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Growing Flows of E-waste: International and Domestic Policy Reforms

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ABSTRACT

In this technologically conscious and advanced age, electronics have been a boon in raising the standard of living. However, there is an insidious monster awaiting us beyond the shiny LED lights and AI programs: electronic disposal in the form of e-waste has been growing at an alarming rate of 3-5% per year and can reach up to 75 megatons (Mt) by 2030 (Forti et al., 2020). Even among those of us who are aware of the problem of e-waste, few bother to investigate beyond the garbage truck that drives away from our homes. Often, this waste is shipped off unprocessed to other countries where waste is nearly untraceable. E-waste is of particular concern due to the toxic materials that are not found in other kinds of waste. But, due to the economic benefits and convenience it provides for both the countries that are selling and the countries that are receiving the waste, the e-waste issue is multifaceted. This paper will attempt to track the current international e-waste trade through the countries and industries that participate in it. Current international policy towards e-waste is examined with the 1989 Basel Convention marking the first attempt to define and corral e-waste. To truly make lasting changes in the e-waste market, e-waste must be properly defined and regulated with an international standard. Furthermore, the formal recycling industries must be strengthened in all countries with strict enforcement of the rules in countries that export the e-waste.

Introduction

Worldwide sales of consumer electronics continue to rise and are projected to reach $462 billion USD by 2021. Although the advanced gadgets have elevated our standards of living, there is an insidious monster awaiting us beyond the shiny LED lights and AI programs. In 2019, e-waste generation increased by 9.2 Mt from 2014 to 53.6 Mt (Forti et al., 2020). E-waste is growing at an alarming rate of 3-5% per year (Ilankoon, 2018) and is projected to reach 75 Mt. by 2030 (Forti et al., 2020). E-waste accumulates nearly 3 times faster than other types of waste (Abalansa et al., 2021, p. 2) due to its quick turnover from upgrading of electronic equipment, short life cycles, and its complex disposal process. This problem is the most prevalent in affluent countries where the demand and turnover rate of electronic devices is the highest. Unfortunately, the most affluent countries do little to safely dispose of electronic waste. In 2014, only about 15% of e-waste was officially reported as disposed of through national take-back programs. Additionally, the United Nations Environmental Programme (UNEP) estimates that only 10% of e-waste is recycled in developed countries, with the remaining 90% sent off to various developing countries (Abalansa et al., 2021, p. 2).

Predictably, the majority of the developing countries such as Ghana, India, and China that are receiving the e-waste lack strong infrastructure and efficient waste management systems, leading to large, informal sectors taking over much of the e-waste dumped in developing countries. Formal e-waste activities are regulated and documented by governments, but they are also expensive and capital intensive. As a result, less than 20% of e-waste is formally processed, with informal activities accounting for 98% of China's e-waste sector and 95% of India's (Abalansa et al., 2021, p. 6-7).

Informal waste management constitutes significant harm to the environment and human welfare. Electronics typically contain toxic materials, and, therefore, the inappropriate extraction of them is extremely dangerous. During the first stage of the extraction process, electronics are scavenged to be sorted into functional and non-functional components. Functional components can be resold, but non-functional components are valued for their resources. Next, the cables are burnt for their copper wires, while mother boards are leached in acid baths for their resources (Abalansa et al., 2021, p. 7). Workers in Agbogbloshie, Ghana, one of the most polluted e-waste sites in the world, burn plastic cables in the open air to get to the copper stored inside them (Stowell, 2019). Accordingly, the concentrations of copper, cadmium, lead, iron, chromium, and nickel in the Odaw River in Agbogbloshie have exceeded WHO guidelines (Abalansa et al., 2021, p. 8).

Incinerating the waste also releases greenhouse gases and contaminants like dioxins and furans into the environment. With E-waste producing 70% of reported toxic and hazardous chemicals such as lead, mercury, cadmium, beryllium, and pollution PVC plastics, informal e-waste activities contribute heavily to air, soil, and water pollution (Abalansa et al., 2021, p. 2). Given how E-waste workers are exposed to all of these toxic materials, studies have found higher concentrations of heavy metals in their blood, PAH metabolites in urine, and polychlorinated biphenyls in breast milk. Pregnancy issues are also a major concern. Spontaneous abortions, stillbirths, premature births, reduced birthweights and birth lengths have all been linked to e-waste exposure (Abalansa et al., 2021, p. 10). Informal activities also actively involve child labor. In the city of Guiyi, China, another one of the most concentrated e-waste sites, the children have experienced reduced vital capacity as a result of blood chromium concentrations. A reduction in weight, height, and body-mass index has also been reported (Abalansa et al., 2021, p. 10).

