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The Role of Government Involvement in Addressing the Environmental Impact of the "Underrated Hazardous Waste"

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ABSTRACT (10PT)

The negligence of e-waste emits pollutants and poses environmental risks. The growing volume of e-waste is a concern, particularly in developing countries using unsafe practices to handle waste – including those transported from industrialized nations as a cheap alternative for disposal. The annual amount of e-waste generated worldwide is alarming, ranging from 44.7 to 50 million metric tons (Mt) per year, or 6.1 kg per inhabitant (kg/inch) – equating to 4,500 Eiffel Towers. E-waste management in Indonesia must improve in parallel with the periodic increase of the e-waste chain. Handling environmentally hazardous substances requires technical norms, public-private collaborations, and the government. Indonesian officials can be a significant catalyst for enlightening the misinformed population about the seriousness of e-waste. We conducted our research by thoroughly reviewing articles and journals about the state of e-waste in Indonesia and how the government may help raise awareness and deal with ethical disposal procedures. A study was conducted to identify the types and amounts of electrical and electronic equipment produced by DKI Jakarta inhabitants – as well as the education level of the respondents and the number of people living under one roof. The study reveals that a large percentage of the respondents (29%) obtained high school education, and that an average up to 52% of 3-4 people lives in one house. Within this one house, the e-waste produced in lighting-related products (4241 units) as well as washing machines (roughly 1597.24 Kg.n/year).

Introduction

Electronic equipment and devices that have ended their useful lives or lost value to their existing users are called "e-waste," or electronic garbage. If improperly disposed of or repurposed, e-waste emits toxins and poses a risk to the environment.The increase of e-waste is a growing issue, especially in developing nations where the material is carried as a less expensive disposal option, frequently using improper disposal methods. The uncontrolled generation and innovation of electrical and electronic equipment have multiplied the volume of waste electrical and electronic equipment (WEEE), also known as electronic waste or e-waste. (Cobbing 2008). Furthermore, According to the report by the Global E-waste Statistics Partnership, the annual amount of e-waste generated worldwide is alarming, with 44.7–50 million metric tons (Mt) per year or an equivalent of 6.1 kg per inhabitant (kg/inch) (2017). This amount is equal to 4,500 Eiffel Towers each year. The amount of e-waste is expected to rise to 52.2 Mt by 2021, or 6.8 kg per inhabitant (Dias et al., 2018; Alfakihuddin et al., 2022).

In recent years, there has been a growing public awareness of the environmental impact on our daily lives (Sosiawati et al., 2023; Sena et al., 2023). The demand for a more sustainable answer to our shopping patterns is growing more pressing. This trend is impacting consumer behavior-influencing industrial sectors, especially the electronics sector, where short product life cycles and rapidly advancing technology are leading to an increase in e-waste. Most e-waste is disposed of in landfills. However, the semi-recyclable nature of their material features led to the development of recovery systems for e-waste and waste management recycling and reuse.

Final electrical and electronic equipment (EEE), sometimes known as waste electrical and electronic equipment (WEEE) in the European Union, is a common abbreviation for e-waste. Computers, laptops, mobile phones, televisions, and refrigerators are just a few examples of electronics and electrical products that have reached the end of their useful life and are now considered electronic waste. (Sthiannopkao, 2012; Patsy et al., 2023). These ideas help us comprehend waste more broadly. The three most prevalent categories of waste produced are large appliances (washers, dryers, and refrigerators), I.T. equipment (individual laptops or computers), and household appliances (cell phones and T.V.s). In addition to these categories, e-waste can come from toys, medical equipment, and microwave ovens.

According to the previous research by Dino and Siti, the management of e-waste in DKI Jakarta is in its initial phases, and there are various obstacles to its maintenance. One method for e-waste management is to reduce the volume created. Technical standards, public-private partnerships, and government involvement are all required to address hazardous items in the e-waste chain. Electronic waste management is also highly supported by enforcement laws and regulatory sectors. Public engagement in e-waste management should be encouraged to reduce the impact of e-waste on the environment and public health (2016).

