

International Institute of Communication

Future Leaders Competition 2024

Breaking down Barriers to Sustainability: A Review from E-Waste Recycling Management Perspective

12 August 2024

Abstract

The rapid advancements in technology have improved efficiency and connectivity but have also led to a surge in electronic waste (e-waste), causing significant sustainability challenges. This essay reviews the worsening global e-waste crisis, examining the factors contributing to its growth, including rapid technological innovation, shortened product lifecycles, and inadequate recycling infrastructure. It highlights the environmental and health hazards posed by improperly managed e-waste and emphasizes the need for sustainable solutions, such as Extended Producer Responsibility (EPR), circular economy practices, and technological innovations like blockchain. A collaborative approach among governments, industry, and public communities is essential to address these challenges and ensure a sustainable future.”

The ever-growing technological innovation and advancements have significantly improved our daily lives by making information more accessible and faster communication, which subsequently reduces the need to travel from one place to another. Moreover, countless tasks have become more efficient with the integration of digital technologies that streamline processes, reduce manual labour, and enhance accuracy in various sectors. Much of the world is currently in the process of technology transformation towards digitalisation which has profoundly changed the way we do our work, live, learn, socialize, and do business¹. However, the rapid progress of technological advancement mainly in the production of new upgraded technology electronic devices and equipment has triggered significant challenges, particularly in the form of electronic waste or e-waste².

E-waste is regarded as discarded and dysfunctional electronic devices such as smartphones, laptops, computers, smart televisions, etc. have become one of the fastest-growing waste streams globally³. According to the Global E-waste Monitor 2024 Report⁴, the world generated a staggering 62 billion kilograms of e-waste in 2022, which translates to an average of 7.8 kilograms per person per year. This indicates such an alarming increase of over 80% compared to the 34 billion kilograms of e-waste recorded in 2010. If the current trends persist, the amount of e-waste is projected to increase to 82 billion kilograms by 2030. Notably, the surge in e-waste is significantly overtaking the global capacity for its formal collection and recycling, with the growth rate of waste generation nearly five times higher than that of proper recycling infrastructure. A significant portion of this e-waste consists of small IT and telecommunication equipment, including computers, laptops, mobile phones, and other relevant networking devices contributing to 4.9 billion kilograms of waste as well as screens and monitors contributing to 5.9 billion kilograms of waste which are rapidly discarded due to technological advancements and shorter product lifecycles.

The surge of e-waste can be attributed to several factors, primarily linked to the technological rapid innovation progress that has powered our modern digital age. The evolution of devices such as smartphones, laptops, computers, telecommunication gadgets, and other smart home appliances, coupled with high accessibility of internet connectivity, has led to an exponential increase in the usage of technology and telecommunication devices. These devices usually pose short lifecycles, exacerbated by industry's push for constant innovation which results in regular technology upgrades and disruptions. On top of that, repair options are limited for outdated devices, leading consumers to discard the obsolete devices rather than trying to repair them. This situation is further accelerated by inadequate e-waste management infrastructure, mainly in low and lower-middle income countries, where informal recycling activities dominate, affecting environmental contamination and health hazards.

¹ Cornelis P. Baldé, Ruediger Kuehr, Tales Yamamoto, Rosie McDonald, Elena D'Angelo, Shahana Althaf, Garam Bel, Otmar Deubzer, Elena Fernandez-Cubillo, Vanessa Forti, Vanessa Gray, Sunil Herat, Shunichi Honda, Giulia Iattoni, Deepali S. Khatriwal, Vittoria Luda di Cortemiglia, Yuliya Lobuntsova, Innocent Nnorom, Noémie Pralat, Michelle Wagner (2024). International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR). 2024. Global E-waste Monitor 2024. Geneva/Bonn, Page 10.

² Department of Environment, Ministry of Environment and Water, Malaysia
<https://ewaste.doe.gov.my/index.php/what-is-e-waste/>

³ [https://www.who.int/news-room/fact-sheets/detail/electronic-waste-\(e-waste\)](https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste))

⁴ Ibid, Page 26 – 27

The implications of inadequate e-waste management can severely impact both environmental and human health as well as well-being. The World Health Organization (WHO) considers e-waste as hazardous waste as it contains toxic materials and can produce toxic chemicals when treated inappropriately. Most of the toxic materials are known or suspected to cause harm to human health and several materials are included in the ten (10) chemicals of public health concern, including dioxin, lead, and mercury⁵. Poorly treated e-waste will cause serious health issues since it contains hazardous chemicals that will contaminate air, water, and soil, and highly likely will put people's health at risk. For instance, improper disposal and recycling methods such as open burning and acid baths used in informal recycling, will lead to the release of toxic fumes and pollutants into the air, contributing to air pollution and respiratory diseases. The sheer scale of e-waste generation, coupled with the challenges of safe disposal, underlines the urgency of addressing this growing issue.