Planned Obsolescence

Unfortunately, the management of e-waste is only the bookend of the problem. The overconsumption of electronics is the undeniable creator of e-waste. Consumers and producers both play significant roles in its production, but, more deliberately, tech producers use planned obsolescence to encourage consumers to continuously buy new products through a variety of strategies. Planned obsolescence is the conscious decision taken by a company to produce a product that will become obsolete, or useless, in a predefined time frame. Vance Packard, who popularised the term in the mid 1900's, separated planned obsolescence into three main categories: function, quality, and desirability (Barros and Dimla, 2021, 1608). All three are still applicable to modern day planned obsolescence. Obsolescence of function occurs when new products outperform existing ones. Companies can release a product while already planning for its substitute. Obsolescence of quality (also known as technological obsolescence) takes place when a technology or one component of the technology is deliberately designed to fail after a certain time period. Examples include smartphones that malfunction after a software update, printers that have a limited number of printed pages, and washing machines that only last for a few years (Becher and Sibony, 2021). Lastly, obsolescence of desirability leads to discarding the product entirely when it becomes difficult to obtain or to replace failed components (Barros and Dimla, 2021, 1609). For example, Apple has been criticized for their batteries that are glued in place and protected by proprietary pentalobe screws along with many other perceived planned obsolescence strategies (al-Sharif, 2021). Moreover, obsolescence of desirability involves the change in superficial aesthetics of a product from one model to the next. Through marketing, companies convince consumers that the latest model is far more desirable than the old model even though the primary functions of the product are essentially the same.

Currently, the world operates in a linear economy. Consumers buy electronics, use them, throw them away, and then buy a new product again. This behavior leaves an ever-growing pile of e-waste at the end of the line to damage the developing countries and workers that are forced to deal with it. The only way to minimize planned obsolescence is through provident policy, because companies will not give up the profit made from planned obsolescence themselves. Governments must combat planned obsolescence on the part of tech companies to increase the lifespan of electronics and to reduce e-waste. Policies should be implemented on a nationwide scale to increase producer responsibility and hold everyone to the same standard.

Extended Producer Responsibility

Extended producer responsibility (EPR) is one potential policy that may optimize producer responsibility. The Organisation for Economic Co-operation and Development (OECD) defines EPR as “an environmental policy approach in which a producer’s responsibility for a product is extended to the post-consumer stage of a product’s life cycle including its final disposal.” EPR encompasses both the beginning and end of e-waste’s life cycle by creating physical and financial incentives, thus making companies more willing to develop environmentally conscious product designs (Gupt and Sahay, 2015, p. 595).

There are several different approaches for EPR, including take-back mandates, recycling rate targets, and voluntary versions of both. Specific policy models mainly consist of different taxing structures. The advanced recycling fee (ARF) is a tax on the sale of a product to cover the cost of recycling an end of life (EOL) product. The revenue generated from ARFs could also be used to subsidise the producer’s recycling responsibility or the cost of managing the waste. Deposit refund system (DRS) taxes product consumption (deposit) but also gives a rebate or refund when an EOL product is recycled. Taxes during the beginning of a product’s life include material taxes and upstream combination taxes. Material taxes are levied on specific environmentally harmful or difficult materials. Upstream taxes are simply taxes paid by producers to subsidise waste management (Gupt and Sahay, 2015, p. 596-597).

Japan is one country that has established a unique EPR system. Japan has two main e-waste recycling legislations: the Law for the Promotion of Effective Utilization of Resources (LPUR) and the Law for the Recycling of Specified Kinds of Home Appliances (LRHA). LPUR regulates electronic devices and small batteries. The recycling fee is included in the sales price, so consumers don’t pay any extra visible cost. They can then dispose of the electronics through the post office or directly through manufacturers. LRHA regulates larger home appliances like washing machines, refrigerators, and etc. In this case, consumers pay a transportation fee to retailers who transport the e-waste to manufacturer designated sites. LRHA requires manufacturers to have their own recycling facilities or to have commercial recycling companies that recycle the e-waste for them. Both of these laws include heavy penalties for non-compliance. Japan’s system has also had a significant impact on product design as they were the first to develop electronics free of hazardous substances like lead and bromine (Gupt and Sahay, 2015, p. 603).

Many other industrialized countries like Switzerland have also implemented various forms of EPR for e-waste, but there is one glaring outlier: the United States. The United States lacks any meaningful or uniform EPR legislation apart from a couple of states like California and Maine. In 2003, California passed The Electronic Waste Recycling Act of 2003, which assesses a $6-$10 fee on the sales of electronic devices depending on screen size, and the Act has since been extended to cover a wider range of e-waste (Gupt and Sahay, 2015, p. 605). However, many manufacturers and distributors of electronic products oppose EPR policies as these costs hinder their profits. They claim that the decreasing demand resulting from expensive EPR policies may halt innovation and may cause the unnecessary loss of jobs in the industry. (Wilson et al., 2015). As the largest producer of e-waste in the Americas, the US must take more legislative action on the federal level to curb its amount of e-waste. Of course, all of the other countries must also continue to strive towards placing more responsibility on producers in regards to reducing levels of e-waste.

