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Electronic Waste Taking Over the Globe: An Overview of the Law in Malaysia, India, China and the United Kingdom

Hiral Sanghvi
Shearn Delamore & Co, Malaysia
hiral.sanghvi98@gmail.com
ORCID iD: 0000-0001-7296-0383
(Corresponding author)

ABSTRACT

The rapid growth of the global market for electrical and electronic equipment (EEE) has resulted in an alarming increase in electronic waste (e-waste). E-waste, which comprises discarded electrical and electronic devices, poses severe environmental and health risks due to improper disposal and treatment. Many electronic devices contain hazardous materials that can leach into the environment, contaminating soil, water, and air. This paper explores the e-waste situation in Malaysia, India, China, and the United Kingdom, along with the laws and regulations governing e-waste in these countries respectively. While some countries have implemented adequate laws, compliance, and enforcement remain significant challenges. Encouraging extended producer responsibility (EPR), ensuring compliance with laws, and investing in recycling infrastructure are proposed as effective strategies for managing e-waste. To tackle this global problem, governments, industries, and individuals must collaborate, raise public awareness, and promote sustainable practices to build a circular economy for electronic products. By taking collective action, we can protect the environment and create a cleaner and greener future.

Keywords: Digital waste; Electronics; Recycling; Waste of electrical and electronic equipment

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1. Introduction

One of the earliest laptops, the Macintosh PowerBook 100, weighed more than five pounds when it was released in 1991 while the lightest laptop currently on the market is less than

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two. Over the years, due to technological advancement and design upgrades, we've begun to use fewer cables and cords. In fact, the latest Apple iPhones don't even come with an adapter. So why are we generating more and more e-waste than ever before?[1]

As the global market of electrical and electronic equipment (EEE) continues to grow rampantly, more and more old devices are being replaced with new ones. The rapid replacement of these old devices has led to an increase in the waste of electrical and electronic equipment (WEEE) or alternatively, e-waste. E-waste is a broad term encompassing various types of discarded or end-of-life electrical and electronic equipment, including household appliances, office communication devices, consumer electronics, lighting equipment, electric tools, toys, and recreational items powered by electricity. Increasing amounts of e-waste are also generated due to the widespread application of concepts such as 'smart home' or 'smart cities'. Electronics become e-waste once they have been discarded by their owner as waste without the intent of reuse. Each product has different material content, is disposed of and recycled in different ways, and may be harmful to the environment and humans if improperly managed.[2]

According to Houlin Zhao, Secretary-General of the International Telecommunication Union (ITU), e-waste management is an urgent issue in today's digitally dependent world, where the use of electronic devices is increasing more than ever. The ITU, the UN University (UNU), and the International Solid Waste Association (ISWA) released a Global E-Waste Monitor 2017 which highlights increasing levels of e-waste and its treatment and disposal through burning or at dumpsites.[3] The improper disposal and management of e-waste can have severe environmental and health consequences. Many electronic devices contain hazardous materials such as lead, mercury, cadmium, and brominated flame retardants. When e-waste is dumped in landfills or incinerated, these toxic substances can leach into the soil and groundwater, contaminating the environment and posing risks to human health.

The burning of e-waste releases harmful chemicals and heavy metals into the atmosphere, contributing to air pollution and respiratory problems for nearby communities. Workers involved in informal e-waste recycling, especially in developing countries, are often exposed to dangerous substances without adequate protection, leading to serious health issues, including respiratory and neurological disorders.

The following part of this paper sets out the e-waste situation in various parts of the globe and the different laws in force to deal with the issue of e-waste in those countries.

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[1] Jeff Turrentine, 'At 59 Million Tons, Our E-waste Problem Is Getting Out of Control' (*NRDC*, 2020) <https://www.nrdc.org/stories/59-million-tons-our-e-waste-problem-getting-out-control>.

[2] 'Electronic Waste (e-Waste)' (*Gartner*) <https://www.gartner.com/en/information-technology/glossary/electronic-e-waste>.