When these products are discarded or improperly recycled, the number of e-waste increases, if the product is discarded, the adverse effects on the life cycle of these products are usually unknown to the public. Another critical factor in the e-waste problem is the short life cycle of many electronic products. For example, a study published in Economics Research International found that many cell phones and laptops today have a useful life of fewer than two years. The growth of e-waste can also be traced to consumer desires and technology trends. Mobile phone and laptop models are released more frequently, usually with newer model chargers. As a result, the lifespan of electrical and electronic equipment is shortening, and e-waste is increasing.

The release of toxic chemicals such as lead, chromium, manganese, and polybrominated diphenyl ethers (PBDEs) from e-waste causes many environmental and health problems. A review published in The Lancet Global Health evaluated the relationship between these exposures and health outcomes. PBDEs have been associated with impaired thyroid function in e-waste demolition workers and adverse birth outcomes such as low birth weight and spontaneous abortion. Children exposed to lead from e-waste recycling were at increased risk of developing neurocognitive problems, and the presence of chromium, manganese, and nickel also affected lung function. However, when disposing of e-waste, it is known as e-waste related mixture (EWM), a highly toxic combination of chemicals usually removed by inhalation or contact with the ground. People are exposed to things. , even the consumption of contaminated food and water enters the environment.

EWM is especially dangerous because it can spread over long distances. It travels through atmospheric movement to spread to bodies of water and land, which affects soil through water runoff and contaminates aquatic ecosystems. When these chemicals are released into the environment, they may cause widespread environmental pollution and contaminate food sources. Persistent Organic Pollutants (POPs) found in electronic device components are substances such as flame retardants. They are organic chemical substances that can resist environmental degradation – and are intentionally produced for various industrial uses. These can infest waterways and contaminate the air – which pollutes most seafood. These substances increase the greenhouse effect and can contaminate food and dust particles.

A study from the Environmental Monitoring and Assessment discussed the inappropriate recycling of e-waste in India to observe the processes and specific components of electronic devices that pose a hazard to the environment. One discovery is the cathode ray tube used in a television; when this breaks or the yoke is removed, substances like lead and barium can saturate groundwater and release toxic phosphorus, polluting the environment. Another is that circuit boards must undergo a tedious procedure of desoldering and removing computer chips as it may pose occupational hazards of inhalation of tin, lead, brominated dioxins, and mercury. An Annals of Global Health research discovered that roughly 70% of e-waste is unreported or unknown. Vast recycling areas, like the ones in Accra, Ghana, are just one instance of recycling facilities located in low-income areas, causing minorities to be infinitely exposed to improper e-waste recycling. In said communities, women and children are a large percentage of people who engage in e-waste recycling as it is a source of income for them. However, their lack of knowledge of conducting the proper practice and absence of appropriate equipment unknowingly exposes them to these harmful pollutants. The exposure includes dangerous health effects like learning and memory impairment, thyroid, estrogen, endocrine changes, and neurotoxicity – from exposure to brominated flame retardants alone.

Along with shavings and gold-plated parts that are treated with a chemical strip using hydrochloric and nitric acids - these release hydrocarbons and brominated matter that may be ejected into rivers and banks. E-waste pollutes water as rain dissolves chemicals and runoff flow into bodies of water. Hence, besides posing a risk to human health, these substances can acidify rivers and release hydrocarbons into the atmosphere.

Mentioned above are all known hazards interconnected with handling e-waste and heightened due to the under-regulated procedures. This emphasizes the importance of implementing solid laws and regulations for the handling and disposal of e-waste in every country, particularly in developing countries. As it happens, developed countries often send their e-waste to underdeveloped areas to deal with. Approximately 75% of the 20-50 million tons of e-waste generated worldwide is sent to countries in Africa and Asia. About 8.7 million tons of e-waste are generated in the European Union alone, and up to 1.3 million tons of this waste are exported to these two continents. The legislation called The Basel Convention based on hazardous wastes, and the disposal of it to other countries was signed in 1989 – yet the United States is one of the handfuls of countries that have not signed, which means that the country legally transports these electronic devices to underdeveloped ones to deal with, despite the inadequate facilities which immensely affects the people and environment, like discussed earlier. Countries like the U.S. can do this because of their region's high labor costs and environmental laws, along with regulatory loopholes.