Despite the push for increased producer responsibility, major gaps still remain between successful EPR policies and actual recycling success, as evidenced by the amount of e-waste that ends up in developing countries. Reports from developing countries, inspection of shipments, case studies, and the discrepancies in e-waste-related data have allowed most to reach the consensus that a vast majority of e-waste goes unaccounted for. As explained earlier, it is estimated that 90% of e-waste said to be “recycled” in developed countries is actually carted off to developing countries. The incentives are clear: it is much cheaper to export e-waste than to recycle it domestically. This is where EPR falls short: manufacturers can often fulfill their obligation of recycling through exportation.

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The International Effort Against E-waste

Current international policies and loose regulations make it fairly easy for developed countries to send their e-waste off to developing countries in Africa and Southeast Asia. Fundamentally, international waste management law does not serve to protect the environment from waste and merely facilitates the movement of waste around the world. Developing countries especially view waste imports as a valuable commodity despite the substantial long-term harms discussed earlier (Barsalou and Picard, 2018, p. 898-899), while developed countries are all the more willing to hand their waste to them. Although many of these policies, laws, and regulations exist at different levels, poor implementation, enforcement, and loopholes render them essentially futile in protecting the environment.

The best example is the 1989 Basel Convention. The Basel Convention was first conceived as a response to the growing global waste trade and is now the largest international waste management treaty with 187 signatories. Its main objective was to reduce the amount of hazardous waste production and transfer, but all evidence suggests that it has failed in doing so. There are several glaring reasons for the failures of the Convention's goals. The Basel Convention specifically provides for the "efficient management" and flow of hazardous waste across sovereign jurisdictions, with no mention of reducing waste production or transfer (Barsalou and Picard, 2018, p. 898-899). The convention was almost amended to include a ban on hazardous waste in 1995, but there were not enough ratifications. Additionally, in the realm of international law, there are no uniform definitions of waste, and the Basel Convention also does not clearly define "hazardous waste." This loophole allows states to determine at their own discretion what legally qualifies as waste. Different definitions are severely taken advantage of by developed countries, and there is also no limit on the amount of waste flow.

Moreover, because properly functioning used goods are not within the jurisdiction of the Basel Convention, exporters are able to label e-waste as recyclable goods and avoid the obstacle that is hazardous waste all together (Shukla 2020). Exporting waste is a much more preferable option for many manufacturers because of the low cost, which results in high volumes of waste transportation to foreign countries. In China, the informal e-waste sector is quite robust due to e-waste's role within consumers and the recycling industry. Second-hand devices are in high demand and are distributed by small but numerous waste collecting companies. These collectors have standardized informal recycling operations that are unsafe but highly profitable. Finally, there are no punitive measures to encourage the Chinese government to crack down on the informal recycling industry (Chi et al, 2011). Simply competing with these industries will not solve the inherent problem of informal recycling. When devising international policy, the economic consequences of all countries must be considered.

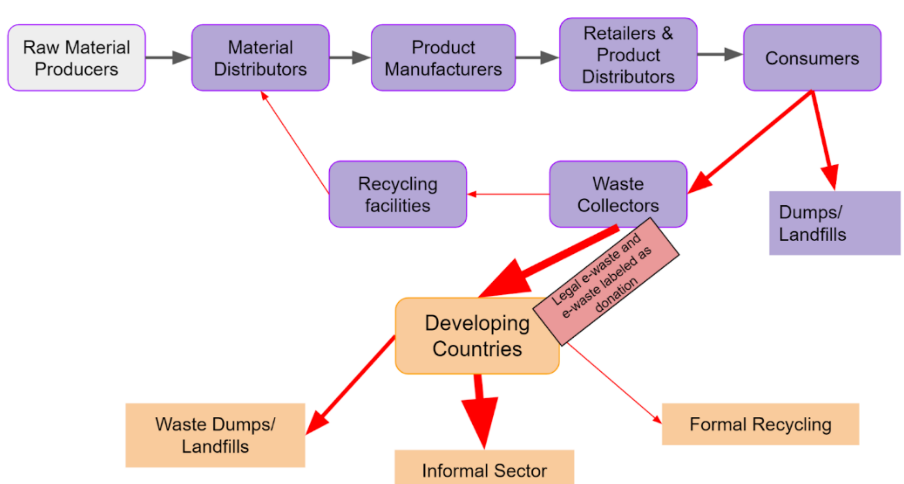

Figure 1. The international flow of waste materials. A majority of the waste is either left in dumps and landfills domestically or exported to other countries.