[3] 'Electronic Waste Poses "Growing Risk" to Environment, Human Health, UN Report Warns' (*United Nations*, 2017) <https://news.un.org/en/story/2017/12/639312>.

2. E-waste in Malaysia

In Malaysia, e-waste is a fast-growing solid waste category. In 2021, approximately 2,459 tonnes of e-waste was collected.[4] The e-waste landscape in Malaysia is still manageable in the sense that there are no overflowing open-air, large-scale e-waste landfills where workers scavenge around for valuable metals. However, although the situation in Malaysia is not as severe as that in India or China (yet), the issue should be paid attention to due to the increasing use of electronics among Malaysians. According to a recent study, revenue in the consumer electronics market is projected to reach US$2,144.00 million in 2023.[5] This would invariably lead to more electronics being disposed of, increasing the amount of e-waste in the country. Malaysia should learn from other countries and be better prepared to handle the incoming wave of e-waste in the country in the near future.

3. E-waste Regulations in Malaysia

Laws and regulations will play a pivotal role in ensuring that Malaysia can properly handle and manage its e-waste in a manner that is not detrimental to the environment, as well as the communities involved. E-waste in Malaysia is governed under the Environmental Quality (Scheduled Wastes) Regulations 2005. Particularly, e-waste is categorised as Scheduled Wastes under the Code SW110, First Schedule of the 2005 Regulations. Generally, e-waste is divided into two types, according to its generation sources, i.e. e-waste generated from the industrial sector and household e-waste. Wastes under code SW110 are defined as waste from electrical and electronic assemblies containing components such as accumulators, mercury switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenyl-capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl. In Malaysia, only licensed facilities are authorised to treat e-waste. In this regard, the Department of Environment (DOE) has licensed 35 companies to treat and/or manage e-waste and an additional 121 collection centres to gather the said e-waste.

Essentially, industries generating electronic waste (e-waste) are required to report their e-waste generation and disposal through the online portal eSWIS (Electronic Scheduled Waste Information System). However, these guidelines apply only to industries and do not cover household e-waste. This leaves household e-waste unregulated, meaning people tend to throw away their old phone chargers or batteries directly into the bin together with their scraps of food and torn papers. To date, there are no well-defined regulatory guidelines for managing household e-waste, leading to challenges in monitoring and regulating it. Nevertheless, The Environmental Quality (Household Scheduled Waste) Regulation 2005 allows certain informal parties to offer monetary incentives to the public in exchange for

[4] Saman Ilankoon, 'Where Does Your Household E-Waste End up?' *New Straits Times* (16 March 2023) <https://www.nst.com.my/opinion/columnists/2023/03/889610/where-does-your-household-e-waste-end>.

[5] 'Consumer Electronics—Malaysia' (*Statista*) <https://www.statista.com/outlook/emo/electronics/consumer-electronics/malaysia?currency=usd>.

their e-waste. This 2005 Regulation also prohibits stakeholders from selling their e-waste to non-DOE authorised parties.

In 2015, the Malaysian Communications and Multimedia Commission (MCMC), along with the Malaysian Technical and Standards Forum Bhd and other stakeholders initiated the 'Mobile E-Waste: Old Phone, New Life' campaign. Collection boxes were placed near telecommunication companies, schools, universities, shops, and offices to collect small electronics, such as mobile phones, tablets, hard disks, iPods, MP3 players, and power banks, that were no longer being used. This program successfully collected over 2 tonnes of e-waste between June 2015 and March 2018. However, such programs are usually only carried out on an ad-hoc basis and not practised regularly enough to make it a habit amongst the community. Additionally, initiatives of this nature are mainly concentrated in urban areas of West Malaysia, neglecting the e-waste management in other regions.