In addressing the intensification of the e-waste crisis, the global community has recognised the importance of integrating sustainable practices into all aspects of development. Pursuing sustainability has become a global agenda in addressing environmental challenges, improving quality of life, and ensuring the well-being of all beings on Earth. The sustainability agenda begins with making a commitment to incorporating economic, environmental, technological, social, and ethical factors into every organisation's strategic direction. The United Nations Sustainable Development Goals (SDG)⁶, particularly Goal 11, which focuses on sustainable cities and communities and Goal 12 focuses on responsible consumption and production, emphasising the need for adequate and sustainable management of e-waste. The SDG also underscores the importance of reducing waste generation via promoting a circular economy through prevention, reduction, recycling, and reuse⁷ that aims to minimise the environmental impact of e-waste.

A significant aspect of the global sustainability agenda is the evolution of green and digital transformation which is widely known as twin transition. These dual forces seek to address environmental sustainability and digital transformation simultaneously, recognising that both are crucial for the future generation. However, achieving these twin transitions comes with significant challenges, mainly from the e-waste management perspective. The rapid development of digital transformation has eventually led to an increase in electronic consumption which subsequently has accumulated more e-waste. Therefore, balancing the benefits of digital transformation with the need for sustainable e-waste management requires thorough planning, collaboration, and concerted effort from various stakeholders that include industry players, relevant authorities, the Government, and public communities.

Through effective management of twin transition will be able to solve the e-waste crisis and challenges. Digital technologies can help to improve the waste management process by enabling better tracking and monitoring, collection, and recycling of obsolete electronic devices and equipment via the leveraging of blockchain technology. The blockchain technology could be used to create a transparent and traceable e-waste supply chain,

⁵ [https://www.who.int/news-room/fact-sheets/detail/electronic-waste-\(e-waste\)](https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste))

⁶ The 17 Goals, Sustainable Development Goals. <https://sdgs.un.org/goals>

⁷ Chapter 2: E-waste and Its Relation to the Sustainable Development Goals, Global E-waste Monitor 2017 Report, <https://www.itu.int/en/ITU-D/Environment/Pages/Toolbox/Global-E-waste-Monitor-2017.aspx#FullReport>

ensuring the discarded devices are properly recycled and hazardous materials are safely disposed of. In addition, advancement in materials innovation towards green technologies may lead to the development of recyclable materials for electronic devices or equipment, subsequently reducing the environmental footprint of digital devices.

As much as the industry players are actively adopting innovative technology via the production of new devices and equipment, they are also playing an important role in addressing the e-waste crisis, given its significant influence on consumer behaviour and technology consumption trends. The industry player is encouraged to adopt a proactive approach in ensuring future sustainability in managing e-waste such as focusing on both reducing the environmental impact of their product and promoting responsible consumption. One alternative solution is the implementation of product stewardship also known as Extended Producer Responsibility (EPR) the term that is often used interchangeably to describe long-term solutions in managing e-waste via shifting of responsibility for collection, transportation, and management of products away from local governments to the industry player or manufacturer⁸ – taking responsibility for managing the whole product life cycle which covers from the product design until product disposal. This is where the industry player or manufacturer can adopt the circular economy model by designing devices that are easier to repair, upgrade, recycle, and reuse whereby it is eventually will expand their lifecycle and minimise the e-waste volume. For instance, companies like Apple and Samsung have introduced recycling programs that allow consumers to return their old devices for recycling or refurbishment, reducing the need for new raw materials and minimizing waste.

Case Study 1: The 3G Sunset and Its Implications on Electronic Waste in Malaysia

The digital age has ushered in an era of rapid technological advancement, marked by the constant obsolescence of electronic devices. A recent example of this phenomenon is the recent 3G sunset implemented by Malaysia. The gradual retirement of 3G networks was completed by the end of 2021⁹. While this transition to more advanced networks promises improved connectivity and data speeds, it also carries significant implications for electronic waste.

The 3G sunset, essentially the decommissioning of 3G mobile networks, necessitates the replacement of older devices that rely on this technology. This surge in device replacement is anticipated to contribute substantially to the growing electronic waste problem. Mobile phones, once considered cutting-edge technology, have become commonplace, with users often opting for newer models with upgraded features. The discontinuation of 3G services accelerates this cycle of obsolescence, as older devices become functionally redundant.