As the e-waste chain has increased from time to time, the e-waste management in Indonesia must also increase. Technical standards, public-private partnerships, and the government are necessary to handle hazardous materials to the environment. Hence, the involvement of government officials can be a massive catalyst for educating uninformed locals about the severity of e-waste. When the topic of e-waste is understood in mainstream media, regulations can be set more strictly and successfully.

Method

The study's goal was to collect data on household e-waste creation from researchers (mainly The Ministry of Research and Technology of Indonesia). Our research was done through a thorough review of papers and journals related to the e-waste circumstances in Indonesia and how the government can assist with raising awareness along with dealing with ethical practices to dispose of e-waste. The study will conduct direct interviews with residents to gather information on purchasing and discarding preferences for electrical and electronic devices. The survey mechanism was implemented from the United Nations Environment Programme E-waste assessment methodologies (Lwanga & Lemeshow, 1991). Additionally, the homeowners' tendencies for disposing of their e-waste were obtained via the questionnaire. The questionnaire's questions were designed to gather information about a range of variables, including the kind and quantity of electronic devices and how long they should be used and stored.

The study was carried out in DKI Jakarta. Each DKI Jakarta region has a random selection of households. Furthermore, the research implemented WHO methods to determine the number of households. In addition, estimating a population proportion with specific absolute precision will require a confidence level of 95% and an anticipated population proportion of 5% (Oguchi et al., 2008). As a result, the sample size required for the table to approximate the resident proportion with perfect certainty is about 80 for each location. Therefore, there were around 400 homes for this study's occupants. Once the types and amounts of electrical and electronic equipment held by DKI Jakarta inhabitants are known, any product's potential for e-waste creation may be assessed.

Moreover, a calculation of e-waste creation was done to determine the probable rate of e-waste generation in DKI Jakarta. The research also looks into and calculates the kind and characteristics of residents' electronic goods. The data, which includes the quantity of equipment, product weight, and lifespan, is required to calculate the rate of e-waste creation.

Result and Discussion

DKI Jakarta conducted research in five areas to collect data on possible e-waste generation by residents. Several categories of electronic equipment were surveyed, including large household equipment, small household items, lamps, telecommunication devices, consumer equipment, batteries, and other electronic equipment.

The graph depicted the amount of e-waste based on the type. Furthermore, the image indicates that the quantity of lighting was estimated to be 4241 units higher. The small amount of e-waste category, on the other hand, was significant. The graph is interesting because it shows the number of IT and telecommunication appliances, around 2300 units. It will demonstrate a significant contribution to the overall weight of e-waste.

The amount of e-waste generated by Jakarta households is shown in the table above. In addition, other forms of research equipment, including televisions, refrigerators, rice cookers, laptops, monitors, and mobile phones, are employed. Furthermore, the analysis showed that washing machines have the highest generation rate of roughly 1597.24 Kg.n/year. Furthermore, among responders, Battery 1.5V is one of the most popular sorts of electrical items. Furthermore, the outcome suggests that the inhabitant possesses a range of televisions. This product contributes roughly 743.185 Kg.n of garbage every year. According to Peralta and Fontanos [37] According to research on e-waste generation in the Philippines in 2010, approximately 445.300 refrigerators, 943,000 televisions, and 576.700 washing machines became obsolete. Furthermore, Qingbin Song et al., (2012) In a 2010 study of 100 Macau residences, 264 air conditioning systems, 154 desktop computers, and 56 laptop computers were detected.. [38]

DKI Jakarta statistics and statistical analysis from 2015 were utilized to forecast future population increase. Geometric approaches were also employed to estimate the population. [39].The survey was conducted on 400 residents, with an average household size of four persons, for a total of 1200 people whose e-waste generation will be estimated. The total amount of electronic garbage produced is 6208.141. As a result, people of DKI Jakarta generate around 5.173 kg of e-waste every year. Furthermore, the population in 2014 was roughly 10,075,310, according to BPS DKI Jakarta data. As a result, the following table shows the predicted rate of e-waste generation.