In Malaysia, the lack of a proper e-waste management framework for household e-waste has also often led to e-waste being discarded with other household waste. This makes it harder to sort out the e-waste from other household waste, which sometimes leads to e-waste not being separated from other waste at all. This in turn would lead to the e-waste not being able to be recycled efficiently. To say that there has been no governmental directive to solve this issue would be erroneous as the DOE has come up with many good initiatives to encourage people to recycle e-waste. For instance, the DOE website contains a list of nearby registered collection centres and members of the public have the option to either self-deliver the waste to the centre or have it picked up from their homes. In a similar vein, the Malaysian Ministry of Environment and Water has also, since January 2021, implemented an e-waste collection day on every last Saturday of the month.

Generally, on paper, Malaysia seems to have many good initiatives and policies in place to tackle the growing problem of e-waste. However, most Malaysians are not even aware that these policies exist. Some may think it is not a problem in our country because the scene is not as bad as that in other nations around the globe, but if we wait until our children start scrapping off heavy metals from motherboards with their bare hands to pay more attention to the issue, it would definitely be too late. Additionally, the lack of data and reporting on the issue of e-waste in Malaysia makes it hard to determine if the programs carried out by the various government bodies are effective or if they are mere 'paper laws'.

4. E-Waste Laws and Enforcement Around the Globe

Approximately 78 countries around the world have some variation of a policy, legislation, or regulation in place to govern e-waste. This would mean that about 71% of the world's population is currently covered. Interestingly, this is an increase of 5% from 66% in 2017. Although these rates look promising, they can be misleading as they give the impression that the management of e-waste is mostly well-regulated and under control. The converse is true. In many countries, policies are not legally binding and compliance with Regulations is sometimes only 'encouraged'. Most stakeholders get away with non-compliance since most

of the penalties prescribed are not strictly enforced. To further illustrate, across Africa and Asia, for example, 19 countries have legally binding legislation on e-waste, 5 countries with an e-waste policy but non-legally binding legislation, and 31 countries with policy in development.[6] The international trade of e-waste has become a significant concern.

Developed countries often export their e-waste to developing countries with lax regulations, where it is dismantled and recycled in hazardous conditions. This practice not only exacerbates the e-waste problem in developing nations but also puts the health and well-being of workers at risk. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was introduced as an attempt to regulate the international movement of hazardous wastes, including e-waste. However, challenges persist in enforcing the Convention and preventing the illegal trade of e-waste. Hence, the issue of e-waste needs to be tackled not only from a country-specific perspective but it should also be viewed as an overall global issue.

4.1 India

According to the Global E-waste Monitor 2020 report, the world generated a staggering 53.6 million metric tons of electronic waste (e-waste) in 2019. Among the contributors to this issue, India stood out with its production of 3.2 million metric tons of e-waste during the same year. Unfortunately, a significant portion of this e-waste ended up being dumped for unregulated dismantling and recycling in a specific area called Seelampur, where proper regulations and oversight are lacking. India produces one of the most e-waste in the world but recycles very little of it. In this area, pickers sift through the scrap and sort out circuit boards, and capacitors. Most of these compound materials are submerged in chemical solutions or burned to retrieve small quantities of gold, copper, and other metals. This acid bath exposes approximately 50,000 workers to toxins. To make matters worse, most of these workers comprise children, who earn a living by dismantling, extracting, and recycling e-waste.[7]

The Indian Government acknowledges the significance of recycling and has authorised a total of 472 dismantlers/recyclers with a combined processing capacity of over 14.3 lakh tonnes (LT) for electronic waste (e-waste) recycling. However, it has been observed that a majority of these authorised recyclers have not utilised even 50% of their licensed capacity in recent years. From 2019 to 2020, India generated approximately 10.1 lakh tonnes (LT) of e-waste. However, out of this significant amount, only 22% was actually processed through proper recycling channels.[8] This indicates that a substantial portion of e-waste is not being

[6] 'E-Waste Legislative Framework Map' (GSMA) <https://www.gsma.com/mobilefordevelopment/cleantech/e-waste/>.