The Way Forward

There are several steps that need to be taken to mitigate the severe lack of regulation in the realm of international law in regard to e-waste. First, a comprehensive perspective on the movement of e-waste must be clearly established by facilitating numerous and precise data collection. There is currently insufficient data on e-waste at the international level; only 41 countries currently report data, but, even then, countries are only partly, if at all, fulfilling their reporting obligations. Moreover, countries do not cover the complete scope of e-waste because statistics do not refer to e-waste that is labeled as "recyclable" or "reusable" (Baldé et al., 2017). Official data collection of e-waste movement and quantities is essential to track the current statuses of e-waste. International organizations like the UN must establish specific groups to monitor waste that travels both throughout the world and within countries. Legal and illegal exports/imports can be recorded to help inform governments on creating targets and policymaking.

There must also be substantial revisions and updates to be made to the Basel Convention and other international agreements. In the recent Paris Accord Agreements to combat climate change and the dangerous effects of pollution, e-waste is merely identified as a problem without any practical measures to fix it. To start, a specific and concrete definition of hazardous waste must be established, and all countries need to be unified in how they abide by the convention. A definition doesn't necessarily have to be all-encompassing, but it is imperative to agree on what "hazardous waste" is. The convention must also adopt stricter regulations of e-waste and other objects that could be labeled as "recyclable."

The role of producers and manufacturers of electronic devices will also be crucial to these corrective operations. Companies need to be examined for instances of planned obsolescence and should be held accountable for their contribution to the e-waste market. An effective policy may be to require companies to present their plans to combat planned obsolescence within the design process of their products so that companies engaging in systemic application of obsolescence can be harshly fined for their actions. The disadvantage of this method is that these rules may only be enforced after the products are released. The fines and fees that companies pay are a good opportunity to provide funding for e-waste monitoring efforts that are overseen by international organizations such as the UN. Producers and manufacturers of electronic devices must also be included within this operation and follow regulations to effectively track or retrieve the e-waste that their products will become.

Finally, formal recycling must be strengthened as an industry in both countries that export and import e-waste. Formal e-waste recycling is still a young industry with the oldest facilities dating merely twenty years. More facilities must be established across the country with easy transport from the consumer to the facilities. One method that the governments may initiate is to establish e-waste collecting stations at public institutions such as the post office or the Department of Motor Vehicles. One sure way to improve the recycling industry is to collaborate with producers of electronic devices and design their products for easy disassembly (Cabellos & Dong, 2019).

Changes in international e-waste policy will be the first of many steps towards changing the international flow of e-waste around the world. By pushing more affluent countries to strengthen domestic industries of processing waste and contributing to the formal recycling in developing countries, there may be a significant reduction in the amount of e-waste currently toxifying Earth and our communities.

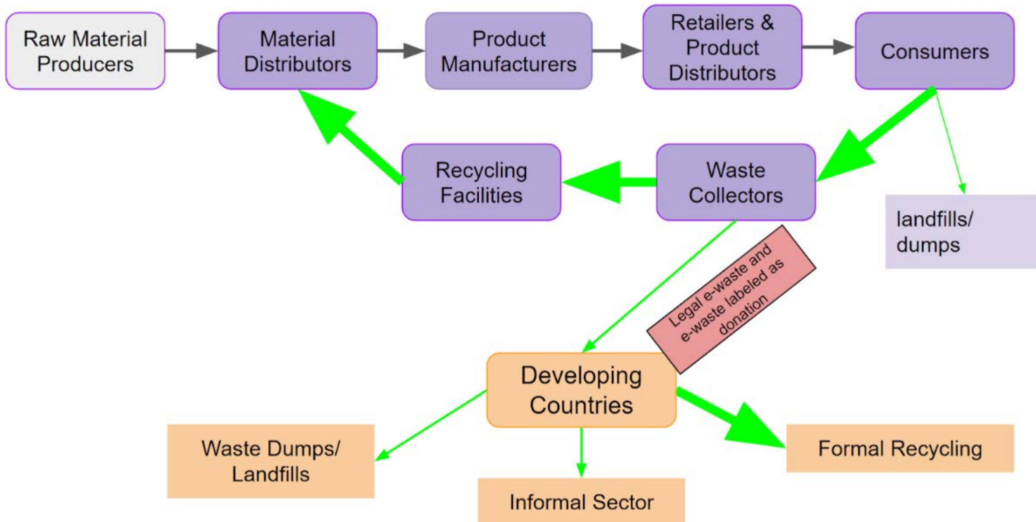

Figure 2. Changes in international e-waste policy reducing the flow of waste to developing countries. Additional measures made to strengthen formal recycling industries in all countries.

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