The environmental impact of this trend is far-reaching whereby e-waste is a complex mixture of hazardous substances, including heavy metals such as lead, mercury, cadmium, and chromium. Improper disposal of e-waste can lead to soil and water contamination, posing risks to human health and ecosystems. As the volume of e-waste increases due to the 3G sunset, the potential for environmental damage also grows proportionally.

⁸ Northwest Product Stewardship Council. What is Product Stewardship?
<https://productstewardship.net/about/what-product-stewardship>

Moreover, the removal of raw materials required to manufacture new technology devices contributes to environmental degradation and resource depletion. Mining activities associated with the production of essential components, such as lithium for batteries, often involve harmful practices that have detrimental impacts on ecosystems and communities. The accelerated demand for new devices to replace obsolete 3G phones exacerbates this issue, perpetuating a cycle of resource consumption and waste generation.

Malaysia, like many other countries, is also struggling with the challenges of e-waste management. The Government has taken steps to address this issue through regulations and initiatives aimed at promoting responsible disposal and recycling. However, the influx of electronic waste generated by the 3G sunset poses a significant strain on existing infrastructure and recycling capabilities. The disposal of 3G technology equipment is under the responsibility of the relevant telecommunication service provider to manage the e-waste involved.

Note: Implementation of 3G Sunset is one of the initiatives under JENDELA Report⁹

Besides that, the communications industry can leverage its reach and influence to raise awareness about the importance of responsible e-waste management. Public campaigns and educational initiatives can encourage consumers to dispose of their electronic devices properly and to choose products that are designed with sustainability in mind. Collaborating with governments and non-governmental organizations (NGOs) to establish and promote e-waste collection centers can also help ensure that obsolete and discarded electronics are properly managed.

The role of industry players in managing e-waste is demonstrated via initiatives such as the Global E-Waste Statistics Partnership¹⁰, which brings together industry, government, and academic stakeholders to improve the collection, management, and recycling of e-waste. This collaborative effort shows the potential for the communications industry to contribute to global sustainability goals by mitigating the e-waste challenge.

Achieving the goals of sustainable e-waste management requires a collaborative effort among governments, investors, and public communities. Current policies and regulations play a critical role in shaping the approach to e-waste management, but their adequacy remains a subject of debate. Many countries have introduced and adopted e-waste management policies, often based on the Extended Producer Responsibility (EPR) principle, which holds manufacturers responsible for their end-to-end product lifecycle management.

However, the effectiveness of these policies varies from one another. In some regions, weak enforcement and a lack of infrastructure hinder the success of e-waste management programs. Additionally, the informal recycling sector, which handles a significant portion of e-waste in developing countries, often operates outside the regulatory framework, leading to

⁹ JENDELA Concluding Report, Phase 1

<https://myjendela.my/Sitejendela/media/Doc/JENDELA-Phase-1-Concluding-Report.pdf>

¹⁰ The Global E-Waste Statistics Partnership

<https://globalewaste.org/>

environmental and health risks. To ensure sustainability, it is crucial to strengthen existing regulations, enhance enforcement mechanisms, and provide support for the formalization of informal recycling practices.

The question of who should bear the cost of e-waste management is another critical issue. While the EPR principle puts responsibility on manufacturers, consumers, and governments also have roles to play. Consumers can contribute by choosing products with lower environmental impacts and by participating in recycling programs. Governments can support these efforts by providing incentives for sustainable product design and by investing in infrastructure for e-waste collection and recycling.

According to the Global E-waste Monitor 2024 Report¹¹, 81 out of 193 countries are analysed to either have a policy, regulation, or legislation concerning e-waste, representing 42% of the worldwide. Although there has been a steady increase in the number of countries adopting any legal instrument, policy, or regulation to regulate e-waste since 2014, the progress has shown a diminishing increase in 2019 with only 3 new countries introducing and implementing legal instrument, policy, and regulation that is relevant to e-waste. This indicates that there are remaining 112 countries have yet to introduce or adopt legal instruments, policies, and regulations related to e-waste. An example of an effective e-waste management policy can be seen in the European Union, which has implemented the Waste Electrical and Electronic Equipment (WEEE) Directive which aims to promote the reuse, recycling, and other forms of recovery of waste electrical and electronic equipment to reduce the quantity of such waste to be disposed of and to improve the environmental performance of the economic operators involved in the treatment of WEEE¹². This regulation requires member states to establish collection schemes where consumers can return their e-waste free of charge. The WEEE Directive also sets criteria and targets for the recovery, recycling, and reuse of e-waste, ensuring that valuable materials are recovered, and environmental impact is minimized. This comprehensive approach serves as a model for other regions looking to improve their e-waste management practices.