[7] Adil Bhat, 'India: E-Waste Provides Poor Children a Dangerous Living' *DW* (2 September 2023) <https://www.dw.com/en/india-electronic-waste-provides-poor-children-a-dangerous-living/a-64656699>.

[8] Vishwa Mohan, 'Why India Needs to Ramp up E-waste Collection Now' *The Times of India* (3 December 2022) <https://timesofindia.indiatimes.com/india/why-india-needs-to-ramp-up-e-waste-collection-now/articleshow/95953025.cms>.

adequately managed and recycled, which can lead to environmental pollution and other potential hazards.

Efforts need to be made to encourage and ensure the efficient utilisation of the licensed capacity among recyclers to handle the growing e-waste problem responsibly. Increased e-waste processing would not only help in resource recovery but also mitigate the adverse environmental and health impacts associated with the improper disposal of electronic waste.

Various ministries have also taken steps to formalise the e-waste recycling sector through E-waste (Management) Rules, 2016, and the amended Scheme for Promotion of Manufacturing of Electronic Components and Semiconductors (SPECS). The scheme provides a financial incentive of 25% on e-waste collection. Under the 2016 rules, the principle of extended producer responsibility (EP) has been implemented for e-waste management. Producers have to collect targeted quantities of e-waste that are processed by authorised dismantlers and recyclers per Central Pollution Control Board (CPCB) guidelines. As India produces a considerable amount of EEE, proper implementation and adherence to these rules would be a good way to procure secondary raw materials in a cost-effective and environment-friendly manner.

However, it is yet to be seen how these Regulations and guidelines will help places like Seelampur recover from the changes brought about by years of harmful e-waste accumulation. Even though the e-waste situation in India cannot be remedied by merely creating new laws and rules, it is a step in the right direction. The next big hurdle that the government and other relevant stakeholders should look to overcome is the issue of implementation and ensuring compliance.

4.2 China

As the largest exporter of electrical and electronic equipment and importer of e-waste around the world, China plays a crucial part in the global life cycle of electronics. Indeed, the digital economy plays a significant role in China's economic landscape, as highlighted by the China Academy of Information and Communications Technology (CAICT), a government-affiliated think tank, which reports that nearly 40% of China's Gross Domestic Product (GDP) comes from the digital sector.[9] Given China's prominent role as a global manufacturing hub for electronics, it is reasonable to assume that the accumulation of e-waste in the country is substantial compared to many other nations. The production of vast quantities of electronic devices and components in China, coupled with the fast pace of technological advancements and consumer demand, contributes to a substantial generation of e-waste within the country.

Thus, it does not come as a surprise that the world's largest electronic waste site is located in Guiyu in the Guangdong Province. The traditionally rice-growing community at

[9] Tianlei Huang and Nicholas R Lardy, 'China's Tech Crackdown Affects Only a Small Share of Its Digital Economy and Total GDP' (*PIIE*, 20 October 2021) <https://www.piie.com/research/piie-charts/chinas-tech-crackdown-affects-only-small-share-its-digital-economy-and-total>.

Guiyu has transformed into an intensive e-waste recycling centre since 1995. A significant number of individual workshops, approximately 75% of them, are engaged in the business of dismantling or processing electronic waste (e-waste). This industry has led to the employment of nearly 100,000 migrant labourers in Guiyu.[10] However, there has been a disturbing lack of consideration for health and environmental protection in the e-waste recycling practices in Guiyu. The operations carried out in the area often disregard proper safety measures and environmental regulations, leading to serious concerns for the health and well-being of the workers and the surrounding environment.

Migrant labourers working in these workshops are exposed to hazardous substances and materials found in electronic devices, such as heavy metals and toxic chemicals. The improper handling of e-waste results in the release of harmful pollutants into the air, soil, and water, causing significant environmental degradation and potential health risks for the local population. Along the once rich and thriving rivers and rice fields, now stand at least three large-scale e-waste open-burning sites that emit dangerous gasses and pollute the surrounding soil.