From our extensive literature review of previous studies, the results agree with our notion that government involvement can be a massive catalyst for educating uninformed locals about the severity of e-waste – and, therefore, successfully implementing regulations related to the practice of e-waste.

Conclusion

The growing amount of e-waste in Indonesia is due to several factors, including a lack of information, inaccurate data, and limited sources regarding e-waste and also the number of uses of electronic devices that the public can access, an inadequate knowledge in managing e-waste on small scale, and different perception between government institutions about e-waste regulations as well as management procedures. The management of e-waste in DKI Jakarta is in its early stages, and there are various obstacles to the management of e-waste in DKI Jakarta. One strategy for e-waste management is to lower the volume produced. To handle hazardous products in the e-waste stream, technical specifications, public-private partnerships, and government involvement are all required. Electronic waste management is also highly supported by enforcement laws and regulatory sectors. Public participation in e-waste management should be encouraged to reduce the impact of e-waste on the environment and public health. Further research on the full scientific viewpoint is required to acquire a more detailed scenario regarding the management of electrical and e-waste in DKI Jakarta. There are currently various programs sponsored by the government on a regional level to manage e-waste in Jakarta, Indonesia's capital city. However, most Indonesian provinces have yet to implement such programs, and the national government has yet to develop explicit legislation for the management of e-waste. An intelligent environment can be created by implementing an effective e-waste management system, enforcing clear electronic waste legislation, and educating the general public about the risks and detrimental effects of e-waste with the help of individuals, businesses, and the government.

References

Alfakihuddin, M. L. B., Budi, A. P., Kartika, D., & Trijayati, S. (2022). MENGELOLA SAMPAH PLASTIK DENGAN MENINGKATKAN KESADARAN MASYARAKAT TERHADAP PERILAKU DAUR ULANG. *Jurnal Inovasi Pendidikan dan Sains*, *3*(3), 119-123.

A. Terazono, S. Murakami, N. Abe, B. Inanc, Y. Moriguchi and S. Sakai, Current status and research on e-waste issues in Asia, J Mater Cycles Waste Manage. 8, pp. 1-12

B. K. Fishbein, End-of-life management of electronics abroad, Waste in the wireless world: the challenge of cell phones, INFORM Inc., New York, http://www.informinc.org

B. K. Gullett, W. P. Linak, A. Touati, S. J. Wasson, S. Gatica and C. J. King, Characterization of air emissions and residual ash from open burning of electronic wastes during simulated rudimentary recycling operations, J Mater Cycl Waste Manag

Cornelis P. Baldé, Vanessa Forti, Vanessa Gray, Ruediger Kuehr, and Paul Stegmann, The Global EWaste Monitor 2017: Quantities, Flows and Resources, United Nations University, International Telecommunication Union, and International Solid Waste Association, 2017.

C. Scheutz, H. Mosbaek and P. Kjeldsen, Attenuation of methane and volatile organic compounds in landfill soil covers, J Environ Qual. 33, pp. 61-71

Dias, P., Bernardes, A. M., & Huda, N. (2018, June 19). *Waste Electrical and Electronic Equipment (WEEE) management: An analysis on the Australian e-waste recycling scheme*. Journal of Cleaner Production. Retrieved October 20, 2022, from https://www.sciencedirect.com/science/article/abs/pii/S0959652618318110
E. Spalvins, B. Dubey and T. Townsend, Impact of electronic waste disposal on lead concentrations in landfill leachate, Environ Sci Technol. 42, pp. 7452-7454

J. Huisman and F. Magalini, Where are WEEE now?, Lessons from WEEE: Will EPR work for the US?, Proceedings of the 2007 IEEE International Symposium on Electronics & the Environment, Conference Record, pp. 149-154

Lwanga SK., and Lemeshow S., 1991, Sample size determination in health studies, World Health Organization, Geneva.(33)

M. Bertram, T. E. Graedel, H. Rechberger and S. Spatari, The contemporary European copper cycle: waste management subsystem, Ecol Econ. 42, pp. 43-57
M. Cobbing, Toxic Tech: Not in Our Backyard. Uncovering the Hidden Flows of e-waste. Report from Greenpeace International. http://www. greenpeace.org/raw/content/belgium/fr/press/reports/toxic-tech.pdf, Amsterdam, (2008).