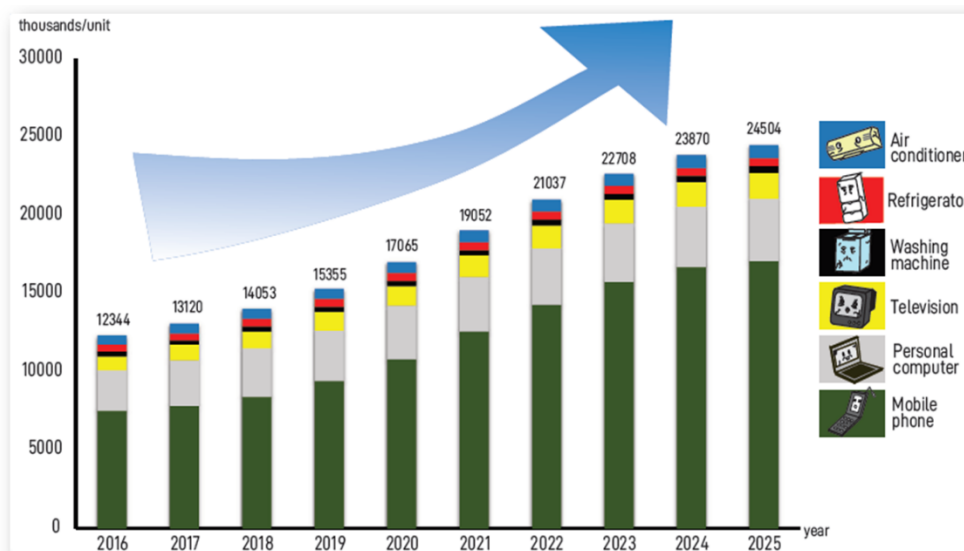
Ensuring consumer adoption of e-waste management practices is essential for the success of sustainability initiatives. This requires a combination of awareness-raising, incentives, and convenient recycling options. Consumers need to be informed about the environmental and health impacts of e-waste and encouraged to participate in recycling programs. Providing easy access to collection points and offering incentives, such as discounts on new products for returning old devices, can also help increase participation.

¹¹ Ibid, Page 36

¹² European Environment Agency. Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU <https://www.eea.europa.eu/policy-documents/waste-electrical-and-electronic-equipment>

Case Study 2: E-Waste Management Program from Malaysia Context

The e-waste problem has been deteriorating globally, and Malaysia is no exception. Figure 1 shows the Department of Environment (DOE) study data in 2022 which estimates that Malaysia is anticipated to generate 24.5 million units of e-waste by 2025¹³.



Realising this gnawing concern, Malaysia has enforced several laws and regulations that are relevant to e-waste management such as Environmental Quality (Scheduled Wastes) Regulations 2005, the National Environmental Quality Act 2007¹⁴, and the Communication and Multimedia Act 1998. In addition to its laws and regulations, Malaysia via various stakeholders has taken a proactive measure to overcome this issue seriously. There are several overviews of e-waste management programs that the public and private sectors in Malaysia have conducted and are in progress.

a. KITAR Program by Malaysian Communications and Multimedia¹⁵

Malaysian Communications and Multimedia Commission (MCMC), the regulator of the telecommunication and multimedia industry launched the Mobile E-Waste: Old Phone, New Life program in 2015 to raise awareness about the environmental implications of improper e-waste disposal and to promote sustainable recycling management. After 7 years of successfully implementing the program, it was then restructured and rebranded to “KITAR: Peranti Lama, Nafas Baharu” in November 2022. The restructuring is driven by the new collaboration established with Shan Poornam Metals Sdn Bhd and Flash Malaysia Express Sdn Bhd to strengthen recycling operations, optimize e-waste logistics, streamline the collection process, and expansion of mobile e-waste collection centers to National

¹³ E-waste Management in Malaysia. What is E-waste? Department of Environment, Ministry of Environment and Water

<https://ewaste.doe.gov.my/index.php/what-is-e-waste/>

¹⁴ E-waste Management in Malaysia. Legislation. Department of Environment, Ministry of Environment and Water

<https://ewaste.doe.gov.my/index.php/resources/acts-rules-regulations-and-order/>

¹⁵ MCMC Annual Report 2022.