The Chinese government has been aware of the environmental issues associated with e-waste for a considerable period and has implemented various environmental laws, regulations, standards, technical guidance, and norms concerning electronic product production and e-waste management. While there are several general environmental laws applicable to e-waste management, such as the General Environmental Law, the Clean Production Promotion Law, and the Solid Waste Pollution Control Law, they were not specifically targeted at e-waste management.[11]

To address this gap, China introduced several legislation specifically aimed at e-waste management between the years 2000 and 2011. These laws were formulated to provide more focused and comprehensive guidelines for handling the growing challenges of e-waste and to ensure better protection of the environment and public health.

By enacting more specific legislation, the Chinese government aimed to enhance the management and disposal of e-waste, encourage recycling and resource recovery, and curb the environmental and health risks associated with improper handling of electronic waste. The focus on dedicated e-waste management laws represents a step forward in addressing the increasing concerns related to e-waste in the country and reflects a commitment to more sustainable practices in the electronics industry.

An example of such a specific policy is the Technical Policy for the Prevention of Pollution from Waste Electrical and Electronic Equipment which was effective from 27 April 2006 and aims to reduce the overall volume of e-waste, to increase the reutilisation rate, and to increase standards for WEEE recycling. It sets forth the overall guiding principles of

[10] MH Wong and others, 'Export of Toxic Chemicals: A Review of the Case of Uncontrolled Electronic-Waste Recycling' (2007) 149(2) Environmental Pollution 131 <https://doi.org/10.1016/j.envpol.2007.01.044>.

[11] Jinglei Yu and others, 'Managing E-waste in China: Policies, Pilot Projects and Alternative Approaches' (2010) 54(11) Resources, Conservation and Recycling 991 <https://doi.org/10.1016/j.resconrec.2010.02.006 >.

'Reduce, Reuse and Recycling' (3R) and 'polluter pay (ie shared responsibility of producers, retailers, and consumers)', and stipulates the general provisions of eco-design and the information disclosure of products about any toxic substances contained, as well as provision for the environmentally sound collection, reuse, recycling and disposal of WEEE. It also lists the technologies and equipment for WEEE recycling and the associated national policies and standards that need to be encouraged and developed in the future.[12]

Another such regulation is the Regulation on Management of the Recycling and Disposal of Waste Electrical and Electronic Equipments which came into effect on 1 January 2011 It stipulates that e-waste should be collected through multiple channels and recycled intensively. A special fund should be set up, and producers and importers of electronic products shall perform their duty in contributing to the fund for e-waste recycling. After the ordinance comes into effect, the government of every province will be required to make a local plan for the recycling and disposal of e-waste. A standards and certification system for e-waste recycling and disposal enterprises should be established to ensure the safe processing of e-waste.[13]

However, many of these laws have clearly not achieved their intended goals as the recycling rate of e-waste in China has not seen a decline since 2011. In fact, a recent study has shown that China produces 10,129 kilotons of e-waste and only recycles 16% of it. A big factor that contributes to these numbers is also the increasing demand for electronics in today's post-COVID era, coupled with the fact that laws and regulations introduced are mostly ambiguous and do not impose strict penalties for non-compliance.

4.3 United Kingdom

In the fourth quarter of 2022, almost 111,400 of e-waste were collected in the United Kingdom.[14] Out of the e-waste generated, an estimated 40% is illegally exported to other countries,[15] where children work in e-waste dumpsites to sort out hazardous materials by hand.

Although the UK is one of the top producers of e-waste after China, its policies and legal framework regarding e-waste are much more refined and well-enforced. EEE is subject to regulation to decrease the quantity of WEEE that is either incinerated or disposed of in landfills. This reduction is accomplished by implementing different measures that promote the recovery, reuse, and recycling of products and their components. The Waste Electrical

[12] Huang and Nicholas (n 9).

[13] Yu and others (n 11).