Ministry of Environment, Japan, 2005, The E-waste Inventory Project in Malaysia. Available at: http://www.env.go.jp/en/recycle/asian_net/Project_N_Research/EwasteProject/06.pdf (Accessed 25 November 2014)

Oguchi, M., Kameya, T., Yagi, S., Urano, K., 2008.Product flow analysis of various consumer durables in Japan.Resour. Conserv.Recycl. 52, 463–480. (34) Qingbin Song, Zhishi Wang, Jinhui Li., 2012, Residents' behaviors, attitudes, and willingness to pay for recycling e-waste in Macau, Journal of Environmental Management 106 (2012) 8-16

Patsy, E., Alfakihuddin, M. L. B., Butar, N. A. B., & Nethania, P. (2023). CORPORATE ACTION ON PLASTIC POLLUTION (THE BODY SHOP CASE STUDY). *Jurnal Ekonomi*, *12*(02), 1350-1355.

R. Hischier, P. Wäger and J. Gauglhofer, Does WEEE Recycling make sense from an environmental perspective? The environmental impacts of the Swiss take-back and recycling systems for waste electrical and electronic equipment (WEEE), Environ Impact Assess Rev. 25, pp. 525-539

Rimantho, Dino & Nasution, Siti. (2016). The Current Status of E-waste Management Practices in DKI Jakarta. International Journal of Applied Environmental Sciences. 11. 1451-1468. Sthiannopkao S., Wong MH., Handling e-waste in developed and developing countries: Initiatives, practices, and consequences, Science of the Total Environment xxx (2012) xxx–xxx

Sena, B., Diawati, P., Alfakihuddin, M. L. B., Mavianti, M., & Sulistyani, T. (2023). Pengembangan Desa Berbasis Tujuan Pembangunan Berkelanjutan pada Desa Sindangmukti, Kecamatan Kutawaluya, Kabupaten Karawang. *Bubungan Tinggi: Jurnal Pengabdian Masyarakat*, *5*(2), 910-918.

Sosiawati, E. S. H., Alfakihuddin, M. L. B., Asni, A., & Jayaputra, T. (2023). Pelatihan Budi Daya Ikan Air Tawar pada Masyarakat Guna Mendukung Program Kampung Keren Kota Kediri. *Bubungan Tinggi: Jurnal Pengabdian Masyarakat*, *5*(1), 585-595.

Spalvins, B. Dubey and T. Townsend, Impact of electronic waste disposal on lead concentrations in landfill leachate, Environ Sci Technol. 42, pp. 7452-7458 United Nations (UN), 1971, Manual on methods of estimating population, Methods of Estimating Total Population For Current Dates, Manual 1, United Nation Publication, ST/SOA/Series A. POPULATION STUDIES, No. 10 Available at: http://www.un.org/esa/population/techcoop/DemEst/ (accessed 29 November 2014)

W. J. Deng, J. S. Zheng, X. H. Bi, J. M. Fu and M. H. Wong, Distribution of PBDEs in air particles from an electronic waste recycling site compared with Guangzhou and Hong Kong, South China, Environ Int. 33, pp. 1063- 1069

Yenita, & Widodo, L. (2020). Implementation of the electronic waste management to achieve environmental sustainability in Indonesia. *Proceedings of the 2nd Tarumanagara International Conference on the Applications of Social Sciences and Humanities (TICASH 2020)*. https://doi.org/10.2991/assehr.k.201209.160

Zoeteman, Bastiaan CJ, Harold R. Krikke, and Jan Venselaar, "Handling WEEE Waste Flows: On The Effectiveness of Producer Responsibility in A Globalizing World," The International Journal of Advanced Manufacturing Technology 47, no. 5-8 (2010): 415-436.