https://www.mcmc.gov.my/skmmgovmy/media/General/Report/Laporan_Tahunan-2022.pdf

Information Dissemination centers (NADI) to increase the accessibility for the public to dispose of their e-waste responsibly. The program also transformed its Strategic Partners into Advocacy Partners and Drop Points to enhance its role in promoting recycling awareness and facilitating collections. Collaborations with major telecommunication companies have also been crucial in establishing a robust e-waste management infrastructure. The KITAR is MCMC's response to the ITU's Resolution 79, adopted at the World Telecommunication Standardization Assembly (WTSA 12), which encourages its Member States to take necessary actions to manage and control e-waste to reduce the risks posed by used telecommunication and ICT equipment¹⁶. To date, more than 140 collection boxes were strategically placed in selected NADI centers and KITAR partners' premises, with plans for further expansion to cover additional NADI centers and more Drop Point Partners' premises. By facilitating the proper handling and recycling of e-waste, KITAR not only helps to reduce the volume of electronic waste in landfills but also supports the recovery of valuable materials, contributing to sustainability efforts in Malaysia.

b. National Strategic Plan for Solid Waste Management¹⁷

The National Strategic Plan for Solid Waste Management which is developed by the Ministry of Housing and Local Government, includes specific provisions for e-waste management. This plan sets clear guidelines for the reduction, reuse, and recycling of electronic waste, recognizing the rapid increase in e-waste due to technological advancements and increased consumption. A key component of the plan is the development of an efficient e-waste collection and recycling infrastructure, ensuring that collected e-waste is processed using environmentally sound technologies. This includes the plan for the implementation of Extended Producer Responsibility (EPR) policies, which hold manufacturers accountable for the entire lifecycle of their electronic products, including end-of-life management¹⁸. By integrating these strategies with robust public awareness and education campaigns, the National Strategic Plan aims to foster a culture of sustainability and environmental responsibility among Malaysians, ultimately reducing the environmental footprint of e-waste and contributing to a circular economy where resources are continuously reused and recycled.

c. Pos Malaysia's E-Waste Program in Collaboration with ERTH¹⁹

The national postal and courier service provider, Pos Malaysia in collaboration with ERTH (Electronic Recycling Through Heroes), has launched a comprehensive e-waste recycling

¹⁶ About KITAR Program.

<https://kitar.mcmc.gov.my/about-kitar/>

¹⁷ Cornelis P. Baldé, Ruediger Kuehr, Tales Yamamoto, Rosie McDonald, Elena D'Angelo, Shahana Althaf, Garam Bel, Otmar Deubzer, Elena Fernandez-Cubillo, Vanessa Forti, Vanessa Gray, Sunil Herat, Shunichi Honda, Giulia Iattoni, Deepali S. Khetriwal, Vittoria Luda di Cortemiglia, Yuliya Lobuntsova, Innocent Nnorom, Noémie Pralat, Michelle Wagner (2024). International Telecommunication Union (ITU) and United Nations Institute for Training and Research (UNITAR). 2024. Global E-waste Monitor 2024. Geneva/Bonn, Page 83.

¹⁸ Circular Economy Blueprint for Solid Waste in Malaysia (2025-2035).

<https://online.anyflip.com/fujgi/rzme/mobile/index.html>

¹⁹ Partnership with ERTH to drive better e-waste management. Pos Malaysia Berhad

<https://www.pos.com.my/sustainability/pos-green/waste-management/pos-erth-partnership>

program to facilitate the responsible disposal of electronic waste across the country. This initiative allows individuals to drop off their e-waste, such as old phones, laptops, and other electronic devices, at designated Pos Malaysia outlets. ERTH then ensures these items are collected and transported to certified recycling centers, where they are processed in an environmentally friendly manner. The program not only aims to reduce the environmental impact of e-waste but also raises public awareness about the importance of proper e-waste management. By partnering with ERTH, Pos Malaysia leverages its extensive network and reach to promote sustainable practices and make e-waste recycling more accessible to the general public.

The escalating e-waste problem in Malaysia has called for a collaborative effort from both the public and private sectors to implement effective management programs. The various initiatives and programs determine Malaysia's strong commitment to curbing the e-waste challenge through legislative measures, public awareness campaigns, and partnerships with the private sector. However, there is still much work to be done to achieve a sustainable and circular economy. Continued efforts to promote responsible e-waste disposal, recycling, and education will be imperative in overcoming the environmental impact of electronic waste to safeguard a better future for Malaysia.

In conclusion, the challenge of e-waste management is complex and becoming more worrying that requires a comprehensive approach. Technological advancements, while beneficial in many ways, have contributed to a growing e-waste problem that poses substantial risks to human health and the environment. Addressing this challenge requires the collaboration of governments, industry, and public communities, with a focus on sustainable product design, effective regulation, adequate infrastructure, and responsible consumption. By breaking down the barriers to sustainability, we can ensure a healthier and more sustainable future for our future generations.