[14] Bruna Alves, 'Quarterly Household WEEE Collected in the United Kingdom (UK) From 1st Quarter 2013 to 4th Quarter 2022' (*Statista*, 11 October 2023) <https://www.statista.com/statistics/517657/household-ewaste-united-kingdom-uk/>.

[15] Kai Malloy, 'UK on Track to Become Europe's Biggest E-waste Contributor' (*resource.co*, 21 October 2021) <https://resource.co/article/uk-track-become-europe-s-biggest-e-waste-contributor>.

and Electronic Equipment Regulations 2013 serves as the fundamental legislation in the UK legislation governing e-waste management.

The 2013 Regulations apply to all EEE sold in the UK which is covered by the scope of the Regulations. In considering whether the Regulations apply or not, the following three questions should be asked; firstly, is the item an EEE? To answer this, reference should be made to Part 1, Regulation 2 of the Regulations, where 'electrical and electronic equipment' is defined as equipment that is dependent on electric currents or electromagnetic fields to work properly and equipment for the generation, transfer, and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1,000 volts for alternating current and 1,500 volts for direct current. If an item is an EEE under the Regulations, the next question to ask is if the item falls into one of the ten categories listed in Schedule 1 of the Regulations. These ten categories are large household appliances, small household appliances, it and telecommunications equipment, consumer equipment and photovoltaic panels, lighting equipment, electrical and electronic tools, toys, leisure and sports equipment, medical devices, monitoring and control instruments, as well as automatic dispensers. The third and final threshold to determine whether or not the Regulations apply is to check if the item is specifically exempt under Regulation 7 or excluded in Regulation 8.[16] As long as an item falls within the ambit of the Regulations, it is usually to be disposed of and treated in an authorised treatment facility that has been granted the appropriate permit, licence, or exemption to do so by one of the relevant environmental agencies.

The 2013 Regulations are one of the most detailed laws dealing with e-waste as they specifically outline which forms of e-waste it covers and how they are to be dealt with. Other nations ought to take inspiration from the 2013 Regulations in their drafting of e-waste laws to make them as targeted as possible.

5. Suggestions to Overcome the E-waste Problem

With e-waste becoming more of a problem with the advancement of technology, the world needs to turn to ways to overcome the issue before it gets out of hand. E-waste is a global phenomenon, albeit its effects are felt more in some parts compared to others. This section of the paper puts forward three plausible suggestions for containing the e-waste problem, namely encouraging extended producer responsibility, ensuring compliance with laws, and investing in recycling infrastructure.

5.1 Encouraging Extended Producer Responsibility

One way to better manage e-waste is extended producer responsibility (EPR), also known as product stewardship. Under this approach, manufacturers are held accountable for the

[16] The Waste Electrical and Electronic Equipment Regulations [2013] OJ No L 197/38 <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02012L0019-20180704>.

entire life-cycle costs of electronic products, including disposal expenses, while promoting the adoption of environmentally friendly manufacturing processes and products. Implementing EPR involves forging partnerships between governments, businesses, and civil society to establish efficient systems that minimise waste and discourage the indiscriminate disposal of used goods. These stakeholders play crucial roles in shaping these systems to ensure products are handled responsibly beyond their usage phase.[17] The benefits of EPR are that products tend to be designed in a more eco-friendly manner, recycling rates increase considerably and the amount of waste in landfills is reduced. It is a good way to ensure that products are taken care of from their usage up to their disposal.

Over 20 states in the United States have already enacted laws or policies that mandate some form of extended producer responsibility (EPR) for electronic products. For example, the New York State Wireless Recycling Act stipulates that authorised retailers and service providers must be obligated to take part in take-back programs, thereby promoting increased recycling and reuse of e-waste. Similarly, Maine became the first U.S. state to implement an EPR-based household e-waste law. In Illinois, the Electronic Products Recycling & Reuse Act requires electronic manufacturers to participate in the management of discarded and unwanted electronic products from residential areas. Additionally, the Illinois Environmental Protection Agency (EPA) has compiled locations for e-waste collection sites, where residents can dispose of their unwanted electronic products without any charge. Moreover, the U.S. Environmental Protection Agency (EPA) has assembled a list of local programs and manufacturers/retailers that assist consumers in correctly donating or recycling e-waste.[18]

