantly available overseas. While precise figures detailing how much a worker is paid in these countries is been difficult to find, the World Resources Institute estimates that a worker in China receives $1.50 per day.[382] Furthermore, lack of environmental and occupational regulations drive down the costs of doing business in these countries.[383] Given how cheap it is to process waste abroad, it is easy to see how domestic treatment can be cost prohibitive given the amount of computers, televisions, cell phones and other electronic devices generated per year.[384]

Another factor influencing the export of these wastes is the demand for the electronics in the developing country, as previously mentioned in the article *The Digital Dump: Exporting Re-Use and Abuse to Africa*.[385] While a large percentage of the waste that is shipped abroad is unsalvageable, there is a portion of the waste that is still functioning.[386] These operational electronics are in high demand in Africa, where they do not have the same access to consumer goods.[387] Brokers of these electronics have driven up the demand for components such as liquid crystal display (LCD) screens and CRT's.

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[380] FAQ's: General Information on E-Waste, *available at* http://www.ohioewaste.com/faqs.html
[381] *Id.*
[382] Nakagawa, Layne, *Toxic Trade: The Real Cost of Electronic Waste Exports from the United States*, EarthTrends Environmental Essay Competition, World Resources Institute, *available at* http://earthtrends.wri.org/features/view_feature.php?theme=5&fid=66
[383] *Id*.
[384] *Id*.
[385] Puckett at 18.
[386] *Id*.
[387] Luther at 15.

Aside from the actual devices and any salvageable valuable components, there is also a high demand for the scrap plastics.[388] As long as the demand for these items continues, and brokers continue to purchase e-waste in bulk, there will be a market for exportation of e-waste.[389]

An additional economic hurdle will be receiving funding and support from the companies who make these devices. Under the proposed legislation discussed above, a producer pays system is the best option to ensure that these goods are recycled properly. There will undoubtedly be some backlash from smaller companies, but as previously mentioned, a number of large manufacturers have already begun to accept their own devices for recycling. Therefore, receiving funding from them should, in theory, be easier than receiving funding from the federal government. In July of 2011 the White House Interagency Task Force issued a report detailing an agreement between several electronics companies such as Dell, Sprint and Sony and the EPA to promote the environmentally sound management of used electronics.[390] The partnership aims at developing "green" design of products, promotes the recycling of these products domestically and plans to create green jobs.[391] However, this show of support in favor of greener standards has recently been called a rouse. Shortly after the release of the report in which this partnership was delineated, a scathing was issued by Allen Hershkowitz of

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[388] *Id.*
[389] *Id.*
[390] Executive Office of the President, Council on Environmental Quality, Obama Administration Officials and Industry Leaders Unveil Federal Strategy to Promote U.S.-Based Electronics Recycling Market and Jobs, July 20, 2011, *available at* http://www.whitehouse.gov/administration/eop/ceq/Press_Releases/July_20_2011
[391] *Id.*

the Natural Resources Defense Council.[392] The blog article critiqued the agreement and statement by the White House for not doing enough.[393] In fact, the article stated that the U.S. government was actually making it easier for these companies to ship e-waste to countries, when it should be doing more to prevent the exportation of waste.[394] Specifically, the language of the agreement that the government will "provide technical assistance and establish partnerships with developing countries to better manage used electronics" means that they will be helping these countries get the waste out of our country and getting it to developing nations.[395] The agreement appears to be at most a flimsy band-aid that does nothing to address the serious health and environmental crisis that is occurring worldwide.

The United States has to be the party to prevent the exportation of these wastes by implementing stringent legislation. While some countries, such as China and India have developed e-waste legislation, it may not be enough to prevent the rapacious shipments that seem to continue. While it should be within the responsibility of the United States and other developed countries to implement and actually enforce regulations that prohibit shipment, ultimately, if countries permit the imports companies will continue to ship the waste.

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[392] Hershkowitz, Allen, *Administration Launches Jobs Killing E-Waste Initiative NRDC*, http://switchboard.nrdc.org/blogs/ahershkowitz/administration_launches_job_killing_e-waste_initiative.html.
[393] *Id.*
[394] *Id.*
[395] *Id.*

VII. CONCLUSION

Computers and other electronic devices are rapidly evolving and multiplying. The startling abundance of these devices coupled with their complexity provides a serious threat to global environmental health and safety. These devices are filled with highly toxic substances such as mercury, lead and cadmium all are potentially lethal when exposed to human populations in small doses, and is a death sentence when exposed to humans in large quantities. The primary concern associated with these devices is that large numbers of electronic devices currently on the market are being disposed of in a careless manner that exposes developing nations to these lethal elements. The need for a national electronic waste bill is clear and the danger is palpable. A national e-waste bill will not only provide protection for developing nations but will ensure that the producers of these wastes take responsibility for the disposal of these devices in a responsible manner.