EPR has also been implemented in Malaysia by the DOE, wherein producers could either bear the e-waste disposal fees on their own or pay a certain amount for each product to ensure its proper disposal by another third party. Other than Malaysia, Taiwan, Japan, South Korea, Germany, and China have some form of law that encourages EPR.[19]

Although EPR is a concept that has been recognised and implemented by most governments, probably because one of the benefits of EPR is also that it saves governments money in dealing with the piling amounts of e-waste around the country, there should be stricter repercussions against manufacturers and products that do not comply with the same. Most of the policies and rules do not contain any form of penalty for producers who do not take responsibility for the waste generated from their products. With e-waste becoming an increasing problem in societies, it is perhaps time to take a stricter approach to ensure e-waste is properly disposed of.

[17] 'Helping Companies in China Reduce and Recycle 50% of E-waste by 2025, From Smartphones to Medical Machinery' (*World Economic Forum*, 1 July 2021) <https://www.weforum.org/impact/helping-chinese-companies-reduce-recycle-e-waste>.

[18] Tom Theis and Jonathan Tomkin (eds), 'Case Study: Electronic Waste and Extended Producer Responsibility' in *Sustainability: A Comprehensive Foundation* (2012) <https://courses.lumenlearning.com/suny-sustainability-a-comprehensive-foundation/chapter/case-study-electronic-waste-and-extended-producer-responsibility>.

[19] Department of Environment Water, 'Infographic: Steps to Reduce E-Waste Generation' <https://ewaste.doe.gov.my/index.php/infographic>.

5.2 Ensuring Compliance With Laws

As discussed above, most countries already have some form of legislation in place to manage e-waste. There is also in existence the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal which was adopted in 1989 and came into force in 1992. It is the most comprehensive global environmental agreement on hazardous wastes and other wastes. However, the Convention only has 53 signatories,[20] and even countries that have ratified it have not taken active steps to formulate legislation in line with the Convention.

Existing laws like the Environmental Quality (Scheduled Wastes) Regulations 2005 in Malaysia and the E-waste (Management) Rules 2016 in India, as well as the Technical Policy for the Prevention of Pollution from Waste Electrical and Electronic Equipment 2006 in China, are all adequate laws but problems arise when they are not implemented as intended. Most times, these laws are implemented and then forgotten because they do not involve matters like the economy or cost of living. Lack of political will and prioritisation has left many laws related to e-waste mere words on paper. The enforcement of e-waste regulations can require substantial resources and investment, which may not always align with the short-term political agendas of governing bodies. Politicians may prioritise other pressing issues that garner more immediate public attention or have a direct impact on the economy. As a result, environmental initiatives, including e-waste management, might take a backseat in government policies and manifestos. Several other factors contribute to the difficulties in fully implementing effective e-waste management practices, the most prominent of them being the lack of public awareness. The success of e-waste management largely depends on public awareness and participation. Many individuals are unaware of the environmental impacts of improper e-waste disposal or the available recycling options. Consequently, they may discard electronic devices with general waste, leading to the loss of valuable resources and increasing the burden on landfills.[21]

5.3 Investing in Recycling Infrastructure

In 2021, it is estimated that humans discarded approximately 57.4 million tonnes of electronic waste, which outweighs the Great Wall of China, the world's heaviest human construction. Worldwide, only 17.4% of this waste is properly recycled.[22] This poses problems not only from the financial standpoint but also from the ecological perspective. Materials found in e-waste, namely copper, rare earths, and cobalt have the potential to be

[20] United Nations, 'Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal' (1989) <https://www.basel.int/Countries/StautsofRatifications/PartiesSignatories/tabid/4499/Default.aspx>.

[21] Abdulaziz I Almulhim, 'Household's Awareness and Participation in Sustainable Electronic Waste Management Practices in Saudi Arabia' (2022) 13(4) Ain Shams Engineering Journal 101729 <https://doi.org/10.1016/j.asej.2022.101729>.

[22] Olivia Rosane, 'This Year's e-Waste to Outweigh Great Wall of China' (*World Economic Forum*, 18 October 2021) <https://www.weforum.org/agenda/2021/10/2021-years-e-waste-outweigh-great-wall-of-china/>.

recycled and reused for several other productions. However, due to the lack of proper recycling infrastructure in most countries, this process has become a dangerous and counter-productive one. The techniques ordinarily used in recycling e-waste are often primitive, without the appropriate facilities to safeguard environmental and human health. For instance, to reduce costs, family workshops in informal recycling centres in China usually disassemble e-waste in the fastest and most direct way possible, such as stripping of metals in open acid baths, removal of electronic components from printed circuit boards by heating over a grill and recovering metals by burning cables and parts.[23] More proactive steps need to be taken by stakeholders in collaboration with national governments to ensure a proper recycling system is in place. As an example, in 2019, the Nigerian government, the Global Environment Facility (GEF), and UN Environment launched a new $15 million initiative to turn the tide on e-waste in Nigeria. This new initiative, funded by a small fee included in the sale of electronics, is aimed at transforming Nigeria's hazardous informal recycling sector into a formally legislated system.[24]

Although the e-waste disposal situation is not as severe in some countries as compared to others, preventive steps need to be taken by all countries to ensure that e-waste does not further harm Mother Nature and its inhabitants.

6. Conclusion

Over the years, e-waste has become an increasingly worrying problem around the globe. While there has been considerable progress in terms of e-waste regulations and laws in most countries, there is still much to be done. Encouraging extended producer responsibility, establishing comprehensive legal frameworks, and investing in recycling infrastructure are crucial steps toward achieving sustainable e-waste management worldwide. It is essential for governments, industries, and individuals to collaborate in finding innovative and environmentally friendly solutions to mitigate the harmful impact of e-waste on our planet.

The amount of e-waste is bound to rapidly increase over the years as new electronic components are introduced into more aspects of our lives, from our handphones to our 'smart homes'. The diminishing supply of finite resources which are used in the production of these technologies necessitates improved strategies to increase reuse, maximise the return of EEE, and improve component and material recovery. This would require cooperation and collaboration between various parties to initiate a systemic change such that products remain in use for optimum lifetimes and recovery and recycling are adequately supported at the end of their lives. The introduction of new legislation alone is not enough and it will take each and every member of society to help effectively deal with e-waste.[25]

[23] Yu and others (n 11).

[24] 'Recycling E-waste in Nigeria Protects Planet and Creates Safe Jobs' (*World Economic Forum*, 27 June 2019) <https://www.weforum.org/impact/recycling-e-waste-in-nigeria/>.

[25] Christine Cole and others, 'An Assessment of Achievements of the WEEE Directive in Promoting Movement up the Waste Hierarchy: Experiences in the UK' (2019) 87(15) Waste Management 417 <https://doi.org/10.1016/j.wasman.2019.01.046>.

With the increasing amount of e-waste generated every year, one of the pivotal things to do would be to increase public awareness of the issue so that people realise it is indeed a problem that will affect them. Governments, NGOs, and corporations should collaborate to develop educational campaigns to inform the public about proper e-waste disposal, recycling options, and the importance of responsible consumption. Additionally, schools and universities can play a vital role in educating the younger generation about e-waste and its environmental implications. Integrating e-waste management and sustainability into existing education systems can cultivate environmental consciousness from an early age.

To sum it up, governments, industries, and individuals must work together to create a more circular economy for electronic products, where waste is minimised, resources are conserved, and the health of our planet and its inhabitants is safeguarded. By embracing sustainable practices and responsible consumption, we can pave the way towards a cleaner and greener future for generations to come.

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